



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**NOTICE TO BIDDERS
AND
SPECIAL PROVISIONS**

**FOR CONSTRUCTION ON STATE HIGHWAY IN SAN BERNARDINO COUNTY IN SAN
BERNARDINO ON ROUTE 210 FROM 0.9 KM WEST TO 0.5 KM EAST OF ROUTE 210/215
SEPARATION AND ON ROUTE 215 FROM 0.2 KM SOUTH OF MASSACHUSSETTS
AVENUE OVERCROSSING TO UNIVERSITY PARKWAY UNDERCROSSING**

In District 08 On Route 210,215

Under

Bid book dated May 18, 2009

Standard Specifications dated 1999

Project Plans approved April 6, 2009

Standard Plans dated 2004

Identified by

Contract No. 08-4440U4

08-SBd-210,215-34.6/36.0,14.4/18.8

SPECIAL NOTICES

- The Department moved the Amendments to the Standard Specifications to the back of the book titled "Notice to Bidders and Special Provisions."
- The Department retitled the "Proposal and Contract" book to "Bid" book and:
 1. Simplified the language
 2. Moved clauses and the contract form from the "Proposal and Contract" book into the Amendments to the Standard Specifications
 3. Standardized the forms
- The Department retitled the "Notice to Contractors" to "Notice to Bidders" and:
 1. Simplified the language
 2. Moved clauses from the "Notice to Contractors" into the Amendments to the Standard Specifications
 3. Standardized instructions for bidders' inquiries
- The Department incorporated boilerplate special provisions into the Amendments to the Standard Specifications.
- The contract award period has been extended for this project.
- See Section 5 of the special provisions for new specifications regarding retentions.
- The Department is implementing new contract requirements for submittal of Small Business Utilization Report forms. See section titled "Small Business Utilization Report" of these special provisions and bid item list.

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STANDARD PLANS LIST

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

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| A77J1 | Metal Beam Guard Railing Connections to Bridge Railings without Sidewalks Details No. 1 |
| A77J2 | Metal Beam Guard Railing Connections to Bridge Railings without Sidewalks Details No. 2 |
| A77J3 | Metal Beam Guard Railing Connections to Abutments and Walls |
| A77J4 | Metal Beam Guard Railing Transition Railing (Type WB) |
| A77K1 | Metal Beam Guard Railing Connections to Bridge Railings with Sidewalks Details No. 1 |
| A77K2 | Metal Beam Guard Railing Connections to Bridge Railings with Sidewalks Details No. 2 |
| A77L1 | Metal Beam Railing Terminal System (Type SRT) |
| A77L2 | Metal Beam Railing Terminal System (Type SKT) |
| A77L3 | Metal Beam Railing Terminal System (Type ET) |
| A77L4 | Metal Beam Railing Terminal System (Type CAT) |
| A77L5 | Metal Beam Railing Terminal System (Type FLEAT) |
| A78A | Thrie Beam Barrier Standard Barrier Railing Section (Wood Post with Wood Block) |
| A78C1 | Thrie Beam Barrier – Standard Hardware Details |
| A78C2 | Thrie Beam Barrier Post And Block Details |
| A78F2 | Single Thrie Beam Barrier Connections to Bridge Railings without Sidewalks |
| A78H | Thrie Beam Barrier – Typical Layout for Connection to Bridge Railing |
| RSP A78I | Thrie Beam Barrier Connections to Concrete Barrier |
| A78K | Thrie Beam Barrier Transition Railing (Type DTB) |
| A82A1 | Crash Cushion (Type CAT) |
| A85 | Chain Link Fence |
| RSP A87A | Curbs and Driveways |
| A87B | Asphalt Concrete Dikes |
| RSP A88A | Curb Ramp Details |
| RSP P1 | Jointed Plain Concrete Pavement |
| RSP P2 | Jointed Plain Concrete Pavement – Widen Slab Details |
| RSP P10 | Concrete Pavement – Dowel Bar Details |
| RSP P12 | Concrete Pavement – Dowel Bar Basket Details |
| RSP P17 | Concrete Pavement – Tie Bar Basket Details |
| RSP P18 | Concrete Pavement – Lane Schematics and Isolation Joint Detail |
| RSP P20 | Concrete Pavement – Joint Details |
| P30 | Concrete Pavement – End Panel Pavement Transitions |
| NSP P33 | Concrete Pavement – Lane Drop Paving Details |
| P35 | Concrete Pavement – Ramp Gore Area Paving Details |
| P45 | Concrete Pavement – Drainage Inlet Details No. 1 |
| P46 | Concrete Pavement – Drainage Inlet Details No. 2 |
| D72 | Drainage Inlets |
| D73 | Drainage Inlets |
| D74A | Drainage Inlets |
| D74B | Drainage Inlets |

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| D74C | Drainage Inlets Details |
| D75A | Pipe Inlets |
| RSP D75B | Pipe Inlets |
| D75C | Pipe Inlets |
| RSP D77A | Grate Details |
| D77B | Bicycle Proof Grate Details |
| D78A | Gutter Depressions |
| D78B | Inlet Depressions – Portland Cement Concrete Shoulders |
| RSP D78C | Inlet Depressions – Asphalt Concrete Shoulders |
| D79 | Precast Reinforced Concrete Pipe – Direct Design Method |
| D80 | Cast-In-Place Reinforced Concrete Single Box Culvert |
| D81 | Cast-In-Place Reinforced Concrete Double Box Culvert |
| D82 | Cast-In-Place Reinforced Concrete Box Culvert Miscellaneous Details |
| D86B | Pipe Culvert Headwalls, Endwalls and Warped Wingwalls |
| D87A | Corrugated Metal Pipe Downdrain Details |
| D87B | Plastic Pipe Downdrain Details |
| D87C | Cable Anchorage System |
| D87D | Overside Drains |
| D88 | Construction Loads on Culverts |
| D89 | Pipe Headwalls |
| D90 | Pipe Culvert Headwalls, Endwalls and Wingwalls-Type A, B And C |
| D93A | Pipe Riser Connections |
| D93C | Pipe Riser with Debris Rack Cage |
| D94A | Metal and Plastic Flared End Sections |
| D94B | Concrete Flared End Sections |
| D97A | Corrugated Metal Pipe Coupling Details No. 1- Annular Coupling Band Bar And Strap and Angle Connections |
| D97C | Corrugated Metal Pipe Coupling Details No. 3- Helical and Universal Couplers |
| D97D | Corrugated Metal Pipe Coupling Details No. 4- Hugger Coupling Bands |
| RSP D97E | Corrugated Metal Pipe Coupling Details No. 5- Standard Joint |
| RSP D97F | Corrugated Metal Pipe Coupling Details No. 6- Positive Joint |
| RSP D97G | Corrugated Metal Pipe Coupling Details No. 7- Downdrain |
| D97H | Reinforced Concrete Pipe or Non-Reinforced Concrete Pipe-Standard and Positive Joints |
| NSP D97I | Corrugated Polyvinyl Chloride Pipe with Smooth Interior – Standard and Positive Joints |
| NSP D97J | Composite Steel Spiral Rib Pipe with Smooth Interior – Standard Joint |
| D98C | Grated Line Drain Details |
| H1 | Planting and Irrigation – Abbreviations |
| RSP H2 | Planting and Irrigation – Symbols |
| H7 | Planting and Irrigation Details |
| H8 | Planting and Irrigation Details |
| H9 | Planting and Irrigation Details |
| H10 | Irrigation Controller Enclosure Cabinet |
| RSP T1A | Temporary Crash Cushion, Sand Filled (Unidirectional) |
| RSP T1B | Temporary Crash Cushion, Sand Filled (Bidirectional) |
| RSP T2 | Temporary Crash Cushion, Sand Filled (Shoulder Installations) |
| T3 | Temporary Railing (Type K) |
| T4 | Temporary Traffic Screen |
| T5 | Temporary Terminal Section (Type K) |
| RSP T10 | Traffic Control System for Lane Closure on Freeways and Expressways |
| RSP T10A | Traffic Control System for Lane and Complete Closures on Freeways and Expressways |
| RSP T11 | Traffic Control System for Lane Closure on Multilane Conventional Highways |
| RSP T12 | Traffic Control System for Lane Closure on Multilane Conventional Highways |
| RSP T14 | Traffic Control System for Ramp Closure |
| RSP T15 | Traffic Control System for Moving Lane Closure on Multilane Highways |
| RSP T16 | Traffic Control System for Moving Lane Closure on Multilane Highways |

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| RSP T17 | Traffic Control System for Moving Lane Closure on Two Lane Highways |
| T51 | Temporary Water Pollution Control Details (Temporary Silt Fence) |
| T53 | Temporary Water Pollution Control Details (Temporary Cover) |
| T54 | Temporary Water Pollution Control Details (Temporary Erosion Control Blanket) |
| T55 | Temporary Water Pollution Control Details (Temporary Erosion Control Blanket) |
| T56 | Temporary Water Pollution Control Details (Temporary Fiber Roll) |
| T57 | Temporary Water Pollution Control Details (Temporary Check Dam) |
| T58 | Temporary Water Pollution Control Details (Temporary Construction Entrance) |
| T59 | Temporary Water Pollution Control Details (Temporary Concrete Washout Facility) |
| B0-1 | Bridge Details |
| B0-3 | Bridge Details |
| B0-5 | Bridge Details |
| B0-13 | Bridge Details |
| B3-1 | Retaining Wall Type 1 – H=1200 Through 9100 mm |
| B3-2 | Retaining Wall Type 1 – H=9700 Through 10 900 mm |
| B3-3 | Retaining Wall Type 1A |
| B3-7 | Retaining Wall Type 5 |
| B3-8 | Retaining Wall Details No. 1 |
| B3-9 | Retaining Wall Details No. 2 |
| RSP B6-21 | Joint Seals (Maximum Movement Rating = 50 mm) |
| B7-1 | Box Girder Details |
| B7-6 | Deck Drains – Types D-1 and D-2 |
| B7-7 | Deck Drains – Type D-3 |
| B7-8 | Deck Drainage Details |
| B7-10 | Utility Opening – Box Girder |
| B7-11 | Utility Details |
| RSP B8-5 | Cast-In-Place Prestressed Girder Details |
| B11-7 | Chain Link Railing |
| B11-47 | Cable Railing |
| B11-51 | Tubular Hand Railing |
| B11-52 | Chain Link Railing Type 7 |
| B11-54 | Concrete Barrier Type 26 |
| B11-55 | Concrete Barrier Type 732 |
| B11-56 | Concrete Barrier Type 736 |
| B11-57 | Concrete Barrier Type 742 |
| B14-3 | Communication and Sprinkler Control Conduits (Conduit Less Than Size 103) |
| B14-4 | Water Supply Line (Bridge) (Pipe Sizes Less Than NPS 4) |
| B14-5 | Water Supply Line (Details) (Pipe Sizes Less Than NPS 4) |
| B15-3 | Soundwall Masonry Block on Pile Cap Detail (1) |
| B15-4 | Soundwall Masonry Block on Pile Cap Detail (2) |
| B15-5 | Soundwall Masonry Block on Pile Cap Detail (3) |
| RSP B15-6 | Soundwall Masonry Block on Type 736S/SV Barrier Details (1) |
| RSP B15-7 | Soundwall Masonry Block on Type 736S/SV Barrier Details (2) |
| B15-8 | Soundwall Masonry Block on Type 736S/SV Barrier Details (3) |
| B15-9 | Soundwall Masonry Block Miscellaneous Details |
| B15-15 | Soundwall Masonry Block on Type 736S/SV Barrier on Pile Footing for Spanning Utilities |
| RS1 | Roadside Signs, Typical Installation Details No. 1 |
| RS2 | Roadside Signs - Wood Post, Typical Installation Details No. 2 |
| RS3 | Roadside Signs - Laminated Wood Box Post Typical Installation Details No. 3 |
| RS4 | Roadside Signs, Typical Installation Details No. 4 |
| RSP S1 | Overhead Signs – Truss, Instructions and Examples |
| RSP S2 | Overhead Signs – Truss, Single Post Type – Post Type II Thru IX |
| RSP S4 | Overhead Signs – Truss, Single Post Type – Structural Frame Members Details No. 1 |
| S5 | Overhead Signs – Truss, Single Post Type – Structural Frame Members Details No. 2 |
| RSP S6 | Overhead Signs – Truss, Gusset Plate Details |

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| RSP S7 | Overhead Signs – Truss, Single Post Type – Square Pedestal Foundation |
| RSP S8 | Overhead Signs – Truss, Single Post Type – Round Pedestal Foundation |
| RSP S9 | Overhead Signs – Truss, Two Post Type – Post Types I-S Thru VII-S |
| RSP S10 | Overhead Signs – Truss, Two Post Type – Base Plate and Anchorage Details |
| RSP S11 | Overhead Signs – Truss, Two Post Type – Structural Frame Members |
| RSP S13 | Overhead Signs – Truss, Frame Juncture Details |
| RSP S16 | Overhead Signs – Walkway Details No. 1 |
| RSP S17 | Overhead Signs – Walkway Details No. 2 |
| NSP S17A | Overhead Signs – Walkway Details No. 3 |
| RSP S20 | Overhead Signs – Steel Frames – Removable Sign Panel Frames |
| S21 | Overhead Signs – Removable Sign Panel Frames Mounting Details |
| RSP S30 | Overhead Signs – Tubular, Instructions and Examples |
| RSP S31 | Overhead Signs – Tubular, Single Post Type – Layout and Pipe Selection |
| RSP S32 | Overhead Signs – Tubular, Two Post Type – Layout and Pipe Selection |
| RSP S33 | Overhead Signs – Tubular, Structural Frame – Details No. 1 |
| RSP S34 | Overhead Signs – Tubular, Structural Frame – Details No. 2 |
| RSP S35 | Overhead Signs – Tubular, Single and Two Post Type – Base Plate and Anchorage Details |
| RSP S36 | Overhead Signs – Tubular, Single Post and Two Post Type – Square Pedestal Pile Foundation |
| RSP S37 | Overhead Signs – Tubular, Single Post and Two Post Type – Round Pedestal Pile Foundation |
| S81 | Overhead Laminated Sign – Single or Multiple Panel, Type A (25.4 mm Thick) |
| S82 | Roadside Laminated Sign – Single or Multiple Panel, Type B (25.4 mm Thick) |
| S83 | Roadside Laminated Sign – Single or Multiple Panel, Type B (63.5 mm Thick) |
| S84 | Roadside Laminated Sign – Single or Multiple Panel, Type H (63.5 mm Thick) |
| S85 | Seam Closure, "H" Section Extrusion and Post Spacing Tables, Multi – Horizontal Laminated Panel Aluminum Signs |
| S86 | Laminated Panel Details – Extrusions for Type A, B and H Panels |
| RSP S87 | Type A – 1 Mounting Hardware – Overhead Laminated Type A Panel, Truss and Lightweight Sign Structures |
| S88 | Type A – 2 Mounting Hardware – Overhead Laminated Type A Panel, Box Beam Closed Truss, Bridge Mounted and Tubular Sign Structures |
| S89 | Roadside Formed Single Sheet Aluminum Panel |
| S90 | Channel and Bolt Hole Location, Overhead Formed Sign Panel |
| S91 | Overhead Formed Sign Panel, Type A – 3 Mounting Hardware |
| S92 | Overhead Formed Sign Panel |
| S93 | Framing Details for Framed Single Sheet Aluminum Signs, Rectangular Shape |
| S94 | Roadside Single Sheet Aluminum Signs, Rectangular Shape |
| S95 | Roadside Single Sheet Aluminum Signs, Diamond Shape |
| RSP ES-1A | Electrical Systems (Symbols And Abbreviations) |
| RSP ES-1B | Electrical Systems (Symbols And Abbreviations) |
| RSP ES-1C | Electrical Systems (Symbols And Abbreviations) |
| RSP ES-2A | Electrical Systems (Service Equipment) |
| RSP ES-2C | Electrical Systems (Service Equipment Notes, Type III Series) |
| RSP ES-2E | Electrical Systems (Service Equipment and Typical Wiring Diagram, Type III – B Series) |
| RSP ES-2F | Electrical Systems (Service Equipment and Typical Wiring Diagram Type III – C Series) |
| RSP ES-3C | Electrical Systems (Controller Cabinet Details) |
| ES-4A | Electrical Systems (Signal Heads and Mountings) |
| ES-4B | Electrical Systems (Signal Heads and Mountings) |
| RSP ES-4C | Electrical Systems (Signal Heads and Mountings) |
| RSP ES-4D | Electrical Systems (Signal Heads and Mountings) |
| ES-4E | Electrical Systems (Signal Faces and Mountings) |
| RSP ES-5A | Electrical Systems (Detectors) |
| ES-5B | Electrical Systems (Detectors) |
| ES-5C | Electrical Systems (Detectors) |
| RSP ES-5D | Electrical Systems (Detectors) |

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| RSP ES-6A | Electrical Systems (Lighting Standard Types 15 and 21) |
| ES-6B | Electrical Systems (Lighting Standards Types 15 and 21, Barrier Rail Mounted Details) |
| RSP ES-6E | Electrical Systems (Lighting Standards Types 30 and 31) |
| ES-6F | Electrical Systems (Lighting Standards Types 30 and 31, Base Plate Details) |
| RSP ES-7A | Electrical Systems (Signal Standards Push Button Posts and Type 15TS Standard) |
| RSP ES-7B | Electrical Systems (Signal And Lighting Standard – Type 1 Standard and Equipment Numbering) |
| RSP ES-7E | Electrical Systems (Signal and Lighting Standard – Case 3 Arm Loading, Wind Velocity = 161 km/h, Arm Lengths 4.6 m to 13.7 m) |
| RSP ES-7F | Electrical Systems (Signal and Lighting Standard – Case 4 Arm Loading, Wind Velocity = 161 km/h, Arm Lengths 7.6 m to 13.7 m) |
| RSP ES-7M | Electrical Systems (Signal and Lighting Standards – Details No. 1) |
| ES-7N | Electrical Systems (Signal and Lighting Standards – Details No. 2) |
| ES-7O | Electrical Systems (Sign Illumination – Internally Illumination Street Name Sign) |
| RSP ES-7P | Electrical Systems (Pedestrian Barricades) |
| RSP ES-8 | Electrical Systems (Pull Box Details) |
| RSP ES-9A | Electrical Systems (Electrical Details, Structure Installations) |
| RSP ES-9B | Electrical Systems (Electrical Details, Structure Installations) |
| RSP ES-9C | Electrical Systems (Electrical Details, Structure Installations) |
| ES-9D | Electrical Systems (Electrical Details, Structure Installations) |
| ES-9E | Electrical Systems (Electrical Details, Structure Installations) |
| RSP ES-10 | Electrical Systems (Isolux Diagrams) |
| RSP ES-11 | Electrical Systems (Foundation Installations) |
| RSP ES-13A | Electrical Systems (Splicing Details) |
| RSP ES-13B | Electrical Systems (Wiring Details and Fuse Ratings) |
| RSP ES-14A | Electrical Systems (LED Extinguishable Message Sign, 250 mm Letter) |
| RSP ES-14B | Electrical Systems (LED Extinguishable Message Sign, Wiring Diagram) |
| RSP ES-14C | Electrical Systems (Extinguishable Message Sign and Flashing Beacons) |
| ES-15A | Electrical Systems (Sign Illumination Equipment) |
| RSP ES-15C | Electrical Systems (Sign Illumination Equipment) |
| RSP ES-15D | Electrical Systems (Lighting and Sign Illumination Control) |
| RSP ES-16A | Electrical Systems (Closed Circuit Television Pole Details) |

NOTICE TO BIDDERS

Bids open Thursday, August 20, 2009

Dated May 18, 2009

General work description: Widen freeways, construct bridges.

The Department will receive sealed bids for CONSTRUCTION ON STATE HIGHWAY IN SAN BERNARDINO COUNTY IN SAN BERNARDINO ON ROUTE 210 FROM 0.9 KM WEST TO 0.5 KM EAST OF ROUTE 210/215 SEPARATION AND ON ROUTE 215 FROM 0.2 KM SOUTH OF MASSACHUSETTS AVENUE OVERCROSSING TO UNIVERSITY PARKWAY UNDERCROSSING.

District-County-Route-Kilometer Post: 08-SBd-210,215-34.6/36.0,14.4/18.8

Contract No. 08-4440U4

The Contractor must have either a Class A 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 750 working days.

The estimated cost of the project is \$110,000,000.

No prebid meeting is scheduled for this project.

The Department will receive bids until 2:00 p.m. on the bid open date at 3347 Michelson Drive, Suite 100, Irvine, CA 92612-1692. Bids received after this time will not be accepted.

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

District office addresses are provided in the Standard Specifications.

Bidders' inquiries may be presented to the Department by following the instructions at:

http://www.dot.ca.gov/hq/esc/oe/project_status/bid_inq.html

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

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

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

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

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

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

DEPARTMENT OF TRANSPORTATION

RMY/KE

Contract No. 08-4440U4

COPY OF BID ITEM LIST

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|----------|-----------|---|-----------------|--------------------|
| 1 | 070012 | PROGRESS SCHEDULE (CRITICAL PATH METHOD) | LS | LUMP SUM |
| 2 | 070013 | SMALL BUSINESS UTILIZATION REPORT | EA | 13 |
| 3 | 070018 | TIME-RELATED OVERHEAD | WDAY | 750 |
| 4 | 016589 | BIOLOGICAL MONITOR | LS | LUMP SUM |
| 5 | 071322 | TEMPORARY FENCE (TYPE CL-1.8) | M | 170 |
| 6 | 071325 | TEMPORARY FENCE (TYPE ESA) | M | 350 |
| 7 | 074016 | CONSTRUCTION SITE MANAGEMENT | LS | LUMP SUM |
| 8 | 074019 | PREPARE STORM WATER POLLUTION PREVENTION PLAN | LS | LUMP SUM |
| 9 | 074027 | TEMPORARY EROSION CONTROL BLANKET | M2 | 5130 |
| 10 | 074028 | TEMPORARY FIBER ROLL | M | 16 800 |
| 11 | 074029 | TEMPORARY SILT FENCE | M | 4740 |
| 12 | 074031 | TEMPORARY GRAVEL BAG BERM | M | 690 |
| 13 | 074032 | TEMPORARY CONCRETE WASHOUT FACILITY | EA | 40 |
| 14 | 074033 | TEMPORARY CONSTRUCTION ENTRANCE | EA | 30 |
| 15 | 074034 | TEMPORARY COVER | M2 | 7410 |
| 16 | 074035 | TEMPORARY CHECK DAM | M | 970 |
| 17 | 074038 | TEMPORARY DRAINAGE INLET PROTECTION | EA | 130 |
| 18 | 074041 | STREET SWEEPING | LS | LUMP SUM |
| 19 | 074042 | TEMPORARY CONCRETE WASHOUT (PORTABLE) | LS | LUMP SUM |
| 20 | 074055 | TEMPORARY SOIL BINDER | M2 | 170 000 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|----------|-----------|--|-----------------|--------------------|
| 21 | 120090 | CONSTRUCTION AREA SIGNS | LS | LUMP SUM |
| 22 | 120100 | TRAFFIC CONTROL SYSTEM | LS | LUMP SUM |
| 23 | 016590 | FLASHING ARROW SIGN | EA | 2 |
| 24 | 120120 | TYPE III BARRICADE | EA | 50 |
| 25 | 120165 | CHANNELIZER (SURFACE MOUNTED) | EA | 1200 |
| 26 | 120182 | PORTABLE DELINEATOR | EA | 13 |
| 27 | 016591 | TEMPORARY TERMINAL SECTION (TYPE K MODIFIED) | EA | 4 |
| 28 | 128650 | PORTABLE CHANGEABLE MESSAGE SIGN | LS | LUMP SUM |
| 29 | 129000 | TEMPORARY RAILING (TYPE K) | M | 34 000 |
| 30 | 129100 | TEMPORARY CRASH CUSHION MODULE | EA | 910 |
| 31 | 129150 | TEMPORARY TRAFFIC SCREEN | M | 31 100 |
| 32 | 150206 | ABANDON CULVERT | M | 220 |
| 33 | 150305 | OBLITERATE SURFACING | M2 | 3130 |
| 34 | 150608 | REMOVE CHAIN LINK FENCE | M | 1260 |
| 35 | 016592 | REMOVE SINGLE THRIE BEAM BARRIER | M | 5200 |
| 36 | 150662 | REMOVE METAL BEAM GUARD RAILING | M | 970 |
| 37 | 150701 | REMOVE YELLOW PAINTED TRAFFIC STRIPE | M | 14 |
| 38 | 150704 | REMOVE YELLOW THERMOPLASTIC TRAFFIC STRIPE | M | 13 300 |
| 39 | 150711 | REMOVE PAINTED TRAFFIC STRIPE | M | 40 |
| 40 | 150714 | REMOVE THERMOPLASTIC TRAFFIC STRIPE | M | 15 000 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|----------|-----------|---|-----------------|--------------------|
| 41 | 150715 | REMOVE THERMOPLASTIC PAVEMENT MARKING | M2 | 44 |
| 42 | 150722 | REMOVE PAVEMENT MARKER | EA | 2450 |
| 43 | 150742 | REMOVE ROADSIDE SIGN | EA | 73 |
| 44 | 150744 | REMOVE ROADSIDE SIGN (WOOD POST) | EA | 28 |
| 45 | 150760 | REMOVE SIGN STRUCTURE | EA | 10 |
| 46 | 150804 | REMOVE DRAINAGE FACILITY | EA | 27 |
| 47 | 150806 | REMOVE PIPE | M | 560 |
| 48 | 150820 | REMOVE INLET | EA | 9 |
| 49 | 150821 | REMOVE HEADWALL | EA | 5 |
| 50 | 150829 | REMOVE RETAINING WALL | M | 310 |
| 51 | 150846 | REMOVE CONCRETE PAVEMENT | M2 | 29 100 |
| 52 | 150860 | REMOVE BASE AND SURFACING | M3 | 520 |
| 53 | 016594 | REMOVE ASPHALT CONCRETE V-DITCH | M3 | 69 |
| 54 | 016595 | RESET SURVEY MONUMENT | EA | 15 |
| 55 | 152291 | RESET GATE | EA | 1 |
| 56 | 152390 | RELOCATE ROADSIDE SIGN | EA | 12 |
| 57 | 152440 | ADJUST MANHOLE TO GRADE | EA | 11 |
| 58 | 152441 | ADJUST VALVE BOX FRAME AND COVER TO GRADE | EA | 16 |
| 59 | 153103 | COLD PLANE ASPHALT CONCRETE PAVEMENT | M2 | 2080 |
| 60 | 153213 | REMOVE CONCRETE (STRUCTURE) | M2 | 1330 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|----------|-----------|--|-----------------|--------------------|
| 61 | 153215 | REMOVE CONCRETE (CURB AND GUTTER) | M | 1640 |
| 62 | 153218 | REMOVE CONCRETE SIDEWALK | M | 1360 |
| 63 | 153220 | REMOVE CONCRETE (CHANNEL) | M3 | 32 |
| 64 | 153229 | REMOVE CONCRETE BARRIER (TYPE K) | M | 1630 |
| 65 | 153239 | REMOVE CONCRETE (CURB, GUTTER, AND SIDEWALK) | M3 | 450 |
| 66 | 153246 | REMOVE CONCRETE (MISCELLANEOUS) | M3 | 340 |
| 67 | 016596 | REMOVE CONCRETE (WALKWAY) | M3 | 18 |
| 68 | 155003 | CAP INLET | EA | 2 |
| 69 | 156535 | REMOVE BOX CULVERT | M | 15 |
| 70 | 156576 | REMOVE METAL RAILING | M | 530 |
| 71 | 156585 | REMOVE CRASH CUSHION | EA | 5 |
| 72 | 157551 | BRIDGE REMOVAL, LOCATION A | LS | LUMP SUM |
| 73 | 157552 | BRIDGE REMOVAL, LOCATION B | LS | LUMP SUM |
| 74 | 157553 | BRIDGE REMOVAL, LOCATION C | LS | LUMP SUM |
| 75 | 160101 | CLEARING AND GRUBBING | LS | LUMP SUM |
| 76 | 170101 | DEVELOP WATER SUPPLY | LS | LUMP SUM |
| 77 | 190101 | ROADWAY EXCAVATION | M3 | 190 000 |
| 78 | 190107 | ROADWAY EXCAVATION (TYPE Y-1) (AERIALY DEPOSITED LEAD) | M3 | 20 600 |
| 79 | 190108 | ROADWAY EXCAVATION (TYPE Y-2) (AERIALY DEPOSITED LEAD) | M3 | 12 100 |
| 80 | 190110 | LEAD COMPLIANCE PLAN | LS | LUMP SUM |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|-----------|-----------|--|-----------------|--------------------|
| 81 (F) | 192003 | STRUCTURE EXCAVATION (BRIDGE) | M3 | 6700 |
| 82 (F) | 192037 | STRUCTURE EXCAVATION (RETAINING WALL) | M3 | 10 745 |
| 83 (F) | 016597 | STRUCTURE EXCAVATION (RETAINING WALL) (TYPE Y-1 AERIALY DEPOSITED LEAD) | M3 | 1280 |
| 84 (F) | 016598 | STRUCTURE EXCAVATION (RETAINING WALL) (TYPE Y-2 AERIALY DEPOSITED LEAD) | M3 | 260 |
| 85 (F) | 193003 | STRUCTURE BACKFILL (BRIDGE) | M3 | 3890 |
| 86 (F) | 193013 | STRUCTURE BACKFILL (RETAINING WALL) | M3 | 16 780 |
| 87 (F) | 193031 | PERVIOUS BACKFILL MATERIAL (RETAINING WALL) | M3 | 1761 |
| 88 | 193114 | SAND BACKFILL | M3 | 220 |
| 89 | 198001 | IMPORTED BORROW | M3 | 141 000 |
| 90 | 200114 | ROCK BLANKET | M2 | 15 100 |
| 91 | 203001 | EROSION CONTROL (BLANKET) | M2 | 13 500 |
| 92 | 203016 | EROSION CONTROL (TYPE D) | HA | 15 |
| 93 | 203021 | FIBER ROLLS | M | 15 400 |
| 94 | 203026 | MOVE-IN/MOVE-OUT (EROSION CONTROL) | EA | 9 |
| 95 (F) | 208038 | NPS 3 SUPPLY LINE (BRIDGE) | M | 218 |
| 96 | 016599 | 40 MM WATER METER | EA | 6 |
| 97 | 208420 | BACKFLOW PREVENTER ASSEMBLY | EA | 6 |
| 98 | 208421 | BACKFLOW PREVENTER ASSEMBLY ENCLOSURE | EA | 6 |
| 99 | 208502 | 50 MM PLASTIC PIPE (SCHEDULE 40) (SUPPLY LINE) | M | 19 |
| 100 | 208743 | 250 MM CORRUGATED STEEL PIPE CONDUIT (1.63 MM THICK) | M | 110 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|----------|-----------|--|-----------------|--------------------|
| 101 | 208744 | 300 MM CORRUGATED STEEL PIPE CONDUIT (1.63 MM THICK) | M | 620 |
| 102 | 208800 | 300 MM WELDED STEEL PIPE CONDUIT (6.35 MM THICK) | M | 230 |
| 103 | 260201 | CLASS 2 AGGREGATE BASE | M3 | 20 900 |
| 104 | 280000 | LEAN CONCRETE BASE | M3 | 15 800 |
| 105 | 016600 | HOT MIX ASPHALT (TYPE A, BOND BREAKER) | TONN | 7460 |
| 106 | 390131 | HOT MIX ASPHALT | TONN | 50 000 |
| 107 | 394060 | DATA CORE | LS | LUMP SUM |
| 108 | 394074 | PLACE HOT MIX ASPHALT DIKE (TYPE C) | M | 400 |
| 109 | 394075 | PLACE HOT MIX ASPHALT DIKE (TYPE D) | M | 1710 |
| 110 | 394076 | PLACE HOT MIX ASPHALT DIKE (TYPE E) | M | 710 |
| 111 | 394077 | PLACE HOT MIX ASPHALT DIKE (TYPE F) | M | 720 |
| 112 | 394090 | PLACE HOT MIX ASPHALT (MISCELLANEOUS AREA) | M2 | 43 |
| 113 | 397005 | TACK COAT | TONN | 29 |
| 114 | 401000 | CONCRETE PAVEMENT | M3 | 28 200 |
| 115 | 401066 | CONCRETE PAVEMENT (RAMP TERMINI) | M3 | 820 |
| 116 | 404092 | SEAL PAVEMENT JOINT | M | 53 500 |
| 117 | 404094 | SEAL LONGITUDINAL ISOLATION JOINT | M | 510 |
| 118 | 490505 | FURNISH STEEL PILING (HP 250 X 62) | M | 1658 |
| 119 | 490506 | DRIVE STEEL PILE (HP 250 X 62) | EA | 136 |
| 120 | 490511 | FURNISH STEEL PILING (HP 250 X 85) | M | 1891 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|------------|-----------|--|-----------------|--------------------|
| 121 | 490512 | DRIVE STEEL PILE (HP 250 X 85) | EA | 161 |
| 122 | 041982 | FURNISH STEEL PILING (HP 310 X 110) | M | 1357 |
| 123 | 041983 | DRIVE STEEL PILE (HP 310 X 110) | EA | 90 |
| 124 | 490566 | FURNISH STEEL PILING (HP 360 X 132) | M | 10 532 |
| 125 | 490567 | DRIVE STEEL PILE (HP 360 X 132) | EA | 781 |
| 126 | 490657 | 600 MM CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 483 |
| 127 | 490669 | 2.1 M CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 91 |
| 128 | 490671 | 2.4 M CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 450 |
| 129 | 498027 | 400 MM CAST-IN-DRILLED-HOLE CONCRETE PILING (SOUND WALL) | M | 1080 |
| 130 | 500001 | PRESTRESSING CAST-IN-PLACE CONCRETE | LS | LUMP SUM |
| 131 (F) | 041984 | BALLAST | M3 | 122 |
| 132 (F) | 510051 | STRUCTURAL CONCRETE, BRIDGE FOOTING | M3 | 1782 |
| 133 (F) | 510053 | STRUCTURAL CONCRETE, BRIDGE | M3 | 17 628 |
| 134 (F) | 510060 | STRUCTURAL CONCRETE, RETAINING WALL | M3 | 5784 |
| 135 (F) | 510086 | STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N) | M3 | 577 |
| 136 (F) | 510413 | CLASS 1 CONCRETE (BOX CULVERT) | M3 | 96 |
| 137 (F) | 016601 | CLASS 1 CONCRETE (HEADWALLS) | M3 | 7 |
| 138 (F) | 510502 | MINOR CONCRETE (MINOR STRUCTURE) | M3 | 335 |
| 139 (F) | 510524 | MINOR CONCRETE (SOUND WALL) | M3 | 10 |
| 140 (F) | 511064 | FRACTURED RIB TEXTURE | M2 | 6401 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|------------|-----------|--|-----------------|--------------------|
| 141 | 517961 | SOUND WALL (BARRIER) (MASONRY BLOCK) | M2 | 1180 |
| 142 | 518002 | SOUND WALL (MASONRY BLOCK) | M2 | 1385 |
| 143 | 518050 | PTFE BEARING | EA | 5 |
| 144 | 518051 | PTFE SPHERICAL BEARING | EA | 10 |
| 145 | 519124 | JOINT SEAL ASSEMBLY (MR 60 MM) | M | 13 |
| 146 | 519125 | JOINT SEAL ASSEMBLY (MR 70 MM) | M | 13 |
| 147 | 519126 | JOINT SEAL ASSEMBLY (MR 80 MM) | M | 65 |
| 148 | 519127 | JOINT SEAL ASSEMBLY (MR 90 MM) | M | 12 |
| 149 | 519128 | JOINT SEAL ASSEMBLY (MR 100 MM) | M | 12 |
| 150 | 519129 | JOINT SEAL ASSEMBLY (MR 101 MM - 160 MM) | M | 56 |
| 151 | 519130 | JOINT SEAL ASSEMBLY (MR 161 MM - 240 MM) | M | 68 |
| 152 | 519142 | JOINT SEAL (MR 40 MM) | M | 25 |
| 153 (F) | 520101 | BAR REINFORCING STEEL | KG | 224 |
| 154 (F) | 520102 | BAR REINFORCING STEEL (BRIDGE) | KG | 4 485 900 |
| 155 (F) | 520103 | BAR REINFORCING STEEL (RETAINING WALL) | KG | 568 225 |
| 156 (F) | 520107 | BAR REINFORCING STEEL (BOX CULVERT) | KG | 5950 |
| 157 (F) | 520120 | HEADED BAR REINFORCEMENT | EA | 114 |
| 158 (F) | 560203 | FURNISH SIGN STRUCTURE (BRIDGE MOUNTED WITH WALKWAY) | KG | 1844 |
| 159 (F) | 560204 | INSTALL SIGN STRUCTURE (BRIDGE MOUNTED WITH WALKWAY) | KG | 1844 |
| 160 (F) | 560208 | FURNISH SIGN STRUCTURE (TUBULAR) | KG | 77 747 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|------------|-----------|--|-----------------|--------------------|
| 161 (F) | 560209 | INSTALL SIGN STRUCTURE (TUBULAR) | KG | 77 747 |
| 162 (F) | 560213 | FURNISH SIGN STRUCTURE (LIGHTWEIGHT) | KG | 9921 |
| 163 (F) | 560214 | INSTALL SIGN STRUCTURE (LIGHTWEIGHT) | KG | 9921 |
| 164 | 560234 | FURNISH LAMINATED PANEL SIGN (25.4 MM-TYPE A) | M2 | 250 |
| 165 | 560235 | FURNISH LAMINATED PANEL SIGN (25.4 MM-TYPE B) | M2 | 8 |
| 166 | 560238 | FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-UNFRAMED) | M2 | 53 |
| 167 | 560239 | FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-UNFRAMED) | M2 | 41 |
| 168 | 560241 | FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-FRAMED) | M2 | 10 |
| 169 | 560242 | FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-FRAMED) | M2 | 6.6 |
| 170 | 561008 | 760 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION) | M | 3.4 |
| 171 | 561009 | 920 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION) | M | 20 |
| 172 | 561015 | 1524 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION) | M | 110 |
| 173 | 562002 | METAL (BARRIER MOUNTED SIGN) | KG | 75 |
| 174 | 566011 | ROADSIDE SIGN - ONE POST | EA | 98 |
| 175 | 566012 | ROADSIDE SIGN - TWO POST | EA | 10 |
| 176 | 568001 | INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD) | EA | 8 |
| 177 | 016603 | PREPARE AND PAINT CONCRETE BARRIER SURFACES | M2 | 2570 |
| 178 | 620909 | 450 MM ALTERNATIVE PIPE CULVERT | M | 2260 |
| 179 | 620913 | 600 MM ALTERNATIVE PIPE CULVERT | M | 1230 |
| 180 | 620919 | 750 MM ALTERNATIVE PIPE CULVERT | M | 190 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|----------|-----------|---|-----------------|--------------------|
| 181 | 620924 | 900 MM ALTERNATIVE PIPE CULVERT | M | 400 |
| 182 | 620938 | 1350 MM ALTERNATIVE PIPE CULVERT | M | 46 |
| 183 | 650069 | 450 MM REINFORCED CONCRETE PIPE | M | 150 |
| 184 | 650075 | 600 MM REINFORCED CONCRETE PIPE | M | 63 |
| 185 | 650077 | 750 MM REINFORCED CONCRETE PIPE | M | 200 |
| 186 | 650079 | 900 MM REINFORCED CONCRETE PIPE | M | 27 |
| 187 | 650084 | 1200 MM REINFORCED CONCRETE PIPE | M | 32 |
| 188 | 650086 | 1350 MM REINFORCED CONCRETE PIPE | M | 56 |
| 189 | 650089 | 1500 MM REINFORCED CONCRETE PIPE | M | 120 |
| 190 | 664033 | 900 MM CORRUGATED STEEL PIPE (2.01 MM THICK) | M | 12 |
| 191 | 681066 | 150 MM PLASTIC PIPE | M | 180 |
| 192 | 700617 | DRAINAGE INLET MARKER | EA | 13 |
| 193 | 700659 | 900 MM CORRUGATED STEEL PIPE INLET (2.77 MM THICK) | M | 11 |
| 194 | 703233 | GRATED LINE DRAIN | M | 61 |
| 195 | 703287 | 1200 MM CORRUGATED STEEL PIPE RISER (2.01 MM THICK) | M | 1.8 |
| 196 | 041985 | NPS 12 WELDED STEEL PIPE CASING (BRIDGE) | M | 48 |
| 197 | 041986 | NPS 14 WELDED STEEL PIPE CASING (BRIDGE) | M | 48 |
| 198 | 041987 | NPS 18 WELDED STEEL PIPE CASING (BRIDGE) | M | 50 |
| 199 | 705336 | 450 MM ALTERNATIVE FLARED END SECTION | EA | 7 |
| 200 | 705337 | 600 MM ALTERNATIVE FLARED END SECTION | EA | 5 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|----------|-----------|---|-----------------|--------------------|
| 201 | 705338 | 750 MM ALTERNATIVE FLARED END SECTION | EA | 1 |
| 202 | 705339 | 900 MM ALTERNATIVE FLARED END SECTION | EA | 3 |
| 203 | 705340 | 1050 MM ALTERNATIVE FLARED END SECTION | EA | 1 |
| 204 | 705342 | 1350 MM ALTERNATIVE FLARED END SECTION | EA | 1 |
| 205 | 707133 | 900 MM PRECAST CONCRETE PIPE INLET | M | 9 |
| 206 | 707244 | 900 MM PRECAST CONCRETE PIPE MANHOLE | M | 1.6 |
| 207 | 721009 | ROCK SLOPE PROTECTION (FACING, METHOD B) | M3 | 51 |
| 208 | 721011 | ROCK SLOPE PROTECTION (BACKING NO. 2, METHOD B) | M3 | 10 |
| 209 | 721012 | ROCK SLOPE PROTECTION (BACKING NO. 3, METHOD B) | M3 | 18 |
| 210 | 721024 | ROCK SLOPE PROTECTION (1/4T, METHOD B) | M3 | 99 |
| 211 | 721810 | SLOPE PAVING (CONCRETE) | M3 | 230 |
| 212 (F) | 041988 | SLOPE PAVING (CONCRETE)(ROCK BLANKET) | M3 | 254 |
| 213 (F) | 041989 | SLOPE PAVING (CONCRETE PAVERS) | M3 | 189 |
| 214 | 727901 | MINOR CONCRETE (DITCH LINING) | M3 | 86 |
| 215 | 727905 | MINOR CONCRETE (CHANNEL LINING) | M3 | 140 |
| 216 | 729010 | ROCK SLOPE PROTECTION FABRIC | M2 | 470 |
| 217 | 731502 | MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION) | M3 | 850 |
| 218 | 731504 | MINOR CONCRETE (CURB AND GUTTER) | M3 | 210 |
| 219 | 731507 | MINOR CONCRETE (GUTTER DEPRESSION) | M3 | 3.5 |
| 220 | 731516 | MINOR CONCRETE (DRIVEWAY) | M3 | 120 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|------------|-----------|---|-----------------|--------------------|
| 221 | 731517 | MINOR CONCRETE (GUTTER) | M3 | 9 |
| 222 | 731519 | MINOR CONCRETE (STAMPED CONCRETE) | M3 | 87 |
| 223 | 731521 | MINOR CONCRETE (SIDEWALK) | M3 | 270 |
| 224 | 731623 | MINOR CONCRETE (CURB RAMP) | M3 | 21 |
| 225 (F) | 016604 | MISCELLANEOUS METAL (WATER QUALITY OUTLET RISER) | KG | 180 |
| 226 (F) | 750001 | MISCELLANEOUS IRON AND STEEL | KG | 23 300 |
| 227 (F) | 750041 | ISOLATION CASING | KG | 21 805 |
| 228 (F) | 750498 | MISCELLANEOUS METAL (RESTRAINER - CABLE TYPE) | KG | 5750 |
| 229 (F) | 750501 | MISCELLANEOUS METAL (BRIDGE) | KG | 1840 |
| 230 (F) | 750505 | BRIDGE DECK DRAINAGE SYSTEM | KG | 5872 |
| 231 | 016605 | WROUGHT IRON FENCE | M | 100 |
| 232 | 800391 | CHAIN LINK FENCE (TYPE CL-1.8) | M | 2020 |
| 233 | 802671 | 4.3 M CHAIN LINK GATE (TYPE CL-1.8) | EA | 4 |
| 234 | 802675 | 6.1 M CHAIN LINK GATE (TYPE CL-1.8) | EA | 1 |
| 235 | 810110 | SURVEY MONUMENT | EA | 10 |
| 236 | 820107 | DELINEATOR (CLASS 1) | EA | 160 |
| 237 | 832003 | METAL BEAM GUARD RAILING (WOOD POST) | M | 2280 |
| 238 (F) | 041990 | CHAIN LINK RAILING (TYPE 3 MODIFIED) | M | 288 |
| 239 (F) | 833032 | CHAIN LINK RAILING (TYPE 7) | M | 503 |
| 240 (F) | 041991 | CHAIN LINK RAILING (TYPE 6 MODIFIED) | M | 511 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|------------|-----------|---------------------------------------|-----------------|--------------------|
| 241 | 016606 | PORTABLE CONCRETE BARRIER (TYPE 60K) | M | 400 |
| 242 | 833085 | PIPE HANDRAILING | M | 610 |
| 243 (F) | 833088 | TUBULAR HANDRAILING | M | 208 |
| 244 | 833140 | CONCRETE BARRIER (TYPE 26) | M | 250 |
| 245 | 833141 | CONCRETE BARRIER (TYPE 26A) | M | 28 |
| 246 (F) | 833142 | CONCRETE BARRIER (TYPE 26 MODIFIED) | M | 937 |
| 247 (F) | 833143 | CONCRETE BARRIER (TYPE 26A MODIFIED) | M | 136 |
| 248 (F) | 041992 | CONCRETE BARRIER (TYPE 60R) | M | 145 |
| 249 | 839311 | DOUBLE THRIE BEAM BARRIER (WOOD POST) | M | 360 |
| 250 | 839521 | CABLE RAILING | M | 130 |
| 251 | 839541 | TRANSITION RAILING (TYPE WB) | EA | 20 |
| 252 | 839542 | TRANSITION RAILING (TYPE DTB) | EA | 2 |
| 253 | 839566 | TERMINAL SYSTEM (TYPE CAT) | EA | 1 |
| 254 | 839567 | TERMINAL SYSTEM (TYPE CAT) BACKUP | EA | 1 |
| 255 | 839581 | END ANCHOR ASSEMBLY (TYPE SFT) | EA | 23 |
| 256 | 839584 | ALTERNATIVE IN-LINE TERMINAL SYSTEM | EA | 7 |
| 257 | 839585 | ALTERNATIVE FLARED TERMINAL SYSTEM | EA | 26 |
| 258 | 839601 | CRASH CUSHION (TYPE CAT) | EA | 1 |
| 259 | 839602 | CRASH CUSHION (TYPE CAT) BACKUP | EA | 1 |
| 260 | 839701 | CONCRETE BARRIER (TYPE 60) | M | 2800 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|------------|-----------|--|-----------------|--------------------|
| 261 | 839703 | CONCRETE BARRIER (TYPE 60C) | M | 1970 |
| 262 | 839704 | CONCRETE BARRIER (TYPE 60D) | M | 200 |
| 263 | 839705 | CONCRETE BARRIER (TYPE 60E) | M | 90 |
| 264 (F) | 839717 | CONCRETE BARRIER (TYPE 732 MODIFIED) | M | 984 |
| 265 (F) | 839721 | CONCRETE BARRIER (TYPE 732A) | M | 6 |
| 266 | 839723 | CONCRETE BARRIER (TYPE 732B) | M | 160 |
| 267 | 016607 | CONCRETE BARRIER (TYPE 732B MODIFIED) | M | 42 |
| 268 | 839726 | CONCRETE BARRIER (TYPE 736A) | M | 1050 |
| 269 (F) | 839727 | CONCRETE BARRIER (TYPE 736 MODIFIED) | M | 174 |
| 270 (F) | 041993 | CONCRETE BARRIER (TYPE 736A MODIFIED) | M | 47 |
| 271 | 016608 | CONCRETE BARRIER (TYPE 736S) | M | 169 |
| 272 | 839731 | CONCRETE BARRIER (TYPE 736B) | M | 240 |
| 273 | 839734 | CONCRETE BARRIER (TYPE 736SV) | M | 270 |
| 274 | 839736 | CONCRETE BARRIER (TYPE 742A) | M | 95 |
| 275 | 839737 | CONCRETE BARRIER (TYPE 742B) | M | 160 |
| 276 (F) | 041994 | CONCRETE BARRIER (TYPE 742 MODIFIED) | M | 673 |
| 277 | 016609 | CONCRETE BARRIER (TYPE 60E MODIFIED) | M | 42 |
| 278 | 840515 | THERMOPLASTIC PAVEMENT MARKING | M2 | 800 |
| 279 | 840560 | THERMOPLASTIC TRAFFIC STRIPE (SPRAYABLE) | M | 68 100 |
| 280 | 840656 | PAINT TRAFFIC STRIPE (2-COAT) | M | 76 400 |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|----------|-----------|---|-----------------|--------------------|
| 281 | 840666 | PAINT PAVEMENT MARKING (2-COAT) | M2 | 220 |
| 282 | 850101 | PAVEMENT MARKER (NON-REFLECTIVE) | EA | 13 500 |
| 283 | 850111 | PAVEMENT MARKER (RETROREFLECTIVE) | EA | 12 100 |
| 284 | 860090 | MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION | LS | LUMP SUM |
| 285 | 860251 | SIGNAL AND LIGHTING (LOCATION 1) | LS | LUMP SUM |
| 286 | 860252 | SIGNAL AND LIGHTING (LOCATION 2) | LS | LUMP SUM |
| 287 | 860253 | SIGNAL AND LIGHTING (LOCATION 3) | LS | LUMP SUM |
| 288 | 860297 | SIGNAL AND LIGHTING (CITY) | LS | LUMP SUM |
| 289 | 860460 | LIGHTING AND SIGN ILLUMINATION | LS | LUMP SUM |
| 290 | 860703 | INTERCONNECTION CONDUIT AND CABLE | LS | LUMP SUM |
| 291 | 016610 | FIBER OPTIC CONDUIT 53C | M | 1150 |
| 292 | 016611 | FIBER OPTIC CONDUIT 41C | M | 400 |
| 293 | 016612 | FIBER OPTIC CONDUIT 103C | M | 4400 |
| 294 (F) | 860792 | COMMUNICATION CONDUIT (BRIDGE) | M | 218 |
| 295 | 860797 | ELECTRIC SERVICE (IRRIGATION) | LS | LUMP SUM |
| 296 | 860931 | TRAFFIC MONITORING STATION (LOCATION 1) | LS | LUMP SUM |
| 297 | 860932 | TRAFFIC MONITORING STATION (LOCATION 2) | LS | LUMP SUM |
| 298 | 860933 | TRAFFIC MONITORING STATION (LOCATION 3) | LS | LUMP SUM |
| 299 | 016613 | CLOSED CIRCUIT TELEVISION SYSTEM (LOCATION 2) | LS | LUMP SUM |
| 300 | 016614 | CLOSED CIRCUIT TELEVISION SYSTEM (LOCATION 3) | LS | LUMP SUM |

| Item No. | Item Code | Item Description | Unit of Measure | Estimated Quantity |
|----------|-----------|---|-----------------|--------------------|
| 301 | 016615 | CLOSED CIRCUIT TELEVISION SYSTEM (LOCATION 4) | LS | LUMP SUM |
| 302 | 016616 | CLOSED CIRCUIT TELEVISION SYSTEM (LOCATION 5) | LS | LUMP SUM |
| 303 | 016617 | CLOSED CIRCUIT TELEVISION SYSTEM (LOCATION 1) | LS | LUMP SUM |
| 304 | 016618 | CLOSED CIRCUIT TELEVISION SYSTEM (LOCATION 6) | LS | LUMP SUM |
| 305 | 861101 | RAMP METERING SYSTEM (LOCATION 1) | LS | LUMP SUM |
| 306 | 861102 | RAMP METERING SYSTEM (LOCATION 2) | LS | LUMP SUM |
| 307 | 861103 | RAMP METERING SYSTEM (LOCATION 3) | LS | LUMP SUM |
| 308 | 861104 | RAMP METERING SYSTEM (LOCATION 4) | LS | LUMP SUM |
| 309 | 861349 | REMOVE EXISTING SIGNAL SYSTEM | LS | LUMP SUM |
| 310 | 016619 | MODIFY COMMUNICATION SYSTEM | LS | LUMP SUM |
| 311 | 867014 | 12 SINGLEMODE FIBER OPTIC CABLE | M | 870 |
| 312 | 867017 | 48 SINGLEMODE FIBER OPTIC CABLE | M | 4580 |
| 313 | 016620 | 144 SINGLE MODE FIBER OPTIC CABLE | M | 4580 |
| 314 | 867130 | FIBER OPTIC SPLICE CLOSURE | EA | 10 |
| 315 | 016621 | MODIFY EXISTING COMMUNICATION HUB ASSEMBLY | LS | LUMP SUM |
| 316 | 016622 | MODIFY TRANSPORTATION MANAGEMENT CENTER | LS | LUMP SUM |
| 317 | 869047 | SPLICE VAULT | EA | 10 |
| 318 | 869075 | SYSTEM TESTING AND DOCUMENTATION | LS | LUMP SUM |
| 319 | 869080 | TRAINING | LS | LUMP SUM |
| 320 | 999990 | MOBILIZATION | LS | LUMP SUM |

SPECIAL PROVISIONS

SECTION 1 (BLANK)

SECTION 2 BIDDING

Reserved

SECTION 3 CONTRACT AWARD AND EXECUTION

3-1.01 CONTRACT AWARD

If the Department awards the Contract, the award is made to the lowest responsible bidder within 60 days.

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

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

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

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

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

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

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

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

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

Complete the work within 750 working days.

Liquidated damages are \$21,900 per day starting on the 1st day after exceeding 750 working days.

SECTION 5 GENERAL

5-1.01 PARTNERING DISPUTE RESOLUTION

The Department encourages the project team to exhaust the use of partnering in dispute resolution before engagement of an objective third party. Comply with Section 5-1.102, "Partnering," of the Standard Specifications.

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

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

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

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

5-1.02 RETENTION EXCLUSION

The Department does not retain moneys from progress payments due to the Contractor for work performed (Pub Cont Code § 7202). The 3rd paragraph in Section 9-1.06, "Partial Payments," of the Standard Specifications does not apply.

5-1.03 FORCE ACCOUNT PAYMENT

Payment for extra work at force account will be determined by either non-subcontracted or subcontracted force account payment unless otherwise specified.

Non-Subcontracted Force Account Payment

When extra work to be paid for on a force account basis is performed by the Contractor, compensation will be determined in accordance with Section 9-1.03, "Force Account Payment," of the Standard Specifications and these special provisions.

The second, third and fourth paragraphs of Section 9-1.03A, "Work Performed by Contractor," in the Standard Specifications, shall not apply.

Attention is directed to "Time-Related Overhead" of these special provisions.

To the total of the direct costs for work performed on a force account basis, computed as provided in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications, there will be added the following markups:

| Cost | Percent Markup |
|------------------|----------------|
| Labor | 28 |
| Materials | 10 |
| Equipment Rental | 10 |

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

The above markups, together with payments made for time-related overhead pursuant to "Time-Related Overhead" of these special provisions, shall constitute full compensation for all overhead costs for work performed on a force account basis. These overhead costs shall be deemed to include all items of expense not specifically designated as cost or equipment rental in conformance with the provisions in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications. The total payment made as provided above and in the first paragraph of Section 9-1.03A, "Work Performed by Contractor," of the Standard Specifications shall be deemed to be the actual cost of the work performed on a force account basis, and shall constitute full compensation therefor.

Full compensation for overhead costs for work performed on a force account basis, and for which no adjustment is made to the quantity for time-related overhead conforming to the provisions in "Time-Related Overhead" of these special provisions, shall be considered as included in the markups specified above, and no additional compensation will be allowed therefor.

Subcontracted Force Account Payment

When extra work to be paid for on a force account basis is performed by a subcontractor approved in conformance with the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, compensation will be determined in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

5-1.04 RESPONSIBILITY TO OTHER ENTITIES

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person including, but not limited to, workers and the public or damage to property, and shall indemnify and save harmless any county, city or district, its officers and employees connected with the work, within the limits of which county, city or district the work is being performed, all in the same manner and to the same extent conforming to the provisions in Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications, for the protection of the State of California and all officers and employees thereof connected with the work.

5-1.05 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

The provisions of this section shall apply only to the following contract items:

| ITEM CODE | ITEM |
|-----------|--|
| 390131 | HOT MIX ASPHALT (TYPE A) |
| 397005 | TACK COAT |
| 016600 | HOT MIX ASPHALT (TYPE A, BOND BREAKER) |

The compensation payable for asphalt binder used in hot mix asphalt and tack coat will be increased or decreased in conformance with the provisions of this section for asphalt binder price fluctuations exceeding 10 percent (Iu/Ib is greater than 1.10 or less than 0.90) which occur during performance of the work.

The quantity of asphalt binder used in tack coat will be determined by multiplying the item quantity for asphaltic tack coat included in a monthly estimate by the minimum percent residue specified in Section 94, "Asphaltic Emulsions," of the Standard Specifications. The asphaltic emulsion minimum percent residue will be based on the type of emulsion used by the Contractor.

At the Contractor's option, the Contractor may provide actual daily test results for asphalt binder residue for the tack coat used. Test results provided by the Contractor shall be from an independent testing laboratory that participates in the AASHTO Proficiency Sample Program. The Contractor shall take samples of asphaltic emulsion from the distributor truck at mid-load from a sampling tap or thief. Two separate 2-liter samples shall be taken in the presence of the Engineer. The Contractor shall provide one sample to the Contractor's independent testing laboratory within 24 hours of sampling. The second sample shall be given to the Engineer. The test results from the Contractor's independent testing laboratory shall be delivered to the Engineer within 10 days from sample date.

The adjustment in compensation will be determined in conformance with the following formulae when the item of hot mix asphalt or tack coat or both are included in a monthly estimate:

- A. Total monthly adjustment = AQ
- B. For an increase in asphalt binder price index exceeding 10 percent:

$$A = 0.90 (1.1023) (Iu/Ib - 1.10) Ib$$

- C. For a decrease in asphalt binder price index exceeding 10 percent:

$$A = 0.90 (1.1023) (Iu/Ib - 0.90) Ib$$

- D. Where:

A = Adjustment in dollars per tonne of asphalt binder used to produce hot mix asphalt and asphaltic emulsion residue used as tack coat rounded to the nearest \$0.01.

Iu = The California Statewide Paving Asphalt Price Index which is in effect on the first business day of the month within the pay period in which the quantity subject to adjustment was included in the estimate.

Ib = The California Statewide Paving Asphalt Price Index for the month in which the bid opening for the project occurred.

Q = Quantity in tonnes of asphalt binder that was used in producing the quantity of hot mix asphalt shown under "This Estimate" on the monthly estimate using the amount of asphalt binder determined by the Engineer plus the quantity in tonnes of asphalt binder that would have been used as residue in the tack coat shown under "This Estimate" on the monthly estimate.

The adjustment in compensation will also be subject to the following:

- A. The compensation adjustments provided herein will be shown separately on payment estimates. The Contractor shall be liable to the State for decreased compensation adjustments and the Department may deduct the amount thereof from moneys due or that may become due the Contractor.
- B. Compensation adjustments made under this section will be taken into account in making adjustments in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.
- C. In the event of an overrun of contract time, adjustment in compensation for asphalt binder included in estimates during the overrun period will be determined using the California Statewide Paving Asphalt Price Index in effect on the first business day of the month within the pay period in which the overrun began.

The California Statewide Paving Asphalt Price Index is determined each month on the first business day of the month by the Department using the median of posted prices in effect as posted by Chevron, ExxonMobil, and Union 76 for the Buena Vista, Huntington Beach, and Midway Sunset fields.

In the event that the companies discontinue posting their prices for a field, the Department will determine an index from the remaining posted prices. The Department reserves the right to include in the index determination the posted prices of additional fields.

The California Statewide Paving Asphalt Price Index is available on the Division of Engineering Services website at:

http://www.dot.ca.gov/hq/esc/oe/asphalt_index/astable.html

5-1.06 AREAS FOR CONTRACTOR'S USE

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

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

No State-owned parcels adjacent to the right of way are available for the exclusive use of the Contractor within the contract limits. The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials, or for other purposes.

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

The Contractor shall obtain encroachment permits prior to occupying State-owned parcels outside the contract limits. The required encroachment permits may be obtained from the Department of Transportation, Permit Engineer, 655 West 2nd Street, San Bernardino California, 92401-1400, Telephone (909) 383-4526.

Residence trailers will not be allowed within the highway right of way, except that one trailer will be allowed for yard security purposes.

The Contractor shall remove equipment, materials, and rubbish from the work areas and other State-owned property which the Contractor occupies. The Contractor shall leave the areas in a presentable condition in conformance with the provisions in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials or for other purposes, if sufficient area is not available to the Contractor within the contract limits, or at the sites designated on the plans outside the contract limits.

5-1.07 PAYMENTS

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

- A. Prestressing Steel for Cast-in-Place Members (Sealed Packages only)
- B. Prestressing Ducts and Anchorages
- C. Steel Piling
- D. PTFE Bearings
- E. PTFE Spherical Bearings
- F. Type B Joint Seals

- G. Joint Seal Assemblies
- H. Bar Reinforcing Steel
- I. Welded Steel Pipes
- J. Corrugated Steel Pipe Conduit
- K. Isolation Casings
- L. Miscellaneous Bridge Metal
- M. Bridge Deck Drainage Systems
- N. Railings
- O. Backflow Preventer Assemblies
- P. Backflow Preventer Assembly Enclosure
- Q. Piling
- R. Tieback Anchors
- S. Sound Wall (Masonry Block, Precast Concrete, Panels, Timber)
- T. Metal Sign Structures
- U. Culvert Pipe
- V. Miscellaneous Iron and Steel
- W. Miscellaneous Metal
- X. Fences and Gates
- Y. Metal Beam Guard Railing (MBGR)
- Z. MBGR (End Treatment)
- AA. Crash Cushions
- AB. Pavement Markers
- AC. Lighting Fixtures
- AD. Signal and Lighting Standards
- AE. Signal Heads and Mounting Brackets
- AF. Camera Assemblies
- AG. Fiber Optic Cable
- AH. Fiber Optic Conduit
- AI. Luminaires
- AJ. 334 Cabinets (CCTV and TMS)
- AK. Twisted Pair Cable
- AL. Splice Vaults
- AM. Innerducts
- AN. Sign Lighting Fixtures

5-1.08 SUPPLEMENTAL PROJECT INFORMATION

The Department makes the following supplemental project information available:

Supplemental Project Information

| Means | Description |
|---|---|
| Included in the Information Handout | <p>1. Department of Fish and Game Permit 2. U.S Army Corps of Engineers Permit 4. CA Regional Water Quality Board Permit 5. San Bernardino County Flood Control District 6. Geotechnical Design Report 7. Materials Report</p> <p>Segment 5:</p> <p>1. Final Foundation Report, Massachusetts Avenue Overcrossing (Replace), Br. No. 54-1265, San Bernardino, California, prepared by Earth Mechanics, Inc., dated February 18, 2008</p> <p>2. Final Foundation Report, Highland Avenue Overcrossing (Replace), Br. No. 54-1266, San Bernardino, California, prepared by Earth Mechanics, Inc., dated February 18, 2008</p> <p>3. Final Foundation Report, Retaining Wall No. 54E-0030, I-215 Segment 5, San Bernardino, California, prepared by Earth Mechanics, Inc., dated March 13, 2008</p> <p>Segment 11:</p> <p>1. "Structure Foundation Report, NW Connector, Route 210, Segment 11 Project, San Bernardino County, California, SR-210 KP R33.1/36.9, I-215 KP 14.3/18.7, Contract No. 08-444001", prepared by Group Delta Consultants, Inc., dated January 21, 2003, and "Addendum No. 1", dated August 4, 2006, and "Addendum No. 2", dated November 6, 2008.</p> <p>2. "Revised Final Foundation Report, 27th Street Overcrossing (Replace), Bridge No. 54-1221, San Bernardino County, California, 08-SBd-215, KP 15.62, CU 08236, EA 444071", prepared by Earth Mechanics, Inc., dated December 16, 2003.</p> <p>3. "Final Structure Foundation Report, E210-S215 Conn/S215-27th St Offramp Sep (ES Connector – TW4 Ramp Separation), Route 210 Segment 11 Project, San Bernardino County, California, SR-210 KP R33.1/37.5, Contract No. 08-444001", prepared by Group Delta Consultants, Inc., dated January 7, 2003 and August 5, 2003.</p> <p>4. "Final Structure Foundation Report, Cajon Boulevard Overhead (ES), Route 210, Segment 11 Project, San Bernardino County, California, SR-210 KP R33.1/36.9, I-215 KP 14.3/18.7, Contract No. 08-444001", prepared by Group Delta Consultants, Inc., dated January 16, 2003, Revised August 5, 2003.</p> |
| Available for inspection at the District Office | <p>1. Cross sections 2. Aerially Deposited Lead Investigation Report</p> |
| Available as specified in the Standard Specifications | Bridge as-built drawings |

5-1.09 SOUND CONTROL REQUIREMENTS

Sound control shall conform to the provisions in Section 7-1.01I, "Sound Control Requirements," of the Standard Specifications and these special provisions.

The noise level from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBA at a distance of 15 m. This requirement shall not relieve the Contractor from responsibility for complying with local ordinances regulating noise level.

The noise level requirement shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

5-1.10 PROJECT APPEARANCE

The Contractor shall maintain a neat appearance to the work.

In areas visible to the public, the following shall apply:

- A. When practicable, broken concrete and debris developed during clearing and grubbing shall be disposed of concurrently with its removal. If stockpiling is necessary, the material shall be removed or disposed of weekly.
- B. Trash bins shall be furnished for debris from structure construction. Debris shall be placed in trash bins daily. Forms or falsework that are to be re-used shall be stacked neatly concurrently with their removal. Forms and falsework that are not to be re-used shall be disposed of concurrently with their removal.

Full compensation for conforming to the provisions in this section, not otherwise provided for, shall be considered as included in prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

5-1.11 RELATIONS WITH CALIFORNIA DEPARTMENT OF FISH AND GAME

A portion of this project is located within the jurisdiction of the California Department of Fish and Game. An agreement regarding a stream or lake has been entered into by the Department of Transportation and the Department of Fish and Game. The Contractor shall be fully informed of the requirements of this agreement as well as rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly.

Copies of the agreement may be obtained at the Department of Transportation, Plans and Bid Documents Section, MS 26, 1120 N Street, Room 200, Sacramento, CA 95814, Telephone (916) 654-4490, and are available for inspection at the office of the District Director of Transportation at 464 W. 4th Street San Bernardino, CA 92401.

It is unlawful for any person to divert, obstruct or change the natural flow of the bed, channel or bank of a stream, river or lake without first notifying the Department of Fish and Game, unless the project or activity is noticed and constructed in conformance with conditions imposed under Fish and Game Code Section 1602.

Attention is directed to Sections 7-1.01, "Laws to be Observed," 7-1.01G, "Water Pollution," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

Modifications to the agreement between the Department of Transportation and the Department of Fish and Game which are proposed by the Contractor shall be submitted in writing to the Engineer for transmittal to the Department of Fish and Game for their consideration.

When the Contractor is notified by the Engineer that a modification to the agreement is under consideration, no work shall be performed which is inconsistent with the original agreement or proposed modification until the Departments take action on the proposed modifications. Compensation for delay will be determined in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Modifications to any agreement between the Department of Transportation and the Department of Fish and Game will be fully binding on the Contractor. The provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

5-1.12 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

This project lies within the boundaries of the Santa Ana Regional Water Quality Control Board (RWQCB).

The State Water Resources Control Board (SWRCB) has issued to the Department a permit that governs storm water and non-storm water discharges from the Department's properties, facilities, and activities. The Department's permit is entitled "Order No. 99 - 06 - DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System (NPDES) Permit,

Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans)." Copies of the Department's permit are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254, and may also be obtained at:

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

The Department's permit references and incorporates by reference the current statewide general permit issued by the SWRCB entitled "Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activity" that regulates discharges of storm water and non-storm water from construction activities disturbing one acre or more of soil in a common plan of development. Sampling and analysis requirements as specified in SWRCB Resolution No. 2001-46 are added to the statewide general permit. Copies of the statewide permit and modifications thereto are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254 and may also be obtained at:

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

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

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

The Contractor shall know and comply with provisions of Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from the project site and areas of disturbance outside the project limits during construction. Attention is directed to Sections 7-1.01, "Laws to be Observed," 7-1.11, "Preservation of Property," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The Contractor shall be responsible for penalties assessed on the Contractor or the Department as a result of the Contractor's failure to comply with the provisions in "Water Pollution Control" of these special provisions or with the applicable provisions of the Federal, State, and local regulations and requirements.

Penalties as used in this section shall include fines, penalties, and damages, whether proposed, assessed, or levied against the Department or the Contractor, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Quality Control Act, by governmental agencies or as a result of citizen suits. Penalties shall also include payments made or costs incurred in settlement for alleged violations of applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

WITHHOLDS

The Department will withhold money due the Contractor, in an amount estimated by the Department, to include the full amount of penalties and mitigation costs proposed, assessed, or levied as a result of the Contractor's violation of the permits, or Federal or State law, regulations, or requirements. Funds will be withheld by the Department until final disposition of these costs has been made. The Contractor shall remain liable for the full amount until the potential liability is finally resolved with the entity seeking the penalties. Instead of the withhold, the Contractor may provide a suitable bond in favor of the Department to cover the highest estimated liability for any disputed penalties proposed as a result of the Contractor's violation of the permits, law, regulations, or requirements.

If a regulatory agency identifies a failure to comply with the permits and modifications thereto, or other Federal, State, or local requirements, the Department will withhold money due the Contractor, subject to the following:

- A. The Department will give the Contractor 30 days notice of the Department's intention to withhold funds from payments which may become due to the Contractor before acceptance of the contract. Funds withheld after acceptance of the contract will be made without prior notice to the Contractor.
- B. No withholds of additional amounts out of payments will be made if the amount to be withheld does not exceed the amount being withheld from partial payments in accordance with Section 9-1.06, "Partial Payments," of the Standard Specifications.
- C. If the Department has withheld funds and it is subsequently determined that the State is not subject to the entire amount of the costs and liabilities assessed or proposed in connection with the matter for which the withhold was made, the Department will return the excess amount withheld to the Contractor in the progress payment following the determination. If the matter is resolved for less than the amount withheld, the Department will pay interest at a rate of 6 percent per year on the excess withhold.

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

5-1.13 RELATIONS WITH SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

A portion of this project is located within the jurisdiction of the San Bernardino County Flood Control District. The San Bernardino County Flood Control District has issued to the Department a permit (No. P-22008036). The Contractor shall be fully informed of this permit as well as the rules, regulations and conditions that may govern his operations in the area and shall conduct the work accordingly.

Copies of the permit may be obtained at the Department of Transportation, Plans and Bid Documents Section, MS 26, 1120 N Street, Room 200, Sacramento, CA 95814, Telephone (916) 654-4490, and are available for inspection at the office of the District Director of Transportation at 464 W 4th Street, San Bernardino, CA 92401.

The Contractor shall notify the Engineer 5 days in advance of any planned work under this permit. The Contractor shall maintain a copy of the permit at the project site and shall make it available during construction.

Attention is directed to Sections 7-1.01, "Laws to be Observed," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

Modifications to the permit between the Department and the San Bernardino County Flood Control District, which are proposed by the Contractor, shall be submitted in writing to the Engineer for transmittal to the San Bernardino County Flood Control District for their consideration.

When the Contractor is notified by the Engineer that a modification to the permit is under consideration, no work shall be performed which is inconsistent with the original permit or proposed modification until the Department and the San Bernardino County Flood Control District take action on the proposed modifications. Compensation for delay will be determined in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Modifications to permit between the Department and the San Bernardino County Flood Control District will be fully binding on the Contractor. The provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

5-1.14 RELATIONS WITH UNITED STATES ARMY CORPS OF ENGINEERS

A portion of this project is located within the jurisdiction of the United States Army Corps of Engineers. The Contractor shall be fully informed of the requirements and all rules, regulations and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly.

Copies of the permit may be obtained at the Department of Transportation, Plans and Bid Documents Section, MS 26, 1120 N Street, Room 200, Sacramento, CA 95814, Telephone (916) 654-4490, and are available for inspection at the office of the District Director of Transportation at 464 W 4th Street, San Bernardino, CA 92401.

Modifications to the permit between the Department and the United States Army Corps of Engineers, which are proposed by the Contractor, shall be submitted in writing to the Engineer for transmittal to the United States Army Corps of Engineers for their consideration.

When the Contractor is notified by the Engineer that a modification to the permit is under consideration, no work shall be performed which is inconsistent with the original permit or proposed modification until the Department and the United States Army Corps of Engineers take action on the proposed modifications. Compensation for delay will be determined in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Modifications to permit between the Department and the United States Army Corps of Engineers will be fully binding on the Contractor. The provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

5-1.15 BIRD PROTECTION

GENERAL

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

Nesting or attempted nesting by migratory and nongame birds is anticipated to occur but is not limited to March 1 through September 1.

QUALITY ASSURANCE

Regulatory requirements

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

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

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

Permits are included in the Project Information handout.

CONSTRUCTION

When migratory or nongame bird nests are discovered which may be adversely affected by construction activity, or when a bird is found injured or killed as a result of construction activity, immediately stop work within 16 meters of the nest or bird and notify the Engineer. Work must not resume until the Engineer provides written notification that work may resume at that location.

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

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

MEASUREMENT AND PAYMENT

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

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

5-1.16 BIOLOGICAL MONITOR

Summary

You shall retain, and have on the project site, an authorized biologist for all activities identified in Endangered Species and Wildlife Protection of these special provisions.

You shall submit the name of your biologist to the California Department of Fish and Game (CDFG) and the Engineer at least 30 days prior to the performance of work activities for approval. Approval of the biologist by the resource agencies and the Department of Transportation is required prior to performing any work.

Definitions

Qualified biologist: a person, with appropriate education, training and experience to conduct endangered species surveys, monitor project activities, provide worker education programs, and supervise or perform other implementing actions.

Authorized biologist: a person, approved by the United States Fish and Wildlife Service, authorized to handle protected species in addition to performing the duties of a qualified biologist.

Endangered species: any animal species listed or nominated for listing as protected, threatened, or endangered by the California Department of Fish and Game and the United States Fish and Wildlife Service.

Monitoring Log: a written and typed record containing the name of the biologist, a description of activities being performed by the Contractor, an evaluation of the ESA fence, a description of any night lighting used, and any observation of or activity pertaining to permits on the project site. Each monitoring log must contain at least one digital photograph of a project feature relevant to Endangered Species Protection on this project.

Work shift: each 8 hour period, or portion thereof, within a 24 hour day.

Submittals

Submit to the Engineer the name, business address, telephone number and qualifications of the proposed qualified authorized biologist within 5 days after approval of the contract. The Engineer has 5 days, from receipt of the submittal, to approve or reject the proposed designated biologist.

Monitoring Log

The Monitoring Log shall be submitted electronically and in signed, hard copy within 30 days of the date reported.

The log must be submitted in paper and electronic formats. Software used to prepare the log must be compatible with the current version of the Windows operating system and document processing software in use by the Engineer.

No later than 7 days after completion of construction, but prior to contract acceptance, your biologist shall prepare a summary report for the District Biologist at Caltrans CM3 Unit as stated in the Habitat Mitigation and Monitoring Plan. Two copies of this report shall be submitted to the Engineer prior to contract acceptance.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for biological monitor shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in retaining a biologist, preparing reports, and conforming to the provisions of the Standard Specifications and these special provisions.

5-1.17 AERIALY DEPOSITED LEAD

Aerially deposited lead is present within the project limits. Aerially deposited lead is lead deposited within unpaved areas or formerly unpaved areas, primarily due to vehicle emissions.

Attention is directed to "Material Containing Aerially Deposited Lead" and "Project Information" of these special provisions.

The complete report, entitled "Aerially Deposited Lead_(ADL) Investigation Report Segment 5 08-SBd-215-KP 14.2/16.3 State Route 215 San Bernardino, CA October 4, 2005, Aerial Lead Investigation Highland Avenue dated April 23, 2002, and Report of Aerially Deposited Lead Investigation State Route 210, Segment 11, Contract 3 Project dated July 18, 2008" is available for inspection at the Department of Transportation, District 8, Environmental Engineering, 464 W. 4th Street., San Bernardino, CA 92401.

The Department has received from the California Department of Toxic Substances Control (DTSC) a Variance regarding the use of material containing aerially deposited lead. This project is subject to the conditions of the Variance, as amended. The Variance is available for inspection at the Department of Transportation, District 8, Environmental Engineering, 464 W. 4th Street, San Bernardino, CA 92401.

Once the Contractor has completed the placement of material containing aerially deposited lead in conformance with these special provisions and as directed by the Engineer, the Contractor shall have no responsibility for such materials. The Department will not consider the Contractor a generator of such contaminated materials.

Excavation, reuse, and disposal of material with aerially deposited lead shall be in conformance with all rules and regulations including, but not limited to, those of the following agencies:

- A. United States Department of Transportation,
- B. United States Environmental Protection Agency,
- C. California Environmental Protection Agency,
- D. California Department of Health Services,
- E. Department of Toxic Substances Control,
- F. California Division of Occupational Safety and Health Administration,
- G. Integrated Waste Management Board,
- H. Regional Water Quality Control Board, Region 8, Santa Ana Region,
- I. State Air Resources Control Board, and
- J. South Coast Air Quality Management District.

Materials containing hazardous levels of lead shall be transported and disposed of in conformance with Federal and State laws and regulations, as amended, and county and municipal ordinances and regulations, as amended. Laws and regulations that govern this work include, but are not limited to:

- A. Health and Safety Code, Division 20, Chapter 6.5 (California Hazardous Waste Control Act),
- B. Title 22, California Code of Regulations, Division 4.5 (Environmental Health Standards for the Management of Hazardous Waste), and
- C. Title 8, California Code of Regulations.

5-1.18 ENVIRONMENTALLY SENSITIVE AREA

An environmentally sensitive area (ESA) exists within or near the limits of the job site where access is limited or prohibited.

The ESA boundaries shown are approximate; the Department marks the exact ESA boundaries on the ground.

Before starting work, protect the ESA by installing temporary fence (Type ESA).

Do not enter the ESA unless authorized. Vehicle access, storage or transport of materials or equipment, or other job related activities are prohibited within the boundaries of the ESA.

If you damage the ESA, the Department determines the efforts necessary to mitigate the damage. If the Engineer

determines mitigation work will be performed by others or if mitigation fees are assessed on the Department, you are responsible for mitigation costs and fees.

5-1.19 AIR QUALITY – BASIC NESHAP ASBESTOS NOTIFICATION

In compliance with Standard Specifications Section 7-1.01F, the Contractor shall notify the air pollution control district or air quality management district identified below as required by the National Emission Standards for Hazardous Air Pollutants (NESHAP) at 40 CFR Part 61, Subpart M, and California Health and Safety Code section 39658(b)(1). A copy of the notification form and attachments shall be provided to the Engineer prior to submittal. Notification shall take place a minimum of 10 working days prior to starting demolition or renovation activities as defined in the NESHAP regulations.

The Contractor shall mail or otherwise deliver the original notification form with any necessary attachments to:

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
 Asbestos Notifications
 File #55641
 Los Angeles, CA 900704-5641

The Contractor shall also notify other local permit agencies and utility companies prior to starting any demolition activities.

Full compensation for complying with requirements of this section shall be considered as included in the contract price paid for the items involved, and no additional compensation will be allowed therefor.

5-1.20 NONHIGHWAY FACILITIES (INCLUDING UTILITIES)

The utility owner will relocate a utility shown in the following table before the corresponding date shown:

| Utility Relocation and Date of the Relocation | | |
|--|-------------------------------------|-------------|
| Utility | Location | Date |
| Irrigation Water Meter Adjust To Grade (SBMWD) | Massachusetts Ave (E5) Sta 145+76.1 | 5/1/09 |
| Water Valve Adjust To Grade (SBMWD) | Massachusetts Ave (E5) Sta 145+78.2 | 5/1/09 |
| Relocate 300mm Water Line (SBMWD) | I-215 (G) Sta 151+29.9 | 5/1/09 |
| Relocate 300mm Water Line (SBMWD) | I-215 (F) Sta 150+55.8 | 5/1/09 |
| Relocate Water Valve (SBMWD) | I-215 (F) Sta 151+04.7 | 5/1/09 |
| Relocate 300mm Water Line (SBMWD) | I-215 (F) Sta 150+84.2 | 5/1/09 |
| Relocate 300mm Water Line (SBMWD) | Highland Ave (HH) Sta 10+81.8 | 5/1/09 |

During the progress of the work under this Contract, the utility owner will relocate a utility shown in the following table within the corresponding number of days shown. Notify the Engineer before you work within the approximate location of a utility shown. The days start on the notification date.

Utility Relocation and Department-Arranged Time for the Relocation

| Utility | Location | Days |
|--|--|------|
| Relocate Overhead Telephone Pole (BNSF) | Massachusetts Ave (E5) Sta 144+89.8 | 3 |
| Remove Abandoned Sewer Manhole (COSB) | I-215 (G) Sta 150+98.3 | 2 |
| Remove Telephone Line (Verizon) | I-215 (G) Sta 151+10.1 | 5 |
| Remove Abandoned 200mm Sewer Line (COSB) | I-215 (G) Sta 150+98.3 | 5 |
| Remove Abandoned Sewer Manhole (COSB) | Cajon Blvd (G) Sta 151+33.1 | 2 |
| Relocate Telephone Line (Verizon) | Cajon Blvd (G) Sta 151+03.0 to Sta 152+24.7 | 5 |
| Relocate 400mm Water Line (SBMWD) | Cajon Blvd (G) Sta 151+82.5 | 20 |
| Relocate 300mm Water Line (SBMWD) | Mount Vernon Ave (G) Sta 150+88.9 to Sta 151+20.0 | 20 |
| Remove 200mm Abandoned Sewer Line (COSB) | I-215 (G) Sta 151+33.1 | 3 |
| Remove Water Line (SBMWD) | Cajon Blvd (C) Sta 2+85.0 | 5 |
| Abandoned Telephone Line (Verizon) | Highland Ave (HH) Sta 8+70.0 | 10 |
| Remove Abandoned Sewer Manhole (COSB) | I-215 (F) Sta 151+85.7 | 10 |
| Water Valve Adjust To Grade (SBMWD) | Highland Ave (HH) Sta 12+03.6 | 10 |
| Remove 200mm Sewer Line (COSB) | Highland Ave (HH) Sta 11+56.3 | 10 |
| Sewer Manhole Adjust To Grade (COSB) | Highland Ave (HH) Sta 11+96.2 | 10 |
| Water Valve Adjust To Grade (SBMWD) | Highland Ave (HH) Sta 12+04.2 | 10 |
| Fire Hydrant Adjust To Grade (SBMWD) | Highland Ave (HH) Sta 12+07.0 | 10 |
| Water Valve Adjust To Grade (SBMWD) | Highland Ave (HH) Sta 12+60.0 | 10 |
| Water Meter Adjust To Grade (SBMWD) | Highland Ave (HH) Sta 11+33.7 | 5 |
| Water Meter Adjust To Grade (SBMWD) | Mount Vernon Ave (C) Sta 2+17.3 | 5 |
| Unidentified Pull Box Adjust To Grade | Mount Vernon Ave (C) Sta 2+21.4 | 5 |
| Relocate Overhead Electric (SCE) | Massachusetts Ave (G) Sta 144+69.7 to Sta 145+03.9 | 10 |

Installation of the utilities shown in the following table requires coordination with your activities. Make the necessary arrangements with the utility company through the Engineer and submit a schedule:

1. Verified by a representative of the utility company
2. Allowing at least the time shown for the utility owner to complete its work

Utility Relocation and Contractor-Arranged Time for the Relocation

| Utility | Location | Days |
|--|---|------|
| Relocate 50 mm Gas Line (SCG) | Highland Ave (G) Sta 151+10.7 | 30 |
| Relocate 150 mm Gas Line (SCG) | Highland Ave (G) Sta 150+97.5 to Sta 151+29.9 | 30 |
| Relocate 200 mm Sewer Line With Concrete Encasement (COSB) | Massachusetts Ave (E5) Sta 145+10.9 | 30 |
| Encase Portion of 375 mm Sewer Line | TW1 Line at Sta 156+70.7 | 60 |
| Relocate Sewer Manhole | TW1 Line at Sta 156+70.7 | 60 |
| Cap Sewer Manhole | TW4 Line at Sta 157+53.0 | 60 |
| Abandon Sewer Line And Two Sewer Manholes | TW4 Line at Sta 157+90.9 | 60 |
| Encase Portion of Sewer Line | TW4 Line at Sta 157+45.4 | 60 |
| Encase Portion of 200 mm Sewer Line | TW Line at Sta 13+35.3 | 60 |
| Encase Portion of 375 mm Sewer Line | TW Line at Sta 13+26.0 | 60 |
| Encase Portion of 300 mm Water Line | TW1 Line at Sta 156+68.6 | 120 |
| Encase Portion of 300 mm Water Line | TW4 Line at Sta 157+37.3 | 120 |
| Encase Portion of 350 mm Water Line | TW Line at Sta 13+16.3 | 120 |
| Encase Portion of 300 mm Water Line | TW Line at Sta 13+23.4 | 120 |
| Abandon 300 mm Water Line | TW Line at Sta 13+23.4 | 120 |
| Abandon 254 mm Water Line | TM Line at Sta 11+25.0 | 120 |
| Abandon 600 mm Water Line | TM Line at Sta 11+21.0 | 120 |
| Abandon 300 mm Water Line | TW2 Line at Sta 151+64.5 | 120 |
| Relocate Overhead Line(SCE) | LM line at Sta 11+01.2 | 120 |
| Relocate Overhead Line(SCE) | TM line at Sta 11+26.7 | 120 |
| Relocate Overhead Line(Verizon) | TM line at Sta 11+26.7 | 45 |
| Encase Portion of 50 mm Gas Line | TW Line at Sta 13+43.6 | 45 |
| Lower 50 mm Gas Line | MD Line at Sta 10+54.2 | 45 |

SECTION 6. (BLANK)

SECTION 7. (BLANK)

SECTION 8. MATERIALS

SECTION 8-1. MISCELLANEOUS

8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the United States Standard Measures which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following provisions:

- A. Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.
- B. Before other non-metric materials and products will be considered for use, the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish necessary information as required by the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision will be final.
- C. When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, the list of sources of material specified in Section 6-1.01, "Source of Supply and Quality of Materials," of the Standard Specification shall include a list of substitutions to be made and contract items involved. In addition, for a change in design or details, the Contractor shall submit plans and working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The plans and working drawings shall be submitted at least 7 days before the Contractor intends to begin the work involved.

Unless otherwise specified, the following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR PLAIN WIRE REINFORCEMENT
ASTM Designation: A 82

| METRIC SIZE SHOWN ON THE PLANS mm ² | SIZE TO BE SUBSTITUTED inch ² x 100 |
|---|---|
| MW9 | W1.4 |
| MW10 | W1.6 |
| MW13 | W2.0 |
| MW15 | W2.3 |
| MW19 | W2.9 |
| MW20 | W3.1 |
| MW22 | W3.5 |
| MW25 | W3.9, except W3.5 in piles only |
| MW26 | W4.0 |
| MW30 | W4.7 |
| MW32 | W5.0 |
| MW35 | W5.4 |
| MW40 | W6.2 |
| MW45 | W6.5 |
| MW50 | W7.8 |
| MW55 | W8.5, except W8.0 in piles only |
| MW60 | W9.3 |
| MW70 | W10.9, except W11.0 in piles only |
| MW80 | W12.4 |
| MW90 | W14.0 |
| MW100 | W15.5 |

SUBSTITUTION TABLE FOR BAR REINFORCEMENT

| METRIC BAR DESIGNATION NUMBER ¹ SHOWN ON THE PLANS | BAR DESIGNATION NUMBER ² TO BE SUBSTITUTED |
|--|--|
| 10 | 3 |
| 13 | 4 |
| 16 | 5 |
| 19 | 6 |
| 22 | 7 |
| 25 | 8 |
| 29 | 9 |
| 32 | 10 |
| 36 | 11 |
| 43 | 14 |
| 57 | 18 |

¹Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.

²Bar numbers are based on the number of eighths of an inch included in the nominal diameter of the bars.

No adjustment will be required in spacing or total number of reinforcing bars due to a difference in minimum yield strength between metric and non-metric bars.

SUBSTITUTION TABLE FOR SIZES OF:

(1) STEEL FASTENERS FOR GENERAL APPLICATIONS (ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55), and

(2) HIGH STRENGTH STEEL FASTENERS (ASTM Designation: A 325 or A 449)

| METRIC SIZE SHOWN ON THE PLANS mm | SIZE TO BE SUBSTITUTED inch |
|--------------------------------------|--------------------------------|
| 6 or 6.35 | 1/4 |
| 8 or 7.94 | 5/16 |
| 10 or 9.52 | 3/8 |
| 11 or 11.11 | 7/16 |
| 13, 12.70, or M12 | 1/2 |
| 14 or 14.29 | 9/16 |
| 16, 15.88, or M16 | 5/8 |
| 19, 19.05, or M20 | 3/4 |
| 22, 22.22, or M22 | 7/8 |
| 24, 25, 25.40, or M24 | 1 |
| 29, 28.58, or M27 | 1-1/8 |
| 32, 31.75, or M30 | 1-1/4 |
| 35 or 34.93 | 1-3/8 |
| 38, 38.10, or M36 | 1-1/2 |
| 44 or 44.45 | 1-3/4 |
| 51 or 50.80 | 2 |
| 57 or 57.15 | 2-1/4 |
| 64 or 63.50 | 2-1/2 |
| 70 or 69.85 | 2-3/4 |
| 76 or 76.20 | 3 |
| 83 or 82.55 | 3-1/4 |
| 89 or 88.90 | 3-1/2 |
| 95 or 95.25 | 3-3/4 |
| 102 or 101.60 | 4 |

SUBSTITUTION TABLE FOR NOMINAL THICKNESS OF SHEET METAL

| UNCOATED HOT AND COLD ROLLED SHEETS | | HOT-DIPPED ZINC COATED SHEETS (GALVANIZED) | |
|--|-----------------------------------|---|-----------------------------------|
| METRIC THICKNESS SHOWN ON THE PLANS mm | GAGE TO BE SUBSTITUTED inch | METRIC THICKNESS SHOWN ON THE PLANS mm | GAGE TO BE SUBSTITUTED inch |
| 7.94 | 0.3125 | 4.270 | 0.1681 |
| 6.07 | 0.2391 | 3.891 | 0.1532 |
| 5.69 | 0.2242 | 3.510 | 0.1382 |
| 5.31 | 0.2092 | 3.132 | 0.1233 |
| 4.94 | 0.1943 | 2.753 | 0.1084 |
| 4.55 | 0.1793 | 2.372 | 0.0934 |
| 4.18 | 0.1644 | 1.994 | 0.0785 |
| 3.80 | 0.1495 | 1.803 | 0.0710 |
| 3.42 | 0.1345 | 1.613 | 0.0635 |
| 3.04 | 0.1196 | 1.461 | 0.0575 |
| 2.66 | 0.1046 | 1.311 | 0.0516 |
| 2.28 | 0.0897 | 1.158 | 0.0456 |
| 1.90 | 0.0747 | 1.006 or 1.016 | 0.0396 |
| 1.71 | 0.0673 | 0.930 | 0.0366 |
| 1.52 | 0.0598 | 0.853 | 0.0336 |
| 1.37 | 0.0538 | 0.777 | 0.0306 |
| 1.21 | 0.0478 | 0.701 | 0.0276 |
| 1.06 | 0.0418 | 0.627 | 0.0247 |
| 0.91 | 0.0359 | 0.551 | 0.0217 |
| 0.84 | 0.0329 | 0.513 | 0.0202 |
| 0.76 | 0.0299 | 0.475 | 0.0187 |
| 0.68 | 0.0269 | ----- | ----- |
| 0.61 | 0.0239 | ----- | ----- |
| 0.53 | 0.0209 | ----- | ----- |
| 0.45 | 0.0179 | ----- | ----- |
| 0.42 | 0.0164 | ----- | ----- |
| 0.38 | 0.0149 | ----- | ----- |

SUBSTITUTION TABLE FOR WIRE

| METRIC THICKNESS SHOWN ON THE PLANS mm | WIRE THICKNESS TO BE SUBSTITUTED inch | GAGE NO. |
|--|---|----------|
| 6.20 | 0.244 | 3 |
| 5.72 | 0.225 | 4 |
| 5.26 | 0.207 | 5 |
| 4.88 | 0.192 | 6 |
| 4.50 | 0.177 | 7 |
| 4.11 | 0.162 | 8 |
| 3.76 | 0.148 | 9 |
| 3.43 | 0.135 | 10 |
| 3.05 | 0.120 | 11 |
| 2.69 | 0.106 | 12 |
| 2.34 | 0.092 | 13 |
| 2.03 | 0.080 | 14 |
| 1.83 | 0.072 | 15 |
| 1.57 | 0.062 | 16 |
| 1.37 | 0.054 | 17 |
| 1.22 | 0.048 | 18 |
| 1.04 | 0.041 | 19 |
| 0.89 | 0.035 | 20 |

SUBSTITUTION TABLE FOR PIPE PILES

| METRIC SIZE SHOWN ON THE PLANS mm x mm | SIZE TO BE SUBSTITUTED inch x inch |
|--|--|
| PP 360 x 4.55 | NPS 14 x 0.179 |
| PP 360 x 6.35 | NPS 14 x 0.250 |
| PP 360 x 9.53 | NPS 14 x 0.375 |
| PP 360 x 11.12 | NPS 14 x 0.438 |
| PP 406 x 12.70 | NPS 16 x 0.500 |
| PP 460 x T | NPS 18 x T" |
| PP 508 x T | NPS 20 x T" |
| PP 559 x T | NPS 22 x T" |
| PP 610 x T | NPS 24 x T" |
| PP 660 x T | NPS 26 x T" |
| PP 711 x T | NPS 28 x T" |
| PP 762 x T | NPS 30 x T" |
| PP 813 x T | NPS 32 x T" |
| PP 864 x T | NPS 34 x T" |
| PP 914 x T | NPS 36 x T" |
| PP 965 x T | NPS 38 x T" |
| PP 1016 x T | NPS 40 x T" |
| PP 1067 x T | NPS 42 x T" |
| PP 1118 x T | NPS 44 x T" |
| PP 1219 x T | NPS 48 x T" |
| PP 1524 x T | NPS 60 x T" |

The thickness in millimeters (T) represents an exact conversion of the thickness in inches (T").

SUBSTITUTION TABLE FOR CIDH CONCRETE PILING

| METRIC SIZE SHOWN ON THE PLANS | ACTUAL AUGER SIZE TO BE SUBSTITUTED inches |
|-----------------------------------|--|
| 350 mm | 14 |
| 400 mm | 16 |
| 450 mm | 18 |
| 600 mm | 24 |
| 750 mm | 30 |
| 900 mm | 36 |
| 1.0 m | 42 |
| 1.2 m | 48 |
| 1.5 m | 60 |
| 1.8 m | 72 |
| 2.1 m | 84 |
| 2.4 m | 96 |
| 2.7 m | 108 |
| 3.0 m | 120 |
| 3.3 m | 132 |
| 3.6 m | 144 |
| 4.0 m | 156 |
| | |
| | |
| | |
| | |

SUBSTITUTION TABLE FOR STRUCTURAL TIMBER AND LUMBER

| METRIC MINIMUM DRESSED DRY, SHOWN ON THE PLANS mm x mm | METRIC MINIMUM DRESSED GREEN, SHOWN ON THE PLANS mm x mm | NOMINAL SIZE TO BE SUBSTITUTED inch x inch |
|---|---|---|
| 19x89 | 20x90 | 1x4 |
| 38x89 | 40x90 | 2x4 |
| 64x89 | 65x90 | 3x4 |
| 89x89 | 90x90 | 4x4 |
| 140x140 | 143x143 | 6x6 |
| 140x184 | 143x190 | 6x8 |
| 184x184 | 190x190 | 8x8 |
| 235x235 | 241x241 | 10x10 |
| 286x286 | 292x292 | 12x12 |

SUBSTITUTION TABLE FOR NAILS AND SPIKES

| METRIC COMMON NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm | METRIC BOX NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm | METRIC SPIKE, SHOWN ON THE PLANS Length, mm Diameter, mm | SIZE TO BE SUBSTITUTED Penny-weight |
|---|--|--|--|
| 50.80 2.87 | 50.80 2.51 | _____ | 6d |
| 63.50 3.33 | 63.50 2.87 | _____ | 8d |
| 76.20 3.76 | 76.20 3.25 | 76.20 4.88 | 10d |
| 82.55 3.76 | 82.55 3.25 | 82.55 4.88 | 12d |
| 88.90 4.11 | 88.90 3.43 | 88.90 5.26 | 16d |
| 101.60 4.88 | 101.60 3.76 | 101.60 5.72 | 20d |
| 114.30 5.26 | 114.30 3.76 | 114.30 6.20 | 30d |
| 127.00 5.72 | 127.00 4.11 | 127.00 6.68 | 40d |
| _____ | _____ | 139.70 7.19 | 50d |
| _____ | _____ | 152.40 7.19 | 60d |

SUBSTITUTION TABLE FOR IRRIGATION
COMPONENTS

| METRIC WATER METERS, TRUCK LOADING STANDPIPES, VALVES, BACKFLOW PREVENTERS, FLOW SENSORS, WYE STRAINERS, FILTER ASSEMBLY UNITS, PIPE SUPPLY LINES, AND PIPE IRRIGATION SUPPLY LINES SHOWN ON THE PLANS DIAMETER NOMINAL (DN) mm | NOMINAL SIZE TO BE SUBSTITUTED inch |
|--|--|
| 15 | 1/2 |
| 20 | 3/4 |
| 25 | 1 |
| 32 | 1-1/4 |
| 40 | 1-1/2 |
| 50 | 2 |
| 65 | 2-1/2 |
| 75 | 3 |
| 100 | 4 |
| 150 | 6 |
| 200 | 8 |
| 250 | 10 |
| 300 | 12 |
| 350 | 14 |
| 400 | 16 |

Unless otherwise specified, substitutions of United States Standard Measures standard structural shapes corresponding to the metric designations shown on the plans and in conformance with the requirements in ASTM Designation: A 6/A 6M, Annex 2, will be allowed.

8-1.02 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS

The Department maintains the following list of Prequalified and Tested Signing and Delineation Materials. The Engineer shall not be precluded from sampling and testing products on the list of Prequalified and Tested Signing and Delineation Materials.

The manufacturer of products on the list of Prequalified and Tested Signing and Delineation Materials shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each type of traffic product supplied.

For those categories of materials included on the list of Prequalified and Tested Signing and Delineation Materials, only those products shown within the listing may be used in the work. Other categories of products, not included on the list of Prequalified and Tested Signing and Delineation Materials, may be used in the work provided they conform to the requirements of the Standard Specifications.

Materials and products may be added to the list of Prequalified and Tested Signing and Delineation Materials if the manufacturer submits a New Product Information Form to the New Product Coordinator at the Transportation Laboratory. Upon a Departmental request for samples, sufficient samples shall be submitted to permit performance of required tests. Approval of materials or products will depend upon compliance with the specifications and tests the Department may elect to perform.

PAVEMENT MARKERS, PERMANENT TYPE

Retroreflective With Abrasion Resistant Surface (ARS)

1. Apex, Model 921AR (100 mm x 100 mm)

2. Ennis Paint, Models C88 (100 mm x 100 mm), 911 (100 mm x 100 mm) and C80FH
3. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm) and ARC Round Shoulder (100 mm x 100 mm)
4. 3M Series 290 (89 mm x 100 mm)
5. 3M Series 290 PSA
6. Glowlite, Inc Model 988AR (100 mm x 100 mm)

Retroreflective With Abrasion Resistant Surface (ARS)

(for recessed applications only)

1. Ennis Paint, Model 948 (58 mm x 119 mm)
 2. Ennis Paint, Model 944SB (51 mm x 100 mm)*
 3. Ray-O-Lite, Model 2002 (51 mm x 117 mm)
 4. Ray-O-Lite, Model 2004 ARS (51 mm x 100 mm)*
- *For use only in 114 mm wide (older) recessed slots

Non-Reflective, 100-mm Round

1. Apex Universal (Ceramic)
2. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
3. Glowlite, Inc. (Ceramic) and PP (Polypropylene)
4. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
5. Interstate Sales, "Diamond Back" (Polypropylene)
6. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
7. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
8. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)

PAVEMENT MARKERS, TEMPORARY TYPE

Temporary Markers For Long Term Day/Night Use (180 days or less)

1. Vega Molded Products "Temporary Road Marker" (75 mm x 100 mm)

Temporary Markers For Short Term Day/Night Use (14 days or less)

(For seal coat or chip seal applications, clear protective covers are required)

1. Apex Universal, Model 932
2. Filtrona Extrusion, Models T.O.M., T.R.P.M., and "HH" (High Heat)
3. Hi-Way Safety, Inc., Model 1280/1281
4. Glowlite, Inc., Model 932

STRIPING AND PAVEMENT MARKING MATERIAL

Permanent Traffic Striping and Pavement Marking Tape

1. Advanced Traffic Marking, Series 300 and 400
2. Brite-Line, Series 1000
3. Brite-Line, "DeltaLine XRP"
4. Swarco Industries, "Director 35" (For transverse application only)
5. Swarco Industries, "Director 60"
6. 3M, "Stamark" Series 380 and 5730
7. 3M, "Stamark" Series 420 (For transverse application only)

Temporary (Removable) Striping and Pavement Marking Tape (180 days or less)

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

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

Preformed Thermoplastic (Heated in place)

1. Flint Trading Inc., "Hot Tape"
2. Flint Trading Inc., "Premark Plus"
3. Ennis Paint Inc., "Flametape"

Ceramic Surfacing Laminate, 150 mm x 150 mm

1. Highway Ceramics, Inc.

CLASS 1 DELINEATORS

One Piece Driveable Flexible Type, 1700-mm

1. Filtrona Extrusion, "Flexi-Guide Models 400 and 566"
2. Carsonite, Curve-Flex CFRM-400
3. Carsonite, Roadmarker CRM-375
4. FlexStake, Model 654 TM
5. GreenLine Model CGD1-66

Special Use Type, 1700-mm

1. Filtrona Extrusion, Model FG 560 (with 450-mm U-Channel base)
2. Carsonite, "Survivor" (with 450-mm U-Channel base)
3. Carsonite, Roadmarker CRM-375 (with 450-mm U-Channel base)
4. FlexStake, Model 604
5. GreenLine Model CGD (with 450-mm U-Channel base)
6. Impact Recovery Model D36, with #105 Driveable Base
7. Safe-Hit with 200-mm pavement anchor (SH248-GP1)
8. Safe-Hit with 380-mm soil anchor (SH248-GP2) and with 450-mm soil anchor (SH248-GP3)

Surface Mount Type, 1200-mm

1. Bent Manufacturing Company, Masterflex Model MF-180EX-48
2. Carsonite, "Channelizer"
3. FlexStake, Models 704, 754 TM, and EB4
4. Impact Recovery Model D48, with #101 Fixed (Surface-Mount) Base
5. Three D Traffic Works "Channelflex" ID No. 522248W

CHANNELIZERS

Surface Mount Type, 900-mm

1. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
2. Filtrona Extrusion, Flexi-Guide Models FG300PE, FG300UR, and FG300EFX
3. Carsonite, "Super Duck" (Round SDR-336)
4. Carsonite, Model SDCF03601MB "Channelizer"
5. FlexStake, Models 703, 753 TM, and EB3
6. GreenLine, Model SMD-36
7. Hi-way Safety, Inc. "Channel Guide Channelizer" Model CGC36
8. Impact Recovery Model D36, with #101 Fixed (Surface-Mount) Base
9. Safe-Hit, Guide Post, Model SH236SMA and Dura-Post, Model SHL36SMA
10. Three D Traffic Works "Boomerang" 5200 Series

Lane Separation System

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

4. Tuff Curb

CONICAL DELINEATORS, 1070-mm

(For 700-mm Traffic Cones, see Standard Specifications)

1. Bent Manufacturing Company "T-Top"
2. Plastic Safety Systems "Navigator-1070 mm"
3. Traffix Devices "Grabber"
4. Three D Traffic Works "Ringtop" TD7000, ID No. 742143
5. Three D Traffic Works, TD7500
6. Work Area Protection Corp. C-42

OBJECT MARKERS

Type "K", 450-mm

1. Filtrona Extrusion, Model FG318PE
2. Carsonite, Model SMD 615
3. FlexStake, Model 701 KM
4. Safe-Hit, Model SH718SMA

Type "K-4" / "Q" Object Markers, 600-mm

1. Bent Manufacturing "Masterflex" Model MF-360-24
2. Filtrona Extrusion, Model FG324PE
3. Carsonite, "Channelizer"
4. FlexStake, Model 701KM
5. Safe-Hit, Models SH824SMA_WA and SH824GP3_WA
6. Three D Traffic Works ID No. 531702W and TD 5200
7. Three D Traffic Works ID No. 520896W

**CONCRETE BARRIER MARKERS AND
TEMPORARY RAILING (TYPE K) REFLECTORS**

Impactable Type

1. ARTUK, "FB"
2. Filtrona Extrusion, Models PCBM-12 and PCBM-T12
3. Duraflex Corp., "Flexx 2020" and "Electriflexx"
4. Hi-Way Safety, Inc., Model GMKRM100
5. Plastic Safety Systems "BAM" Models OM-BARR and OM-BWAR
6. Three D Traffic Works "Roadguide" Model TD 9304

Non-Impactable Type

1. ARTUK, JD Series
2. Plastic Safety Systems "BAM" Models OM-BITARW and OM-BITARA
3. Vega Molded Products, Models GBM and JD
4. Plastic Vacuum Forming, "Cap-It C400"

METAL BEAM GUARD RAIL POST MARKERS

(For use to the left of traffic)

1. Filtrona Extrusion, "Mini" (75 mm x 254 mm)
2. Creative Building Products, "Dura-Bull, Model 11201"
3. Duraflex Corp., "Railrider"
4. Plastic Vacuum Forming, "Cap-It C300"

CONCRETE BARRIER DELINEATORS, 400-mm

(For use to the right of traffic)

1. Filtrona Extrusion, Model PCBM T-16
2. Safe-Hit, Model SH216RBM

CONCRETE BARRIER-MOUNTED MINI-DRUM (260 mm x 360 mm x 570 mm)

1. Stinson Equipment Company "SaddleMarker"

GUARD RAILING DELINEATOR

(Place top of reflective element at 1200 mm above plane of roadway)

Wood Post Type, 686-mm

1. Filtrona Extrusion, FG 427 and FG 527
2. Carsonite, Model 427
3. FlexStake, Model 102 GR
4. GreenLine GRD 27
5. Safe-Hit, Model SH227GRD
6. Three D Traffic Works "Guardflex" TD9100
7. New Directions Mfg, NDM27

Steel Post Type

1. Carsonite, Model CFGR-327

RETROREFLECTIVE SHEETING

Channelizers, Barrier Markers, and Delineators

1. Avery Dennison T-6500 Series (For rigid substrate devices only)
2. Avery Dennison WR-7100 Series
3. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
4. Reflexite, PC-1000 Metalized Polycarbonate
5. Reflexite, AC-1000 Acrylic
6. Reflexite, AP-1000 Metalized Polyester
7. Reflexite, Conformalight, AR-1000 Abrasion Resistant Coating
8. 3M, High Intensity

Traffic Cones, 100-mm and 150-mm Sleeves

1. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
2. Reflexite, Vinyl, "TR" (Semi-transparent) or "Conformalight"
3. 3M Series 3840
4. Avery Dennison S-9000C

Drums

1. Avery Dennison WR-6100
2. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
3. Reflexite, "Conformalight", "Super High Intensity" or "High Impact Drum Sheeting"
4. 3M Series 3810

Barricades: Type I, Medium-Intensity (Typically Enclosed Lens, Glass-Bead Element)

1. Nippon Carbide Industries, CN8117
2. Avery Dennison, W 1100 series
3. 3M Series CW 44

Barricades: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

1. Avery Dennison, W-2100 Series

Signs: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

1. Avery Dennison, T-2500 Series
2. Nippon Carbide Industries, Nikkalite 18000

Signs: Type III, High-Intensity (Typically Encapsulated Glass-Bead Element)

1. Avery Dennison, T-5500A and T-6500 Series
2. Nippon Carbide Industries, Nikkalite Brand Ultralite Grade II

3. 3M 3870 and 3930 Series

Signs: Type IV, High-Intensity (Typically Unmetallized Microprismatic Element)

1. Avery Dennison, T-6500 Series
2. Nippon Carbide Industries, Crystal Grade, 94000 Series
3. Nippon Carbide Industries, Model No. 94847 Fluorescent Orange
4. 3M Series 3930 and Series 3924S

Signs: Type VI, Elastomeric (Roll-Up) High-Intensity, without Adhesive

1. Avery Dennison, WU-6014
2. Novabrite LLC, "Econobrite"
3. Reflexite "Vinyl"
4. Reflexite "SuperBright"
5. Reflexite "Marathon"
6. 3M Series RS20

Signs: Type VII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

1. 3M Series 3924S, Fluorescent Orange
2. 3M LDP Series 3970

Signs: Type VIII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

1. Avery Dennison, T-7500 Series
2. Avery Dennison, T-7511 Fluorescent Yellow
3. Avery Dennison, T-7513 Fluorescent Yellow Green
4. Avery Dennison, W-7514 Fluorescent Orange
5. Nippon Carbide Industries, Nikkalite Crystal Grade Series 92800
6. Nippon Carbide Industries, Nikkalite Crystal Grade Model 92847 Fluorescent Orange

Signs: Type IX, Very-High-Intensity (Typically Unmetallized Microprismatic Element)

1. 3M VIP Series 3981 Diamond Grade Fluorescent Yellow
2. 3M VIP Series 3983 Diamond Grade Fluorescent Yellow/Green
3. 3M VIP Series 3990 Diamond Grade
4. Avery Dennison T-9500 Series
5. Avery Dennison, T9513, Fluorescent Yellow Green
6. Avery Dennison, W9514, Fluorescent Orange
7. Avery Dennison, T-9511 Fluorescent Yellow

SPECIALTY SIGNS

1. Reflexite "Endurance" Work Zone Sign (with Semi-Rigid Plastic Substrate)

ALTERNATIVE SIGN SUBSTRATES

Fiberglass Reinforced Plastic (FRP) and Expanded Foam PVC

1. Fiber-Brite (FRP)
2. Sequentia, "Polyplate" (FRP)
3. Intoplast Group "InteCel" (13 mm for Post-Mounted CZ Signs, 1200 mm or less)(PVC)

Aluminum Composite, Temporary Construction Signs and Permanent Signs up to 1400 mm.

1. Alcan Composites "Dibond Material, 2 mm"
2. Mitsubishi Chemical America, Alpolc 350

8-1.03 STATE-FURNISHED MATERIALS

Attention is directed to Section 6-1.02, "State-Furnished Materials," of the Standard Specifications and these special provisions.

The following materials will be furnished to the Contractor:

- A. Padlocks for controller enclosure cabinets, and external cabinet for battery backup system.
- B. Model 170 controller assemblies (ramp metering systems), including controller unit, completely wired controller cabinet, and inductive loop detector sensor units.
- C. Model 2070L controller assemblies (signal), including controller unit, completely wired controller cabinet, and inductive loop detector sensor units.
- D. Components of battery backup system:
 - 1. Inverter/charger unit
 - 2. Power transfer relay
 - 3. Manually-operated bypass switch
 - 4. Battery harness
 - 5. Utility interconnect wires
 - 6. Battery temperature probe
 - 7. Relay contact wires
- E. Reflectors and adhesive for temporary Railing (Type K).

Completely wired controller cabinets, with auxiliary equipment but without controller unit, will be furnished to the Contractor at 175 Cluster Street San Bernardino, 92408.

The Contractor shall notify the District Warehouse Manager, Telephone 909-383-4630 and the Engineer not less than 48 hours before State-furnished material is to be picked up by the Contractor. A full description of the material and the time the material will be picked up shall be provided.

8-1.04 ADHESIVE FOR BONDING REFLEX REFLECTORS TO PORCELAIN ENAMEL TRAFFIC SIGNS

Adhesive shall be an RTV (room temperature vulcanizing) one-component silicone - rubber adhesive. Adhesive shall be compounded to be highly resistant to ozone, ultraviolet light, and extremes of ambient temperature, shall possess good chemical resistance, and shall exhibit excellent overall weatherability. The cured material shall remain flexible and maintain its adhesive qualities indefinitely.

The adhesive shall possess the following physical properties:

| Property | Value | Test Method |
|-----------------------|------------------------------------|---|
| Color | Translucent | Visual Determination |
| Consistency | Soft, spreadable thixotropic paste | Visual Determination |
| Tack-Free Time | One hour maximum | Finger-touch test |
| Durometer, Shore A | 25-40 | ASTM Designation: D 2240 ⁽¹⁾ |
| Tensile Strength, MPa | 2.1 minimum | ASTM Designation: D 412 ⁽¹⁾ |
| Elongation, Percent | 350 minimum | ASTM Designation: D 412 ⁽¹⁾ |
| Specific Gravity | 1.07±0.02 | ASTM Designation: D 792, Method A-1, Notes: (1) and (2) |
| Shear-Adhesion, MPa | 1.0 minimum | Note: (3) |

Notes:

- (1) After specimen has cured for a total of 48 hours.
- (2) 25-mm square specimen.
- (3) Test method on file and available at the Transportation Laboratory.

When stored at temperatures below 27°C, the adhesive shall have a shelf life of at least one year.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for each lot of adhesive supplied.

8-1.05 ENGINEERING FABRICS

Engineering fabrics shall conform to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

Filter fabric for this project shall be ultraviolet (UV) ray protected.

SECTION 8-2. CONCRETE

8-2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

The Department maintains a list of sources of fine and coarse aggregate that have been approved for use with a reduced amount of supplementary cementitious material in the total amount of cementitious material to be used. A source of aggregate will be considered for addition to the approved list if the producer of the aggregate submits to the Transportation Laboratory certified test results from a qualified testing laboratory that verify the aggregate complies with the requirements. Before the testing starts, the aggregate test shall be registered with the Department. A registration number can be obtained by calling (916) 227-7228. The registration number shall be used as the identification for the aggregate sample in correspondence with the Department. Upon request, a split of the tested sample shall be provided to the Department. Approval of aggregate will depend upon compliance with the specifications, based on the certified test results submitted, together with any replicate testing the Department may elect to perform. Approval will expire 3 years from the date the most recent registered and evaluated sample was collected from the aggregate source.

Qualified testing laboratories shall conform to the following requirements:

1. Laboratories performing ASTM Designation: C 1293 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Concrete Proficiency Sample Program and shall have received a score of 3 or better on each test of the previous 2 sets of concrete samples.
2. Laboratories performing ASTM Designation: C 1260 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Pozzolan Proficiency Sample Program and shall have received a score of 3 or better on the shrinkage and soundness tests of the previous 2 sets of pozzolan samples.

Aggregates on the list shall conform to one of the following requirements:

1. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1293, the average expansion at one year shall be less than or equal to 0.040 percent; or
2. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1260, the average of the expansion at 16 days shall be less than or equal to 0.15 percent.

If the aggregates used in the concrete are on the Department's list, the minimum amount of supplementary cementitious material shall conform to the following:

1. If fly ash or natural pozzolan conforming to the provisions in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials," of the Standard Specifications is used, the minimum amount of supplementary cementitious material shall be 15 percent by mass of the total cementitious material; or
2. If silica fume conforming to the provisions in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials," of the Standard Specifications is used, the minimum amount of supplementary cementitious material shall be 7 percent by mass of the total cementitious material.

The limitation on tricalcium silicate (C₃S) content in Type II cement specified in Section 90-2.01A, "Cement," of the Standard Specifications shall not apply.

SECTION 8-3. WELDING

8-3.01 WELDING

GENERAL

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

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

| AWS Code | Year of Adoption |
|----------|------------------|
| D1.1 | 2006 |
| D1.4 | 2005 |
| D1.5 | 2002 |
| D1.6 | 1999 |

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

Section 6.1.1.1 of AWS D1.5 is replaced with the following:

Quality Control (QC) shall be the responsibility of the Contractor. As a minimum, the Contractor shall perform inspection and testing of each weld joint prior to welding, during welding, and after welding as specified in this section and as necessary to ensure that materials and workmanship conform to the requirements of the contract documents.

Unless otherwise specified, Sections 6.1.3 through 6.1.4.3 of AWS D1.1, Section 7.1.2 of AWS D1.4, and Sections 6.1.1.2 through 6.1.3.3 of AWS D1.5 are replaced with the following:

The QC Inspector shall be the duly designated person who acts for and on behalf of the Contractor for inspection, testing, and quality related matters for all welding.

Quality Assurance (QA) is the prerogative of the Engineer. The QA Inspector is the duly designated person who acts for and on behalf of the Engineer.

The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship, and shall be currently certified as an AWS Certified Welding Inspector (CWI) in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors."

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

When the term "Inspector" is used without further qualification, it shall refer to the QC Inspector.

When any work is welded in conformance with the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications, not including Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications, Section 6.1.4 of AWS D1.1 is replaced with the following:

The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship and shall be currently certified as an AWS CWI in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors," or as a Welding Inspector Specialist (WIS) in conformance with the requirements in AWS B5.2, "Specification for the Qualification of Welding Inspector Specialists and Welding Inspector Assistants."

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

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

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

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

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

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

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

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

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

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

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

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

In addition to the requirements of AWS D1.1, welding procedures qualification for work welded in conformance with that code shall conform to the following:

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

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

- A. Unless considered prequalified, fillet welds shall be qualified in each position. The fillet weld soundness test shall be conducted using the essential variables of the WPS as established by the Procedure Qualification Record (PQR).
- B. For qualification of joints that do not conform to Figures 2.4 and 2.5 of AWS D1.5, a minimum of two WPS qualification tests are required. The tests shall be conducted using both Figure 5.1 and Figure 5.3. The test conforming to Figure 5.1 shall be conducted in conformance with AWS D1.5, Section 5.12 or 5.13. The test conforming to Figure 5.3 shall be conducted using the welding electrical parameters that were established for the test conducted conforming to Figure 5.1. The ranges of welding electrical parameters established during welding per Figure 5.1 in conformance with AWS D1.5, Section 5.12, shall be further restricted according to the limits in Table 5.3 during welding per Figure 5.3.

- C. Multiple zones within a weld joint may be qualified. The travel speed, amperage, and voltage values that are used for tests conducted per AWS D1.5 Section 5.13 shall be consistent for each pass in a weld joint, and shall in no case vary by more than ± 10 percent for travel speed, ± 10 percent for amperage, and ± 7 percent for voltage as measured from a predetermined target value or average within each weld pass or zone. The travel speed shall in no case vary by more than ± 15 percent when using submerged arc welding.
- D. For a WPS qualified in conformance with AWS D1.5 Section 5.13, the values to be used for calculating ranges for current and voltage shall be based on the average of all weld passes made in the test. Heat input shall be calculated using the average of current and voltage of all weld passes made in the test for a WPS qualified in conformance with Section 5.12 or 5.13.
- E. Macroetch tests are required for WPS qualification tests, and acceptance shall be per AWS D1.5 Section 5.19.3.
- F. When a nonstandard weld joint is to be made using a combination of WPSs, a test conforming to Figure 5.3 may be conducted combining the WPSs to be used in production, provided the essential variables, including weld bead placement, of each process are limited to those established in Table 5.3.
- G. Prior to preparing mechanical test specimens, the PQR welds shall be inspected by visual and radiographic tests. Backing bar shall be 75 mm in width and shall remain in place during NDT testing. Results of the visual and radiographic tests shall comply with AWS D1.5 Section 6.26.2, excluding Section 6.26.2.2. Test plates that do not comply with both tests shall not be used.

WELDING QUALITY CONTROL

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

Unless otherwise specified, welding quality control shall apply when any work is welded in conformance with the provisions in Section 49, "Piling," Section 52, "Reinforcement," Section 55, "Steel Structures," or Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications as well as when any work is welded in conformance with the "PTFE Bearings" and "PTFE Spherical Bearings" provisions of these special provisions.

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

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

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

When joint weld details that are not prequalified to the details of Section 3 of AWS D1.1 or to the details of Figure 2.4 or 2.5 of AWS D1.5 are proposed for use in the work, the joint details, their intended locations, and the proposed welding parameters and essential variables, shall be approved by the Engineer. The Contractor shall allow the Engineer 15 days to complete the review of the proposed joint detail locations. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. Upon approval of the proposed joint detail locations and qualification of the proposed joint details, welders and welding operators using these details shall perform a qualification test plate using the WPS variables and the joint detail to be used in production. The test plate shall have the maximum thickness to be used in production and a minimum length of 460 mm. The test plate shall be mechanically and radiographically tested. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

The Engineer will witness all qualification tests for WPSs that were not previously approved by the Department. Unless otherwise specified, an approved independent third party will witness the qualification tests for welders or welding operators. The independent third party shall be a current CWI and shall not be an employee of the contractor performing the welding. The Contractor shall allow the Engineer 15 days to review the qualifications and copy of the current certification of the independent third party. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. The Contractor shall notify the Engineer 7 days prior to performing any qualification tests. Witnessing of qualification tests by the Engineer shall not constitute approval of the intended joint locations, welding parameters, or essential variables.

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

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

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

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

- A. The work is welded in conformance with AWS D1.5 and is performed at a permanent fabrication or manufacturing facility that is certified under the AISC Quality Certification Program, Category Cbr, Major Steel Bridges and Fracture Critical endorsement F, when applicable.
- B. The work is welded in conformance with AWS D1.1 at a permanent pipe manufacturing or fabrication facility that maintains a QC program that is independent from production.

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

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

The Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 2 copies of a separate WQCP for each subcontractor or supplier for each item of work for which welding is to be performed.

The Contractor shall allow the Engineer 15 days to review the WQCP submittal after a complete plan has been received. No welding shall be performed until the WQCP is approved in writing by the Engineer. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

An amended WQCP or any addendum to the approved WQCP shall be submitted to, and approved in writing by the Engineer, for proposed revisions to the approved WQCP. An amended WQCP or addendum will be required for revisions to the WQCP, including but not limited to a revised WPS; additional welders; changes in NDT firms, QC, or NDT personnel or procedures; or updated systems for tracking and identifying welds. The Engineer shall have 7 days to complete the review of the amended WQCP or addendum. Work affected by the proposed revisions shall not be performed until the amended WQCP or addendum has been approved. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

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

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

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

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

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

- A. A daily production log.
- B. Reports of all visual weld inspections and NDT.

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

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

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

The Engineer will review the Welding Report to determine if the Contractor is in conformance with the WQCP. Except for steel pipe piling, the Engineer shall be allowed 15 days to review the report and respond in writing after the complete Welding Report has been received. Prior to receiving notification from the Engineer of the Contractor's conformance with the WQCP, the Contractor may encase in concrete or cover welds for which the Welding Report has been submitted. However, should the Contractor elect to encase or cover those welds prior to receiving notification from the Engineer, it is expressly understood that the Contractor shall not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase or cover welds pending notification by the Engineer, and in the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

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

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

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

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

The Contractor shall allow the Engineer 7 days to review these procedures. No remedial work shall begin until the repair procedures are approved in writing by the Engineer. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

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

WELDING FOR OVERHEAD SIGN AND POLE STRUCTURES

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

Welding inspection personnel or NDT firms to be used in the work shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project, except for when the welding is performed at a permanent fabrication or manufacturing facility which is certified under the AISC Quality Certification Program, Category Sbd, Conventional Steel Building Structures.

Welding Qualification Audit

Contractors or subcontractors performing welding operations for overhead sign and pole structures shall not deliver materials to the project without having successfully completed the Department's "Manufacturing Qualification Audit for Overhead Sign and Pole Structures," hereinafter referred to as the audit, not more than one year prior to the delivery of the materials. The Engineer will perform the audit. Copies of the audit form, and procedures for requesting and completing the audit, are available at the Transportation Laboratory or at:

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

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

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

Welding Report

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

PAYMENT

Full compensation for conforming to the requirements of "Welding" shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

SECTION 9. DESCRIPTION OF BRIDGE AND RETAINING WALL WORK

SEGMENT 5

The bridge and retaining wall work to be done shall consist, in general, of constructing two new retaining walls, two bridge replacements as shown on the plans and briefly described as follows:

RETAINING WALL #1

A cast-in-place reinforced concrete cantilever retaining wall approximately 47 meters long and with a maximum design height of 3.0 meters for support of sound wall on barrier.

RETAINING WALL #2

A cast-in-place reinforced concrete cantilever retaining wall approximately 101 meters long and with a maximum design height of 9.1 meters.

MASSACHUSETTS AVE OC (REPLACE)
Bridge Number 54-1265

A five span cast-in-place prestressed concrete box girder bridge, approximately 126 meters in length and 14.85 meters in width.

HIGHLAND AVE OC (REPLACE)
Bridge Number 54-1266

A six span cast-in-place prestressed concrete box girder bridge, approximately 238 meters in length and 30.25 meters in width to be constructed in two stages.

SEGMENT 11

The bridge and retaining wall work to be done shall consist, in general, of constructing the following structures as shown on the plans and briefly described as follows:

RETAINING WALL #54

A cast-in-place reinforced concrete cantilever retaining wall approximately 346 meters long and with a maximum design height of 7.3 meters.

RETAINING WALL #55

A cast-in-place reinforced concrete cantilever retaining wall approximately 226 meters long and with a maximum design height of 9.1 meters.

RETAINING WALL #56

A cast-in-place reinforced concrete cantilever retaining wall approximately 446 meters long and with a maximum design height of 7.3 meters.

RETAINING WALL #95

A cast-in-place reinforced concrete cantilever retaining wall approximately 198 meters long and with a maximum design height of 6.7 meters.

RETAINING WALL #96

A cast-in-place reinforced concrete cantilever retaining wall approximately 96 meters long and with a maximum design height of 7.3 meters.

CAJON BOULEVARD OH
(Bridge No. 54-0946G)

A four span cast-in-place, prestressed concrete box girder bridge, approximately 123 meters in length and 12.57 meters in width.

27TH STREET O.C. (REPLACE)
(Bridge No. 54-1221)

A four span cast-in-place, prestressed concrete box girder bridge, approximately 124 meters in length and 21.94 meters in width.

N215-W210 CONNECTOR
(Bridge No. 54-1234)

A thirteen span cast-in-place, prestressed concrete box girder bridge, approximately 626 meters in length and 12.59 meters in width.

E210-S215 CONNECTOR / S215-27TH OFF RAMP SEPARATION
(Bridge No. 54-1249)

A single span cast-in-place, prestressed concrete box girder bridge, approximately 53 meters in length and 12.57 meters in width.

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.01 ORDER OF WORK

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

A first order of work shall be to place the right of way fence to secure the construction area and to provide a measure of safety for the public.

Contractor's attention is directed to Sections 13 in these special provisions, "Railroad Relations and Insurance" which defines the required protocol prior to commencing work within the railroad right of way.

The Contractor is to coordinate with the Burlington Northern Santa Fe Railroad Company (BNSF) for work windows during construction of this project, in and adjacent to BNSF rights of way. No work within 7.6 meters of the centerline of the tracks or above the tracks will be permitted during the fourth quarter, from October 1st to January 2nd, of each calendar year. Also, the Contractor is required to provide eight weeks advanced notice for arrangement of flagmen required for work windows.

Contractor is cautioned that BNSF has placed significant restrictions on the Contractor's work windows and accessibility to areas of the project under BNSF control. Work windows within the fourth quarter of any calendar year will likely be eliminated, for portions of work within BNSF control. Contractor's attention is directed to Sections 13 of these special provisions which states the conditions necessary to work in BNSF controlled areas or the project.

Specific work windows and schedules in BNSF controlled areas will be determined using the processes stated in Sections 13 of these special provisions. Work windows and schedules will be determined as mutually agreed to between BNSF and the Contractor so specific durations or work windows do not exist at this time. When requesting work windows, the Contractor is encouraged to provide eight weeks advanced notice to BNSF with its requests in order to achieve the greatest probability of approval by BNSF.

The Contractor shall coordinate his work with utility relocation activities conducted by others adjacent to, and within the project limits so as to minimize the amount of disruption on any given local street.

Attention is directed to section entitled "Cooperation" of these special provisions. The Contractor shall coordinate and cooperate his operation with state forces, other agency forces, and other contractors that may be performing work within these construction limits.

When pavement is placed next to an existing lane, the existing lane shall be ground and spalls shall be repaired as first order of work.

Attention is directed to Contractor furnishing tests and mix proportions for concrete to be used in concrete pavement in "Jointed Plain Concrete Pavement" and "Prepaving Conference", "Just-In-Time Training", and "Test Strip" of these special provisions.

Attention is directed to "Rock Blanket" of these special provisions regarding furnishing a 2 m x 2 m test panel prior to constructing Rock Blanket.

Attention is directed to "Prepare and Painting Concrete Median Barrier Surface" of these special provisions regarding furnishing a 1 m x 1 m test panel prior to preparing and painting concrete median barrier surface.

Attention is directed to "Architectural Treatment" of these special provisions regarding the construction of a 1.25 m x 1.25 m test panels before beginning work on architectural textures.

Attention is directed to "Maintaining Traffic" and "Temporary Pavement Delineation" of these special provisions and to the traffic handling and detour sheets of the plans.

Attention is directed to "Water Pollution Control" of these special provisions regarding the submittal and approval of the storm water pollution prevention plan (SWPPP) prior to performing work having potential to cause water pollution.

All non-paved areas disturbed by the Contractor's operations during the winter season shall immediately receive erosion control type as specified elsewhere in these special provisions.

Permanent treatment and design pollution prevention BMPs shall be constructed at the earliest time that construction locations permit.

Attention is directed to "Rock Blanket" of these special provisions regarding furnishing a 2 m x 2 m test panel prior to constructing Rock Blanket.

Attention is directed to "Slope Paving" of these special provisions regarding constructing a 1.2 m by 1.8 m test panel prior to placing the permanent slope paving.

Attention is directed to "Miscellaneous Concrete Construction" of these special provisions regarding constructing a 600 mm by 600 mm test panel prior to constructing curb ramps with detectable warning surfaces.

Attention is directed to "Environmentally Sensitive Area" and "Temporary Fence (Type ESA)" of these special provisions. Prior to beginning work, the boundaries of the Environmentally Sensitive Areas (ESA) shall be clearly delineated in the field. The boundaries shall be delineated by the installation of temporary fence (Type ESA).

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

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

Prior to commencement of the traffic signal functional test at any location, all items of work related to signal control shall be completed and all roadside signs, pavement delineation, and pavement markings shall be in place at that location.

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

Attention is directed to "Progress Schedule (Critical Path Method)" of these special provisions regarding the submittal of a general time-scaled logic diagram within 10 days after approval of the contract. The diagram shall be submitted prior to performing any work that may be affected by any proposed deviations to the construction staging of the project.

The work shall be performed in conformance with the stages of construction shown on the plans. Nonconflicting work in subsequent stages may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

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

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

Prior to applying hot mix asphalt (Type A), the Contractor shall cover all manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured to the facility being covered by tape or adhesive. The covered facilities shall be referenced by the Contractor, with a sufficient number of control points to relocate the facilities after the hot mix asphalt (Type A) has been placed. After completion of the hot mix asphalt (Type A) operation, all covers shall be removed and disposed of in a manner satisfactory to the Engineer. Full compensation for covering manholes, valve and monument covers, grates, or other exposed facilities, referencing, and removing temporary cover shall be considered as included in the contract price paid per tonne for hot mix asphalt, and no additional compensation will be allowed therefor.

Construction of the new structural section adjacent to the existing traveled way shall be performed in successive and, once all operations are under way, concurrent operations of excavating, preparing subgrade, placing base materials and paving. Excavation within 1.2 meters of the existing traveled way shall not precede the paving operation by more than 5 working days unless:

- A. approved in writing by the Engineer and;
- B. material is placed and compacted against the vertical cuts within 2.4 meters of the existing traveled way. During excavation operations, native material may be used for this purpose, however, once the placing of the structural section commences, structural material shall be used. The material shall be placed to the level of the elevation of the top of existing pavement and tapered at a slope of 1:4 (vertical:horizontal) or flatter to the bottom of the excavation. Treated base shall not be used for the taper. Full compensation for placing the material on a 1:4 slope, regardless of the number of times it is required, and subsequent removing or reshaping of the material to the lines and grades shown on the plans shall be considered as included in the contract price paid for the materials involved and no additional compensation will be allowed therefor. No payment will be made for material placed in excess of that required for the structural section.

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

At least 60 days before applying seeds, furnish the Engineer a statement from the vendor that the order for the seed required for this contract has been received and accepted by the vendor. The statement from the vendor must include the names and quantity of seed ordered and the anticipated date of delivery.

The Engineer designates ground locations of erosion control by directing the placing of stakes or other suitable markers before application of erosion control materials as specified under "Erosion Control (Type D) of these special provisions.

Unless otherwise shown on the plans or specified in these special provisions, conduits to be jacked or drilled or installed by the open trench method for water line crossovers and sprinkler control crossovers must be installed before the installation of other pipe supply lines.

When embankment settlement periods or surcharge embankment settlement periods are specified, the settlement periods and the deferment of portions of the work shall comply with the provisions in Section 19-6.025, "Settlement Period," of the Standard Specifications and in "Earthwork" of these special provisions.

10-1.02 WATER POLLUTION CONTROL

GENERAL

Water pollution control work shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications, section of these special provisions entitled "Relations With California Regional Water Quality Control Board," and these special provisions.

The Contractor may obtain other National Pollutant Discharge Elimination System (NPDES) permits that apply to activities and mobile operations within or outside of the project limits including hot mix asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards, or access roads.

The Contractor shall perform water pollution control work in conformance with the requirements in the "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual" and its addenda in effect on the day the Notice to Contractors is dated. This manual is referred to as the "Preparation Manual." Copies of the Preparation Manual may be obtained from:

State of California
Department of Transportation
Publication Distribution Unit
1900 Royal Oaks Drive
Sacramento, California 95815
Telephone: (916) 445-3520

The Preparation Manual and other references for performing water pollution control work are available from the Department's Construction Storm Water and Water Pollution Control web site at:

<http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm>

Before the start of job site activities, the Contractor shall provide training for project managers, supervisory personnel, and employees involved with water pollution control work. The training shall include:

- A. Rules and regulations
- B. Implementation and maintenance for:
 - 1. Temporary Soil Stabilization
 - 2. Temporary Sediment Control
 - 3. Tracking Control
 - 4. Wind Erosion Control

The Contractor shall designate in writing a Water Pollution Control Manager (WPCM). The Contractor shall submit a statement of qualifications describing the training, work history, and expertise of the proposed WPCM. The qualifications shall include either:

- A. A minimum of 24 hours of Department approved storm water management training described at Department's Construction Storm Water and Water Pollution Control web site.
- B. Certification as a Certified Professional in Erosion and Sediment Control (CPESC).

The WPCM shall be:

- A. Responsible for water pollution control work.
- B. The primary contact for water pollution control work.
- C. Have authority to mobilize crews to make immediate repairs to water pollution control practices.

The Contractor may designate one manager to prepare the SWPPP and a different manager to implement the plan. The WPCP preparer shall meet the training requirements for the WPCM.

STORM WATER POLLUTION PREVENTION PLAN

The Contractor shall submit a Storm Water Pollution Prevention Plan (SWPPP) to the Engineer for approval. The SWPPP shall conform to the requirements in the Preparation Manual, the NPDES permit, and these special provisions. The SWPPP shall be submitted in place of the water pollution control program required by the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications.

The SWPPP shall include water pollution control practices:

- A. For storm water and non-storm water from areas outside of the job site related to construction activities for this contract such as:
 - 1. Staging areas.
 - 2. Storage yards.
 - 3. Access roads.
- B. Appropriate for each season as described in "Implementation Requirements" of these special provisions.
- C. For activities or mobile operations related to all NPDES permits.

The SWPPP shall include a schedule that:

- A. Describes when work activities that could cause water pollution will be performed.
- B. Identifies soil stabilization and sediment control practices for disturbed soil area.
- C. Includes dates when these practices will be 25, 50, and 100 percent complete.
- D. Shows 100 percent completion of these practices before the rainy season.

The SWPPP shall include the following temporary water pollution control practices and their associated contract items of work as shown on the plans or specified in these special provisions:

- A. Temporary Soil Stabilization
 - 1. Temporary Soil Binder
 - 2. Temporary Erosion Control Blanket
 - 3. Temporary Cover
- B. Temporary Sediment Control
 - 1. Street Sweeping
 - 2. Temporary Check Dam
 - 3. Temporary Fiber Roll
 - 4. Temporary Silt Fence
 - 5. Temporary Storm Drain Inlet Protection
- C. Tracking Control
 - 1. Temporary Construction Entrance
 - 2. Street Sweeping
- D. Wind Erosion Control
 - 1. Temporary Soil Binder
 - 2. Temporary Cover

- E. Non-Storm Water Management
 - 1. Construction Site Management
- F. Waste Management and Materials Pollution Control
 - 1. Construction Site Management
 - 2. Temporary Concrete Washout Facility
 - 3. Temporary Concrete Washout (Portable)

The SWPPP shall include the following contract items of work for permanent water pollution control as shown on the plans or as specified in these special provisions:

- A. Erosion Control (Type D)
- B. Slope Paving
- C. Erosion Control Blanket
- D. Fiber Roll

Within 20 days after contract approval, the Contractor shall submit 3 copies of the SWPPP to the Engineer. The Contractor shall allow 20 days for the Engineer's review. If revisions are required, the Engineer will provide comments and specify the date that the review stopped. The Contractor shall revise and resubmit the SWPPP within 15 days of receipt of the Engineer's comments. The Engineer's review will resume when the complete SWPPP is resubmitted. When the Engineer approves the SWPPP, the Contractor shall submit 4 copies of the approved SWPPP to the Engineer. The Contractor may proceed with construction activities if the Engineer conditionally approves the SWPPP while minor revisions are being completed. If the Engineer fails to complete the review within the time allowed and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay, the Contractor will be compensated for resulting losses, and an extension of time will be granted, as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The SWPPP shall include a copy of the RWQCB Waste Discharge Requirements for MATERIAL CONTAINING AERIALY DEPOSITED LEAD, California Department of Fish and Game Agreement and San Bernardino County Flood Control District Permit.

The Contractor shall not perform work that may cause water pollution until the SWPPP has been approved by the Engineer. The Engineer's review and approval shall not waive any contract requirements and shall not relieve the Contractor from complying with Federal, State and local laws, regulations, and requirements.

The Contractor shall amend the SWPPP annually and shall resubmit it to the Engineer 25 days before the defined rainy season.

If there is a change in construction schedule or activities, the Contractor shall prepare an amendment to the SWPPP to identify additional or revised water pollution control practices. The Contractor shall submit the amendment to the Engineer for review within a time agreed to by the Engineer not to exceed the number of days specified for the initial submittal of the SWPPP. The Engineer will review the amendment within the same time allotted for the review of the initial submittal of the SWPPP.

If directed by the Engineer or requested in writing by the Contractor and approved by the Engineer, changes to the water pollution control work specified in these special provisions will be allowed. Changes may include addition of new water pollution control practices. The Contractor shall incorporate these changes in the SWPPP. Additional water pollution control work will be paid for as extra work in accordance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

The Contractor shall keep a copy of the approved SWPPP at the job site. The SWPPP shall be made available when requested by a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency, or the local storm water management agency. Requests from the public shall be directed to the Engineer.

SAMPLING AND ANALYSIS

The Contractor shall include a Sampling and Analysis Plan (SAP) in the SWPPP to monitor the effectiveness of the water pollution control practices. The Contractor shall prepare the SAP in conformance with the Preparation Manual.

The Contractor shall designate trained personnel to collect water quality samples. The personnel and training shall be documented in the SAP. Training shall consist of the following elements:

- A. SAP review,
- B. Health and safety review, and
- C. Sampling simulations.

In the SAP the Contractor shall describe the following water quality sampling procedures:

- A. Sampling preparation,
- B. Collection,
- C. Quality assurance and quality control,
- D. Sample labeling,
- E. Collection documentation,
- F. Sample shipping,
- G. Chain of custody,
- H. Sample numbering, and
- I. Precautions from the construction site health and safety plan.

The Contractor shall document sample collection during precipitation.

Samples to be analyzed in the field shall be taken by the Contractor's designated sampling personnel using collection and analysis methods, and equipment calibration specified by the manufacturer of the sampling equipment. Samples to be analyzed by a laboratory, shall be sampled, preserved, and analyzed by a State-certified laboratory in conformance with the requirements in 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants." The Contractor shall identify the State-certified laboratory, sample containers, preservation requirements, holding times, and analysis method in the SAP. A list of State-certified laboratories that are approved by the Department is available at:

<http://www.dhs.ca.gov/ps/ls/ELAP/html/lablist.htm>

Non-Visible Pollutants

This project has the potential to discharge non-visible pollutants in storm water from the construction site. The Contractor shall include in the SAP a description of the sampling and analysis strategy to be implemented on the project for monitoring non-visible pollutants.

In the SAP the Contractor shall identify potential non-visible pollutants that will be present on the construction site associated with the following:

- A. Construction materials and wastes;
- B. Existing contamination due to historical site usage; or
- C. Application of soil amendments, including soil stabilization products, with the potential to alter pH or contribute toxic pollutants to storm water.

The Contractor shall show the locations planned for storage and use of the potential non-visible pollutants on the SWPPP Water Pollution Control Drawings.

The Contractor shall include in the SAP the following list of conditions that require sampling when observed during a storm water inspection:

- A. Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions.
- B. Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but:
 - 1. A breach, leakage, malfunction, or spill is observed;
 - 2. The leak or spill has not been cleaned up before precipitation; and
 - 3. There is the potential for discharge of non-visible pollutants to surface waters or drainage system.
- C. Construction activities; such as application of fertilizer, pesticide, herbicide, methyl methacrylate concrete sealant, or non-pigmented curing compound; have occurred during precipitation or within 24 hours preceding precipitation, and have the potential to discharge pollutants to surface waters or drainage system.
- D. Soil amendments, including soil stabilization products, with the potential to alter pH levels or contribute toxic pollutants to storm water runoff have been applied, and have the potential to discharge pollutants to surface waters or drainage system (unless independent test data are available that demonstrate acceptable concentrations of non-visible pollutants in the soil amendment).

- E. Storm water runoff from an area contaminated by historical usage of the site has the potential to discharge pollutants to surface waters or drainage system.

The Contractor shall describe in the SAP the schedule for collecting a sample downhill from each non-visible pollutant source and an uncontaminated control sample, during the first 2 hours of discharge from precipitation during daylight hours that result in enough discharge for sample collection. If discharge flows to the non-visible pollutant source, a sample shall be collected immediately downhill from where the discharge enters the Department's right of way. If precipitation occurs again after at least 72 hours of dry weather the Contractor shall take new samples.

In the SAP the Contractor shall identify sampling locations for collecting downstream and control samples, and the reason for their selection. The control sampling location shall be selected so the sample does not come into contact with materials, wastes or areas associated with potential non-visible pollutants or disturbed soil areas. The Contractor shall show non-visible pollutant sampling locations on the SWPPP Water Pollution Control Drawings.

The Contractor shall identify in the SAP the analytical method to be used for downhill and control samples for potential non-visible pollutants on the project.

Analytical Results and Evaluation

The Contractor shall submit a hard copy and electronic copy of water quality analytical results, and quality assurance and quality control data to the Engineer within 5 days of sampling for field analyses, and within 30 days for laboratory analyses. The Contractor shall also provide an evaluation of whether the downhill samples show levels of the tested parameter higher than in the control sample. If downhill or downstream samples show increased levels, the Contractor will assess the water pollution control measures, site conditions, and surrounding influences to determine the probable cause for the increase. As determined by the assessment, the Contractor will repair or modify water pollution control measures to address increases and amend the SWPPP as necessary. Electronic results (in one of the following file formats: .xls, .txt, .csv, .dbs, or .mdb) shall have the following information:

- A. Sample identification number.
- B. Contract number.
- C. Constituent.
- D. Reported value.
- E. Analytical method.
- F. Method detection limit.
- G. Reported limit.

The Contractor shall maintain the water quality sampling documentation and analytical results with the SWPPP on the project site.

If construction activities or knowledge of site conditions change such that discharges or sampling locations change, the Contractor shall amend the SAP in conformance with this section, "Water Pollution Control."

IMPLEMENTATION REQUIREMENTS

The Contractor's responsibility for SWPPP implementation shall continue throughout any temporary suspension of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

If the Contractor or the Engineer identifies a deficiency in the implementation of the approved SWPPP, the deficiency shall be corrected immediately, unless an agreed date for correction is approved in writing by the Engineer. The deficiency shall be corrected before the onset of precipitation. If the Contractor fails to correct the deficiency by the agreed date or before the onset of precipitation, the Department may correct the deficiency and deduct the cost of correcting deficiencies from payments.

If the Contractor fails to conform to the provisions of this section, "Water Pollution Control," the Engineer may order the suspension of work until the project complies with the requirements of this section.

Year-Round

The Contractor shall monitor the National Weather Service weather forecast on a daily basis during the contract. The Contractor may use an alternative weather forecasting service if approved by the Engineer. Appropriate water pollution control practices shall be in place before precipitation.

The Contractor may discontinue earthwork operations for a disturbed area for up to 21 days and the disturbed soil area will still be considered active. When earthwork operations in the disturbed area have been completed, the Contractor shall

implement appropriate water pollution control practices within 15 days, or before predicted precipitation, whichever occurs first.

Rainy Season

The Contractor shall provide soil stabilization and sediment control practices during the rainy season between October 1 and May 1.

The Contractor shall implement soil stabilization and sediment control practices a minimum of 10 days before the start of the rainy season.

During the defined rainy season, the active disturbed soil area of the project site shall be not more than 2 hectares. The Engineer may approve expansions of the active disturbed soil area limit if requested in writing. The Contractor shall maintain soil stabilization and sediment control materials on site to protect disturbed soil areas.

INSPECTION AND MAINTENANCE

The WPCM shall inspect the water pollution control practices identified in the SWPPP as follows:

- A. Before a forecasted storm,
- B. After precipitation that causes site runoff,
- C. At 24-hour intervals during extended precipitation,
- D. On a predetermined schedule, a minimum of once every 2 weeks outside of the defined rainy season, and
- E. On a predetermined schedule, a minimum of once a week during the defined rainy season.

The WPCM shall oversee the maintenance of the water pollution control practices.

The WPCM shall use the Storm Water Quality Construction Site Inspection Checklist provided in the Preparation Manual or an alternative inspection checklist provided by the Engineer. A copy of the completed site inspection checklist shall be submitted to the Engineer within 24 hours of finishing the inspection.

REPORTING REQUIREMENTS

If the Contractor identifies discharges into surface waters or drainage systems causing or potentially causing pollution, or if the project receives a written notice or order from a regulatory agency, the Contractor shall immediately inform the Engineer. The Contractor shall submit a written report to the Engineer within 7 days of the discharge, notice or order. The report shall include the following information:

- A. The date, time, location, and nature of the operation, type of discharge and quantity, and the cause of the notice or order.
- B. The water pollution control practices used before the discharge, or before receiving the notice or order.
- C. The date of placement and type of additional or altered water pollution control practices placed after the discharge, or after receiving the notice or order.
- D. A maintenance schedule for affected water pollution control practices.

Annual Certifications

By June 15 of each year, the Contractor shall complete and submit to the Engineer an Annual Certification of Compliance, as contained in the Preparation Manual.

PAYMENT

During each estimate period the Contractor fails to conform to the provisions in this section, "Water Pollution Control," or fails to implement the water pollution control practices shown on the plans or specified elsewhere in these special provisions as items of work, the Department will withhold 25 percent of the progress payment.

Withholds for failure to perform water pollution control work will be in addition to all other withholds provided for in the contract. The Department will return performance-failure withholds in the progress payment following the correction of noncompliance.

The contract lump sum price paid for prepare storm water pollution prevention plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing, obtaining approval of, and amending the SWPPP and inspecting water pollution control practices as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for prepare storm water pollution prevention plan will be made as follows:

- A. After the SWPPP has been approved by the Engineer, 50 percent of the contract item price for prepare storm water pollution prevention plan will be included in the monthly progress estimate.
- B. Forty percent of the contract item price for prepare storm water pollution prevention plan will be paid over the life of the contract.
- C. After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, payment for the remaining 10 percent of the contract item price for prepare storm water pollution prevention plan will be made in conformance with the provisions in Section 9-1.07A, "Payment Prior to Proposed Final Estimate."

Storm water sampling and analysis will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. No payment will be made for the preparation, collection, analysis, and reporting of storm water samples where appropriate water pollution control practices are not implemented before precipitation or if a failure of a water pollution control practice is not corrected before precipitation.

Implementation of water pollution control practices in areas outside the highway right of way not specifically provided for in the SWPPP or in these special provisions will not be paid for.

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

10-1.03 CONSTRUCTION SITE MANAGEMENT

Construction site management shall consist of controlling potential sources of water pollution before they come in contact with storm water systems or watercourses. The Contractor shall control material pollution and manage waste and non-storm water existing at the construction site by implementing effective handling, storage, use, and disposal practices.

Attention is directed to "Water Pollution Control" of these special provisions regarding the Contractor's appointment of a water pollution control manager (WPCM) for the project.

The Contractor shall train all employees and subcontractors regarding:

- A. Material pollution prevention and control;
- B. Waste management;
- C. Non-storm water management;
- D. Identifying and handling hazardous substances; and
- E. Potential dangers to humans and the environment from spills and leaks or exposure to toxic or hazardous substances.

Training shall take place before starting work on this project. New employees shall receive the complete training before starting work on this project. The Contractor shall have regular meetings to discuss and reinforce spill prevention and control; material delivery, storage, use, and disposal; waste management; and non-storm water management procedures.

Instructions for material and waste handling, storage, and spill reporting and cleanup shall be posted at all times in an open, conspicuous, and accessible location at the construction site.

Nonhazardous construction site waste and excess material shall be recycled when practical or disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, unless otherwise specified.

Vehicles and equipment at the construction site shall be inspected by the WPCM on a frequent, predetermined schedule, and by the operator each day of use. Leaks shall be repaired immediately, or the vehicle or equipment shall be removed from the construction site.

SPILL PREVENTION AND CONTROL

The Contractor shall implement spill and leak prevention procedures when chemicals or hazardous substances are stored. Spills of petroleum products; substances listed under CFR Title 40, Parts 110, 117, and 302; and sanitary and septic waste shall be contained and cleaned up as soon as is safe.

Minor spills involve small quantities of oil, gasoline, paint, or other material that can be controlled by the first responder upon discovery of the spill. Cleanup of minor spills includes:

- A. Containing the spread of the spill,
- B. Recovering the spilled material using absorption,
- C. Cleaning the contaminated area, and
- D. Disposing of contaminated material promptly and properly.

Semi-significant spills are those that can be controlled by the first responder with the help of other personnel. Cleanup of semi-significant spills shall be immediate. Cleanup of semi-significant spills includes:

- A. Containing the spread of the spill;
- B. Recovering the spilled material using absorption if the spill occurs on paved or an impermeable surface;
- C. Containing the spill with an earthen dike and digging up contaminated soil for disposal if the spill occurs on dirt;
- D. Covering the spill with plastic or other material to prevent contaminating runoff if the spill occurs during precipitation; and
- E. Disposing of contaminated material promptly and properly.

Significant or hazardous spills are those that cannot be controlled by construction personnel. Notifications of these spills shall be immediate. The following steps shall be taken:

- A. Construction personnel shall not attempt to cleanup the spill until qualified staff have arrived;
- B. Notify the Engineer and follow up with a written report;
- C. Obtain the services of a spills contractor or hazardous material team immediately;
- D. Notify the local emergency response team by dialing 911 and county officials at the emergency phone numbers kept on the construction site;
- E. Notify the Governor's Office of Emergency Services Warning Center at (805) 852-7550;
- F. Notify the National Response Center at (800) 424-8802 regarding spills of Federal reportable quantities in conformance with CFR Title 40, Parts 110, 119, and 302;
- G. Notify other agencies as appropriate, including:
 - 1. Fire Department,
 - 2. Public Works Department,
 - 3. Coast Guard,
 - 4. Highway Patrol,
 - 5. City Police or County Sheriff Department,
 - 6. Department of Toxic Substances,
 - 7. California Division of Oil and Gas,
 - 8. Cal OSHA, or
 - 9. Regional Water Resources Control Board.

The WPCM shall oversee and enforce proper spill prevention and control measures. Minor, semi-significant, and significant spills shall be reported to the Contractor's WPCM who shall notify the Engineer immediately.

The Contractor shall prevent spills from entering storm water runoff before and during cleanup. Spills shall not be buried or washed with water.

The Contractor shall keep material or waste storage areas clean, well organized, and equipped with enough cleanup supplies for the material being stored. Plastic shall be placed under paving equipment when not in use to catch drips.

MATERIAL MANAGEMENT

Material shall be delivered, used, and stored for this contract in a manner that minimizes or eliminates discharge of material into the air, storm drain systems, or watercourses.

The Contractor shall implement the practices described in this section when taking delivery of, using, or storing the following materials:

- A. Hazardous chemicals including:
 - 1. Acids,
 - 2. Lime,
 - 3. Glues,
 - 4. Adhesives,
 - 5. Paints,
 - 6. Solvents, and
 - 7. Curing compounds;
- B. Soil stabilizers and binders;
- C. Fertilizers;

- D. Detergents;
- E. Plaster;
- F. Petroleum products including:
 - 1. Fuel,
 - 2. Oil, and
 - 3. Grease;
- G. Asphalt components and concrete components; and
- H. Pesticides and herbicides.

The Contractor shall supply the Material Safety Data Sheet to the Engineer for material used or stored. The Contractor shall keep an accurate inventory of material delivered and stored at the construction site.

Employees trained in emergency spill cleanup procedures shall be present when hazardous materials or chemicals are unloaded.

The Contractor shall use recycled or less hazardous products when practical.

Material Storage

The Contractor shall store liquids, petroleum products, and substances listed in CFR Title 40, Parts 110, 117, and 302 in containers or drums approved by the United States Environmental Protection Agency, and place them in secondary containment facilities.

Secondary containment facilities shall be impervious to the materials stored there for a minimum contact time of 72 hours.

Throughout the rainy season secondary containment facilities shall be covered during non-working days and when precipitation is predicted. Secondary containment facilities shall be adequately ventilated.

The Contractor shall keep the secondary containment facility free of accumulated rainwater or spills. After precipitation, or in the event of spills or leaks, accumulated liquid shall be collected and placed into drums within 24 hours. These liquids shall be handled as hazardous waste in accordance with the provisions in "Hazardous Waste" of these special provisions, unless testing determines them to be nonhazardous.

Incompatible materials, such as chlorine and ammonia, shall not be stored in the same secondary containment facility.

Materials shall be stored in the original containers with the original product labels maintained in legible condition. Damaged or illegible labels shall be replaced immediately.

The secondary containment facility shall have the capacity to contain precipitation from a 24-hour-long, 25-year storm; and 10 percent of the aggregate volume of all containers, or all of the volume of the largest container within the facility, whichever is greater.

The Contractor shall store bagged or boxed material on pallets. Throughout the rainy season, bagged or boxed material shall be protected from wind and rain during non-working days and when precipitation is predicted.

The Contractor shall provide sufficient separation between stored containers to allow for spill cleanup or emergency response access. Storage areas shall be kept clean, well organized, and equipped with cleanup supplies appropriate for the materials being stored.

The Contractor shall repair or replace perimeter controls, containment structures, covers, and liners as needed. Storage areas shall be inspected before and after precipitation, and at least weekly during other times.

Stockpile Management

The Contractor shall reduce or eliminate potential air and water pollution from stockpiled material including soil, paving material, or pressure treated wood. Stockpiles shall be located out of floodplains when possible, and at least 15 m from concentrated flows of storm water, drainage courses, or inlets unless written approval is obtained from the Engineer.

The Contractor may discontinue adding or removing material for up to 21 days and a stockpile will still be considered active.

The Contractor shall protect active stockpiles with plastic or geotextile cover, soil stabilization measures, or with linear sediment barrier when precipitation is predicted. Active stockpiles of cold mix asphalt concrete shall be placed on an impervious surface and covered with plastic when precipitation is predicted.

The Contractor shall protect inactive soil stockpiles with a plastic or geotextile cover, or with soil stabilization measures at all times during the rainy season. A linear sediment barrier around the perimeter of the stockpile shall also be used. During the non-rainy season soil stockpiles shall be covered and protected with a linear sediment barrier when precipitation is predicted. The Contractor shall control wind erosion during dry weather as provided in Section 10, "Dust Control," of the Standard Specifications.

Stockpiles of portland cement concrete rubble, asphalt concrete (AC), hot mix asphalt (HMA), AC and HMA rubble, aggregate base, or aggregate subbase shall be covered with plastic or geotextile, or protected with a linear sediment barrier at all times during the rainy season, and when precipitation is predicted during the non-rainy season.

Stockpiles of cold mix asphalt concrete shall be placed on and covered with impermeable material at all times during the rainy season, and when precipitation is predicted during the non-rainy season.

Stockpiles of pressure treated wood shall be covered with impermeable material and placed on pallets at all times during the rainy season, and when precipitation is predicted during the non-rainy season.

The Contractor shall repair or replace linear sediment barriers and covers as needed or as directed by the Engineer to keep them functioning properly. Sediment shall be removed when it accumulates to 1/3 of the linear sediment barrier height.

WASTE MANAGEMENT

Solid Waste

The Contractor shall not allow litter or debris to accumulate anywhere on the construction site, including storm drain grates, trash racks, and ditch lines. The Contractor shall pick up and remove trash and debris from the construction site at least once a week. The WPCM shall monitor solid waste storage and disposal procedures on the construction site. The Contractor shall provide enough dumpsters of sufficient size to contain the solid waste generated by the project. Dumpsters shall be emptied when refuse reaches the fill line. Dumpsters shall be watertight. The Contractor shall not wash out dumpsters on the construction site. The Contractor shall provide additional containers and more frequent pickup during the demolition phase of construction

Solid waste includes:

- A. Brick,
- B. Mortar,
- C. Timber,
- D. Metal scraps,
- E. Sawdust,
- F. Pipe,
- G. Electrical cuttings,
- H. Non-hazardous equipment parts,
- I. Styrofoam and other packaging materials,
- J. Vegetative material and plant containers from highway planting, and
- K. Litter and smoking material, including litter generated randomly by the public.

Trash receptacles shall be provided and used in the Contractor's yard, field trailers, and locations where workers gather for lunch and breaks.

Hazardous Waste

The Contractor shall implement hazardous waste management practices when waste is generated on the construction site from the following substances:

- A. Petroleum products,
- B. Asphalt products,
- C. Concrete curing compound,
- D. Pesticides,
- E. Acids,
- F. Paints,
- G. Stains,
- H. Solvents,
- I. Wood preservatives,
- J. Roofing tar, and
- K. Materials classified as hazardous by California Code of Regulations, Title 22, Division 4.5; or listed in CFR Title 40, Parts 110, 117, 261, or 302.

Nothing in these special provisions shall relieve the Contractor of the responsibility for compliance with Federal, State, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.

The WPCM shall oversee and enforce hazardous waste management practices. Production of hazardous materials and hazardous waste on the construction site shall be kept to a minimum. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced when damaged.

The Contractor shall have a laboratory certified by the Department of Health Services (DHS) sample and test waste when hazardous material levels are unknown to determine safe methods for storage and disposal.

The Contractor shall segregate potentially hazardous waste from nonhazardous waste at the construction site. Hazardous waste shall be handled, stored, and disposed of as required in California Code of Regulations, Title 22, Division 4.5, Section 66262.34; and in CFR Title 49, Parts 261, 262, and 263.

The Contractor shall store hazardous waste in sealed containers constructed and labeled with the contents and date accumulated as required in California Code of Regulations, Title 22, Division 4.5; and in CFR Title 49, Parts 172, 173, 178, and 179. Hazardous waste containers shall be kept in temporary containment facilities conforming to the provisions in "Material Storage" of these special provisions.

There shall be adequate storage volume and containers shall be conveniently located for hazardous waste collection. Containers of hazardous waste shall not be overfilled and hazardous wastes shall not be mixed. Containers of dry waste that are not watertight shall be stored on pallets. The Contractor shall not allow potentially hazardous waste to accumulate on the ground. Hazardous waste shall be stored away from storm drains, watercourses, moving vehicles, and equipment.

The Contractor shall clean water based or oil based paint from brushes or equipment within a contained area and shall not contaminate soil, watercourses, or storm drain systems. Paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths shall be disposed of as solid waste.

The Contractor shall dispose of hazardous waste within 90 days of being generated. Hazardous waste shall be disposed of by a licensed hazardous waste transporter using uniform hazardous waste manifest forms and taken to a Class I Disposal Site. A copy of the manifest shall be provided to the Engineer.

Contaminated Soil

The Contractor shall identify contaminated soil from spills or leaks by noticing discoloration, odors, or differences in soil properties. Soil with evidence of contamination shall be sampled and tested by a laboratory certified by DHS. If levels of contamination are found to be hazardous, the soil shall be handled and disposed of as hazardous waste.

Contaminated soil existing on the construction site before mobilization shall be handled in accordance with "MATERIAL CONTAINING AERIALY DEPOSITED LEAD" of these special provisions.

The Contractor shall prevent the flow of water, including ground water, from mixing with contaminated soil by using one or a combination of the following measures:

- A. Berms,
- B. Cofferdams,
- C. Grout curtains,
- D. Freeze walls, or
- E. Concrete seal course.

If water mixes with contaminated soil and becomes contaminated, the water shall be sampled and tested by a laboratory certified by the DHS. If levels of contamination are found to be hazardous, the water shall be handled and disposed of as hazardous waste.

Concrete Waste

The Contractor shall implement practices to prevent the discharge of portland cement concrete, AC, or HMA waste into storm drain systems or watercourses.

Portland cement concrete, AC, or HMA waste shall be collected at the following locations and disposed of:

- A. Where concrete material, including grout, is used;
- B. Where concrete dust and debris result from demolition;
- C. Where sawcutting, coring, grinding, grooving, or hydro-concrete demolition of portland cement concrete, AC, or HMA creates a residue or slurry; or
- D. Where concrete trucks or other concrete-coated equipment is cleaned at the construction site.

Sanitary and Septic Waste

Wastewater from sanitary or septic systems shall not be discharged or buried within the Department right of way. The WPCM shall inspect sanitary or septic waste storage and monitor disposal procedures at least weekly. Sanitary facilities that discharge to the sanitary sewer system shall be properly connected and free from leaks.

The Contractor shall obtain written approval from the local health agency, city, county, and sewer district before discharging from a sanitary or septic system directly into a sanitary sewer system, and provide a copy to the Engineer. The Contractor shall comply with local health agency requirements when using an on-site disposal system.

Liquid Waste

The Contractor shall not allow construction site liquid waste, including the following, to enter storm drain systems or watercourses:

- A. Drilling slurries or fluids,
- B. Grease-free or oil-free wastewater or rinse water,
- C. Dredgings,
- D. Liquid waste running off a surface including wash or rinse water, or
- E. Other non-storm water liquids not covered by separate permits.

The Contractor shall hold liquid waste in structurally sound, leak proof containers such as:

- A. Sediment traps,
- B. Roll-off bins, or
- C. Portable tanks.

Liquid waste containers shall be of sufficient quantity and volume to prevent spills and leaks. The containers shall be stored at least 15 m from storm drains, watercourses, moving vehicles, and equipment.

The Contractor shall remove and dispose of deposited solids from sediment traps as provided in "Solid Waste" of these special provisions, unless determined infeasible by the Engineer.

Liquid waste may require testing to determine hazardous material content before disposal.

Drilling fluids and residue shall be disposed of outside the highway right of way. If the Engineer determines that an appropriate location is available, fluids and residue exempt under California Code of Regulations, Title 23, Section 2511(g) may be dried by infiltration and evaporation in a leak proof container. The remaining solid waste may be disposed of as provided in "Solid Waste" of these special provisions.

NON-STORM WATER MANAGEMENT

Water Control and Conservation

The Contractor shall prevent erosion or the discharge of pollutants into storm drain systems or watercourses by managing the water used for construction operations. The Contractor shall obtain the Engineer's approval before washing anything on the construction site with water that could discharge into a storm drain system or watercourse. Discharges shall be reported to the Engineer immediately.

The Contractor shall implement water conservation practices when water is used on the construction site. Irrigation areas shall be inspected and watering schedules shall be adjusted to prevent erosion, excess watering, or runoff. The Contractor shall shut off the water source to broken lines, sprinklers, or valves, and they shall be repaired as soon as possible. When possible, water from waterline flushing shall be reused for landscape irrigation. Paved areas shall be swept and vacuumed, not washed with water.

Construction water runoff, including water from water line repair, shall be directed to areas to infiltrate into the ground and shall not be allowed to enter storm drain systems or watercourses. Spilled water shall not be allowed to escape water truck filling areas. When possible, the Contractor shall direct water from off-site sources around the construction site, or shall minimize contact with the construction site.

Illegal Connection and Discharge Detection and Reporting

The Contractor shall inspect the construction site and the site perimeter before beginning work for evidence of illegal connections, discharges, or dumping. Subsequently, the construction site and perimeter shall be inspected on a frequent, predetermined schedule.

The Contractor shall immediately notify the Engineer when illegal connections, discharges, or dumping are discovered. The Contractor shall take no further action unless directed by the Engineer. Unlabeled or unidentifiable material shall be assumed to be hazardous.

The Contractor shall look for the following evidence of illegal connections, discharges, or dumping:

- A. Debris or trash piles,
- B. Staining or discoloration on pavement or soils,
- C. Pungent odors coming from drainage systems,
- D. Discoloration or oily sheen on water,
- E. Stains or residue in ditches, channels or drain boxes,
- F. Abnormal water flow during dry weather,
- G. Excessive sediment deposits,
- H. Nonstandard drainage junction structures, or
- I. Broken concrete or other disturbances near junction structures.

Vehicle and Equipment Cleaning

The Contractor shall limit vehicle and equipment cleaning or washing on the construction site to that necessary to control vehicle tracking or hazardous waste. Vehicles and equipment shall not be cleaned on the construction site with soap, solvents, or steam until the Engineer has been notified. The resulting waste shall be contained and recycled, or disposed of as provided in "Liquid Waste" or "Hazardous Waste" of these special provisions, whichever is applicable. The Contractor shall not use diesel to clean vehicles or equipment, and shall minimize the use of solvents.

The Contractor shall clean or wash vehicles and equipment in a structure equipped with disposal facilities. If using a structure is not possible, vehicles and equipment shall be cleaned or washed in an outside area with the following characteristics:

- A. Located at least 15 m from storm drainage systems or watercourses,
- B. Paved with AC, HMA or portland cement concrete,
- C. Surrounded by a containment berm, and
- D. Equipped with a sump to collect and dispose of wash water.

When washing vehicles or equipment with water, the Contractor shall use as little water as possible. Hoses shall be equipped with a positive shutoff valve.

Wash racks shall discharge to a recycle system or to another system approved by the Engineer. Sumps shall be inspected regularly, and liquids and sediments shall be removed as needed.

Vehicle and Equipment Fueling and Maintenance

The Contractor shall fuel or perform maintenance on vehicles and equipment off the construction site whenever practical. When fueling or maintenance must be done at the construction site, the Contractor shall designate a site, or sites, and obtain approval from the Engineer before using. The fueling or maintenance site shall be protected from storm water, shall be on level ground, and shall be located at least 15 m from drainage inlets or watercourses. The WPCM shall inspect the fueling or maintenance site regularly. Mobile fueling or maintenance shall be kept to a minimum.

The Contractor shall use containment berms or dikes around the fueling and maintenance area. Adequate amounts of absorbent spill cleanup material and spill kits shall be kept in the fueling and maintenance area and on fueling trucks. Spill cleanup material and kits shall be disposed of immediately after use. Drip pans or absorbent pads shall be used during fueling or maintenance unless performed over an impermeable surface.

Fueling or maintenance operations shall not be left unattended. Fueling nozzles shall be equipped with an automatic shutoff control. Vapor recovery fueling nozzles shall be used where required by the Air Quality Management District. Nozzles shall be secured upright when not in use. Fuel tanks shall not be topped-off.

The Contractor shall recycle or properly dispose of used batteries and tires.

Material and Equipment Used Over Water

Drip pans and absorbent pads shall be placed under vehicles or equipment used over water, and an adequate supply of spill cleanup material shall be kept with the vehicle or equipment. Drip pans or plastic sheeting shall be placed under vehicles or equipment on docks, barges, or other surfaces over water when the vehicle or equipment will be idle for more than one hour.

The Contractor shall provide watertight curbs or toe boards on barges, platforms, docks, or other surfaces over water to contain material, debris, and tools. Material shall be secured to prevent spills or discharge into water due to wind.

Structure Removal Over or Adjacent to Water

The Contractor shall not allow demolished material to enter storm water systems or watercourses. The Contractor shall use covers and platforms approved by the Engineer to collect debris. Attachments shall be used on equipment to catch debris on small demolition operations. Debris catching devices shall be emptied regularly and debris shall be handled as provided in "Waste Management" of these special provisions.

The WPCM shall inspect demolition sites within 15 m of storm water systems or watercourses every day.

Paving, Sealing, Sawcutting, and Grinding Operations

The Contractor shall prevent the following material from entering storm drain systems or water courses:

- A. Cementitious material,
- B. Asphaltic material,
- C. Aggregate or screenings,
- D. Grinding or sawcutting residue,
- E. Pavement chunks, or
- F. Shoulder backing.

The Contractor shall cover drainage inlets and use linear sediment barriers to protect downhill watercourses until paving, sealing, sawcutting, or grinding operations are completed and excess material has been removed. Drainage inlets and manholes shall be covered during the application of seal coat, tack coat, slurry seal, or fog seal.

During the rainy season or when precipitation is predicted, paving, sawcutting, and grinding operations shall be limited to places where runoff can be captured. Seal coat, tack coat, slurry seal, or fog seal operations shall not begin if precipitation is predicted for the application or the curing period. The Contractor shall not excavate material from existing roadways during precipitation.

The Contractor shall vacuum up slurry from sawcutting operations immediately after the slurry is produced. Slurry shall not be allowed to run onto lanes open to public traffic or off the pavement.

The Contractor shall collect residue from portland cement concrete grinding operations with a vacuum attachment on the grinding machine. The residue shall not be left on the pavement or allowed to flow across the pavement.

Material excavated from existing roadways may be stockpiled as provided in "Stockpile Management" of these special provisions if approved by the Engineer. AC or HMA chunks used in embankment shall be placed above the water table and covered by at least 0.3-m of material.

Substances used to coat asphalt trucks and equipment shall not contain soap, foaming agents, or toxic chemicals.

Thermoplastic Striping and Pavement Markers

Thermoplastic striping and preheating equipment shutoff valves shall work properly at all times when on the construction site. The Contractor shall not preheat, transfer, or load thermoplastic within 15 m of drainage inlets or watercourses. The Contractor shall not fill the preheating container to more than 150 mm from the top. Truck beds shall be cleaned daily of scraps or melted thermoplastic.

The Contractor shall not unload, transfer, or load bituminous material for pavement markers within 15 m of drainage inlets or watercourses. All pressure shall be released from melting tanks before removing the lid to fill or service. Melting tanks shall not be filled to more than 150 mm from the top.

The Contractor shall collect bituminous material from the roadway after marker removal.

Pile Driving

The Contractor shall keep spill kits and cleanup material at pile driving locations. Pile driving equipment shall be parked over drip pans, absorbent pads, or plastic sheeting where possible. When not in use, pile driving equipment shall be stored at least 15 m from concentrated flows of storm water, drainage courses, or inlets. The Contractor shall protect pile driving equipment by parking it on plywood and covering it with plastic when precipitation is predicted. The WPCM shall inspect the pile driving area every day for leaks and spills.

The Contractor shall use vegetable oil instead of hydraulic fluid when practical.

Concrete Curing

The Contractor shall not overspray chemical curing compound. Drift shall be minimized by spraying as close to the concrete as possible. Drainage inlets shall be covered before applying curing compound.

The Contractor shall minimize the use and discharge of water by using wet blankets or similar methods to maintain moisture when curing concrete.

Concrete Finishing

The Contractor shall collect and dispose of water and solid waste from high-pressure water blasting. Drainage inlets within 15 m shall be covered before sandblasting. The nozzle shall be kept as close to the surface of the concrete as possible to minimize drift of dust and blast material. Blast residue may contain hazardous material.

Containment structures for concrete finishing operations shall be inspected for damage before each day of use and before predicted precipitation. Liquid and solid waste shall be removed from the containment structure after each work shift.

DEWATERING

Dewatering shall consist of discharging accumulated storm water, ground water, or surface water from excavations or temporary containment facilities. The Contractor shall discharge water within the limits of the project.

Dewatering discharge shall not cause erosion, scour, or sedimentary deposits that impact natural bedding materials.

The Contractor shall conduct dewatering activities in accordance with the Field Guide for Construction Dewatering available at:

<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

Before dewatering the Contractor shall submit a Dewatering and Discharge Plan to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications and "Water Pollution Control," of these special provisions. At a minimum, the Dewatering and Discharge Plan shall include the following:

- A. A title sheet and table of contents;
- B. A description of the dewatering and discharge operations detailing the locations, quantity of water, equipment, and discharge point;
- C. The estimated schedule for dewatering and discharge (begin and end dates, intermittent or continuous);
- D. Discharge alternatives such as dust control or percolation; and
- E. Visual monitoring procedures with inspection log.

The Contractor shall not discharge storm water or non-storm water that has an odor, discoloration other than sediment, an oily sheen, or foam on the surface and shall notify the Engineer immediately upon discovery.

If water cannot be discharged within the project limits due to site constraints it shall be disposed of in the same manner specified for material in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

PAYMENT

The contract lump sum price paid for construction site management shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in spill prevention and control, material management, waste management, non-storm water management, and dewatering and identifying, sampling, testing, handling, and disposing of hazardous waste, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.04 STREET SWEEPING

GENERAL

Summary

This work includes street sweeping.

The SWPPP must describe and include the use of street sweeping as a water pollution control practice for sediment control and tracking control.

Submittals

At least 5 business days before starting clearing and grubbing, earthwork, or other activities with the potential for tracking sediment or debris, submit:

1. Number of sweepers described in the SWPPP
2. Type of sweeper technology

Quality Control and Assurance

Retain and submit records of street sweeping including:

1. Quantity of sweeping waste disposal
2. Sweeping times and locations

CONSTRUCTION

Street Sweepers

Sweepers must use one of these technologies:

1. Mechanical sweeper followed by a vacuum-assisted sweeper
2. Vacuum-assisted dry (waterless) sweeper
3. Regenerative-air sweeper

Operation

Street sweeping must be done at:

1. Paved roads at job site entrance and exit locations
2. Paved areas within the job site that flow to storm drains or water bodies

Street sweeping must be done:

1. During clearing and grubbing activities
2. During earthwork activities
3. During trenching activities
4. During roadway structural section activities
5. When vehicles are entering and leaving the job site
6. After soil disturbing activities
7. After observing offsite tracking of material

Monitor paved areas and roadway within the jobsite. Street sweeping must be done:

1. Within 1 hour, if sediment or debris is observed during activities that require sweeping
2. Within 24 hours, if sediment or debris is observed during activities that do not require sweeping

At least 1 sweeper must be on the job site at all times when sweeping work is required. The sweeper must be in good working order.

Perform street sweeping to minimize dust. If dust generation is excessive or sediment pickup is ineffective, use water or a vacuum.

You may stockpile collected material on the jobsite according to the approved SWPPP. Dispose of collected material at least once per week.

Material collected during street sweeping must be removed and disposed of under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Your WPCM must inspect paved roads at job site access points:

1. Daily if earthwork and other sediment or debris generating activities occur daily
2. Weekly if earthwork and other sediment or debris generating activities do not occur daily
3. When the National Weather Service predicts precipitation with a probability of at least 30 percent

MEASUREMENT AND PAYMENT

The contract lump sum price paid for street sweeping includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in street sweeping, including disposal of collected material, as shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

10-1.05 TEMPORARY SOIL BINDER

GENERAL

Summary

This work includes applying, maintaining, and removing temporary soil binder. Soil binder uses a mixture of soil binder, and water to stabilize active and nonactive disturbed soil areas.

The SWPPP must describe and include the use of temporary soil binder as a water pollution control practice for soil stabilization.

Submittals

At least 5 business days before applying soil binder, submit:

1. Material Safety Data Sheet for the soil binder.
2. Product label describing the soil binder as an erosion control product.
3. List of pollutant indicators and potential pollutants for the use of temporary soil binder. Pollutant indicators are described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Preparation Manual.
4. Determination of acute and chronic toxicity for aquatic organisms conforming to EPA methods for the soil binder.
5. Composition of ingredients including chemical formulation.

Submit a Certificate of Compliance as specified in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for soil binder:

Quality Control and Assurance

Retain and submit records of temporary soil binder applications including:

1. Compliance with specified rates
2. Application area
3. Application time
4. Quantity

MATERIALS

Soil Binder

The soil binder must be:

1. Nonflammable
2. Nontoxic to aquatic organisms
3. Free from growth or germination inhibiting factors
4. Either a plant-based product or a polymeric emulsion blend

Soil binder classified as a plant-based product must be:

1. A natural high molecular weight polysaccharide
2. A high viscosity hydrocolloid that is miscible in water
3. Functional for at least 180 days
4. Labeled as either guar, psyllium, or starch

Guar must be:

1. A guar gum based product derived from the ground endosperm of the guar plant, *Cyanmopsis tetragonolobus*
2. Treated with dispersant agents for easy mixing
3. Able to be diluted at the rate of 1.2 to 6.0 kg per 1000 liters of water

Psyllium must be:

1. Made of the finely ground muciloid coating of plantago ovata or plantago ispaghula seeds
2. Able to dry and form a firm but rewettable membrane

Starch must be a non-ionic, water-soluble granular material derived from corn, potato, or other plant-based source. Soil binder classified as a polymeric emulsion blend must be:

1. A polymeric emulsion blend with a liquid or dry powder formulation
2. Anionic with a residual monomer content that is at most 0.05 percent by weight
3. Functional for at least 180 days
4. A prepackaged product labeled as containing one of the following as the primary active ingredient of the polymeric emulsion blend:
 - 4.1 Acrylic copolymers and polymers
 - 4.2 Polymers of methacrylates and acrylates
 - 4.3 Copolymers of sodium acrylates and acrylamides
 - 4.4 Polyacrylamide (PAM) and copolymer of acrylamide
 - 4.5 Hydrocolloid polymers

Coloring Agent

Use a biodegradable, nontoxic coloring agent free from copper, mercury, and arsenic to ensure the hydraulic mulch contrasts with the application area.

CONSTRUCTION

Application

Apply soil binder:

1. Per the manufacturer's recommendations for the job site soil conditions. Prewet the area if recommended by the manufacturer.
2. From 2 or more directions to achieve a continuous cover.
3. During dry weather or at least 24 hours before predicted rain.

Do not apply soil binder if:

1. Water is standing on or moving across the soil surface
2. Soil is frozen
3. Air temperature is below 4 °C during the tackifier curing period unless allowed by the manufacturer and approved by the Engineer

Do not over-spray soil binder onto the traveled way, sidewalks, lined drainage channels, or existing vegetation.

Maintenance

Reapply soil binder within 24 hours of discovering visible erosion, unless the Engineer approves a longer period.

Temporary soil binder disturbed or displaced by the Contractor's vehicles, equipment, or operations must be reapplied at the Contractor's expense.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence are not included in the cost for performing maintenance.

Removal

Remove soil binder by mechanically blending it into the soil with track laying equipment, disking, or other approved method.

MEASUREMENT AND PAYMENT

Temporary soil binder is measured by the square meter from measurements along the slope of the areas covered by the soil binder.

The contract item price paid per square meter for temporary soil binder includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying temporary soil binder, complete in place, including removal of soil binder, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The State and the Contractor share the cost of maintaining the temporary soil binder. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays to the Contractor one-half of that cost.

10-1.06 TEMPORARY EROSION CONTROL BLANKET

Temporary erosion control blanket shall be furnished, installed, maintained, and later removed in ditches or swales, on embankment slopes, and excavation slopes at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary erosion control blanket shall be one of the water pollution control practices for soil stabilization. The SWPPP shall include the use of temporary erosion control blanket.

MATERIALS

Materials for the temporary erosion control blanket shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions. Temporary erosion control blanket shall be a rolled erosion control product (RECP) and shall be classified either as temporary and degradable or long-term and nondegradable.

Temporary and Degradable

Temporary and degradable RECP shall be as follows:

1. Machine produced mats consisting of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The excelsior blanket shall be of consistent thickness with wood fiber evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with extruded photodegradable plastic netting or lightweight nonsynthetic netting. The blanket shall be smolder resistant without the use of chemical additives, nontoxic, and noninjurious to plant and animal life. Excelsior blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m².
2. Machine produced mats consisting of 70 percent straw and 30 percent coconut fiber with extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The straw and coconut shall adhere to the netting using thread or glue strip. The straw and coconut blanket shall be of consistent thickness, with straw and coconut fiber evenly distributed over the entire area of the blanket. Straw and coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m².
3. Machine produced mats consisting of 100 percent coir consisting of coconut fiber with extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The coconut fiber shall adhere to the netting using thread or glue strip. The coconut blanket shall be of consistent thickness, with coconut fiber evenly distributed over the entire area of the blanket. Coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m².
4. Machine woven netting consisting of 100 percent spun coir consisting of coconut fiber with an average open area of 63 percent to 70 percent. Coconut coir netting shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m².

Long-Term and Nondegradable Erosion Control Blanket

The long-term and nondegradable erosion control blanket shall be a geotextile blanket conforming to the provisions in Section 88-1.04, "Rock Slope Protection Fabric," of the Standard Specifications for rock slope protection fabric (Type A).

Staples

An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval before installation.

INSTALLATION

Temporary erosion control blanket shall be installed as follows:

1. Temporary erosion control blanket strips shall be placed loosely along the ditch or swale with the longitudinal edges and joints parallel to the centerline of the ditch or swale. Longitudinal joints of blankets shall be overlapped and stapled. The blanket on the upper portion of the slope shall overlap the blanket on the lower portion of the slope. Transverse joints of blankets shall be secured in intermediate joint trenches. Ends of the blankets shall be secured in place in key trenches.

2. Temporary erosion control blanket strips shall be placed loosely on the embankment or excavation slope with the longitudinal joints perpendicular to the slope contour lines. Longitudinal and transverse joints of blankets shall be overlapped and stapled. For transverse joints, the blanket on the upper portion of the slope shall overlap the blanket on the lower portion of the slope. For longitudinal joints, the blanket on the side of the prevailing wind shall overlap the blanket on the downwind side of the slope. Ends of the blankets shall be secured in place in key trenches.
3. Temporary erosion control blanket strips shall be secured in place with wire staples. Staples shall be driven perpendicular to the slopes.

When no longer required, as determined by the Engineer, temporary erosion control blanket fabric shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbances, including holes and depressions caused by the installation and removal of the temporary erosion control blanket shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Sediment in excess of 50 mm above the surface of the blanket, or when directed by the Engineer, shall be removed. Removed sediment shall be deposited within the project limits and shall not be subject to erosion by wind or water.

Temporary erosion control blanket shall be repaired or replaced on the same day the damage occurs. When washouts occur between joints or beneath the temporary erosion control blanket, the blanket shall be repaired. Temporary erosion control blanket shall be repaired or replaced when the area treated with temporary erosion control blanket becomes exposed or exhibits visible erosion. Temporary erosion control blanket damaged during the progress of work or resulting from the Contractor's vehicles, equipment, or operations shall be repaired or replaced at the expense of the Contractor.

MEASUREMENT AND PAYMENT

The quantity of temporary erosion control blanket to be paid for will be measured by the square meter of the actual area covered excluding overlaps.

The contract price paid per square meter for temporary erosion control blanket shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary erosion control blanket, complete in place, including trench excavation and backfill, and removal of temporary erosion control blanket, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The State and you share the cost of maintaining the temporary erosion control blankets. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

10-1.07 TEMPORARY COVER

Temporary cover shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary cover shall be one of the water pollution control practices for soil stabilization. The SWPPP shall include the use of temporary cover.

MATERIALS

Temporary Cover Fabric

Temporary cover fabric shall be either a geotextile (engineering fabric) or a geomembrane (plastic sheeting) conforming to the following requirements:

1. Geotextile shall be a woven, slit film fabric which is also known as woven tape. The fabric shall be nonbiodegradable, resistant to deterioration by sunlight, and inert to most soil chemicals. Edges of the film fabric shall be selvage or serge to prevent unraveling. The film fabric shall also conform to the following requirements:

| Specification | Requirements |
|--|---------------|
| Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632* | 0.89 |
| Elongation at break, percent min. ASTM Designation: D4632* | 15 |
| Toughness, kilonewtons, min. (percent elongation x grab tensile strength) | 13.3 |
| Permittivity, l/sec, max. (liters per minute per square meter) ASTM Designation: D 4491 | 0.08 (244) |
| Ultraviolet light stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon arc lamp method) | 70 |

* or appropriate test method for specific polymer

- The geomembrane shall consist of 0.25-mm thick, single-ply material in conformance with the requirements in ASTM Designation: D 5199.

Temporary cover fabric shall be manufactured from polyethylene, polypropylene, or comparable polymers. The polymer materials may be virgin, recycled, or a combination of virgin and recycled materials. The polymer materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance with the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Restrainers

Restrainers for securing the temporary cover fabric on slopes and stockpiles shall consist of one or a combination of the following:

- Gravel-filled bags used as restrainers shall be knotted, roped, and placed at a maximum of 2 m apart on the temporary cover fabric as shown on the plans. Gravel-filled bags shall be between 13 kg and 22 kg in mass, between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width. Gravel bag fabric shall be nonwoven polypropylene geotextile with a minimum unit weight of 270 g/m². The fabric shall have a minimum grab tensile strength (25-mm grip) of 0.89-kN in conformance with the requirements in ASTM Designation: D 4632, and an ultraviolet (UV) stability of 70 percent tensile strength retained after 500 hours in conformance with the requirements in ASTM Designation: D 4355, xenon arc lamp method. Gravel shall consist of noncohesive material between 10 mm and 20 mm in diameter, free of clay balls, organic matter, and other deleterious material. The openings of gravel-filled bags shall be secured to prevent escape of gravel.
- Restrainers consisting of a steel anchor with a wooden lath shall be fabricated and placed as shown on the plans. Wooden lath shall conform to the provisions in Section 20-2.12, "Lumber," of the Standard Specifications and shall be fir or pine, 38 mm x 89 mm in size, and 2.4 m in length. The wooden lath shall be secured to the temporary cover with steel anchors placed 1.2 m apart along the lath.

The Contractor may use an alternative restrainer if approved by the Engineer in writing. The Contractor shall submit details for an alternative restrainer to the Engineer before installation. The alternative restrainer shall be installed and maintained in conformance with these special provisions.

INSTALLATION

Temporary cover shall be installed as follows:

- Temporary cover fabric shall be placed and anchored as shown on the plans.
- Abutting edges of the temporary cover fabric shall overlap a minimum of 600 mm. Nonabutting edges shall be embedded in the soil a minimum of 150 mm.
- Restrainers shall be placed at the overlap area and along the toe of the slope. Restrainers outside the overlap areas shall be placed at a maximum spacing of 2.4 m.
- Steel anchors shall be installed to allow the leg of the steel anchor to pierce through the temporary cover fabric into the slope with the crown section securing the wooden lath firmly against the slope.

5. Earthen berm, a linear sediment barrier, shall be constructed adjacent to the toe of the slope with a minimum height of 200 mm and a minimum width of 940 mm. The earthen berm shall be hand or mechanically compacted. Alternative linear sediment barrier may be used if approved by the Engineer in writing.

If the Contractor removes the temporary cover in order to facilitate other work, the temporary cover shall be replaced and secured.

When no longer required as determined by the Engineer, temporary cover shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbances, including holes and depressions, caused by the installation and removal of the temporary cover shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

The Contractor shall maintain the temporary cover throughout the contract to prevent displacement or migration of the material on the slope or stockpiled.

Temporary cover shall be maintained to minimize exposure of the protected area. Restrainers shall be relocated and secured as needed to restrain the temporary cover fabric in place. Temporary cover that breaks free shall be immediately secured. Holes, tears, and voids in the temporary cover fabric shall be patched, repaired, or replaced. When patches or repairs are unacceptable as determined by the Engineer, the temporary cover shall be replaced.

Temporary cover shall be repaired or replaced on the same day when the damage occurs. Damage to the temporary cover resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

The quantity of temporary cover to be paid for will be measured by the square meter for the actual area covered.

The contract price paid per square meter for temporary cover shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary cover, complete in place, including trench excavation and backfill, maintenance, and removal of temporary cover, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.08 TEMPORARY CONCRETE WASHOUT FACILITY

Temporary concrete washout facilities shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary concrete washout facilities shall be one of the water pollution control practices for waste management and materials pollution control. The SWPPP shall include the use of temporary concrete washout facilities.

MATERIALS

Plastic Liner

Plastic liners shall be single ply, new polyethylene sheeting, a minimum of 0.25-mm thick and shall be free of holes, punctures, tears or other defects that compromise the impermeability of the material. Plastic liners shall not have seams or overlapping joints.

Gravel-filled Bags

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

| Specification | Requirements |
|---|--------------|
| Mass per unit area, grams per square meter, min. ASTM Designation: D 5261 | 270 |
| Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632* | 0.89 |
| Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method | 70 |

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials.

The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

Straw Bales

Straw for straw bales shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications.

Straw bales shall be a minimum of 360 mm in width, 450 mm in height, 900 mm in length and shall have a minimum mass of 23 kg. The straw bale shall be composed entirely of vegetative matter, except for binding material.

Straw bales shall be bound by either wire, nylon or polypropylene string. Jute or cotton binding shall not be used. Baling wire shall be a minimum 1.57 mm in diameter. Nylon or polypropylene string shall be approximately 2 mm in diameter with 360 N of breaking strength.

Stakes

Stakes shall be wood or metal. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots or other defects which would render them unfit for the purpose intended. Wood stakes shall be a minimum 50 mm x 50 mm in size. Metal stakes may be used as an alternative, and shall be a minimum 13 mm in diameter. Stakes shall be a minimum 1.2 m in length. The tops of the metal stakes shall be bent at a 90-degree angle or capped with an orange or red plastic safety cap that fits snugly to the metal stake. The Contractor shall submit a sample of the metal stake and plastic cap, if used, for the Engineer's approval before installation.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval before installation.

Signs

Wood posts for signs shall conform to the provisions in Section 56-2.02B, "Wood Posts," of the Standard Specifications. Lag screws shall conform to the provisions in Section 56-2.02D, "Sign Panel Fastening Hardware," of the Standard Specifications.

Plywood shall be freshly painted for each installation with not less than 2 applications of flat white paint. Sign letters shown on the plans shall be stenciled with commercial quality exterior black paint. Testing of paint will not be required.

INSTALLATION

Temporary concrete washout facilities shall be as follows:

1. Temporary concrete washout facilities shall be installed before beginning placement of concrete and located a minimum of 15 m from storm drain inlets, open drainage facilities, and water courses unless determined infeasible by the Engineer. Temporary concrete washout facilities shall be located away from construction traffic or access areas at a location determined by the Contractor and approved by the Engineer.
2. A sign shall be installed adjacent to each washout facility at a location determined by the Contractor and approved by the Engineer. Signs shall be installed in conformance with the provisions in Section 56-2.03, "Construction," and Section 56-2.04, "Sign Panel Installation," of the Standard Specifications.
3. The length and width of a temporary concrete washout facility may be increased from the minimum dimensions shown on the plans upon approval of the Engineer.
4. Temporary concrete washout facilities shall be constructed in sufficient quantity and size to contain liquid and concrete waste generated by washout operations for concrete wastes. These facilities shall be constructed to contain liquid and concrete waste without seepage, spills, or overflow.
5. Berms for below grade temporary concrete washout facilities shall be constructed from compacted native material. Gravel may be used in conjunction with compacted native material.
6. A plastic liner shall be installed in below grade temporary concrete washout facilities.

Details for an alternative temporary concrete washout facility shall be submitted to the Engineer for approval at least 7 days before installation.

When temporary concrete washout facilities are no longer required for the work, as determined by the Engineer, the hardened concrete and liquid residue shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Temporary concrete washout facilities shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 300 mm. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Holes, rips, and voids in the plastic liner shall be patched and repaired by taping or the plastic liner shall be replaced. The plastic liner shall be replaced when patches or repairs compromise the impermeability of the material as determined by the Engineer.

Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out.

Temporary concrete washout facilities shall be repaired or replaced on the same day the damage occurs. Damage to temporary concrete washout facilities resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary concrete washout facilities will be measured as units determined from actual count in place.

The contract unit price paid for temporary concrete washout facility shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing a temporary concrete washout facility, complete in place, including excavation and backfill, maintenance, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.09 TEMPORARY CONCRETE WASHOUT (PORTABLE)

A portable temporary concrete washout shall be furnished, maintained, and removed as specified in the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions and as directed by the Engineer.

A portable temporary concrete washout shall consist of a commercially available drum at a minimum size of 208-liter or alternate container upon written approval from the Engineer. The drum shall be stenciled "Concrete Waste Material." The letters shall be black and 100 mm in height on a white background. The top of the stenciling shall be 300 mm from the top of the barrel.

PLACEMENT

A portable temporary concrete washout shall be as follows:

- A. A portable temporary concrete washout shall be in place prior to placement of concrete and shall be located in the immediate area of the concrete work as approved by the Engineer. The temporary concrete washout shall be located away from construction traffic or public access areas. After initial placement, temporary concrete washout shall be moved as needed for concrete construction work. When the temporary concrete washout is no longer required, as determined by the Engineer, it shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
- B. A sign shall be installed adjacent to each washout at a location determined by the Contractor and approved by the Engineer. Signs shall be installed in conformance with the provisions in Section 12-3.06B, "Portable Signs" of the Standard Specifications. Each portable sign shall consist of a base, framework and a sign panel. The sign panel shall be made out of plywood and shall have a minimum size of 610 mm by 1200 mm. The sign panel shall read "Concrete Washout" with black letters, 150 mm in height, on a white background.
- C. The Contractor shall provide sufficient temporary concrete washout capacity to contain liquid and concrete waste generated by washout operations without seepage or spills.

Maintaining the portable temporary concrete washout shall include removing and disposing of concrete waste. Concrete waste material generated shall be removed each day and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

The Contractor shall provide the name and location of the disposal facility to the Engineer before disposal of solid and liquid concrete waste. The Contractor shall provide verification that the off-site commercial or noncommercial disposal site has a permit issued by the California Regional Water Quality Control Board (RWQCB). If the disposal site is located outside of the State of California, the Contractor shall provide a copy of the permit issued by the state or local agency having jurisdiction over the disposal site.

When relocating or transporting a portable temporary concrete washout, the portable washout shall be properly secured to prevent spilling of concrete waste material.

PAYMENT

The contract lump sum price paid for temporary concrete washout (portable) shall include full compensation for furnishing all labor, materials, tools, equipment, including the sign, and incidentals, and for doing all the work involved in furnishing, placing, maintaining, repairing, replacing, transporting, disposing of concrete waste, and removing the washout, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.10 TEMPORARY CHECK DAM

Temporary check dams shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary check dams shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary check dams.

Temporary check dams shall be either Type 1 (fiber roll) or Type 2 (gravel bag).

MATERIALS

Fiber Roll

Fiber rolls shall be one of the following:

1. Constructed with a premanufactured blanket consisting of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. Rolls shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length and shall weigh at least 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the rolls.

Stakes

Wood stakes shall be a minimum of 19 mm x 38 mm x 450 mm. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots or other defects which would render them unfit for the purpose intended. Metal stakes may be used as an alternative. The Contractor shall submit a sample of the metal stake for the Engineer's approval before installation. The tops of the metal stakes shall be bent at a 90-degree angle.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

Gravel-filled Bag

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

| Specification | Requirements |
|---|--------------|
| Mass per unit area, grams per square meter, min. ASTM Designation: D 5261 | 270 |
| Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632* | 0.89 |
| Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method | 70 |

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used in construction of the gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

INSTALLATION

Temporary check dams shall be installed as follows:

1. Temporary check dam (Type 1): Rope and notched stakes shall be used to restrain the fiber rolls against the surface of the unlined ditch or swale. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope so that the rope will hold the fiber roll tightly to the slope. Furrows will not be required. If metal stakes are used, the rope may be laced and knotted on the bend at the top of the metal stakes.
2. Temporary check dam (Type 2): A single layer of gravel bags shall be placed in lined or unlined ditches with ends abutted tightly and not overlapped.
3. The bedding area for the temporary check dam shall be cleared of obstructions including, rocks, clods, and debris greater than 25 mm in diameter before installation.
4. The temporary check dam shall be installed across and approximately perpendicular to the centerline of a ditch or drainage line.
5. The temporary check dam shall be installed with sufficient spillway depth to prevent flanking of concentrated flow around the ends of the check dam.
6. The temporary check dam shall be installed in an unlined ditch or swale before the application of other temporary erosion control or soil stabilization material in the same unlined ditch or swale.
7. The temporary check dam shall be installed upon completion of temporary erosion control blanket in earthen ditches or swales.

Details for an alternative temporary check dam shall be submitted to the Engineer for approval at least 7 days before installation.

When the temporary check dam is no longer required, as determined by the Engineer, it shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary check dam shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary check dams shall be maintained to provide sediment holding capacity and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out. Locations where rills and other evidence of concentrated runoff have occurred beneath the check dams shall be corrected.

When sediment exceeds 1/3 of the height of the check dam above ground, or when directed by the Engineer, sediment shall be removed. The removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water.

Temporary check dams shall be repaired or replaced the same day damage occurs. Washouts or scour beneath the temporary check dam shall be repaired. Temporary check dams damaged during the progress of work or resulting from the Contractor's vehicles, equipment, or operations shall be repaired or replaced at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary check dams to be paid for will be determined by the meter measured along the centerline of the installed check dam.

The contract price paid per meter for temporary check dam shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary check dams, complete in place, including and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The State and you share the cost of maintaining the temporary check dams. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

10-1.11 TEMPORARY FIBER ROLL

Temporary fiber roll shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary fiber roll shall be installed on excavation and embankment slopes and other disturbed soil areas, active or nonactive.

Temporary fiber roll shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary fiber roll.

Temporary fiber roll shall be either Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be either:

1. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh a minimum 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

INSTALLATION

Temporary fiber roll shall be installed as follows:

1. Temporary fiber roll (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Temporary fiber roll (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Temporary fiber rolls shall be placed 3 m apart along the slope for slope inclination (vertical:horizontal) of 1:2 and steeper, 4.5 m apart along the slope for slope inclination between 1:2 and 1:4, 6 m apart along the slope for slope inclination between 1:4 and 1:10, and a maximum of 15 m apart along the slope for slope inclination of 1:10 and flatter.
4. The bedding area for the fiber roll shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Temporary fiber rolls shall be installed approximately parallel to the slope contour.
6. Temporary fiber rolls shall be installed before the application of other temporary erosion control or soil stabilization materials in the same area.

When no longer required, as determined by the Engineer, temporary fiber rolls shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Temporary fiber rolls may be abandoned in place when approved in writing by the Engineer.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary fiber roll shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary fiber rolls shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Temporary fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Quantities of temporary fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where temporary fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for temporary fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary fiber rolls, complete in place, including furrow excavation and backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to temporary fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

The cost of maintaining temporary fiber rolls will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary fiber rolls in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying half of that cost to the Contractor.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.12 TEMPORARY SILT FENCE

Temporary silt fence shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary silt fence shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary silt fence.

MATERIALS

Temporary silt fence shall either be prefabricated or constructed with silt fence fabric, posts, and fasteners.

Silt Fence Fabric

Silt fence fabric shall be geotextile manufactured from woven polypropylene or polymer material. Silt fence fabric may be virgin, recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled polymer materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Silt fence fabric shall conform to the following requirements:

| Specification | Requirements |
|---|--------------|
| Width, mm, min. | 900 |
| Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632* | 0.55 |
| Elongation, percent minimum in each direction ASTM Designation: D 4632* | 15 |
| Permittivity, 1/sec., min. ASTM Designation: D 4491 | 0.05 |
| Flow rate, liters per minute per square meter, min. ASTM Designation: D 4491 | 400 |
| Ultraviolet stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method) | 70 |

* or appropriate test method for specific polymer

Posts

Posts for temporary silt fence shall be one of the following:

1. Untreated fir or pine, a minimum of 34 mm x 40 mm in size, and 1.2 m in length. One end of the post shall be pointed.
2. Steel and have a "U," "T," "L," or other cross sectional shape that can resist failure from lateral loads. The steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.2 m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly to the steel post. The Contractor shall submit to the Engineer for approval a sample of the capped steel post before installation.

Fasteners

Fasteners for attaching silt fence fabric to posts shall be as follows:

1. When prefabricated silt fence is used, posts shall be inserted into sewn pockets.
2. Silt fence fabric shall be attached to wooden posts with nails or staples as shown on the plans or as recommended by the manufacturer or supplier. Tie wire or locking plastic fasteners shall be used to fasten the silt fence fabric to steel posts. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.

INSTALLATION

Temporary silt fence shall be installed parallel with the slope contour in reaches not to exceed 150 m. A reach is considered a continuous run of temporary silt fence from end to end or from an end to an opening, including joined panels. Each reach shall be constructed so that the elevation at the base of the fence does not deviate from the contour more than 1/3 of the fence height.

The silt fence fabric shall be installed on the side of the posts facing the slope. The silt fence fabric shall be anchored in a trench as shown on the plans. The trench shall be backfilled and mechanically or hand tamped to secure the silt fence fabric in the bottom of the trench.

Mechanically pushing 300 mm of the silt fence fabric vertically through the soil may be allowed if the Contractor can demonstrate to the Engineer that the silt fence fabric will not be damaged and will not slip out of the soil resulting in sediment passing under the silt fence fabric.

The maximum post spacing may be increased to 3 m if the fence is reinforced by a wire or plastic material by prefabrication or by field installation. The field-assembled reinforced temporary silt fence shall be able to retain saturated sediment without collapsing.

Temporary silt fence shall be joined as shown on the plans. The tops of the posts shall be tied together by minimum of 2 wraps of tie wire of a minimum 1.5-mm diameter. The silt fence fabric shall be attached to the posts at the joint as specified in these special provisions.

When no longer required as determined by the Engineer, temporary silt fence shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Trimming the silt fence fabric and leaving it in place will not be allowed.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary silt fence shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary silt fence shall be maintained to provide a sediment holding capacity of approximately 1/3 the height of the silt fence fabric above ground. When sediment exceeds this height or when directed by the Engineer, sediment shall be removed. The removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water.

Temporary silt fence shall be repaired or replaced the same day the damage occurs. Damage to the temporary silt fence resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary silt fence to be paid for will be determined by the meter, measured parallel with the ground slope along the line of the installed temporary silt fence, deducting the widths of openings.

The contract price paid per meter for temporary silt fence shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary silt fence, complete in place, including trench excavation and backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The State and you share the cost of maintaining the temporary silt fences. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

10-1.13 TEMPORARY FENCE

Temporary fence shall be furnished, constructed, maintained, and later removed as shown on the plans, as specified in these special provisions and as directed by the Engineer.

Except as otherwise specified in this section, temporary fence shall conform to the plan details and the specifications for permanent fence of similar character as provided in Section 80, "Fences," of the Standard Specifications.

Used materials may be installed provided the used materials are good, sound and are suitable for the purpose intended, as determined by the Engineer.

Materials may be commercial quality provided the dimensions and sizes of the materials are equal to, or greater than, the dimensions and sizes shown on the plans or specified herein.

Posts shall be either metal or wood at the Contractor's option.

Galvanizing and painting of steel items will not be required.

Treating wood with a wood preservative will not be required.

Concrete footings for metal posts will not be required.

Temporary fence that is damaged during the progress of the work shall be repaired or replaced by the Contractor at the Contractor's expense.

When no longer required for the work, as determined by the Engineer, temporary fence shall be removed. Removed facilities shall become the property of the Contractor and shall be removed from the site of the work, except as otherwise provided in this section.

Removed temporary fence materials that are not damaged may be constructed in the permanent work provided the materials conform to the requirements specified for the permanent work and such materials are new when used for the temporary fence.

Holes caused by the removal of temporary fence shall be backfilled in conformance with the provisions in the second paragraph of Section 15-1.02, "Preservation of Property," of the Standard Specifications.

The various types and kinds of temporary fence will be measured and paid for in the same manner specified for permanent fence of similar character as provided in Section 80, "Fences," of the Standard Specifications.

Full compensation for maintaining, removing, and disposing of temporary fence shall be considered as included in the contract prices paid per meter for the various types of temporary fence and no additional compensation will be allowed therefor.

10-1.14 TEMPORARY FENCE (TYPE ESA)

Temporary fence (Type ESA) shall be furnished, installed, maintained, and later removed in conformance with the details shown on the plans, as specified in these special provisions and as directed by the Engineer.

MATERIALS

Used materials may be installed provided the used materials conform to these special provisions. Materials for temporary fence (Type ESA) shall conform to the following:

High Visibility Fabric

High visibility fabric shall be machine produced, orange colored mesh manufactured from polypropylene or polyethylene. High visibility fabric may be made of recycled materials. Materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. High visibility fabric shall be fully stabilized ultraviolet resistant, shall be a minimum of 1.22 m in width with a maximum mesh opening of 50 mm x 50 mm. High visibility fabric shall be furnished in one continuous width and shall not be spliced to conform to the specified width dimension.

Posts

Posts for temporary fence (Type ESA) shall be of one of the following:

- A. Wood posts shall be fir or pine, shall have a minimum cross section of 50 mm x 50 mm, and a minimum length of 1.6 m. The end of the post to be embedded in the soil shall be pointed. Wood posts shall not be treated with wood preservative.
- B. Steel posts shall have a "U", "T", "L" or other cross sectional shape that resists failure by lateral loads. Steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.6 m. One end of the steel post shall be pointed and the other end shall have a high visibility colored top.

Fasteners

Fasteners for attaching high visibility fabric to the posts shall be as follows:

- A. The high visibility fabric shall be attached to wooden posts with commercial quality nails or staples, or as recommended by the manufacturer or supplier.
- B. Tie wire or locking plastic fasteners shall be used for attaching the high visibility fabric to steel posts. Maximum spacing of tie wire or fasteners shall be 600 mm along the length of the steel post.

INSTALLATION

Temporary fence (Type ESA) shall be installed as follows:

- A. All fence construction activities shall be conducted from outside the ESA as shown on the plans or as staked.
- B. Posts shall be embedded in the soil a minimum of 380 mm. Post spacing shall be 2.5 m maximum from center to center and shall at all times support the fence in a vertical position.
- C. Temporary fence (Type ESA) shall be constructed prior to clearing and grubbing work, shall enclose the foliage canopy (drip line) of protected plants, and shall not encroach upon visible roots of the plants.

When Type ESA temporary fence is no longer required, as determined by the Engineer, the temporary fence shall become the property of the Contractor and shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, except when reused as provided in this section.

Holes caused by the removal of temporary fence (Type ESA) shall be backfilled in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary fence (Type ESA) that is damaged during the progress of the work shall be repaired or replaced by the Contractor the same day the damage occurs.

MEASUREMENT AND PAYMENT

Temporary fence (Type ESA) shall be measured and paid for in the same manner specified for permanent fence as provided in Section 80, "Fences," of the Standard Specifications.

Full compensation for maintaining, removing, and disposing of temporary fence (Type ESA) shall be considered as included in the contract price paid per meter for temporary fence (Type ESA) and no additional compensation will be allowed therefor.

10-1.15 TEMPORARY GRAVEL BAG BERM

Temporary gravel bag berms shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary gravel bag berms shall be one of the water pollution control practices for sediment control. The Storm Water Pollution Prevention Plan shall include the use of temporary gravel bag berms.

MATERIALS

Gravel-filled Bags

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

| Specification | Requirements |
|---|--------------|
| Mass per unit area, grams per square meter, min. ASTM Designation: D 5261 | 270 |
| Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632* | 0.89 |
| Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method | 70 |

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

INSTALLATION

Temporary gravel bag berms shall be installed as follows:

- A. A single layer of gravel bags shall be placed with ends abutted tightly and not overlapped.
- B. The bedding area for the temporary gravel bag berm shall be cleared of obstructions, including rocks, clods, and debris greater than 25 mm in diameter, prior to installation.
- C. Temporary gravel bag berms shall be installed approximately parallel to the slope contour.
- D. The last 2 m of the temporary gravel bag berm shall be angled up-slope.

When no longer required, as determined by the Engineer, temporary gravel bag berm shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary gravel bag berm shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary gravel bag berms shall be maintained to provide a sediment holding capacity of approximately 1/3 the height of the gravel bag berm above the ground. When sediment exceeds this height, or when directed by the Engineer, sediment shall be removed. Removed sediment shall be deposited within the project limits in such a way that the sediment is not subject to erosion by wind or by water.

Temporary gravel bag berms shall be repaired or replaced on the same day the damage occurs. Damage to the temporary gravel bag berm resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out.

MEASUREMENT AND PAYMENT

Quantities of temporary gravel bag berm to be paid for will be determined by the meter, measured along the centerline of the installed temporary gravel bag berm.

The contract price paid per meter for temporary gravel bag berm shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary gravel bag berm, complete in place, including backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The State and you share the cost of maintaining the temporary gravel bag berms. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

10-1.16 TEMPORARY CONSTRUCTION ENTRANCE

Temporary construction entrances shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary construction entrances shall be one of the water pollution control practices for tracking control. The SWPPP shall include the use of temporary construction entrances.

Temporary construction entrances shall be either Type 1 or Type 2.

MATERIALS

Temporary Entrance Fabric

Temporary entrance fabric shall be manufactured from polyester, nylon, or polypropylene material, or any combination thereof. Temporary entrance fabric shall be a nonwoven, needle-punched fabric, free of needles which may have broken off during the manufacturing process. Temporary entrance fabric shall be permeable and shall not act as a wicking agent.

Temporary entrance fabric shall be manufactured from virgin, recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Temporary entrance fabric shall conform to the following requirements:

| Specification | Requirements |
|---|--------------|
| Mass per unit area, grams per square meter, min. ASTM Designation: D 5261 | 235 |
| Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632* | 0.89 |
| Elongation at break, percent min. ASTM Designation: D4632* | 50 |
| Toughness, kilonewtons, min. (percent elongation x grab tensile strength) | 53 |

* or appropriate test method for specific polymer

Rocks

Rocks shall conform to the material quality requirements in Section 72-2.02, "Materials," of the Standard Specifications for shape and for apparent specific gravity, absorption, and durability index. Rocks used for the temporary entrance shall conform to the following sizes:

| Square Screen Size (mm) | Percentage Passing | Percentage Retained |
|----------------------------|--------------------|---------------------|
| 150 | 100 | 0 |
| 75 | 0 | 100 |

Corrugated Steel Panels

Corrugated steel panels shall be prefabricated and shall be pressed or shop welded, with a slot or hooked section to facilitate coupling at the ends of the panels.

INSTALLATION

Temporary construction entrances shall be installed as follows:

1. Before placing the temporary entrance fabric, the areas shall be cleared of all trash and debris. Vegetation shall be removed to the ground level. Trash, debris, and removed vegetation shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
2. A sump shall be constructed within 6 m of each temporary construction entrance as shown on the plans.
3. Before placing the temporary entrance fabric, the ground shall be graded to a uniform plane. The relative compaction of the top 0.5-m shall be not less than 90 percent. The ground surface shall be free of sharp objects that may damage the temporary entrance fabric, and shall be graded to drain to the sump as shown on the plans.
4. Temporary entrance fabric shall be positioned longitudinally along the alignment of the entrance, as directed by the Engineer.
5. The adjacent ends of the fabric shall be overlapped a minimum length of 300 mm.
6. Rocks to be placed directly over the fabric shall be spread in the direction of traffic, longitudinally and along the alignment of the temporary construction entrance.
7. During spreading of the rocks, vehicles or equipment shall not be driven directly on the fabric. A layer of rocks a minimum 150 mm thick shall be placed between the fabric and the spreading equipment to prevent damage to the fabric.
8. For Type 2 temporary construction entrances, a minimum of 6 coupled panel sections shall be installed for each temporary construction entrance. Before installing the panels, the ground surface shall be cleared of all debris to ensure uniform contact with the ground surface.

Fabric damaged during rock placement shall be repaired by placing a new piece of fabric over the damaged area. The piece of fabric shall be large enough to cover the damaged area and provide a minimum 450-mm overlap on all edges.

Details for a proposed alternative temporary construction entrance or alternative sump shall be submitted to the Engineer for approval at least 7 days before installation. The Contractor may eliminate the sump if approved in writing by the Engineer.

When no longer required as determined by the Engineer, temporary construction entrances shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary construction entrance, including the sumps, shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

While the temporary construction entrance is in use, pavement shall be cleaned and sediment removed at least once a day, and as often as necessary when directed by the Engineer. Soil and sediment or other extraneous material tracked onto existing pavement shall not be allowed to enter drainage facilities.

MAINTENANCE

The Contractor shall maintain temporary construction entrances throughout the contract or until removed. The Contractor shall prevent displacement or migration of the rock surfacing or corrugated steel panels. Significant depressions resulting from settlement or heavy equipment shall be repaired by the Contractor, as directed by the Engineer.

Temporary construction entrances shall be maintained to minimize tracking of soil and sediment onto existing public roads.

If buildup of soil and sediment deter the function of the temporary construction entrance, the Contractor shall immediately remove and dispose of the soil and sediment, and install additional corrugated steel panels and spread additional rocks to increase the capacity of the temporary construction entrance.

Temporary construction entrances shall be repaired or replaced on the same day the damage occurs. Damage to the temporary construction entrance resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary construction entrances will be determined from actual count in place.

The contract unit price paid for temporary construction entrance shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing temporary construction entrance, complete in place, including excavation and backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The cost of maintaining the temporary construction entrance will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary construction entrance in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.17 TEMPORARY DRAINAGE INLET PROTECTION

Temporary drainage inlet protection shall be constructed, maintained, and removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in accordance with "Water Pollution Control" of these special provisions, and in accordance with the details shown on the plans and these special provisions.

Temporary drainage inlet protection shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary drainage inlet protection.

The Contractor shall select the appropriate drainage inlet protection in accordance with the details to meet the conditions around the drainage inlet. Throughout the duration of the contract, the Contractor shall provide protection to meet the changing conditions around the drainage inlet.

Temporary drainage inlet protection shall be Type 2, Type 3A, Type 3B, or Type 4B as indicated per project plans.

MATERIALS

Erosion Control Blanket

The erosion control blanket shall be a rolled erosion control product (RECP) and shall be classified either as temporary and degradable or long-term and nondegradable, and shall conform to one of the following:

A. Temporary and degradable:

1. Machine produced mats consisting of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The excelsior blanket shall be of consistent thickness with wood fiber evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with extruded photodegradable plastic netting or lightweight nonsynthetic netting. The blanket shall be smolder resistant without the use of chemical additives and shall be nontoxic and noninjurious to plant and animal life. The excelsior blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m².
2. Machine produced mats consisting of 70 percent straw and 30 percent coconut fiber with extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The straw and coconut shall adhere to the netting using thread or glue strip. The straw and coconut blanket shall be of consistent thickness, and straw and coconut fiber shall be evenly distributed over the entire area of the blanket. The straw and coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m².
3. Machine produced mats that are 100 percent coir consisting of coconut fiber with extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The coconut fiber shall adhere to the netting using thread or glue strip. The coconut blanket shall be of consistent thickness, with coconut fiber evenly distributed over the entire area of the blanket. The coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m².
4. Machine woven netting that is 100 percent spun coir consisting of coconut fiber with an average open area of 63 percent to 70 percent. Coconut coir netting shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m².

B. Long-term and nondegradable:

1. Geotextile blanket shall conform to the provisions for rock slope protection fabric (Type A) in Section 88-1.04, "Rock Slope Protection Fabric," of the Standard Specifications.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval before installation.

Rocks

Rocks shall conform to the requirements in Section 72-2.02, "Materials," of the Standard Specifications except that grading shall conform to the following sizes:

| Square Screen Size (mm) | Percentage Passing | Percentage Retained |
|-------------------------|--------------------|---------------------|
| 150 | 100 | 0 |
| 75 | 0 | 100 |

Gravel-filled Bags

Gravel-filled bag fabric shall be nonwoven polypropylene geotextile or polymer material and shall conform to the following requirements:

| Specification | Requirements |
|---|--------------|
| Mass per unit area, grams per square meter, minimum. ASTM Designation: D 5261 | 270 |
| Grab tensile strength (25-mm grip), kilonewtons, minimum. ASTM Designation: D4632* | 0.89 |
| Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method | 70 |

* or appropriate test method for specific polymer

Gravel-filled bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

Silt Fence

At the Contractor's option, temporary silt fence shall be prefabricated or constructed with silt fence fabric, posts, and fasteners.

Silt fence fabric shall conform to the following requirements:

| Specification | Requirements |
|---|--------------|
| Width, mm, min. | 900 |
| Grab tensile strength (25-mm grip), kilonewtons, minimum. in each direction ASTM Designation: D 4632 or appropriate test method for specific polymer | 0.55 |
| Elongation, percent minimum in each direction ASTM Designation: D 4632 or appropriate test method for specific polymer | 15 |
| Permittivity, l/sec., minimum. ASTM Designation: D 4491 | 1.5 |
| Flow rate, liters per minute per square meter, minimum. ASTM Designation: D 4491 | 400 |
| Ultraviolet stability, percent tensile strength retained after 500 hours, minimum. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method) | 70 |

Silt fence fabric shall be geotextile manufactured from woven polypropylene or polymer material. Silt fence fabric may be made of recycled materials. No materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204.

Posts for temporary silt fences shall be one of the following:

- A. Posts shall be untreated fir, redwood, cedar, or pine, shall be cut from sound timber, and shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Wood post shall be a minimum of 34 mm x 40 mm in size, and 4 feet in length. The end of the post to be embedded in the soil shall be pointed.
- B. Posts shall be steel and have a "U," "T," "L," or other cross sectional shape that can resist failure from lateral loads. The steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.2 m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly to the steel post. The Contractor shall submit to the Engineer for approval a sample of the capped steel post before installation.

Fasteners for attaching silt fence fabric to posts shall be as follows:

- A. When prefabricated silt fence is used, posts shall be inserted into sewn pockets.
- B. Silt fence fabric shall be attached to wooden posts with nails or staples as shown on the plans or as recommended by the manufacturer or supplier. Tie wire or locking plastic fasteners shall be used to fasten the silt fence fabric to steel posts. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.

Foam Barriers

The foam barrier fabric cover and skirt shall be a woven polypropylene fabric with a minimum tensile strength of 0.44-kN, conforming to ASTM Designation: D 4632. The prefabricated fabric shall be high visibility orange in color that is integral to the fabric; painting shall not be allowed. The fabric shall have an ultraviolet stability exceeding 70 percent.

The foam core shall be urethane foam and shall be shaped and dimensioned as shown on the plans.

Adhesive for foam barriers shall be a solvent-free rubber modified asphalt emulsion. The color of the emulsion shall be brown when wet and shall have a drying period of not more than 3 hours.

Anchoring nails or spikes for foam barriers shall be a minimum of 25 mm in length and capable of penetrating concrete or asphalt surfaces.

INSTALLATION

Temporary drainage inlet protection shall be installed at drainage inlets in paved and unpaved areas as follows:

- A. Temporary drainage inlet protection shall be installed such that ponded runoff does not encroach on the traveled way or overtop the curb or dike. Gravel-filled bags shall be placed to control ponding and prevent runoff from overtopping the curb or dike.
- B. The bedding area for the temporary drainage inlet protection shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
- C. A temporary linear sediment barrier shall be installed up-slope of the existing drainage inlet and parallel with the curb, dike, or flow line to prevent sediment from entering the drainage inlet.

Erosion Control Blanket and Geotextile Fabric

The erosion control blanket and geotextile fabric shall be secured to the surface of the excavated sediment trap with staples and embedded in a trench adjacent to the drainage inlet. The perimeter edge of the erosion control blanket and geotextile fabric shall be anchored in a trench.

Silt Fence

Silt fence shall be installed along the perimeter of the erosion control blanket or geotextile fabric, with the posts facing the drainage inlet. The trench shall be backfilled and tamped to secure the silt fence fabric in the bottom of the trench.

Gravel-filled Bags

Gravel-filled bags shall be stacked to form a gravel bag barrier. The gravel-filled bags shall be placed so that the bags are tightly abutted and overlap the joints in adjacent rows. A spillway shall be created by removing one or more gravel-filled bags from the upper layer of the gravel bag barrier.

Gravel-filled bags shall only be used within shoulder areas when placed behind temporary railing (Type K).

Foam Barriers

Foam barriers shall be installed in individual sections adjacent to existing drainage inlets. Foam barriers shall be securely attached to the pavement according to the angle and spacing shown on the plans. Foam barriers shall be installed flush against the sides of concrete, asphalt concrete, or hot mix asphalt curbs, dikes, and pavement with the inner material and fabric cover cut smoothly and evenly to provide a tight flush joint.

MAINTENANCE

Temporary drainage inlet protection shall be maintained to provide sediment holding capacity and to reduce runoff velocities. Temporary drainage inlet protection shall be repaired or replaced immediately after the damage occurs.

Sediment deposits, trash, and debris shall be removed from temporary drainage inlet protection as needed or when directed by the Engineer. Removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water. Trash and debris shall be removed and disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

At locations where rills and other evidence of concentrated runoff have occurred beneath the drainage inlet protection, the protection shall be adjusted to prevent another occurrence.

Temporary silt fence shall be repaired or replaced when silt fence fabric becomes split, torn, or unraveled. Sagging or slumping silt fence shall be repaired with additional stakes or replaced. Broken or split stakes shall be replaced. Temporary silt fence shall be maintained to provide a sediment holding capacity of approximately 1/3 the height of the silt fence fabric above ground.

Sediment in excess of 50 mm above the surface of the erosion control blanket or geotextile fabric shall be removed.

Sediment shall be removed from the sediment trap when the volume has been reduced by approximately one-half.

Sediment deposits shall be removed when the deposit is 1/3 the height of the gravel bag barrier or one half the height of the spillway; whichever is less.

Gravel-filled bags shall be replaced when the bag material ruptures or when the binding fails.

Foam barriers shall be repaired or replaced when the geotextile fabric cover becomes split, torn, or unraveled. Foam barriers that become detached or dislodged shall be reattached to the pavement. Sediment deposits shall be removed when the deposit reaches 1/3 of the foam barrier height.

REMOVAL

When the temporary drainage inlet protection is no longer required the protection materials shall be removed and disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Holes, depressions, or other ground disturbance caused by the removal of the temporary drainage inlet protection shall be backfilled and repaired in accordance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MEASUREMENT

Quantities of temporary drainage inlet protection will be determined from actual count in place. The protection will be measured one time only and no additional measurement will be recognized.

PAYMENT

The contract unit price paid for temporary drainage inlet protection shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the temporary drainage inlet protection, complete in place, including removal of materials, including cleanup and disposal of retained sediment and debris, and backfilling and repairing holes, depressions and other ground disturbance, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No additional compensation will be made if the temporary drainage inlet protection changes during the course of construction.

The cost of maintaining temporary drainage inlet protection will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary drainage inlet protection in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation, or as a result of the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.18 COOPERATION

It is anticipated that work by another contractor may be in progress adjacent to or within the limits of this project during progress of the work on this contract. The following table lists contracts anticipated to be in progress during this contract.

| Contract No. | Co-Rte-KP | Location | Type of Work |
|--------------|-------------------|--|---|
| 08-007164 | SBd-215-12.1-14.4 | I-215 from 0.3 km south of 9 th St to 0.7 km north of 16 th St | Freeway Widening and Interchange Reconstruction |

Comply with Section 7-1.14, "Cooperation," of the Standard Specifications.

10-1.19 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

GENERAL

Summary

Critical path method (CPM) progress schedules are required for this project. Whenever the term "schedule" is used in this section, it means CPM progress schedule.

The provisions in Section 8-1.04, "Progress Schedule," of the Standard Specifications do not apply.

Definitions

The following definitions apply to this section:

activity: A task, event or other project element on a schedule that contributes to completing the project. Activities have a description, start date, finish date, duration and one or more logic ties.

baseline schedule: The initial schedule showing the original work plan beginning on the date of contract approval. This schedule shows no completed work to date and no negative float or negative lag to any activity.

contract completion date: The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer as specified in Section 8-1.06, "Time of Completion," of the Standard Specifications.

critical path: The longest continuous chain of activities for the project that has the least amount of total float of all chains. In general, a delay on the critical path will extend the scheduled completion date.

critical path method (CPM): A network based planning technique using activity durations and the relationships between activities to mathematically calculate a schedule for the entire project.

data date: The day after the date through which a schedule is current. Everything occurring earlier than the data date is "as-built" and everything on or after the data date is "planned."

early completion time: The difference in time between an early scheduled completion date and the contract completion date.

float: The difference between the earliest and latest allowable start or finish times for an activity.

milestone: An event activity that has zero duration and is typically used to represent the beginning or end of a certain stage of the project.

narrative report: A document submitted with each schedule that discusses topics related to project progress and scheduling.

near critical path: A chain of activities with total float exceeding that of the critical path but having no more than 10 working days of total float.

scheduled completion date: The planned project finish date shown on the current accepted schedule.

State owned float activity: The activity documenting time saved on the critical path by actions of the State. It is the last activity prior to the scheduled completion date.

time impact analysis: A schedule and narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.

time-scaled network diagram: A graphic depiction of a CPM schedule comprised of activity bars with relationships for each activity represented by arrows. The tail of each arrow connects to the activity bar for the predecessor and points to the successor.

total float: The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.

updated schedule: A current schedule developed from the baseline or subsequent schedule through regular monthly review to incorporate as-built progress and any planned changes.

Submittals

General Requirements

Submit to the Engineer baseline, monthly updated, and final updated schedules, each consistent in all respects with the time and order of work requirements of the contract. Work must be executed in the sequence indicated on the current accepted schedule.

Schedules must show the order in which you propose to prosecute the work with logical links between time-scaled work activities and calculations made using the critical path method to determine the controlling activities. You are responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

Produce schedules using computer software and submit compatible software for the Engineer's exclusive possession and use. Submit network diagrams and schedule data as parts of each schedule submittal.

Schedule activities must include the following:

1. Project characteristics, salient features, or interfaces, including those with outside entities, that could affect time of completion
2. Project start date, scheduled completion date, and other milestones
3. Work performed by you, your subcontractors, and suppliers
4. Submittal development, delivery, review, and approval, including those from you, your subcontractors, and suppliers
5. Procurement, delivery, installation, and testing of materials, plants, and equipment
6. Testing and settlement periods
7. Utility notification and relocation
8. Erection and removal of falsework and shoring
9. Major traffic stage switches
10. Finishing roadway and final cleanup
11. State-owned float as the predecessor activity to the scheduled completion date

Schedules must have not less than 50 and not more than 500 activities, unless otherwise authorized by the Engineer. The number of activities must be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts.

Schedule activities must include the following:

1. A clear and legible description.
2. Start and finish dates.
3. A duration of not less than one working day, except for event activities, and not more than 20 working days, unless otherwise authorized by the Engineer.
4. At least one predecessor and one successor activity, except for project start and finish milestones.
5. Required constraints. Constraints other than those required by the special provisions may be included only if authorized by the Engineer.
6. Codes for responsibility, stage, work shifts, location, and contract pay item numbers.

You may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time is considered a resource for your exclusive use. You may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently, or by completing activities earlier than planned. You may also submit for approval a cost reduction incentive proposal as specified in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications that will reduce time of construction.

You may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. Provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule.

State-owned float is considered a resource for the exclusive use of the State. The Engineer may accrue State-owned float by the early completion of review of any type of required submittal when it saves time on the critical path. Prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action as specified in "Time Impact Analysis." The Engineer documents State-owned float by directing you to update the State-owned float activity on the next updated schedule. Include a log of the action on the State-owned float activity and include a discussion of the action in the narrative report. The Engineer may use State-owned float to mitigate past, present, or future State delays by offsetting potential time extensions for contract change orders.

The Engineer may adjust contract working days for ordered changes that affect the scheduled completion date as specified in Section 4-1.03, "Changes," of the Standard Specifications. Prepare a time impact analysis to determine the effect

of the change as specified in "Time Impact Analysis" and include the impacts acceptable to the Engineer in the next updated schedule. Changes that do not affect the controlling operation on the critical path will not be considered as the basis for a time adjustment. Changes that do affect the controlling operation on the critical path will be considered by the Engineer in decreasing time or granting an extension of time for completion of the contract. Time extensions will only be granted if the total float is absorbed and the scheduled completion date is delayed one or more working days because of the ordered change.

The Engineer's review and acceptance of schedules does not waive any contract requirements and does not relieve you of any obligation or responsibility for submitting complete and accurate information. Correct rejected schedules and resubmit corrected schedules to the Engineer within 7 days of notification by the Engineer, at which time a new review period of 7 days will begin.

Errors or omissions on schedules do not relieve you from finishing all work within the time limit specified for completion of the contract. If, after a schedule has been accepted by the Engineer, either you or the Engineer discover that any aspect of the schedule has an error or omission, you must correct it on the next updated schedule.

Computer Software

Submit to the Engineer for review a description of proposed schedule software to be used. After the Engineer accepts the proposed software, submit schedule software and all original software instruction manuals. All software must be compatible with the current version of the Windows operating system in use by the Engineer. The schedule software must include:

1. Latest version of Primavera SureTrak Project Manager for Windows, or equivalent
2. Latest version of schedule-comparing HST SureChange, or equivalent

If a schedule software equivalent to SureTrak is proposed, it must be capable of generating files that can be imported into SureTrak. The schedule-comparing software must be compatible with schedule software submitted and must be able to compare two schedules and provide reports of changes in activity ID, activity description, constraints, calendar assignments, durations, and logic ties.

The schedule software and schedule-comparing software will be returned to you before the final estimate. The Department will compensate you as specified in Section 4-1.03, "Extra Work," of the Standard Specifications for replacement of software or manuals damaged, lost, or stolen after delivery to the Engineer.

Instruct the Engineer in the use of the software and provide software support until the contract is accepted. Within 15 days of contract approval, provide a commercial 8-hour training session for 2 Department employees in the use of the software at a location acceptable to the Engineer. It is recommended that you also send at least 2 employees to the same training session to facilitate development of similar knowledge and skills in the use of the software. If schedule software other than SureTrak is submitted, then the training session must be a total of 16-hours for each Department employee.

Network Diagrams, Reports, and Data

Include the following with each schedule submittal:

1. Two sets of originally plotted, time-scaled network diagrams
2. Two copies of a narrative report
3. One read-only compact disk or floppy diskette containing the schedule data

The time-scaled network diagrams must conform to the following:

1. Show a continuous flow of information from left to right
2. Be based on early start and early finish dates of activities
3. Clearly show the primary paths of criticality using graphical presentation
4. Be prepared on 860 mm x 1120 mm (34" x 44")
5. Include a title block and a timeline on each page

The narrative report must be organized in the following sequence with all applicable documents included:

1. Transmittal letter
2. Work completed during the period
3. Identification of unusual conditions or restrictions regarding labor, equipment or material; including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours
4. Description of the current critical path

5. Changes to the critical path and scheduled completion date since the last schedule submittal
6. Description of problem areas
7. Current and anticipated delays:
 - 7.1. Cause of delay
 - 7.2. Impact of delay on other activities, milestones, and completion dates
 - 7.3. Corrective action and schedule adjustments to correct the delay
8. Pending items and status thereof:
 - 8.1. Permits
 - 8.2. Change orders
 - 8.3. Time adjustments
 - 8.4. Noncompliance notices
9. Reasons for an early or late scheduled completion date in comparison to the contract completion date

Schedule submittals will only be considered complete when all documents and data have been submitted as described above.

Preconstruction Scheduling Conference

Schedule a preconstruction scheduling conference with your project manager and the Engineer within 15 days after contract approval. The Engineer will conduct the meeting and review the requirements of this section with you.

Submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of this section. If you propose deviations to the construction staging, then the general time-scaled logic diagram must also display the deviations and resulting time impacts. Be prepared to discuss the proposal.

At this meeting, also submit the alphanumeric coding structure and activity identification system for labeling work activities. To easily identify relationships, each activity description must indicate its associated scope or location of work by including such terms as quantity of material, type of work, bridge number, station to station location, side of highway (such as left, right, northbound, southbound), lane number, shoulder, ramp name, ramp line descriptor, or mainline.

The Engineer reviews the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to you for implementation.

Baseline Schedule

Beginning the week following the preconstruction scheduling conference, meet with the Engineer weekly to discuss schedule development and resolve schedule issues until the baseline schedule is accepted.

Submit to the Engineer a baseline schedule within 20 days of approval of the contract. Allow 20 days for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal is not considered complete until the computer software is delivered and installed for use in review of the schedule.

The baseline schedule must include the entire scope of work and how you plan to complete all work contemplated. The baseline schedule must show the activities that define the critical path. Multiple critical paths and near-critical paths must be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities must be critical or near critical, unless otherwise authorized by the Engineer.

The baseline schedule must not extend beyond the number of contract working days. The baseline schedule must have a data date of contract approval. If you start work before contract approval, the baseline schedule must have a data date of the 1st day you performed work at the job site.

If you submit an early completion baseline schedule that shows contract completion in less than 85 percent of the contract working days, the baseline schedule must be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations must be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for you and your subcontractors. Use average composite crews to display the labor loading of on-site construction activities. Optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms must show labor crafts and equipment classes to be used. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

Updated Schedule

Submit an updated schedule and meet with the Engineer to review contract progress, on or before the 1st day of each month, beginning one month after the baseline schedule is accepted. Allow 15 days for the Engineer's review after the updated schedule and all support data are submitted, except that the review period will not start until the previous month's required schedule is accepted. Updated schedules that are not accepted or rejected within the review period are considered accepted by the Engineer.

The updated schedule must have a data date of the 21st day of the month or other date established by the Engineer. The updated schedule must show the status of work actually completed to date and the work yet to be performed as planned. Actual activity start dates, percent complete, and finish dates must be shown as applicable. Durations for work that has been completed must be shown on the updated schedule as the work actually occurred, including Engineer submittal review and your resubmittal times.

You may include modifications such as adding or deleting activities or changing activity constraints, durations, or logic that do not (1) alter the critical path(s) or near critical path(s) or (2) extend the scheduled completion date compared to that shown on the current accepted schedule. Justify in writing the reasons for any changes to planned work. If any proposed changes in planned work will result in (1) or (2) above, then submit a time impact analysis as specified in this section.

Time Impact Analysis

Submit a written time impact analysis (TIA) to the Engineer with each request for adjustment of contract time, or when you or the Engineer considers that an approved or anticipated change may impact the critical path or contract progress.

The TIA must illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis must use the accepted schedule that has a data date closest to and before the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions before the event, the accepted schedule must be updated to the day before the event being analyzed. The TIA must include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules must be equal to the adjustment of contract time. The Engineer may construct and use an appropriate project schedule or other recognized method to determine adjustments in contract time until you provide the TIA.

Submit 2 copies of your TIA within 20 days of receiving a written request for a TIA from the Engineer. Allow the Engineer 15 days after receipt to review the submitted TIA. All approved TIA schedule changes must be shown on the next updated schedule.

If a TIA you submit is rejected, meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, you are allowed 15 days from the meeting with the Engineer to give notice as specified in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. Only show actual as-built work, not unapproved changes related to the TIA, in subsequent updated schedules. If agreement is reached at a later date, approved TIA schedule changes must be shown on the next updated schedule. The Engineer withholds remaining payment on the schedule contract item if a TIA is requested and not submitted within 20 days. The schedule item payment resumes on the next estimate after the requested TIA is submitted. No other contract payment is retained regarding TIA submittals.

Final Updated Schedule

Submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. Provide a written certificate with this submittal signed by your project manager or an officer of the company stating, "To my knowledge and belief, the enclosed final update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

PAYMENT

Progress schedule (critical path method) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path method) includes full compensation for furnishing all labor, material, tools, equipment, and incidentals, including computer software, and for doing all the work involved in preparing, furnishing, and updating schedules, and instructing and assisting the Engineer in the use of computer software, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for the progress schedule (critical path method) contract item will be made progressively as follows:

1. A total of 25 percent of the item amount or a total of 25 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon achieving all of the following:
 - 1.1. Completion of 5 percent of all contract item work.
 - 1.2. Acceptance of all schedules and approval of all TIAs required to the time when 5 percent of all contract item work is complete.
 - 1.3. Delivery of schedule software to the Engineer.
 - 1.4. Completion of required schedule software training.
2. A total of 50 percent of the item amount or a total of 50 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 25 percent of all contract item work and acceptance of all schedules and approval of all TIAs required to the time when 25 percent of all contract item work is complete.
3. A total of 75 percent of the item amount or a total of 75 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 50 percent of all contract item work and acceptance of all schedules and approval of all TIAs required to the time when 50 percent of all contract item work is complete.
4. A total of 100 percent of the item amount or a total of 100 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of all contract item work, acceptance of all schedules and approval of all TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If you fail to complete any of the work or provide any of the schedules required by this section, the Engineer makes an adjustment in compensation as specified in Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications for the work not performed. Adjustments in compensation for schedules will not be made for any increased or decreased work ordered by the Engineer in submitting schedules.

10-1.20 TIME-RELATED OVERHEAD

The Contractor will be compensated for time-related overhead as described below and in conformance with "Force Account Payment" of these special provisions. The Contractor will not be compensated for time-related overhead for delays to the controlling operations caused by the Engineer that occur prior to the first working day, but will be compensated for actual overhead costs incurred, as determined by an independent Certified Public Accountant audit examination and report.

Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages," "Force Account Payment," and "Progress Schedule (Critical Path Method)" of these special provisions.

The provisions in Section 9-1.08, "Adjustment of Overhead Costs," of the Standard Specifications shall not apply.

Time-related overhead shall consist of those overhead costs, including field and home office overhead, that are in proportion to the time required to complete the work. Time-related overhead shall not include costs that are not related to time, including but not limited to, mobilization, licenses, permits, and other charges incurred only once during the contract. Time-related overhead shall not apply to subcontractors of any tier, suppliers, fabricators, manufacturers, or other parties associated with the Contractor.

Field office overhead expenses include time-related costs associated with the normal and recurring operations of the construction project, and shall not include costs directly attributable to the work of the contract. Time-related costs of field office overhead include, but are not limited to, salaries, benefits, and equipment costs of project managers, general superintendents, field office managers and other field office staff assigned to the project, and rent, utilities, maintenance, security, supplies, and equipment costs of the project field office.

Home office overhead or general and administrative expenses refer to the fixed costs of operating the Contractor's business. These costs include, but are not limited to, general administration, insurance, personnel and subcontract administration, purchasing, accounting, and project engineering and estimating. Home office overhead costs shall exclude expenses specifically related to other contracts or other businesses of the Contractor, equipment coordination, material deliveries, and consultant and legal fees.

The quantity of time-related overhead associated with a reduction in contract time for cost reduction incentive proposals accepted and executed in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications shall be considered a construction cost attributable to the resultant estimated net savings due to the cost reduction incentive.

If the final increased quantity of time-related overhead exceeds 149 percent of the number of working days specified in the Engineer's Estimate, the Contractor shall, within 60 days of the Engineer's written request, submit to the Engineer an audit examination and report performed by an independent Certified Public Accountant of the Contractor's actual overhead costs. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.

Independent Certified Public Accountant's audit examinations shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. Audit examinations and reports shall determine if the rates of field office overhead and home office overhead are:

- A. Allowable in conformance with the requirements of the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.
- B. Adequately supported by reliable documentation.
- C. Related solely to the project under examination.

Within 20 days of receipt of the Engineer's written request, the Contractor shall make its financial records available for audit by the State for the purpose of verifying the actual rate of time-related overhead specified in the audit submitted by the Contractor. The actual rate of time-related overhead specified in the audit, submitted by the Contractor, will be subject to approval by the Engineer.

If the Engineer requests the independent Certified Public Accountant audit, or if it is requested in writing by the Contractor, the contract item payment rate for time-related overhead, in excess of 149 percent of the number of working days specified in the Engineer's Estimate, will be adjusted to reflect the actual rate.

The cost of performing an independent Certified Public Accountant audit examination and submitting the report, requested by the Engineer, will be borne equally by the State and the Contractor. The division of the cost will be made by determining the cost of providing an audit examination and report in conformance with the provisions of Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report for overhead claims other than for the purpose of verifying the actual rate of time-related overhead shall be entirely borne by the Contractor. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report to verify actual overhead costs incurred prior to the first working day shall be entirely borne by the Contractor.

The quantity of time-related overhead to be paid will be measured by the working day, designated in the Engineer's Estimate as WDAY. The estimated number of working days is the number of working days, excluding days for plant establishment, as specified in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions. The quantity of time-related overhead will be increased or decreased only as a result of suspensions or adjustments of contract time which revise the current contract completion date, and which satisfy any of the following criteria:

- A. Suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications, except:
 - 1. Suspensions ordered due to weather conditions being unfavorable for the suitable prosecution of the controlling operation or operations.
 - 2. Suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform the provisions of the contract.
 - 3. Suspensions ordered due to factors beyond the control of and not caused by the State or the Contractor, for which the Contractor is granted extensions of time in conformance with the provisions of the third paragraph of Section 8-1.07, "Liquidated Damages," of the Standard Specifications.
 - 4. Other suspensions that mutually benefit the State and the Contractor.
- B. Extensions of contract time granted by the State in conformance with the provisions in the fifth paragraph in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.
- C. Reductions in contract time set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.

In the event an early completion progress schedule, as defined in "Progress Schedule (Critical Path Method)" of these special provisions, is submitted by the Contractor and approved by the Engineer, the amount of time-related overhead eligible for payment will be based on the total number of working days for the project, in conformance with the provisions in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, rather than the Contractor's early completion progress schedule.

The contract price paid per working day for time-related overhead shall include full compensation for time-related overhead, including the Contractor's share of costs of the independent Certified Public Accountant audit of overhead costs requested by the Engineer, as specified in these special provisions, and as directed by the Engineer.

The provisions in Sections 4-1.03B, "Increased or Decreased Quantities," and 4-1.03C, "Changes in Character of the Work," of the Standard Specifications shall not apply to the contract item of time-related overhead.

Full compensation for additional overhead costs involved in incentive and disincentive provisions to satisfy internal milestone or multiple calendar requirements shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs incurred during days of inclement weather when the contract work is extended into additional construction seasons due to delays caused by the State shall be considered as included in the time-related overhead paid during the contract working days, and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs involved in performing additional contract item work that is not a controlling operation shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

Full compensation for overhead, other than time-related overhead measured and paid for as specified above, and other than overhead costs included in the markups specified in "Force Account Payment" of these special provisions, shall be considered as included in the various items of work and no additional compensation will be allowed therefor.

Overhead costs incurred by subcontractors of any tier, suppliers, fabricators, manufacturers, and other parties associated with the Contractor shall be considered as included in the various items of work and as specified in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

For the purpose of making partial payments pursuant to the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications, the number of working days to be paid for time-related overhead in each monthly partial payment will be the number of working days, specified above to be measured for payment that occurred during that monthly estimate period, including compensable suspensions and right of way delays. Working days granted by contract change order due to extra work or changes in character of the work, will be paid for upon completion of the contract. The amount earned per working day for time-related overhead shall be the lesser of the following amounts:

- A. The contract item price.
- B. Twenty percent of the original total contract amount divided by the number of working days specified in "Beginning of Work, Time of Completion and Liquidated Damages," of these special provisions.

After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount of the total contract item price for time-related overhead not yet paid, will be included for payment in the first estimate made after acceptance of the contract in conformance with the provisions in Section 9-1.07, "Payment After Acceptance," of the Standard Specifications.

10-1.21 SMALL BUSINESS UTILIZATION REPORT

Submit a completed Small Business Utilization Report form on or before the following dates for the prior reporting period:

1. January 15th
2. April 15th
3. July 15th
4. October 15th

Submit a completed final Small Business Utilization Report form within 30 days after contract acceptance.

The Department pays \$250 for each report submitted. The contract unit price paid for small business utilization report includes full compensation for doing all the work involved in submitting the completed Small Business Utilization Report form. If you fail to submit a completed form by the specified time, you will not receive payment for that report.

The Department does not adjust payment for an increase or decrease in the quantity of small business utilization reports submitted. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.

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

Failure to submit the Small Business Utilization Report is not considered a performance failure. Section 9-1.053, "Performance Failure Withholds," of the Standard Specifications does not apply.

10-1.22 DUST CONTROL

Dust control shall conform to the provisions in Section 10, "Dust Control," of the Standard Specifications and these special provisions.

Reclaimed water shall be used for construction watering activities, to the extent feasible or as directed by the Engineer. Cost effective alternative methods for controlling fugitive dust shall be employed during severe water shortages in which the supply of reclaimed water is also limited.

The Contractor shall utilize effective fugitive dust control measures as required by South Coast Air Quality Management District Rule 403, in conjunction with Section 10, "Dust Control," of the Standard Specifications. Certain site conditions, such as those found during Santa Ana wind conditions, may cause the need for acceleration of these measures to prevent the travel of dust pollutants toward more developed areas.

Also, the Contractor shall obtain a permit and prepare a dust control plan as required by San Bernardino County Ordinance 810.0305, Windborne Soil Erosion Control. Refer to Exhibit K for a copy of San Bernardino County Fugitive Dust Control Ordinance.

The Contractor shall suspend grading operations during first and second stage smog alerts, and shall suspend grading operations during high winds (wind exceeding 40 kilometers per hour).

All vehicles hauling dirt, sand, soil, or other building materials shall have their cargo area covered, or shall have a minimum 0.6 meters freeboard between the top of the load and the top of the four sides of the cargo area.

The Contractor shall use only well-tuned and regularly maintained equipment in the execution of this contract in order to minimize the volume of equipment exhaust emissions. Also, the Contractor shall use only clean and low-sulfur fuel for construction equipment. Vehicles used in construction activities shall be equipped with the type of mufflers recommended by the equipment manufacturers. The Contractor shall schedule construction activities to minimize daily vehicle emissions.

In accordance with Caltrans' standard practice, all construction vehicles will be washed and cleaned as necessary to remove mud and other deposits prior to leaving the construction site. All roadway surfaces, parking lots, and vehicle storage shall be paved or chemically treated. Parking shall be prohibited on all unpaved or untreated areas.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in dust control compliance, complete in place, including developing, obtaining approval of and updating a Fugitive Dust Control Plan from AQMD and Dust Control Permit from San Bernardino County, as specified in the Standard Specifications and these special provisions, as required by the Air Quality Management District, the County of San Bernardino and as directed by the Engineer, shall be considered as included in the contract price paid for the items involved and no additional compensation will be allowed therefor.

10-1.23 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

Flagging, signs, and temporary traffic control devices furnished, installed, maintained, and removed when no longer required shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Category 1 temporary traffic control devices are defined as small and lightweight (less than 45 kg) devices. These devices shall be certified as crashworthy by crash testing, crash testing of similar devices, or years of demonstrable safe performance. Category 1 temporary traffic control devices include traffic cones, plastic drums, portable delineators, and channelizers.

If requested by the Engineer, the Contractor shall provide written self-certification for crashworthiness of Category 1 temporary traffic control devices at least 5 days before beginning any work using the devices or within 2 days after the request if the devices are already in use. Self-certification shall be provided by the manufacturer or Contractor and shall include the following:

- A. Date,
- B. Federal Aid number (if applicable),
- C. Contract number, district, county, route and kilometer post of project limits,
- D. Company name of certifying vendor, street address, city, state and zip code,
- E. Printed name, signature and title of certifying person; and
- F. Category 1 temporary traffic control devices that will be used on the project.

The Contractor may obtain a standard form for self-certification from the Engineer.

Category 2 temporary traffic control devices are defined as small and lightweight (less than 45 kg) devices that are not expected to produce significant vehicular velocity change, but may cause potential harm to impacting vehicles. Category 2 temporary traffic control devices include barricades and portable sign supports.

Category 2 temporary traffic control devices shall be on the Federal Highway Administration's (FHWA) list of Acceptable Crashworthy Category 2 Hardware for Work Zones. This list is maintained by FHWA and can be located at:

http://safety.fhwa.dot.gov/roadway_dept/road_hardware/listing.cfm?code=workzone

The Department also maintains this list at:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/pdf/Category2.pdf>

Category 2 temporary traffic control devices that have not received FHWA acceptance shall not be used. Category 2 temporary traffic control devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer. The label shall be readable and permanently affixed by the manufacturer. Category 2 temporary traffic control devices without a label shall not be used.

If requested by the Engineer, the Contractor shall provide a written list of Category 2 temporary traffic control devices to be used on the project at least 5 days before beginning any work using the devices or within 2 days after the request if the devices are already in use.

Category 3 temporary traffic control devices consist of temporary traffic-handling equipment and devices that weigh 45 kg or more and are expected to produce significant vehicular velocity change to impacting vehicles. Temporary traffic-handling equipment and devices include crash cushions, truck-mounted attenuators, temporary railing, temporary barrier, and end treatments for temporary railing and barrier.

Type III barricades may be used as sign supports if the barricades have been successfully crash tested, meeting the NCHRP Report 350 criteria, as one unit with a construction area sign attached.

Category 3 temporary traffic control devices shall be shown on the plans or on the Department's Highway Safety Features list. This list is maintained by the Division of Engineering Services and can be found at:

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

Category 3 temporary traffic control devices that are not shown on the plans or not listed on the Department's Highway Safety Features list shall not be used.

Full compensation for providing self-certification for crashworthiness of Category 1 temporary traffic control devices and for providing a list of Category 2 temporary traffic control devices used on the project shall be considered as included in the prices paid for the various items of work requiring the use of the Category 1 or Category 2 temporary traffic control devices and no additional compensation will be allowed therefor.

10-1.24 CONSTRUCTION AREA SIGNS

Construction area signs for temporary traffic control shall be furnished, installed, maintained, and removed when no longer required in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Furnish Sign" of these special provisions.

Attention is directed to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Type II retroreflective sheeting shall not be used on construction area sign panels. Type III, IV, VIII, or IX retroreflective sheeting shall be used for stationary mounted construction area sign panels.

The Contractor shall furnish and install 4 2006 State Transportation Bond Funding Identification signs at locations designated by the Engineer before starting major construction activities visible to highway users. Upon completion of the project, the Contractor shall remove and dispose of 2006 State Transportation Bond Funding Identification signs. Manufacturing details entitled "SB 210/215: In San Bernardino County, in San Bernardino, on Route 210 from 0.9 km west to 0.5 km east of Route 210/215 Separation, and on Route 215 from 0.2 km south of Massachusetts Avenue Overcrossing to University Parkway Undercrossing (EA 08-4440U4)" for bond funding signs are available at:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/bondfundspecs.htm>

Unless otherwise shown on the plans or specified in these special provisions, the color of construction area warning and guide signs shall have black legend and border on orange background, except W10-1 or W47(CA) (Highway-Rail Grade Crossing Advance Warning) sign shall have black legend and border on yellow background.

Repair to construction area sign panels will not be allowed, except when approved by the Engineer. At nighttime under vehicular headlight illumination, sign panels that exhibit irregular luminance, shadowing or dark blotches shall be immediately replaced at the Contractor's expense.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 business days, but not more than 14 days, prior to commencing excavation for construction area sign posts. The regional notification centers include, but are not limited to, the following:

| Notification Center | Telephone Number |
|---------------------------|------------------|
| Underground Service Alert | 811 |

Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes. The post hole diameter, if backfilled with portland cement concrete, shall be at least 100 mm greater than the longer dimension of the post cross section.

Construction area signs placed within 4.6 m from the edge of the travel way shall be mounted on stationary mounted sign supports as specified in "Construction Area Traffic Control Devices" of these special provisions.

The Contractor shall maintain accurate information on construction area signs. Signs that are no longer required shall be immediately covered or removed. Signs that convey inaccurate information shall be immediately replaced or the information shall be corrected. Covers shall be replaced when they no longer cover the signs properly. The Contractor shall immediately restore to the original position and location any sign that is displaced or overturned, from any cause, during the progress of work.

The term "construction area signs" shall include temporary object markers required for the direction of public traffic through or around the work during construction. Object markers listed or designated on the plans as construction area signs shall be considered to be signs and shall be furnished, erected, maintained, and removed by the Contractor in the same manner specified for construction area signs.

Object markers shall be stationary mounted on wood or metal posts in conformance with the details shown on the plans and the provisions in Section 82, "Markers and Delineators," of the Standard Specifications.

Marker panels for Type N, Type P and Type R object markers shall conform to the provisions for sign panels for stationary mounted signs.

Target plates for Type K and Type L object markers and posts, reflectors and hardware shall conform to the provisions in Section 82, but need not be new.

PAYMENT

Full compensation for furnishing and installing 2006 State Transportation Bond Funding Identification signs, including removal and disposal upon project completion, is included in the contract lump sum price paid for Construction Area Signs, and no separate payment will be allowed therefor.

10-1.25 MAINTAINING TRAFFIC

Maintaining traffic shall conform to the provisions in Sections 7-1.08, "Public Convenience," Section 7-1.09, "Public Safety," and Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, "Public Safety" of these special provisions and these special provisions.

Closure is defined as the closure of a traffic lane or lanes, including shoulder, ramp or connector lanes, within a single traffic control system.

Closures shall conform to the provisions in "Traffic Control System for Lane Closure" of these special provisions.

At locations where falsework pavement lighting or pedestrian openings through falsework are designated, falsework lighting shall be installed in conformance with the provisions in Section 86-6.11, "Falsework Lighting," of the Standard Specifications.

Openings shall be provided through bridge falsework for the use of public traffic at each location where falsework is constructed over the streets or routes listed in the following table. The type, minimum width, height, and number of openings at each location, and the location and maximum spacing of falsework lighting, if required for each opening, shall conform to the requirements in the table. The width of vehicular openings shall be the clear width between temporary railings or other protective work. The spacing shown for falsework pavement lighting is the maximum distance center to center in meters between fixtures.

ROUTE 215

| | Number | Width | Height |
|-----------------------------|----------|-------------------------|--------|
| Vehicle Openings | 1-NB | 11.1 | 4.6 |
| | 1-SB | 11.1 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 12 staggered ½ space | |

(Width and Height in meters)

(R = Right side of traffic. L = Left side of traffic)

"K" LINE

| | Number | Width | Height |
|-----------------------------|----------|---------|--------|
| Vehicle Openings | 1 | 7.5 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 9 | |

(Width and Height in meters)

(R = Right side of traffic. L = Left side of traffic)

(C = Centered overhead)

ROUTE 210

| | Number | Width | Height |
|-----------------------------|----------|----------|--------|
| Vehicle Openings | 1-NB | 14.714.7 | 4.6 |
| | 1-SB | | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 | |

(Width and Height in meters)

(R = Right side of traffic. L = Left side of traffic)

"J" LINE

| | Number | Width | Height |
|-----------------------------|----------|---------------------------|--------|
| Vehicle Openings | 1 | 11.1 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 12 staggered 1/2 space | |

(Width and Height in meters)

(R = Right side of traffic. L = Left side of traffic)

(C = Centered overhead)

"N" LINE

| | Number | Width | Height |
|-----------------------------|----------|---------|--------|
| Vehicle Openings | 1 | 7.5 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 9 | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

CAJON BOULEVARD

| | Number | Width | Height |
|-----------------------------|----------|-----------------------|--------|
| Vehicle Openings | 1 | 9.6 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 staggered 1/2 space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

"TW4" LINE

| | Number | Width | Height |
|-----------------------------|----------|-----------------------|--------|
| Vehicle Openings | 1 | 9.6 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 staggered 1/2 space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

The exact location of openings will be determined by the Engineer.

Closures are only allowed during the hours shown in the lane requirement charts included in this section "Maintaining Traffic," except for work required under Sections 7-1.08, "Public Convenience," and Section 7-1.09, "Public Safety."

The full width of the traveled way shall be open for use by public traffic when construction operations are not actively in progress.

The closure starts with the first cone down and ends with the last cone picked up. No closure sign(s) shall be exposed to traffic more than 30 minutes before or after a closure, except as otherwise indicated in the special provisions.

Unless approved by the Engineer, the maximum length of a single stationary lane closure shall be 3 km.

Unless approved by the Engineer, not more than 2 separate stationary lane closures will be allowed at one time. Concurrent stationary closures shall be spaced no closer than 2 km apart.

Adjacent ramps, in the same direction of travel, servicing 2 consecutive local streets shall not be closed simultaneously unless directed by the Engineer.

SC6-3(CA) (RAMP CLOSED) sign shall be used to inform motorists of the temporary closing of a connector, entrance ramp or exit ramp for one business day.

SC6-4(CA) (RAMP CLOSED) sign shall be used to inform motorists of the temporary closing of a connector, entrance ramp or exit ramp for more than one business day.

The SC6-3(CA) or SC6-4(CA) signs shall be installed at least 7 days before closing the connector or ramp, but not more than 14 days before the connector or ramp closure. The Contractor shall notify the Engineer at least 2 business days before installing the SC6-3(CA) or SC6-4(CA) signs. The SC6-3(CA) or SC6-4(CA) signs shall be stationary mounted at locations shown on the plans and as directed by the Engineer.

Accurate information shall be maintained on the SC6-3(CA) or SC6-4(CA) signs. The SC6-3(CA) or SC6-4(CA) signs, when no longer required, shall be immediately covered or removed.

Personal vehicles of the Contractor's employees shall not be parked on the traveled way or shoulders including sections closed to public traffic.

When work vehicles or equipment are parked on the shoulder within 1.8 m of a traffic lane, the shoulder area shall be closed as shown on the plans.

A minimum of one paved traffic lane, not less than 3.3 m wide, shall be open for use by public traffic in each direction of travel, on local streets.

If minor deviations from the lane requirement charts are required, a written request shall be submitted to the Engineer at least 15 days before the proposed date of the closure. The Engineer may approve the deviations if there is no significant increase in the cost to the State and if the work can be expedited and better serve the public traffic.

When complete freeway, expressway or conventional highway closure is required, only one detour for each direction of travel will be allowed for the following operations: bridge demolition, overhead sign construction, falsework erection and removal, erection of girders and restriping of freeway.

Designated legal holidays are: January 1st, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, November 11th, Thanksgiving Day, and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When November 11th falls on a Saturday, the preceding Friday shall be a designated legal holiday.

Special Days are: Martin Luther King Day, Lincoln's Birthday, Good Friday through Easter Sunday, Cesar Chavez Day, Columbus Day and December 26th through December 31st.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the SC6-3(CA) and SC6-4(CA), signs shall be considered as included in the contract lump sum price paid for construction area signs and no additional compensation will be allowed therefor.

| Lane Closure Restriction for Designated Legal Holidays and Special Days | | | | | | | | | | |
|--|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----|-----|-----|
| Thu | Fri | Sat | Sun | Mon | Tues | Wed | Thu | Fri | Sat | Sun |
| x | H xx | xx | xx | xxx | | | | | | |
| | SD xx | | | | | | | | | |
| x | xx | H xx | xx | xxx | | | | | | |
| | | SD xx | | | | | | | | |
| | x | xx | H xx | xx | | | | | | |
| | | | SD xx | | | | | | | |
| | x | xx | xx | H xx | xxx | | | | | |
| | x | xx | xx | SD xx | | | | | | |
| | | | | x | H xx | | | | | |
| | | | | x | SD xx | | | | | |
| | | | | | x | H xx | xxx | | | |
| | | | | | | SD xx | | | | |
| | | | | xxx | | x | H xx | xx | xx | xx |
| | | | | | | | SD xx | | | |
| Legends: | | | | | | | | | | |
| | Refer to lane closure charts | | | | | | | | | |
| x | The full width of the traveled way shall be open for use by public traffic after 0600. | | | | | | | | | |
| xx | The full width of the traveled way shall be open for use by public traffic. | | | | | | | | | |
| xxx | The full width of the traveled way shall be open for use by public traffic until 1800. | | | | | | | | | |
| H | Designated Legal Holiday | | | | | | | | | |
| SD | Special Day | | | | | | | | | |

District 8 Special Events List

No work that encroaches onto the traveled way of the affected Routes shall be allowed from 3 hours before to 2 hours following special events listed below unless otherwise permitted by the District Traffic Manager

| Venue/Special Event | Affected Routes | Route Impact | Route Limits | Presently Identified The Month Of Events | Website | Contact # |
|--|-----------------------------|---------------------------------|---|--|------------------------------------|-----------------------------|
| Glen Helen Hyundai Pavilion | 215 15 | *** ** | University Pkwy to I-15/215 connector I-60 to Devore Road | Various events May-Oct yearly See web site | www.hyundaipavilion.com | 909-880-6500 |
| Route 66 Rendezvous | 215 | *** | Mill St. to 5 th St | September | www.route-66.org | 909-889-3980 |
| California Speedway | 10 15 210 66 60 | *** *** *** *** *** | LA I-57 to SBD I-215 I-15/215 to SR-91 Haven to I-215 Haven to Cherry I-15 to County Line | Various events Through the year See web site | www.californiaspeedway.com | 909-429-5000 |
| Temecula Balloon and Wine Festival | 15 | ** | SR-79 (Winchester Rd.) and Rancho California | June | www.tvbwf.com | 951-676-6713 |
| Bob Hope/Chrysler Classic | 10 | ** | Palm Springs off ramp at SR-111 | January | www.bhcc.com | 760-346-6329 |
| Kraft Nabisco Championship | 10 | ** | Palm Springs off ramp at SR-111 | March | www.nabiscochampionship.com | 760-324-4546 |
| Festival of Lights (Downtown Riverside) | 91 | ** | I-15 to I-215/SR-60 split | November | www.riversidedowntown.org | 951-683-7100 |
| March Air Show March Air Reserve Base | 215 | *** | Cactus to Ramona Express Way | May | www.marchfieldairfest.com/ | 951-655-1110 |
| UCR Graduation | 60 215 | *** *** | I-215/SR-60/SR-91 split to Central Ave. | June | www.commencement.ucr.edu | 951-787-3144 |
| Laughlin River Run | 40 | *** | I-40/ From I-15 to Arizona State Line | April | www.laughlinriverrun.com/ | 949-502-3434 |
| Thunder & Lightning Powwow | 10 | *** | I-10/ Morongo Valley | September | www.morongocasinosort.com/pow3.cfm | 800-252-4499 ext.# 23800 |

Note: The dates of events change yearly. Contact numbers and websites provided to verify exact dates

- ** Designates-Moderate Impact (20 minute delay or less)
- *** Designates-High Impact (30 minute delay or less)

Pedestrian access facilities shall be provided through construction areas within the right of way as shown on the plans and as specified herein. Pedestrian walkways shall be surfaced with hot mix asphalt or portland cement concrete. The surface shall be skid resistant and free of irregularities. Hand railings shall be provided on each side of pedestrian walkways as necessary to protect pedestrian traffic from hazards due to construction operations or adjacent vehicular traffic. Protective overhead covering shall be provided as necessary to insure protection from falling objects and drip from overhead structures.

In addition to the required openings through falsework, pedestrian facilities shall be provided during pile driving, footing, wall, and other bridge construction operations, as shown on the plans and as directed by the Engineer. At least one walkway shall be available at all times. If the Contractor's operations require the closure of one walkway, then another walkway shall be provided nearby, off the traveled roadway.

Railings shall be constructed of wood, S4S, and shall be painted white. Railings and walkways shall be maintained in good condition. Walkways shall be kept clear of obstructions.

Full compensation for providing pedestrian facilities shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

| Chart No. 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|---|---|-------------------------|---|---|---|---|---|---|----|----|----|---------------|----|----|----|----|----|----|----|----|----|----|----|---|---|
| Freeway/Expressway Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| County: San Bernardino | | | | | Route/Direction: 210/EB | | | | | | | | | | KP: 35.1/36.7 | | | | | | | | | | | | | |
| Closure Limits: | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | | |
| Mondays through Thursdays | | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | | 2 | 2 | 1 | |
| Fridays | | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | | | 2 | 2 | |
| Saturdays | | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | | | | 2 | 2 | |
| Sundays | | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | | | | | | | | | | | | | | | | | 2 | 2 | 1 |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | Provide at least one through freeway lane open in direction of travel | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | Provide at least two adjacent through freeway lanes open in direction of travel | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Work permitted within project right of way where shoulder or lane closure is not required. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Chart No. 2

Freeway/Expressway Lane Requirements

| | | |
|------------------------|-------------------------|---------------|
| County: San Bernardino | Route/Direction: 210/WB | KP: 35.1/36.7 |
|------------------------|-------------------------|---------------|

Closure Limits:

| FROM HOUR TO HOUR | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---------------------------|----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Mondays through Thursdays | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | 2 | 2 | 1 | 1 |
| Fridays | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | | 2 | 2 | 1 |
| Saturdays | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | | | 2 | 2 | 1 |
| Sundays | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | | 2 | 2 | 1 |

Legend:

- 1 Provide at least one through freeway lane open in direction of travel
- 2 Provide at least two adjacent through freeway lanes open in direction of travel
- Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

Chart No. 3

Freeway/Expressway Lane Requirements

| | | |
|------------------------|-------------------------|---------------|
| County: San Bernardino | Route/Direction: 215/NB | KP: 14.4/18.7 |
|------------------------|-------------------------|---------------|

Closure Limits:

| FROM HOUR TO HOUR | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---------------------------|----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| Fridays | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | |
| Sundays | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | |

Legend:

- 1 Provide at least one through freeway lane open in direction of travel
- Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

| Chart No. 4 Freeway/Expressway Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----|---|---|---|---|---|-------------------------|---|---|---|----|----|----|---------------|----|----|----|----|----|----|----|----|----|----|----|
| County: San Bernardino | | | | | | | Route/Direction: 215/SB | | | | | | | KP: 14.4/18.7 | | | | | | | | | | | |
| Closure Limits: | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | |
| Fridays | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> 1 Provide at least one through freeway lane open in direction of travel | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Work permitted within project right of way where shoulder or lane closure is not required. | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 5 Freeway/Expressway Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----|---|---|---|---|---|-------------------------|---|---|---|----|----|----|---------------|----|----|----|----|----|----|----|----|----|----|----|
| County: San Bernardino | | | | | | | Route/Direction: 210/EB | | | | | | | KP: 35.1/36.7 | | | | | | | | | | | |
| Closure Limits: | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Mondays through Thursdays | C | C | C | C | | | | | | | | | | | | | | | | | | | | | C |
| Fridays | C | C | C | C | | | | | | | | | | | | | | | | | | | | | |
| Saturdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | |
| Sundays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | C |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> C Freeway or expressway may be closed completely. | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> No complete freeway or expressway closure is permitted. | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: A total of 5 nights of full closure will take place. | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 6 Freeway/Expressway Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----|---|---|---|---|---|---|-------------------------|---|---|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----|----|
| County: San Bernardino | | | | | | | | Route/Direction: 210/WB | | | | | | | | KP: 35.1/36.7 | | | | | | | | | |
| Closure Limits: | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Mondays through Thursdays | C | C | C | | | | | | | | | | | | | | | | | | | | | | C |
| Fridays | C | C | C | | | | | | | | | | | | | | | | | | | | | | |
| Saturdays | C | C | C | C | | | | | | | | | | | | | | | | | | | | | |
| Sundays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | C |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> C Freeway or expressway may be closed completely. <input type="checkbox"/> No complete freeway or expressway closure is permitted. | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: A total of 5 nights of full closure will take place. | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 7 Freeway/Expressway Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----|---|---|---|---|---|---|-------------------------|---|---|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----|----|
| County: San Bernardino | | | | | | | | Route/Direction: 215/NB | | | | | | | | KP: 14.4/18.7 | | | | | | | | | |
| Closure Limits: | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Mondays through Thursdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | |
| Fridays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | C | C | C | C | C | | | | | | | | | | | | | | | | | | | |
| Sundays | | C | C | C | C | C | | | | | | | | | | | | | | | | | | | |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> C Freeway or expressway may be closed completely. <input type="checkbox"/> No complete freeway or expressway closure is permitted. | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: A total of 23 nights of full closure will take place. | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 8 Freeway/Expressway Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----|---|---|---|---|---|---|-------------------------|---|---|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----|----|
| County: San Bernardino | | | | | | | | Route/Direction: 215/SB | | | | | | | | KP: 14.4/18.7 | | | | | | | | | |
| Closure Limits: | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Mondays through Thursdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | |
| Fridays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | C | C | C | C | C | | | | | | | | | | | | | | | | | | | |
| Sundays | | C | C | C | C | C | | | | | | | | | | | | | | | | | | | |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> C Freeway or expressway may be closed completely. | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> No complete freeway or expressway closure is permitted. | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: A total of 23 nights of full closure will take place. | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 9 Complete Connector Closure Hours | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----|---|---|---|---|---|---|-------------------------|---|---|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|
| County: SBd | | | | | | | | Route/Direction: 215/SB | | | | | | | | KP: 16.4 | | | | | | | | | |
| Closure Limits: S215 to E210, & S215 to W210 | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Mondays through Thursdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | C | C | C |
| Fridays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | C | C |
| Saturdays | C | C | C | C | C | C | | | | | | | | | | | | | | | | | | C | C |
| Sundays | C | C | C | C | C | C | C | | | | | | | | | | | | | | | | | C | C |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> C Connector may be closed completely | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Work permitted within project right of way where shoulder or lane closure is not required. | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 10 Complete Connector Closure Hours | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|---|---|---|---|-------------------------|---|---|---|---|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|
| County: San Bernardino | | | | | | | Route/Direction: 215/SB | | | | | | | KP: 17.2 | | | | | | | | | | | | |
| Closure Limits: S215 to W210 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Mondays through Thursdays | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| Fridays | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | 1 | 1 |
| Saturdays | | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | 1 | 1 |
| Sundays | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | 1 | 1 |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | Provide at least one connector lane open in direction of travel | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Work permitted within project right of way where shoulder or lane closure is not required. | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 11 Complete Ramp Closure Hours | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|---|---|---|---|-------------------------|---|---|---|---|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|
| County: SBd | | | | | | | Route/Direction: 215/NB | | | | | | | KP: 15.8 | | | | | | | | | | | | |
| Closure Limits: Onramp @ 27 th St (15.790) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Mondays through Thursdays | | C | C | C | C | C | C | | | | | | | | | | | | | | | | | | C | C |
| Fridays | | C | C | C | C | C | C | | | | | | | | | | | | | | | | | | | C |
| Saturdays | | C | C | C | C | C | C | C | | | | | | | | | | | | | | | | | | C |
| Sundays | | C | C | C | C | C | C | C | C | | | | | | | | | | | | | | | | C | C |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C | | Ramp may be closed completely | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Work permitted within project right of way where shoulder or lane closure is not required. | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 12 Complete Ramp Closure Hours | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|---|---|---|---|---|-------------------------|---|---|---|----|----|----|---------------|----|----|----|----|----|----|----|----|----|----|----|-------------------------------|--|--|
| County: San Bernardino | | | | | | | Route/Direction: 215/SB | | | | | | | KM: 15.1/16.0 | | | | | | | | | | | | | | |
| Closure Limits: Onramp @ 27 th St (15.158), & Offramp @ 27 th St (15.998) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FROM HOUR TO HOUR | 24 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | | | |
| Mondays through Thursdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | C | C | C | | |
| Fridays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | C | C | | |
| Saturdays | C | C | C | C | C | C | | | | | | | | | | | | | | | | | | | C | C | | |
| Sundays | C | C | C | C | C | C | C | | | | | | | | | | | | | | | | | | C | C | | |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="0"> <tr> <td style="border: 1px solid black; width: 20px; height: 15px; text-align: center;">C</td> <td>Ramp may be closed completely</td> </tr> <tr> <td style="border: 1px solid black; width: 20px; height: 15px;"></td> <td>Work permitted within project right of way where shoulder or lane closure is not required.</td> </tr> </table> | | | | | | | | | | | | | | | | | | | | | | | | | C | Ramp may be closed completely | | Work permitted within project right of way where shoulder or lane closure is not required. |
| C | Ramp may be closed completely | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Work permitted within project right of way where shoulder or lane closure is not required. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

10-1.26 CLOSURE REQUIREMENTS AND CONDITIONS

Closures shall conform to the provisions in "Maintaining Traffic" of these special provisions and these special provisions.

CLOSURE SCHEDULE

By noon Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Sunday noon through the following Sunday noon. Closures involving work (temporary barrier placement and paving operations) that will reduce horizontal clearances, traveled way inclusive of shoulders, to 2 lanes or less shall be submitted not less than 25 days and not more than 125 days before the anticipated start of operation. Closures involving work (pavement overlay, overhead sign installation, falsework and girder erection) that will reduce the vertical clearances available to the public, shall be submitted not less than 25 days and not more than 125 days before the anticipated start of operation.

The Closure Schedule shall show the locations and times of the proposed closures. The Closure Schedule request forms furnished by the Engineer shall be used. Closure Schedules submitted to the Engineer with incomplete or inaccurate information will be rejected and returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.

Closure Schedule amendments, including adding additional closures, shall be submitted by noon to the Engineer, in writing, at least 3 business days in advance of a planned closure. Approval of Closure Schedule amendments will be at the discretion of the Engineer.

The Engineer shall be notified of cancelled closures 2 business days before the date of closure.

Closures that are cancelled due to unsuitable weather may be rescheduled at the discretion of the Engineer.

CONTINGENCY PLAN

A detailed contingency plan shall be prepared for reopening closures to public traffic. If required by "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, the contingency plan shall be submitted to the Engineer before work at the job site begins. Otherwise, the contingency plan shall be submitted to the Engineer within one business day of the Engineer's request.

LATE REOPENING OF CLOSURES

If a closure is not reopened to public traffic by the specified time, work shall be suspended in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. No further closures are to be made until the Engineer has accepted a work plan, submitted by the Contractor, that will insure that future closures will be reopened to public traffic at the specified time. The Engineer will have 2 business days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to compensation for the suspension of work resulting from the late reopening of closures.

For each 10-minute interval, or fraction thereof past the time specified to reopen the closure, the Department will deduct the following amounts per interval from moneys due or that may become due the Contractor under the contract:

\$4,400 for closures on eastbound Route 210
\$5,300 for closures on westbound Route 210
\$2,400 for closures on northbound Route 215
\$4,700 for closures on southbound Route 215

COMPENSATION

The Engineer shall be notified of delays in the Contractor's operations due to the following conditions, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of those conditions, and the Contractor's loss due to that delay could not have been avoided by rescheduling the affected closure or by judicious handling of forces, equipment and plant, the delay will be considered a right of way delay and will be compensated in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications:

1. The Contractor's proposed Closure Schedule is denied and his planned closures are within the time frame allowed for closures in "Maintaining Traffic" of these special provisions, except that the Contractor will not be entitled to compensation for amendments to the Closure Schedule that are not approved.
2. The Contractor is denied a confirmed closure.

Should the Engineer direct the Contractor to remove a closure before the time designated in the approved Closure Schedule, delay to the Contractor's schedule due to removal of the closure will be considered a right of way delay and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

10-1.27 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A traffic control system shall consist of closing traffic lanes and ramps in conformance with the details shown on the plans, the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, the provisions under "Maintaining Traffic" and "Construction Area Signs" of these special provisions, and these special provisions.

The provisions in this section will not relieve the Contractor of responsibility for providing additional devices or taking measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

During traffic stripe operations and pavement marker placement operations using bituminous adhesive, traffic shall be controlled, at the option of the Contractor, with either stationary or moving lane closures. During other operations, traffic shall be controlled with stationary lane closures. Attention is directed to the provisions in Section 84-1.04, "Protection From Damage," and Section 85-1.06, "Placement," of the Standard Specifications.

If components in the traffic control system are displaced or cease to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair the components to the original condition or replace the components and shall restore the components to the original location.

STATIONARY LANE CLOSURE

When lane and ramp closures are made for work periods only, at the end of each work period, components of the traffic control system, except portable delineators placed along open trenches or excavation adjacent to the traveled way, shall be removed from the traveled way and shoulder. If the Contractor so elects, the components may be stored at selected central locations, designated by the Engineer within the limits of the highway right of way.

Each vehicle used to place, maintain and remove components of a traffic control system on multilane highways shall be equipped with a Type II flashing arrow sign which shall be in operation when the vehicle is being used for placing, maintaining or removing the components. Vehicles equipped with Type II flashing arrow sign not involved in placing, maintaining or removing the components when operated within a stationary type lane closure shall only display the caution display mode. The sign shall be controllable by the operator of the vehicle while the vehicle is in motion. The flashing arrow sign shown on the plans shall not be used on the vehicles which are doing the placing, maintaining and removing of components of a traffic control system and shall be in place before a lane closure requiring the sign's use is completed.

The 500-m section of a lane closure, shown along lane lines between the 300-m lane closure tapers on the plans entitled "Traffic Control System for Lane Closures on Freeways and Expressways" and "Traffic Control System for Lane and Complete Closures on Freeways and Expressways" shall not be used.

The traffic cones shown to be placed transversely across closed traffic lanes and shoulders on the plans entitled "Traffic Control System for Lane Closures on Freeways and Expressways" and "Traffic Control System for Lane and Complete Closures on Freeways and Expressways" shall not be placed.

MOVING LANE CLOSURE

Flashing arrow signs used in moving lane closures shall be truck-mounted. Changeable message signs used in moving lane closure operations shall conform to the provisions in Section 12-3.12, "Portable Changeable Message Signs," of the Standard Specifications, except the signs shall be truck-mounted and the full operation height of the bottom of the sign may be less than 2.1 m above the ground, but should be as high as practicable.

Truck-mounted attenuators (TMA) for use in moving lane closures shall be any of the following approved models, or equal:

1. Hexfoam TMA Series 3000, Alpha 1000 TMA Series 1000, and Alpha 2001 TMA Series 2001, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:
 - 1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
 - 1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501
2. Cal T-001 Model 2 or Model 3, manufacturer and distributor: Hexcel Corporation, 11711 Dublin Boulevard, P.O. Box 2312, Dublin, CA 94568, telephone (925) 551-4900
3. Renco Rengard Model Nos. CAM 8-815 and RAM 8-815, manufacturer and distributor: Renco Inc., 1582 Pflugerville Loop Road, P.O. Box 730, Pflugerville, TX 78660-0730, telephone (800) 654-8182

Each TMA shall be individually identified with the manufacturer's name, address, TMA model number, and a specific serial number. The names and numbers shall each be a minimum 13 mm high and located on the left (street) side at the lower front corner. The TMA shall have a message next to the name and model number in 13 mm high letters which states, "The bottom of this TMA shall be _____ mm \pm _____ mm above the ground at all points for proper impact performance." Any TMA which is damaged or appears to be in poor condition shall not be used unless recertified by the manufacturer. The Engineer shall be the sole judge as to whether used TMAs supplied under this contract need recertification. Each unit shall be certified by the manufacturer to meet the requirements for TMA in conformance with the standards established by the Transportation Laboratory.

Approvals for new TMA designs proposed as equal to the above approved models shall be in conformance with the procedures (including crash testing) established by the Transportation Laboratory. For information regarding submittal of new designs for evaluation contact: Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, California 95819.

New TMAs proposed as equal to approved TMAs or approved TMAs determined by the Engineer to need recertification shall not be used until approved or recertified by the Transportation Laboratory.

PAYMENT

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor, materials (including signs), tools, equipment, and incidentals, and for doing all the work involved in placing, removing, storing, maintaining, moving to new locations, replacing and disposing of the components of the traffic control system shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the item of traffic control system. Adjustments in compensation for traffic control system will be made only for increased or decreased traffic control system required by changes ordered by the Engineer and will be made on the basis of the cost of the increased or decreased traffic control necessary. The adjustment will be made on a force account basis as provided in Section 9-1.03, "Force Account Payment," of the Standard Specifications for increased work and estimated on the same basis in the case of decreased work.

Traffic control system required by work which is classed as extra work, as provided in Section 4-1.03D of the Standard Specifications, will be paid for as a part of the extra work.

10-1.28 TEMPORARY PAVEMENT DELINEATION

Temporary pavement delineation shall be furnished, placed, maintained, and removed in conformance with the provisions in Section 12-3.01, "General," of the Standard Specifications and these special provisions. Nothing in these special provisions shall be construed as reducing the minimum standards specified in the California MUTCD or as relieving the Contractor from the responsibilities specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

GENERAL

When the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place before opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided for traveled ways open to public traffic. On multilane roadways (freeways and expressways), edgeline delineation shall be provided for traveled ways open to public traffic.

Work necessary, including required lines or markers, to establish the alignment of temporary pavement delineation shall be performed by the Contractor. Surfaces to receive application of paint or removable traffic tape temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with a new pattern of temporary pavement delineation or permanent pavement delineation, or as determined by the Engineer.

Temporary pavement markers and removable traffic tape that conflicts with a new traffic pattern or that is applied to the final layer of surfacing or existing pavement to remain in place shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

Temporary pavement delineation shall be used on or adjacent to lanes open to public traffic for a maximum of 14 days. Before the end of the 14 days, the permanent pavement delineation shall be placed. If the permanent pavement delineation is not placed within the 14 days, additional temporary pavement delineation shall be provided by the Contractor at no additional cost to the Department. The additional temporary pavement delineation to be provided shall be equivalent to the pattern specified for the permanent pavement delineation for the area, as determined by the Engineer.

Painted traffic stripe used for temporary delineation shall conform to "Paint Traffic Stripe and Pavement Marking" of these special provisions, except for payment. The number of coats shall be, at the option of the Contractor, either one or 2 coats. The quantity of painted traffic stripe used for temporary delineation will not be included in the quantities of paint traffic stripe to be paid for.

TEMPORARY LANELINE AND CENTERLINE DELINEATION

When lanelines or centerlines are obliterated, the minimum laneline and centerline delineation to be provided shall be temporary pavement markers placed at longitudinal intervals of not more than 7.3 m. The temporary pavement markers shall be the same color as the laneline or centerline the markers replace. Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers listed for short term day/night use (14 days or less) or long term day/night use (6 months or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Temporary pavement markers shall be placed in conformance with the manufacturer's instructions and shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place pavement markers in areas where removal of the markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary pavement markers shall be placed on longitudinal intervals of not more than 7.3 m.

Full compensation for furnishing, placing, maintaining, and removing temporary pavement markers used for temporary laneline and centerline delineation and for providing equivalent patterns of permanent traffic lines for these areas when required shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

Full compensation for furnishing, placing, and maintaining temporary painted laneline and centerline pavement delineation shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

Full compensation for furnishing, placing, maintaining, and removing signing specified for "no passing" zones shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

TEMPORARY EDGELINE DELINEATION

When edgelines are obliterated on multilane roadways (freeways and expressways), the edgeline delineation to be provided for that area adjacent to lanes open to public traffic shall consist of, at the option of the Contractor, either solid 100-mm wide traffic stripe tape of the same color as the stripe it replaces, traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 30 m. Where removal of the 100-mm wide traffic stripe will not be required, painted traffic stripe may be used.

Temporary removable construction grade striping and pavement marking tape shall be as listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Temporary removable construction grade striping and pavement marking tape when used shall be applied in conformance with the manufacturer's recommendations.

The lateral offset for traffic cones, portable delineators or channelizers used for temporary edgeline delineation shall be determined by the Engineer. If traffic cones or portable delineators are used as temporary pavement delineation for edgelines, the Contractor shall provide personnel to remain at the project site to maintain the cones or delineators during hours of the day that the cones or delineators are in use.

Channelizers used for temporary edgeline delineation shall be the surface mounted type and shall be orange in color. Channelizer bases shall be cemented to the pavement in the same manner provided for cementing pavement markers to pavement in "Pavement Markers" of these special provisions, except epoxy adhesive shall not be used to place channelizers on the top layer of pavement. Channelizers shall be, at the Contractor's option, one of the surface mount types (900 mm) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary edgeline delineation shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

Full compensation for furnishing, placing, maintaining, and removing temporary edgeline delineation shall be considered as included in the contract prices paid for the items of work that obliterated the edgeline pavement delineation and no separate payment will be made therefor. The quantity of channelizers used as temporary edgeline delineation will not be included in the quantity of channelizer (surface mounted) to be paid for.

10-1.29 BARRICADE

Barricades shall be furnished, placed and maintained at the locations shown on the plans, specified in the Standard Specifications or in these special provisions or where designated by the Engineer. Barricades shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Prequalified and Tested Signing and Delineation Materials" of these special provisions regarding retroreflective sheeting for barricades.

Construction area sign and marker panels conforming to the provisions in Section 12-3.06, "Construction Area Signs," of the Standard Specifications shall be installed on barricades in a manner determined by the Engineer at the locations shown on the plans.

Sign panels for construction area signs and marker panels installed on barricades shall conform to the provisions in Section 12-3.06A, "Stationary Mounted Signs," of the Standard Specifications.

Full compensation for furnishing, installing, maintaining, and removing construction area signs and marker panels on barricades shall be considered as included in the contract unit price paid for the type of barricade involved and no separate payment will be made therefor.

Barricades shown on the plans as part of a traffic control system will be paid for as provided in "Traffic Control System for Lane Closure" of these special provisions and will not be included in the count for payment of barricades.

10-1.30 PORTABLE CHANGEABLE MESSAGE SIGNS

GENERAL

Summary

Work includes furnishing, placing, operating, maintaining, and removing portable changeable message signs. Comply with Section 12-3.12 "Portable Changeable Message Signs," of the Standard Specifications.

Definitions

useable shoulder area: Paved or unpaved contiguous surface adjacent to the traveled way with:

1. Sufficient weight bearing capacity to support portable changeable message sign
2. Slope not greater than 6:1 (horizontal:vertical)

Submittals

Upon request, submit a Certificate of Compliance for each portable changeable message sign under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Quality Control and Assurance

Comply with the manufacturer's operating instructions for portable changeable message sign.

Approaching drivers must be able to read the entire message for all phases at least twice at the posted speed limit before passing portable changeable message sign. You may use more than 1 portable changeable message sign to meet this requirement.

Only display the message shown on the plans or ordered by the Engineer or specified in these special provisions.

MATERIALS

The text of the message displayed on portable changeable message sign must not scroll, or travel horizontally or vertically across the face of the message panel.

CONSTRUCTION

Continuously repeat the entire message in no more than 2 phases of at least 3 seconds per phase.

If useable shoulder area is at least 4.6 meters wide, the displayed message on portable changeable message sign must be minimum 46 centimeters character height. If useable shoulder area is less than 4.6 meters wide, you may use a smaller message panel with minimum 31 centimeters character height to prevent encroachment in the traveled way.

You or your representative must be available by cell phone for operations that require portable changeable message signs. Give the Engineer your cell phone number. When the Engineer contacts you, immediately comply with the Engineer's request to modify the displayed message.

Start displaying the message on portable changeable message sign 30 minutes before closing the lane.

Place portable changeable message sign in advance of the first warning sign for:

1. Each stationary lane closure
2. Each off-ramp closure
3. Each connector closure
4. Each shoulder closure
5. Each speed reduction zone

For 5 days starting on the day of signal activation, place 1 portable changeable message sign in each direction of travel and display the message, "SIGNAL AHEAD -- PREPARE TO STOP."

Place portable changeable message sign as far from the traveled way as practicable where it is legible to traffic and does not encroach on the traveled way. Place portable changeable sign before or at the crest of vertical roadway curvature where it is visible to approaching traffic. Avoid placing portable changeable message sign within or immediately after horizontal roadway curvature. Where possible, place portable changeable message sign behind guardrail or temporary railing (Type K).

Except where placed behind guardrail or temporary railing (Type K) use traffic control for shoulder closure to delineate portable changeable message sign.

Remove portable changeable message sign when not in use.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for portable changeable message signs includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, placing, operating, modifying messages, maintaining portable changeable message signs, complete in place, including transporting from location to location, removing, and repairing or replacing defective or damaged portable changeable message signs, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Portable changeable message signs ordered by the Engineer in excess of the number shown on the plans or specified in these special provisions will be paid for as extra work under Section 4-1.03D, "Extra Work," of the Standard Specifications.

10-1.31 FLASHING ARROW SIGN

Flashing arrow signs shall be furnished, placed, operated, and maintained at locations shown on the plans, in conformance with these special provisions for "Traffic Control System for Lane Closure", or where designated by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

At the end of each night's work, flashing arrow sign units shall be left in operation, if required for traffic handling, or be removed from the traveled way, if ordered by the Engineer or as shown on the plans. The Contractor has the option of storing the flashing arrow sign units within the limits of the highway right of way, upon prior approval from the Engineer.

Flashing arrow signs will be measured by the unit from actual count in place at the locations shown on the plans. Each flashing arrow sign will be counted once at each location shown on the plans. Repaired or replacement flashing arrow signs placed at the locations will not be considered as additional units for payment purposes.

Flashing arrow signs shown on the plans as part of a traffic control system shall be considered as part of that traffic control system and will be paid for in conformance with the provisions in "Traffic Control System for Lane Closures" of these special provisions.

The contract unit price paid for flashing arrow signs shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in furnishing, placing, operating, maintaining repairing, transporting from location to location and removing portable changeable message signs, complete in place as specified in the Standard Specifications and these special provisions, as shown in the plans and as directed by the Engineer.

10-1.32 TEMPORARY RAILING

Temporary railing (Type K) shall be placed as shown on the plans, as specified in the Standard Specifications or these special provisions or where ordered by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Temporary railing (Type K) shall be secured in place before starting work for which the temporary railing is required.

Reflectors on temporary railing (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.

Temporary terminal section (Type K) (Modified) for connecting temporary railing (Type K) to Type 60 concrete barrier shall consist of either new or undamaged used precast units, as shown on the plans. Fabricating, placing, painting, and removing the units shall conform to the provisions specified for temporary railing (Type K).

Closure plate for the temporary terminal section (Type K) shall be of a good commercial quality steel shaped to conform to cross section of the barriers. Mechanical expansion anchors for connecting closure plate to railings shall conform to the provisions specified for concrete anchorage devices in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Temporary terminal section (Type K) (Modified) will be measured by the unit from actual count in place.

The contract unit price paid for temporary terminal section (Type K) (Modified) shall include full compensation for furnishing all labor, materials (including reinforcement and concrete anchorage devices), tools, equipment, and incidentals, and for doing all the work involved in furnishing, placing, maintaining, repairing, replacing, and removing temporary terminal section (Type K) (Modified), complete in place, including excavation, backfill, grout and concrete, and connecting to concrete barrier, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.33 CHANNELIZER

Channelizers shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Channelizers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

When no longer required for the work as determined by the Engineer, channelizers and underlying adhesive used to cement the channelizer bases to the pavement shall be removed. Removed channelizers and adhesive shall become the property of the Contractor and shall be removed from the site of work.

10-1.34 PORTABLE DELINEATOR

Portable delineators shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Portable delineators shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Portable delineators shall be placed and maintained at the locations shown on the plans, or as directed by the Engineer.

When no longer required for the work as determined by the Engineer, portable delineators shall be removed. Removed portable delineators shall become the property of the Contractor and shall be removed from the site of work.

Portable delineator will be measured by the unit from actual count in place at the locations shown on the plans or at other locations designated by the Engineer. Each portable delineator will be counted once at each location shown on the plans or at other locations determined by the Engineer. Replacement portable delineator placed at the locations will not be considered as additional units for payment purposes.

Portable delineator shown on the plans as part of a traffic control system shall be considered as part of that traffic control system and will be paid for in conformance with the provisions in "Traffic Control System for Lane Closures" of these special provisions.

The contract unit price paid for portable delineator shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, placing, maintaining, replacing, and removing the portable delineator, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.35 TEMPORARY TRAFFIC SCREEN

Temporary traffic screen shall be furnished, installed, and maintained on top of temporary railing (Type K) at the locations designated on the plans, specified in the special provisions or directed by the Engineer and shall conform to the provisions specified for traffic handling equipment and devices in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Temporary traffic screen panels shall be new or used CDX Grade, or better, plywood or weather resistant strandboard mounted and anchored on temporary railing (Type K). Wale boards shall be new or used Douglas fir, rough sawn, Construction Grade, or better. Pipe screen supports shall be new or used galvanized steel pipe, Schedule 40. Nuts, bolts, and washers shall be cadmium plated. Screws shall be black or cadmium plated flat head, cross slotted screws with full thread length.

When no longer required, as determined by the Engineer, temporary traffic screen shall be removed from the site of the work and shall become the property of the Contractor.

Temporary traffic screen will be measured by the meter from actual measurements along the line of the completed temporary traffic screen, at each location designated on the plans, specified or directed by the Engineer. If the Engineer orders a lateral move of temporary railing, with temporary traffic screen attached, and the repositioning is not shown on the plans, moving the temporary traffic screen will be paid for as part of the extra work for moving the temporary railing as specified in Section 12-4.01, "Measurement and Payment," of the Standard Specifications. Temporary traffic screen placed in excess of the length shown, specified or directed by the Engineer will not be paid for.

The contract price paid per meter for temporary traffic screen shall include full compensation for furnishing all labor, materials (including anchoring systems), tools, equipment, and incidentals, and for doing all the work involved in installing, maintaining, and removing the temporary traffic screen, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.36 TEMPORARY CRASH CUSHION MODULE

This work shall consist of furnishing, installing, and maintaining sand filled temporary crash cushion modules in groupings or arrays at each location shown on the plans, as specified in these special provisions or where designated by the Engineer. The grouping or array of sand filled modules shall form a complete sand filled temporary crash cushion in conformance with the details shown on the plans and these special provisions.

Temporary crash cushions shall be secured in place prior to commencing work for which the temporary crash cushions are required.

Whenever the work or the Contractor's operations establishes a fixed obstacle, the exposed fixed obstacle shall be protected with a sand filled temporary crash cushion. The sand filled temporary crash cushion shall be in place prior to opening the lanes adjacent to the fixed obstacle to public traffic.

Sand filled temporary crash cushions shall be maintained in place at each location, including times when work is not actively in progress. Sand filled temporary crash cushions may be removed during a work period for access to the work provided that the exposed fixed obstacle is 4.6 meters or more from a lane carrying public traffic and the temporary crash cushion is reset to protect the obstacle prior to the end of the work period in which the fixed obstacle was exposed. When no longer required, as determined by the Engineer, sand filled temporary crash cushions shall be removed from the site of the work.

Sand filled temporary crash cushion modules shall be one of the following, or equal, and be manufactured after March 31, 1997:

1. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:
 - 1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
 - 1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501
2. Traffix Sand Barrels, manufactured by Traffix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672, telephone (949) 361-5663, FAX (949) 361-9205
 - 2.1. Northern California: United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112, telephone (408) 287-4303, FAX (408) 287-1929
 - 2.2. Southern California: Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448, telephone (800) 559-7080, FAX (805) 929-5786
3. CrashGard Model CC-48 Sand Barrels, manufactured by Plastic Safety Systems, Inc., 2444 Baldwin Road, Cleveland, OH 44104:
 - 3.1. Northern California:
 - 3.1.1. Capitol Barricade Safety & Sign, 6329 Elvas Ave, Sacramento, CA 95819, telephone (888) 868-5021, FAX (916) 451-5388
 - 3.1.2. Sierra Safety, Inc., 9093 Old State Highway, New Castle, CA 95658, telephone (916) 663-2026, FAX (916) 663-1858
 - 3.2. Southern California: Hi Way Safety Inc., 13310 5th Street, Chino, CA 91710, telephone (909) 591-1781, FAX (909) 627-0999

Modules contained in each temporary crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color, as furnished by the vendor, with black lids. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects. The modules need not be new. Good used undamaged modules conforming to color and quality of the types specified herein may be utilized. If used Fitch modules requiring a seal are furnished, the top edge of the seal shall be securely fastened to the wall of the module by a continuous strip of heavy duty tape.

Modules shall be filled with sand in conformance with the manufacturer's directions, and to the sand capacity in pounds for each module shown on the plans. Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water as determined by California Test 226.

Modules damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Modules damaged beyond repair, as determined by the Engineer, due to the Contractor's operations shall be removed and replaced by the Contractor at the Contractor's expense.

Temporary crash cushion modules may be placed on movable pallets or frames. Comply with dimensions shown on the plans. The pallets or frames shall provide a full bearing base beneath the modules. The modules and supporting pallets or frames shall not be moved by sliding or skidding along the pavement or bridge deck.

A Type R or P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 3.6 meters of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion modules, sand filling, pallets or frames, and marker panels shall become the property of the Contractor and shall be removed from the site of the work. Temporary crash cushion modules shall not be installed in the permanent work.

Temporary crash cushion modules will be measured by the unit as determined from the actual count of modules used in the work or ordered by the Engineer at each location. Temporary crash cushion modules placed in conformance with Section 7-1.09, "Public Safety," of the Standard Specifications and modules placed in excess of the number specified or shown will not be measured nor paid for.

Repairing modules damaged by public traffic will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Modules damaged beyond repair by public traffic, when ordered by the Engineer, shall be removed and replaced immediately by the Contractor. Modules replaced due to damage by public traffic will be measured and paid for as temporary crash cushion module.

If the Engineer orders a lateral move of the sand filled temporary crash cushions and the repositioning is not shown on the plans, moving the sand filled temporary crash cushion will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and these temporary crash cushion modules will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion module shall include full compensation for furnishing all labor, materials (including sand, pallets or frames and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, maintaining, moving, and resetting during a work period for access to the work, and removing from the site of the work when no longer required (including those damaged by public traffic) sand filled temporary crash cushion modules, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.37 EXISTING HIGHWAY FACILITIES

The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. Work practices and worker health and safety shall conform to the California Division of Occupational Safety and Health Construction Safety Orders Title 8, of the California Code of Regulations including Section 5158, "Other Confined Space Operations."

Existing footing concrete that is below ground and outside of the footing limits shown on the contract plans or original contract plans shall be removed as directed by the Engineer and will be paid in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

EXISTING PAINT SYSTEMS

The existing paint systems on Bridge Number 54-0467 consist of red lead primer. Any work that disturbs the existing paint system will expose workers to health hazards and will (1) produce debris containing heavy metal in amounts that exceed the thresholds established in Titles 8 and 22 of the California Code of Regulations or (2) produce toxic fumes when disturbed or heated. All debris disturbed or produced while working on the bridge shall be contained.

Debris Containment and Collection Program

Prior to starting work, the Contractor shall submit a debris containment and collection program to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, for debris produced when the existing paint system is disturbed. The program shall identify materials, equipment, and methods to be used when the existing paint system is disturbed and shall include working drawings of containment systems, loads applied to the bridge by containment structures, and provisions for ventilation and air movement for visibility and worker safety.

If the measures being taken by the Contractor are inadequate to provide for the containment and collection of debris produced when the existing paint system is disturbed, the Engineer will direct the Contractor to revise the operations and the debris containment and collection program. The directions will be in writing and will specify the items of work for which the Contractor's debris containment and collection program is inadequate. No further work shall be performed on the items until the debris containment and collection program is adequate and, if required, a revised program has been approved for the containment and collection of debris produced when the existing paint system is disturbed.

The Engineer will notify the Contractor of the approval or rejection of the submitted or revised debris containment and collection program within 2 weeks of submittal of the Contractor's program or revised program.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised debris containment and collection program, nor for delays to the work due to the Contractor's failure to submit an acceptable program.

Full compensation for the debris containment and collection program shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

Safety and Health Provisions

Attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. Work practices and worker health and safety shall conform to the California Code of Regulations, Title 8, Construction Safety Orders, including Section 1532.1, "Lead."

The Contractor shall furnish the Engineer a written Code of Safe Practices that included a Lead Compliance Plan and shall implement an Injury and Illness Prevention Program and a Hazard Communication Program in conformance with the requirements of Construction Safety Orders, Sections 1509 and 1510.

Prior to starting work that disturbs the existing paint system, and when revisions to the program are required by Section 1532.1, "Lead," the Contractor shall submit the compliance programs required in subsection (e)(2), "Compliance Program," of Section 1532.1, "Lead," of the Construction Safety Orders to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The compliance programs shall include the data specified in subsections (e)(2)(B) and (e)(2)(C) of Section 1532.1, "Lead." The compliance programs shall be reviewed and signed by a Certified Industrial Hygienist (CIH) who is certified in comprehensive practice by the American Board of Industrial Hygiene (ABIH). Copies of all air monitoring or jobsite inspection reports made by or under the direction of the CIH in conformance with Section 1532.1, "Lead," shall be furnished to the Engineer within 10 days after the date of monitoring or inspection.

Prior to performing work in areas containing lead, personnel who have no prior training, including State personnel, shall complete a safety training program provided by the Contractor that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Code of Safe Practices. Training required by the Contractor's Code of Safe Practices shall be supplied to State personnel by the Contractor. The number of State personnel will be 3.

Full compensation for furnishing the Engineer with the submittals and for implementing the programs required by this safety and health section shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

Debris Handling

Debris produced when the existing paint system is disturbed shall not be temporarily stored on the ground. Debris accumulated inside the containment system shall be removed before the end of each work shift. Debris shall be stored in approved, leakproof containers and shall be handled in such a manner that no spillage will occur.

Disposal of debris produced when the existing paint system is disturbed shall be performed in conformance with all applicable Federal, State, and Local hazardous waste laws. Laws that govern this work include:

- A. Health and Safety Code, Division 20, Chapter 6.5 (California Hazardous Waste Control Act).
- B. Title 22; California Code of Regulations, Division 4.5, (Environmental Health Standards for the Management of Hazardous Waste).
- C. Title 8, California Code of Regulations.

Except as otherwise provided herein, debris produced when the existing paint system is disturbed shall be disposed of by the Contractor at an approved Class 1 disposal facility in conformance with the requirements of the disposal facility operator. The debris shall be hauled by a transporter currently registered with the California Department of Toxic Substances Control using correct manifesting procedures and vehicles displaying current certification of compliance. The Contractor shall make all arrangements with the operator of the disposal facility and perform any testing of the debris required by the operator.

At the option of the Contractor, the debris produced when the existing paint system is disturbed may be disposed of by the Contractor at a facility equipped to recycle the debris, subject to the following requirements:

- A. Copper slag abrasive blended by the supplier with a calcium silicate compound shall be used for blast cleaning.
- B. The debris produced when the existing paint system is disturbed shall be tested by the Contractor to confirm that the solubility of the heavy metals is below regulatory limits and that the debris may be transported to the recycling facility as a non-hazardous waste.
- C. The Contractor shall make all arrangements with the operator of the recycling facility and perform any testing of the debris produced when the existing paint system is disturbed that is required by the operator.

Full compensation for debris handling and disposal shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

ABANDON CULVERT

Existing culverts, where shown on the plans to be abandoned, shall be abandoned in place or, at the option of the Contractor, the culverts and pipelines shall be removed and disposed of. Resulting openings into existing structures that are to remain in place shall be plugged with concrete conforming to the provisions in Section 90-10 "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 300 kg of cementitious material per cubic meter.

Abandoning culverts in place shall conform to the following:

1. Culverts that intersect the side slopes shall be removed to a depth of not less than one meter measured normal to the plane of the finished side slope, before being abandoned.
2. Culverts 300 mm in diameter and larger, shall, at the Contractor's option, be backfilled with either sand, controlled low strength material or slurry cement backfill conforming to the provisions in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications by any method acceptable to the Engineer that completely fills the pipe. Sand backfill material shall be clean, free draining, and free from roots and other deleterious substances.
3. The ends of culverts shall be securely closed by a 150 mm thick tight fitting plug or wall of commercial quality concrete.

Culverts shall not be abandoned until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended culvert abandonment.

If the Contractor elects to remove and dispose of a culvert which is specified to be abandoned, as provided herein, backfill specified for the pipe will be measured and paid for in the same manner as if the culvert or pipeline has been abandoned in place.

Backfill will be measured by the cubic meter determined from the dimensions of the culverts to be abandoned.

The contract price paid per cubic meter for sand backfill shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in backfilling culverts with sand, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Controlled low strength material and slurry cement backfill, if used at the Contractor's option, will be measured and paid for by the cubic meter as sand backfill.

Full compensation for concrete plugs, pipe removal, structure excavation, and backfill shall be considered as included in the contract unit price paid for abandon culvert and no additional compensation will be allowed therefor.

REMOVE METAL BEAM GUARD RAILING

Existing metal beam guard railing, where shown on the plans to be removed, shall be removed and disposed of.

Existing concrete anchors or steel foundation tubes shall be completely removed and disposed of. Full compensation for removing concrete anchors shall be considered as included in the contract price paid per meter for remove metal beam guard railing and no separate payment will be made therefor.

Full compensation for removing cable anchor assemblies, terminal anchor assemblies or steel foundation tubes shall be considered as included in the contract price paid per meter for remove metal beam guard railing and no separate payment will be made therefor.

REMOVE SINGLE THRIE BEAM BARRIER

Existing single thrie beam barrier, where shown on the plans to be removed, shall be removed and disposed of.

Existing concrete anchors or steel foundation tubes shall be completely removed and disposed of. Full compensation for removing concrete anchors shall be considered as included in the contract price paid per meter for single thrie beam barrier and no separate payment will be made therefor.

Full compensation for removing cable anchor assemblies, terminal anchor assemblies or steel foundation tubes shall be considered as included in the contract price paid per meter for remove single thrie beam barrier and no separate payment will be made therefor.

TREATED-WOOD WASTE

This work includes handling, storing, transporting, and disposing treated-wood waste.

Wood removed from metal beam guard railing is treated with creosote, pentachlorophenol, copper azole, copper boron azole, chromated copper arsenate, ammoniacal copper zinc arsenate, copper naphthenate, or alkaline copper quaternary. Treated-wood waste must be disposed in an approved treated-wood-waste facility. A list of currently approved treated-wood-waste facilities may be viewed at:

http://www.dtsc.ca.gov/HazardousWaste/upload/TWW_Confirmed_Landfill_List.pdf

Manage treated-wood waste under Title 22 CA Code of Regulations, Division 4.5, Chapter 34.

Personnel who handle treated-wood waste or may come in contact with treated-wood waste must receive training that includes:

1. All applicable requirements of Title 8 CA Code of Regulations
2. Procedures for identifying and segregating treated-wood waste

3. Safe handling practices
4. Requirements of Title 22 CA Code of Regulations, Division 4.5, Chapter 34
5. Proper disposal methods

Store treated-wood waste before disposal using any of the following methods:

1. Elevated on blocks above a reasonably foreseeable run-on elevation and protected from precipitation
2. Placed in water-resistant containers designed for shipping or solid waste collection
3. Placed on a containment surface protected from run-on and precipitation

Prevent unauthorized access to treated-wood waste using a secured enclosure such as a locked chain link fenced area or a lockable shipping container. The enclosure must be located within the project limits.

Resizing or segregating treated-wood waste must be done at a location where debris from the operation including sawdust and chips can be contained. The debris must be collected and managed as treated-wood waste.

Provide water-resistant labels to clearly mark and identify treated-wood waste. Labels on treated-wood waste and accumulation areas must comply with Title 22 CA Code of Regulations, Division 4.5, Chapter 34, § 67386.5. The label must include:

1. In treated wood waste handler area:
 - 1.1. Caltrans, District number, Construction, contract number
 - 1.2. District office address
 - 1.3. Engineer's name, address, and telephone number
 - 1.4. Contractor's contact name and telephone number

Before transporting treated-wood waste, obtain agreement from the receiving facility that the treated-wood waste will be accepted. Protect shipments of treated-wood waste from loss and exposure to precipitation. Request a generator identification number from the Engineer at least 5 days before the first shipment. Each shipment must be accompanied by a shipping record such as a manifest or bill of lading that includes:

1. Caltrans, District number, Construction, contract number, generator identification number
2. District office address
3. Engineer name, address, and telephone number
4. Contractor contact name and telephone number
5. Receiving facility name and address
6. Waste description: Treated wood waste (preservative type if known or unknown/mixture)
7. Project location
8. Estimated quantity of shipment by weight or volume
9. Date of transport
10. Date of receipt
11. Weight of shipment as measured by the receiving treated-wood-waste facility

The shipping document must be at least a 4-part carbon or carbonless 8-1/2" x 11" form to allow retention of copies by the Engineer, transporter, and disposal facility. Submit a copy of each completed shipping record and weight receipt to the Engineer.

Dispose of treated-wood waste within:

1. 90 days of generation if stored on blocks
2. 90 days of filling a container if containerized
3. 180 days of generation if stored on a containment surface

Full compensation for handling, storing, transporting, and disposing treated-wood waste, including personnel training, is included in the contract prices paid per meter for remove metal beam guard railing and remove single thrie beam barrier and no additional compensation will be allowed therefor.

REMOVE SIGN STRUCTURE

Existing sign structures, where shown on the plans to be removed, shall be removed and disposed of.

Overhead sign structure removal shall consist of removing posts, frames, portions of foundations, sign panels, walkways with safety railings, and sign lighting electrical equipment.

Bridge mounted sign structure removal shall consist of removing sign panels and frames, sign lighting electrical equipment, walkways with safety railings, structural braces and supports, and hardware.

A sign structure shall not be removed until the structure is no longer required for the direction of public traffic.

Concrete foundations may be abandoned in place, except that the top portion, including anchor bolts, reinforcing steel, and conduits shall be removed to a depth of not less than 1 m below the adjacent finished grade. The resulting holes shall be backfilled and compacted with material equivalent to the surrounding material.

Electrical wiring shall be removed to the nearest pull box. Fuses within spliced connections in the pull box shall be removed and disposed of.

Electrical equipment, where shown on the plans, shall be salvaged.

REMOVE PAVEMENT MARKER

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

REMOVE CHAIN LINK FENCE

Existing chain link fence, where shown on the plans to be removed, shall be removed and disposed of as provided for in these special provisions.

Post foundations shall be removed to a depth of at least 0.75 meter below the finished grade.

Full compensation for backfilling and compacting post holes shall be considered as included in the contract price paid per meter for remove chain link fence and no additional compensation will be allowed therefor.

Full compensation for removing gates shall be considered as included in the contract price paid per meter for remove chain link fence, and no separate payment will be made therefor.

REMOVE METAL RAILING

Existing metal railing, including post footings and anchor blocks, where shown on the plans, shall be removed and disposed of.

Full compensation for backfilling and compacting post holes shall be considered as included in the contract price paid per meter for remove metal railing and no additional compensation will be allowed therefore.

REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING

Traffic stripe and pavement marking shall be removed at the locations shown on the plans and as directed by the Engineer.

Attention is directed to "Water Pollution Control" of these special provisions.

Waste from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking contains lead chromate in average concentrations greater than or equal to 5 mg/L Soluble Lead or 1000 mg/kg Total Lead. Yellow thermoplastic and yellow paint traffic stripe and pavement marking exist as shown on plans. Residue produced from the removal of yellow thermoplastic and yellow paint contains heavy metals in concentrations that exceed thresholds established by the California Health and Safety Code and Title 22 of the California Code of Regulations. The Contractor shall assume that the residue is not regulated under the Federal Resource Conservation and Recovery Act (RCRA). Yellow thermoplastic and yellow paint may produce toxic fumes when heated.

The removed yellow thermoplastic and yellow paint shall be disposed of at a Class 1 disposal facility in conformance with the requirements of the disposal facility operator within 45 days after accumulating 100 kg of residue and dust. The Contractor shall make necessary arrangements to test the yellow thermoplastic and yellow paint residue as required by the disposal facility and these special provisions. Testing shall include, at a minimum, (1) Total Lead by EPA Method 6010B and Chromium by EPA Method 7000 series, (2) Soluble Lead and Chromium by California Waste Extraction Test, and (3) Soluble Lead and Chromium by Toxicity Characteristic Leaching Procedure. From the first 840 L of waste or portion thereof, if less than 840 L of waste are produced, a minimum of four randomly selected samples shall be taken and analyzed individually. Samples shall not be composited. From each additional 3360 L of waste or portion thereof, if less than 3360 L are produced, a minimum of one additional random sample shall be taken and analyzed. Each sample shall be homogenized prior to analysis by the laboratory performing the analyses. A sample aliquot sufficient to cover the amount necessary for the total and the soluble analyses shall then be taken. This aliquot shall be homogenized a second time and the total and soluble (if necessary) run on this aliquot. The homogenization process shall not include grinding of the samples. The Contractor shall submit the name and location of the disposal facility and analytical laboratory along with the testing requirements to the Engineer not less than 5 days prior to the start of removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking. The analytical laboratory shall be certified by the Department of Health Services Environmental

Laboratory Accreditation Program for all analyses to be performed. Test results shall be provided to the Engineer for review prior to signing a waste profile as requested by the disposal facility, prior to issuing an EPA identification number, and prior to allowing removal of the waste from the site.

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling removed yellow thermoplastic and yellow paint residue. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific Cal-OSHA requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The Plan shall be submitted to the Engineer at least 7 days prior to beginning removal of yellow thermoplastic and yellow paint.

Prior to removing yellow thermoplastic and yellow painted traffic stripe and pavement marking, personnel who have no prior training, including State personnel, shall complete a safety training program provided by the Contractor that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Lead Compliance Program.

Personal protective equipment, training, and washing facilities required by the Contractor's Lead Compliance Plan shall be supplied to State personnel by the Contractor. The number of State personnel will be 7.

Where grinding or other methods approved by the Engineer are used to remove yellow thermoplastic and yellow painted traffic stripe and pavement marking, the removed residue, including dust, shall be contained and collected immediately. Collection shall be by a high efficiency particulate air (HEPA) filter equipped vacuum attachment operated concurrently with the removal operations or other equally effective methods approved by the Engineer. The Contractor shall submit a written work plan for the removal, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe and pavement marking to the Engineer for approval not less than 15 days prior to the start of the removal operations. Removal operations shall not be started until the Engineer has approved the work plan.

The removed yellow thermoplastic and yellow painted traffic stripe and pavement marking residue shall be stored and labeled in covered containers. Labels shall conform to the provisions of Title 22, California Code of Regulations, Sections 66262.31 and 66262.32. Labels shall be marked with date when the waste is generated, the words "Hazardous Waste," composition and physical state of the waste (for example, asphalt grindings with thermoplastic or paint), the word "Toxic," the name and address of the Engineer, the Engineer's telephone number, contract number, and Contractor or subcontractor. The containers shall be metal and a type approved by the United States Department of Transportation for the transportation and temporary storage of the removed residue. The containers shall be handled so that no spillage will occur. The containers shall be stored in a secured fenced enclosure at a location within the project limits until disposal, as approved by the Engineer.

If the yellow thermoplastic and yellow painted traffic stripe and pavement marking residue is transported to a Class 1 disposal facility as a hazardous waste, a manifest shall be used, and the transporter shall be registered with the California Department of Toxic Substance Control. The Contractor shall submit a written request for the United States Environmental Protection Agency Identification Number (US EPA ID Number) to the Engineer. The Engineer will obtain the US EPA ID Number and sign all manifests as the generator within 2 working days of receiving sample test results, approving the test methods, and receiving the written request for the US EPA ID Number from the Contractor. The Contractor shall submit receiving landfill documentation of proper disposal to the Engineer.

Additional disposal costs for removal residue regulated under RCRA, as determined by test results, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Nothing in these special provisions shall relieve the Contractor of the Contractor's responsibilities as specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

Attention is directed to "Material Containing Aerially Deposited Lead" of these special provisions regarding payment for the Lead Compliance Plan. One Lead Compliance Plan shall be prepared that addresses exposure to lead from traffic stripe and pavement marking and from aerially deposited lead.

Full compensation for providing a written work plan for the removal, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe and pavement marking and for providing receiving landfill documentation of proper disposal of yellow thermoplastic and yellow painted traffic stripe and pavement marking shall be considered as included in the contract prices paid per meter for remove yellow thermoplastic traffic stripe and remove yellow painted traffic stripe or per square meter for remove yellow thermoplastic pavement marking and yellow painted pavement marking and no separate payment will be made therefor.

REMOVE DRAINAGE FACILITY

Existing box culverts, inlets, channels, headwalls and endwalls, where any portion of these structures is within one meter of the grading plane in excavation areas, or within 0.3-m of original ground in embankment areas, or where shown on the plans to be removed, shall be completely removed and disposed of. Existing pipes, where shown on the plans to be removed, shall be removed in their entirety and disposed of.

REMOVE FENCE

Existing fence, where shown on the plans to be removed, shall be removed and disposed of as provided for in these special provisions.

Post foundations shall be removed to a depth of at least 0.75 meter below the finished grade.

Full compensation for removing gates shall be considered as included in the contract price paid per meter for remove fence and no separate payment will be made therefor.

REMOVE ROADSIDE SIGN

Existing roadside signs, at those locations shown on the plans to be removed, shall be removed and disposed of.

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

RESET GATE

Existing gates shall be removed and reset in conformance with the details shown on the plans.

When construction is complete, the gate shall be installed in the final position.

The space around the gate posts shall be backfilled with earthy material. The backfill material shall be placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted.

Existing posts, mounts, and hardware shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Full compensation for disposing of existing posts, mounts, and hardware; moving and maintaining the gate (regardless of the number of moves required); and for furnishing new posts, planks, and hardware shall be considered as included in the contract unit price paid for reset gate and no additional compensation will be allowed therefor.

RELOCATE ROADSIDE SIGN

Existing roadside signs shall be removed and relocated to the new locations shown on the plans.

Each roadside sign shall be installed at the new location on the same day that the sign is removed from its original location.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

RELOCATE SIGN PANEL

Relocating sign panels shall consist of removing and relocating existing sign panels as shown on the plans.

Full compensation for doing all the work involved in relocating sign panels (including fastening hardware) shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

ADJUST FRAME AND COVER TO GRADE

Frames and covers of existing manholes, junction structures, utility valves box or other facilities shall be adjusted to grade in conformance with the provisions in Section 15-2.05, "Reconstruction," of the Standard Specifications.

OBLITERATE SURFACING

Existing surfacing, when no longer required for the passage of public traffic, shall be obliterated at the locations shown on the plans.

Surfacing shall not be obliterated by the earth cover method.

Obliteration shall consist of rooting, plowing, pulverizing or scarifying the existing surfacing in conformance with the provisions in Section 15-2.02A, "Obliterating Roads and Detours," of the Standard Specifications.

REMOVE PORTLAND CEMENT CONCRETE PAVEMENT

Removing portland cement concrete pavement shall conform to the provisions in Section 15-3, "Removing Concrete," of the Standard Specifications.

Where no joint exists in the pavement on the line at which concrete is to be removed, a straight, neat cut with a power driven saw shall be made along the line to a minimum depth of 50 mm before removing the concrete.

The quantities of portland cement concrete pavement removed will be measured and paid for by the square meter.

No deduction will be made from any excavation quantities for the quantity of portland cement concrete pavement removed.

Full compensation for removing bituminous or other overlying material and sawing joints at removal lines, as required, shall be considered as included in the contract price paid per square meter for remove concrete pavement and no additional compensation will be allowed therefor.

REMOVE BASE AND SURFACING

Existing base and bituminous surfacing shown on the plans to be removed, shall be removed to a depth of at least 150 mm below the grade of the existing surfacing or to a depth as directed by the Engineer. Resulting holes and depressions shall be backfilled with earthy material selected from excavation to the lines and grade established by the Engineer.

The material removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 15-2.03, "Disposal," of the Standard Specifications.

Removing base and surfacing will be measured by the cubic meter in the same manner specified for roadway excavation in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications and will be paid for at the contract price per cubic meter for remove base and surfacing.

RESET MONUMENTS

GENERAL

Summary

This work includes resetting survey monuments.

Comply with the provisions in Section 81, "Monuments," of the Standard Specifications and these special provisions.

Submittals

Provide a written schedule for resetting the survey monuments at each location for the Engineer's approval. Submit the schedule at least fifteen working days prior to resetting the survey monuments. Once the Engineer has approved the proposed work schedule, the Engineer will give you written confirmation and authorization to proceed within fifteen working days. Monuments must not be reset until the roadwork at each location has been completed, and reference points to reset the survey monuments have been established by the Engineer.

Construction

Protect all existing survey monuments from damage during work on this project until the Engineer has referenced the survey monument positions. The exact location of the survey marker disk in the monument shall be established from the reference points established by the Engineer.

COLD PLANE ASPHALT CONCRETE PAVEMENT

Existing asphalt concrete pavement shall be cold planed at the locations and to the dimensions shown on the plans.

Planing asphalt concrete pavement shall be performed by the cold planing method. Planing of the asphalt concrete pavement shall not be done by the heater planing method.

Cold planing machines shall be equipped with a cutter head not less than 750 mm in width and shall be operated so that no fumes or smoke will be produced. The cold planing machine shall plane the pavement without requiring the use of a heating device to soften the pavement during or prior to the planing operation.

The depth, width, and shape of the cut shall be as shown on the plans or as designated by the Engineer. The final cut shall result in a uniform surface conforming to the plans. The outside lines of the planed area shall be neat and uniform. Planing asphalt concrete pavement operations shall be performed without damage to the surfacing to remain in place.

Planed widths of pavement shall be continuous except for intersections at cross streets where the planing shall be carried around the corners and through the conform lines. Following planing operations, a drop-off of more than 45 mm will not be allowed between adjacent lanes open to public traffic.

Where transverse joints are planed in the pavement at conform lines no drop-off shall remain between the existing pavement and the planed area when the pavement is opened to public traffic. If Hot Mix Asphalt (HMA) has not been placed to the level of existing pavement before the pavement is to be opened to public traffic a temporary HMA taper shall be constructed. HMA for temporary tapers shall be placed to the level of the existing pavement and tapered on a slope of 1:30 (Vertical: Horizontal) or flatter to the level of the planed area.

HMA for temporary tapers shall be the same quality as the HMA used elsewhere on the project. HMA for tapers shall be compacted by any method that will produce a smooth riding surface. Temporary HMA tapers shall be completely removed, including the removal of loose material from the underlying surface, before placing the permanent surfacing. The removed material shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Operations shall be scheduled so that not more than 7 days shall elapse between the time when transverse joints are planed in the pavement at the conform lines and the permanent surfacing is placed at the conform lines.

The material planed from the roadway surface, including material deposited in existing gutters or on the adjacent traveled way, shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Removal operations of cold planed material shall be concurrent with planing operations and follow within 15 m of the planer, unless otherwise directed by the Engineer.

Cold plane asphalt concrete pavement will be measured by the square meter. The quantity to be paid for will be the actual area of surface cold planed irrespective of the number of passes required to obtain the depth shown on the plans.

The contract price paid per square meter for cold plane asphalt concrete pavement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cold planing asphalt concrete surfacing and disposing of planed material, including furnishing the HMA for and constructing, maintaining, removing, and disposing of temporary HMA tapers, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

CAP INLET

Existing pipe inlets and concrete drainage inlets, where shown on the plans to be capped, shall be capped and the bottoms of the inlets shall be rounded with portland cement concrete as shown on the plans.

Concrete shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 350 kg of cementitious material per cubic meter.

Inlets shall be removed to a depth of at least 0.3-m below the grading plane.

Concrete removal shall be performed without damage to portions of the inlet that are to remain in place. Damage to existing concrete, which is to remain in place, shall be repaired by the Contractor to a condition equal to that existing prior to the beginning of removal operations. The repair of existing concrete damaged by the Contractor's operations shall be at the Contractor's expense.

Existing reinforcement that is to be incorporated in the new work shall be protected from damage and shall be thoroughly cleaned of adhering material before being embedded in the new concrete.

The quantity of capping inlets will be determined as units from actual count.

The contract unit price paid for cap inlet shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in capping inlets, including removing portions of inlets, rounding bottoms of inlets, bar reinforcing steel, and structure excavation and structure backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

BRIDGE REMOVAL

Removing bridges or portions of bridges shall conform to the provisions in Section 15-4, "Bridge Removal," of the Standard Specifications and these special provisions.

BRIDGE REMOVAL (LOCATION A) MASSACHUSETTS AVENUE OVERCROSSING (Bridge No. 54-0510)

Bridge removal shall consist of removing, as shown on the contract plans, an existing five-span, reinforced concrete "T" beam bridge measuring approximately 97 meters long and 11.3 meters wide.

BRIDGE REMOVAL (LOCATION B) HIGHLAND AVENUE OVERCROSSING (Bridge No. 54-0467)

Bridge removal shall consist of removing, as shown on the contract plans, an existing six-span, welded and painted steel plate girder bridge measuring approximately 208 meters long and 28.3 meters wide. The existing paint systems on this bridge consist of red lead primer.

BRIDGE REMOVAL (LOCATION C) MOUNT VERNON AVENUE OVERCROSSING (Bridge No. 54-0513)

Bridge removal shall consist of removing, as shown on the contract plans, an existing two-span, reinforced concrete box girder bridge measuring approximately 70 meters long and 17.5 meters wide.

BRIDGE REMOVAL (PORTION), LOCATION D
ROUTE 210/215 SEPARATION
(Bridge No. 54-0947R)

Bridge removal shall consist of removing portions of the reinforced concrete deck within the region of permissible closure pour removal, as shown on the contract plans, for temporary openings for construction of falsework for Bridge No. 54-1234. Temporary openings shall be per approved Falsework drawings.

Removed materials that are not to be salvaged or used in the reconstruction shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The Contractor shall submit a complete bridge removal plan to the Engineer for each bridge listed above, detailing procedures, sequences, and all features required to perform the removal in a safe and controlled manner.

The bridge removal plan shall include, but not be limited to the following:

- A. The removal sequence, including staging of removal operations.
- B. Equipment locations on the structure during removal operations.
- C. Temporary support shoring or temporary bracing.
- D. Locations where work is to be performed over traffic, utilities, or railroad property.
- E. Details, locations, and types of protective covers to be used.
- F. Measures to assure that people, property, utilities, and improvements will not be endangered.
- G. Details and measures for preventing material, equipment, and debris from falling onto public traffic, or railroad property.

When protective covers are required for removal of portions of a bridge, or when superstructure removal works on bridges are involved, the Contractor shall submit working drawings, with design calculations, to the Engineer for the proposed bridge removal plan, and the bridge removal plan shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California. The design calculations shall be adequate to demonstrate the stability of the structure during all stages of the removal operations. Calculations shall be provided for each stage of bridge removal and shall include dead and live load values assumed in the design of protective covers. At a minimum, a stage will be considered to be removal of the deck, the soffit, or the girders, in any span; or walls, bent caps, or columns at support locations.

Temporary support shoring, temporary bracing, and protective covers, as required, shall be designed and constructed in conformance with the provisions in Section 51-1.06, "Falsework," of the Standard Specifications and these special provisions.

The assumed horizontal load to be resisted by the temporary support shoring and temporary bracing, for removal operations only, shall be the sum of the actual horizontal loads due to equipment, construction sequence or other causes, and an allowance for wind, but in no case shall the assumed horizontal load to be resisted in any direction be less than 5 percent of the total dead load of the structure to be removed.

The bridge removal plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The number of sets of drawings, design calculations, and unless otherwise specified in the following table, the time for reviewing bridge removal plans shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications.

The time to be provided for the Engineer's review of the bridge removal plans for removing specific structures, or portions thereof, shall be as follows:

| Structure or Portion of Structure | Review Time - Weeks |
|---|---------------------|
| MASSACHUSETTS AVE OC (Bridge Number 54-0510) | 8 |
| HIGHLAND AVE OC (Bridge Number 54-0467) | 8 |
| MOUNT VERNON AVE OC (Bridge Number 54-0513) | 4 |

For bridge removal over railroads, approval by the Engineer of the bridge removal plans will be contingent upon the drawings being satisfactory to the railroad company involved.

Temporary support shoring, temporary bracing, and protective covers over railroads, shall conform to the latest guidelines of the railroad company involved and shall provide the minimum clearances required under "Relations with Railroad Company" of these special provisions for the passage of railroad traffic.

The following additional requirements apply to the removal of bridges or portions of bridges that are over or adjacent to roadways that may be closed to public traffic for only brief periods of time:

- A. The closure of roadways to public traffic shall conform to the provisions in "Order of Work" and "Maintaining Traffic" of these special provisions.
- B. Prior to closing a roadway to traffic to accommodate bridge removal operations, the Contractor shall have all necessary workers, materials, and equipment at the site as needed to proceed with the removal work in an expeditious manner. While the roadway is closed to public traffic, work shall be pursued promptly and without interruption until the roadway is reopened to public traffic.
- C. Bridge removal operations shall be performed during periods of time that the roadway is closed to public traffic except as specified herein for preliminary work.
- D. Preliminary work shall be limited to operations that will not reduce the structural strength or stability of the bridge, or any element thereof, to a level that in the judgment of the Engineer would constitute a hazard to the public. This preliminary work shall also be limited to operations that cannot cause debris or any other material to fall onto the roadway. Protective covers may be used to perform preliminary work such as chipping or cutting the superstructure into segments, provided the covers are of sufficient strength to support all loads and are sufficiently tight to prevent dust and fine material from sifting down onto the traveled way. Protective covers shall extend at least 1.2 m beyond the limit of the work underway. Bottom slabs of box girders may be considered to be protective covers for preliminary work performed on the top slab inside the limits of the exterior girders.
- E. Temporary support shoring and temporary bracing shall be used in conjunction with preliminary work when necessary to insure the stability of the bridge.
- F. Temporary support shoring, temporary bracing, and protective covers shall not encroach closer than 2.4 m horizontally from the edge or 4.6 m vertically above any traffic lane or shoulder that is open to public traffic.
- G. During periods when the roadway is closed to public traffic, debris from bridge removal operations may be allowed to fall directly onto the lower roadway provided adequate protection is furnished for all highway facilities. The minimum protection for paved areas shall be a 0.6-m thick earthen pad or a 25-mm thick steel plate placed over the area where debris can fall. Prior to reopening the roadway to public traffic, all debris, protective pads, and devices shall be removed and the roadway swept clean with wet power sweepers or equivalent methods.
- H. The removal operations shall be conducted in such a manner that the portion of the structure not yet removed remains in a stable condition at all times. For girder bridges, each girder shall be completely removed within a span before the removal of the adjacent girder is begun. For slab type bridges, removal operations within a span shall be performed along a front that roughly parallels the primary reinforcing steel.

The following additional requirements apply to the removal of bridges or portions of bridges whenever the removal work is to be performed over public traffic or railroad property:

- A. A protective cover shall be constructed before beginning bridge removal work. The protective cover shall be supported by shoring, falsework, or members of the existing bridge structure. The Contractor shall be responsible for designing and constructing safe and adequate protective covers, shoring, and falsework with sufficient strength and rigidity to support the entire load to be imposed.
- B. The construction and removal of the protective cover, and the installation and removal of temporary railings shall conform to the provisions in "Order of Work," "Maintaining Traffic," and "Temporary Railings" of these special provisions.
- C. Bridge removal methods shall be described in the working drawings, supported by calculations with sufficient details to substantiate live loads used in the protective cover design. Dead and live load values assumed for designing the protective cover shall be shown on the working drawings.
- D. The protective cover shall prevent any materials, equipment, or debris from falling onto public traffic or railroad property. The protective cover shall have a minimum strength equivalent to that provided by good, sound Douglas fir planking having a nominal thickness of 50 mm. Additional layers of material shall be furnished as necessary to prevent fine materials or debris from sifting down upon the traveled way and shoulders.
- E. During the removal of bridge segments, and when portions of the bridge, such as deck slabs or box girder slabs, comply with the requirements for the protective cover, a separate protective cover need not be constructed.
- F. At locations where entire girders are to be removed, the protective cover shall extend at least 3 m beyond the outside face of the bridge railing.

- G. The protective cover shall provide the openings specified under "Maintaining Traffic" of these special provisions, except that when no openings are specified for bridge removal, a vertical opening of 4.6 m and a horizontal opening of 11.1 m shall be provided for the passage of public traffic.
- H. Falsework or supports for protective covers shall not extend below the vertical clearance level nor to the ground line at any location within the roadbed.
- I. The construction of the protective cover as specified herein shall not relieve the Contractor of responsibilities specified in Section 7-1.12A, "Indemnification," and Section 7-1.12B, "Insurance," of the Standard Specifications.
- J. Before removal of the protective cover, the Contractor shall clean the protective cover of all debris and fine material.

For bridge removal that requires the Contractor's registered engineer to prepare and sign the bridge removal plan, the Contractor's registered engineer shall be present at all times when bridge removal operations are in progress. The Contractor's registered engineer shall inspect the bridge removal operation and report in writing on a daily basis the progress of the operation and the status of the remaining structure. A copy of the daily report shall be available at the site of the work at all times. Should an unplanned event occur or the bridge operation deviate from the approved bridge removal plan, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure of operation proposed to correct or remedy the occurrence.

Full compensation for bridge removal (portion), Location D, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge, and no separate payment will be made therefor.

REMOVE CONCRETE

Concrete shall be removed as shown on the plans and as directed by the Engineer.

The pay quantities of concrete to be removed, except for concrete curb and gutter, concrete barrier (Type K), and concrete sidewalk, will be measured by the square meter, measured before and during removal operations.

Removing concrete curb and gutter and concrete sidewalk will be measured by the cubic meter before removal operations.

Removing concrete barrier (Type K) will be measured by the meter, measured along the barrier before removal operations.

Concrete removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

REMOVE CONCRETE (WALKWAY)

Concrete walkway, where shown on the plans to be removed, shall be removed.

Removal shall include metal railing, post footings, anchor blocks, concrete curbs, concrete ramps, and all other materials involved with the walkway.

The pay quantities of concrete walkway to be removed will be measured by the cubic meter of concrete removed, measured before and during removal operations and shall be paid for as remove concrete (walkway). The contract price paid per cubic meter for remove concrete (walkway) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing the concrete walkway including removing metal railing, post footings, anchor blocks, retaining structures, concrete curbs, concrete ramps, and all other materials involved with the walkway and for backfilling and compacting post holes as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer, and no additional payment shall be allowed therefor.

Concrete and metal removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

REMOVE PIPE

Pipe, where shown on the plans to be removed, shall be removed.

Broken concrete resulting from removal of concrete shall be used to construct broken concrete slope protection in conformance with the provisions in "Broken Concrete Slope Protection" of these special provisions.

The pay quantities of concrete to be removed will be measured by the cubic meter, measured before and during removal operations.

Remove concrete will be paid for on a lump sum basis.

Removing pipe will be measured by the meter, measured along the pipe before removal operations.

Pipe removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

REMOVE RETAINING WALL

Retaining wall, where shown on the plans to be removed, shall be removed.

Broken concrete resulting from removal of concrete shall be used to construct broken concrete slope protection in conformance with the provisions in "Broken Concrete Slope Protection" of these special provisions.

The pay quantities of concrete to be removed will be measured by the cubic meter, measured before and during removal operations.

Remove concrete will be paid for on a lump sum basis.

Removing retaining wall will be measured by the meter, measured along the retaining wall before removal operations.

Retaining wall removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where no joint exists between concrete to be removed and concrete to remain in place, the concrete shall be cut on a neat line to a minimum depth of 50 mm with a power driven saw before the concrete is removed.

Where concrete has been removed outside the roadway prism, the backfilled areas shall be graded to drain and blend in with the surrounding terrain.

Concrete to be removed which has portions of the same structure both above and below ground will be considered as concrete above ground for compensation.

10-1.38 CLEARING AND GRUBBING

Clearing and grubbing shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Contractor's attention is directed to Section 10-1.01, "Order of Work," of these special provisions which restricts the dates between which the Contractor may clear and grub or trim trees without conditions, and outlines other conditions that must be met prior to clearing and grubbing.

Vegetation shall be cleared and grubbed only within the work area. Existing vegetation outside the area to be cleared and grubbed shall be protected from injury or damage resulting from the Contractor's operations.

Protected vegetation shall be irrigated during construction operations.

Existing irrigation facilities within the limits of work, including water meters, irrigation controllers, irrigation controller cabinets with concrete pads, backflow preventers, master remote control valves, remove control valves, gate valves, valve boxes, and related irrigation pipes and sprinklers shall be removed. Facilities that are more than 150 mm below the finished grade may be abandoned in place.

Removed irrigation facilities shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Tree removal shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications. Full compensation for tree removal shall be considered as included in the lump sum contract price paid for clearing and grubbing and no additional compensation will be allowed therefor.

10-1.39 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Attention is directed to "Material Containing Aerially Deposited Lead" of these special provisions.

The grading plane of embankments beneath structure approach slabs shall not project above the grade established by the Engineer.

Surplus excavated material not designated as hazardous waste due to aerially deposited lead shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where a portion of the existing surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 50 mm before removing the surfacing. Full compensation for cutting the existing surfacing shall be considered as included in the contract price paid per cubic meter for roadway excavation and no additional compensation will be allowed therefor.

The portion of imported borrow placed within 1.5 m of the finished grade shall have a Resistance (R-Value) of not less than 50.

Reinforcement or metal attached to reinforced concrete rubble placed in embankments shall not protrude above the grading plane. Prior to placement within 0.6-m below the grading plane of embankments, reinforcement or metal shall be trimmed to no greater than 20 mm from the face of reinforced concrete rubble. Full compensation for trimming reinforcement or metal shall be considered as included in the contract prices paid per cubic meter for the types of excavation shown in the Engineer's estimate, or the contract prices paid for furnishing and placing imported borrow or embankment material, as the case may be, and no additional compensation will be allowed therefor.

Imported borrow shall be mineral material including rock, sand, gravel, or earth. The Contractor shall not use man-made refuse in imported borrow including:

- A. Portland cement concrete
- B. Asphalt concrete
- C. Hot mix asphalt
- D. Material planed from roadway surfaces
- E. Residue from grooving or grinding operations
- F. Metal
- G. Rubber
- H. Mixed debris
- I. Rubble

Imported borrow will be measured and paid for by the cubic meter and the quantity to be paid for will be computed in the following manner:

- A. The total quantity of embankment will be computed in conformance with the provisions for roadway excavation in Section 19-2.08, "Measurement," of the Standard Specifications, on the basis of the planned or authorized cross section for embankments as shown on the plans and the measured ground surface.
- B. The Contractor, at the Contractor's option, may compact the ground surface on which embankment is to be constructed before placing any embankment thereon. If the compaction results in an average subsidence exceeding 75 mm, the ground surface will be measured after completion of the compaction. The Engineer shall be allowed the time necessary to complete the measurement of an area before placement of embankment is started in that area.
- C. The quantities of roadway excavation, structure excavation and ditch excavation, which have been used in the embankment, will be adjusted by multiplying by a grading factor to be determined in the field by the Engineer. No further adjustment will be made in the event that the grading factor determined by the Engineer does not equal the actual grading factor.
- D. The quantity of imported borrow to be paid for will be that quantity remaining after deducting the adjusted quantities of excavation from the total embankment quantity and then adding a quantity of 10,730 cubic meters for the anticipated effect of subsidence. No adjustment will be made in the event that the anticipated subsidence does not equal the actual subsidence.
- E. The Contractor may propose a plan whereby the Contractor would be paid on the basis of measured settlement in lieu of the allowance specified above. The proposal shall include complete details of the subsidence-measuring devices and a detailed plan of each installation. If the proposed plan is approved by the Engineer, the Contractor, at the Contractor's expense, shall provide, install and maintain the subsidence-measuring devices. The Engineer will take necessary readings to determine the progress of subsidence, if any, and the Contractor shall provide necessary assistance to make the readings.
- F. Installed devices which are determined by the Engineer to have been damaged will not be used for the determination of subsidence for the area the devices represent in the pattern of approved installations. The subsidence of the area represented by that installation shall be considered zero, regardless of the subsidence measured at other installations.
- G. The volumes required as a result of subsidence will be computed by the average-end-area method from the original measurements and the final measurements, including zero subsidence at all points and for all areas as provided herein. It shall be understood and agreed that the subsidence at the point of intersection of the side slopes (and end slopes at structures) with the ground line as established by the original cross sections shall be considered as zero. Unless otherwise agreed to by the Engineer, the subsidence shall be considered as zero at the points on the cross sections 15 m beyond the beginning and ending of the instrumented area. The computed volumes for such subsidence will be added to the quantities of embankment measured as specified herein.
- H. Detachable elements of the subsidence-measuring devices which can be salvaged without damage to the work shall remain the property of the Contractor and shall be removed from the highway right of way after final measurements are made.

Settlement periods are required for the bridge approach embankments at the bridges listed in the following table.

| Bridge Name or Number | Abutment Number | Bent Number | Surcharge Height (meters) | Settlement Period (days) |
|---|-----------------|-------------|---------------------------|--------------------------|
| MASSACHUSETTS AVE OC (REPLACE) BRIDGE NO. 54-1265 | 1 | -- | 0.0* | 14 |
| | 6 | | 0.0* | 14 |
| HIGHLAND AVE OC (REPLACE) BRIDGE NO. 54-1266 | 1 | -- | 0.0* | 5 |
| | 7 | | 0.0* | 5 |
| CAJON BLVD OH BRIDGE NO. 54-0946G | 1 | -- | 0.0* | 30 |
| | 2 | | 0.0* | 30 |
| 27 TH STREET OC (REPLACE) BRIDGE NO. 54-1221 | 1 | -- | 0.0* | 3 |
| | 5 | | 0.0* | 3 |
| N215-W210 CONNECTOR BRIDGE NO. 54-1234 | 1 | -- | 0.0* | 30 |
| | 14 | | 0.0* | 30 |
| E210-S215 CONNECTOR / S215-27 TH ST OFF-RAMP SEP BRIDGE NO. 54-1249 | 1 | -- | 0.0* | 30 |
| | 2 | | 0.0* | 30 |

* At this location, the surcharge embankment shall be constructed by extending the grading plane (GP) in the "Elevation" view of the "Bridge Embankment Surcharge" detail of Standard Plan A62B horizontally to the centerline of abutment.

The duration of the required settlement period at each location will be determined by the Engineer. The estimated duration of the settlement periods are listed in the tables of settlement data. The Engineer may order an increase or decrease in any settlement period. An ordered increase or decrease in any settlement period will result in an increase or decrease in the number of contract working days if the settlement period involved is considered to be the current controlling operation in conformance with the provisions in Section 8-1.06, "Time of Completion," of the Standard Specifications. Adjustments of contract time due to increases or decreases in settlement periods will be made by contract change order.

The removal of surplus embankment material placed as a settlement embankment, including material removed to conform to the finished slope lines shown on the plans, will be paid for at the contract price per cubic meter for roadway excavation.

If structure excavation or structure backfill for bridges is not otherwise designated by type and payment for the structure excavation or structure backfill has not otherwise been provided for in the Standard Specifications or these special provisions, the structure excavation or structure backfill will be measured and paid for as structure excavation (bridge) or structure backfill (bridge), respectively.

Structure backfill and roadway embankment, shown on the plans as Low Expansion Material, within the limits of the bridge abutments shall have an Expansion Index (EI) of less than 50 and a Sand Equivalent (SE) of greater than 20. The Expansion Index shall be determined in accordance with ASTM Designation: D 4829. The Sand Equivalent shall be determined in accordance with California Test 217.

Full compensation for conforming to the requirements for Low Expansion Material as specified in these special provisions shall be considered as included in the contract prices paid for the various items of work and no additional compensation will be allowed therefor.

10-1.40 CONTROLLED LOW STRENGTH MATERIAL

Controlled low strength material shall consist of a workable mixture of aggregate, cementitious materials, and water and shall conform to the provisions for slurry cement backfill in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications and these special provisions.

At the option of the Contractor, controlled low strength material may be used as structure backfill for pipe culverts, except that controlled low strength material shall not be used as structure backfill for culverts having a diameter or span greater than 6.1 m.

When controlled low strength material is used for structure backfill, the width of the excavation shown on the plans may be reduced so that the clear distance between the outside of the pipe and the side of the excavation, on each side of the pipe, is a minimum of 300 mm. This minimum may be reduced to 150 mm when the height of cover is less than or equal to 6.1 m or the pipe diameter or span is less than 1050 mm.

Controlled low strength material in new construction shall not be permanently placed higher than the basement soil. For trenches in existing pavements, permanent placement shall be no higher than the bottom of the existing pavement permeable drainage layer. If a drainage layer does not exist, permanent placement in existing pavements shall be no higher than 25 mm below the bottom of the existing asphalt concrete surfacing or no higher than the top of base below the existing portland cement concrete pavement. The minimum height that controlled low strength material shall be placed, relative to the culvert invert, is 0.5 diameter or 0.5 height for rigid culverts and 0.7 diameter or 0.7 height for flexible culverts.

When controlled low strength material is proposed for use, the Contractor shall submit a mix design and test data to the Engineer for approval prior to excavating the trench for which controlled low strength material is proposed for use. The test data and mix design shall provide for the following:

- A. A 28-day compressive strength between 345 kPa and 690 kPa for pipe culverts having a height of cover of 6.1 m or less and a minimum 28-day compressive strength of 690 kPa for pipe culverts having a height of cover greater than 6.1 m. Compressive strength shall be determined in conformance with the requirements in ASTM Designation: D 4832.
- B. Cement shall be any type of portland cement conforming to the requirements in ASTM Designation: C 150; or any type of blended hydraulic cement conforming to the requirements in ASTM Designation: C 595M or the physical requirements in ASTM Designation: C 1157M. Testing of cement will not be required.
- C. Admixtures may be used in conformance with the provisions in Section 90-4, "Admixtures," of the Standard Specifications. Chemical admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined in conformance with the requirements of California Test 415, shall not be used. If an air-entraining admixture is used, the maximum air content shall be limited to 20 percent. Mineral admixtures shall be used at the Contractor's option.

Materials for controlled low strength material shall be thoroughly machine-mixed in a pugmill, rotary drum or other approved mixer. Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material. Controlled low strength material shall be placed in the work within 3 hours after introduction of the cement to the aggregates.

When controlled low strength material is to be placed within the traveled way or otherwise to be covered by paving or embankment materials, the material shall achieve a maximum indentation diameter of 76 mm prior to covering and opening to public traffic. Penetration resistance shall be measured in conformance with the requirements in ASTM Designation: D 6024.

Controlled low strength material used as structure backfill for pipe culverts will be considered structure backfill for compensation purposes.

10-1.41 MATERIAL CONTAINING AERIALY DEPOSITED LEAD

Earthwork involving material containing aerially deposited lead shall conform to the provisions in Section 19, "Earthwork" of the Standard Specifications and these special provisions.

Attention is directed to "Aerially Deposited Lead" of these special provisions.

Type Y-1 material contains aerially deposited lead in average concentrations of 0.5 mg/L or less extractable lead (based on a modified waste extraction test using deionized water as the extractant) and 1411 mg/kg or less total lead. Type Y-1 material exists between 0 meter and more than 80 meter, measured horizontally from the edges of existing pavement, from Station 152+00 to Station 155+70 on Southbound I-215, and from a depth of 0.15 meter to more than 0.91 meter below existing grade as shown on the plans. This material shall be placed as shown on the plans, unless otherwise directed by the Engineer, and covered with a minimum 0.305-m layer of non-hazardous soil or pavement. This material is hazardous waste regulated by the State of California that may be reused as permitted under the Variance of the California Department of Toxic Substances Control (DTSC) provided that the lead contaminated soil is placed a minimum of 1.5 m above the maximum water table elevation and covered with at least 0.3 m of non-hazardous soil. Temporary surplus material may be generated on this project due to the requirements of stage construction. Temporary surplus material shall not be transported outside the State right of way. In order to conform to the requirements of these provisions it may be necessary to stockpile material for subsequent stages, to construct some embankments out of stage, or to handle temporary surplus material more than once.

Type Y-2 material contains aerially deposited lead in average concentrations that exceed either 0.5 mg/L extractable lead (based on a modified waste extraction test using deionized water as the extractant) or 1411 mg/kg total lead but are less than 50 mg/L extractable lead (based on a modified waste extraction test using deionized water as the extractant) and less than 3397 mg/kg of total lead. Type Y-2 material exists between 0 meter and more than 80 meter, measured horizontally from the edges of existing pavement, from Station 152+00 to Station 155+70 on Southbound I-215, and from a depth of 0 meter to 0.15 meter below existing grade as shown on the plans. This material shall be placed as shown on the plans, unless otherwise directed by the Engineer, and covered with a layer of pavement. This material is hazardous waste regulated by the State of California that may be reused as permitted under the Variance of DTSC provided that the lead contaminated soil is placed a

minimum of 1.5 m above the maximum water table elevation and protected from infiltration by a pavement structure which will be maintained by the Department. Temporary surplus material may be generated on this project due to the requirements of stage construction. Temporary surplus material shall not be transported outside the State right of way. In order to conform to the requirements of these provisions, it may be necessary to stockpile material for subsequent stages, to construct some embankments out of stage, or to handle temporary surplus material more than once.

LEAD COMPLIANCE PLAN

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling material containing aeriably deposited lead. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific California Department of Industrial Relations, Division of Occupational Safety and Health (Cal-OSHA) requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The plan shall be submitted to the Engineer for review and acceptance at least 15 days prior to beginning work in areas containing aeriably deposited lead.

The Lead Compliance Plan shall include perimeter air monitoring incorporating upwind and downwind locations as shown on the plans or as approved by the Engineer. Monitoring shall be by personal air samplers using National Institute of Safety and Health Method 7082. Sampling shall achieve a detection limit of 0.05 $\mu\text{g}/\text{m}^3$ of air per day. Daily monitoring shall take place while the Contractor clears and grubs and performs earthwork operations. A single representative daily sample shall be analyzed for lead. Results shall be analyzed and provided to the Engineer within 24 hours. Average lead concentrations shall not exceed 1.5 $\mu\text{g}/\text{m}^3$ of air per day. If concentrations exceed this level the Contractor shall stop work and modify the work to prevent release of lead. Monitoring shall be done under the direction of, and the data shall be reviewed by and signed by a Certified Industrial Hygienist.

The Contractor shall not work in areas containing aeriably deposited lead within the project limits, unless authorized in writing by the Engineer, until the Engineer has accepted the Lead Compliance Plan.

Prior to performing work in areas containing aeriably deposited lead, personnel who have no prior training or are not current in their training status, including Department personnel, shall complete a safety training program provided by the Contractor. The safety training program shall meet the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead."

Personal protective equipment, training, and washing facilities required by the Contractor's Lead Compliance Plan shall be supplied to Department personnel by the Contractor. The number of Department personnel will be 7.

The Engineer will notify the Contractor of acceptance or rejection of the submitted or revised Lead Compliance Plan not more than 10 days after submittal of the plan.

The contract lump sum price paid for Lead Compliance Plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing the Lead Compliance Plan, including paying the Certified Industrial Hygienist, and for providing personal protective equipment, training and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

EXCAVATION AND TRANSPORTATION PLAN

Within 15 days after approval of the contract, the Contractor shall submit 3 copies of an Excavation and Transportation Plan to the Engineer. The Engineer will have 7 days to review the plan. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the plan within 7 days of receipt of the Engineer's comments. The Engineer will have 7 days to review the revisions. Upon the Engineer's approval of the plan, 3 additional copies incorporating the required changes shall be submitted to the Engineer. Minor changes to or clarifications of the initial submittal may be made and attached as amendments to the Excavation and Transportation Plan. In order to allow construction to proceed, the Engineer may conditionally approve the plan while minor revisions or amendments are being completed.

The Contractor shall prepare the written, project specific Excavation and Transportation Plan establishing the procedures the Contractor will use to comply with requirements for excavating, stockpiling, transporting, and placing (or disposing) of material containing aeriably deposited lead. The plan shall conform to the regulations of the DTSC and Cal-OSHA. The sampling and analysis portions of the Excavation and Transportation Plan shall meet the requirements for the design and development of the sampling plan, statistical analysis, and reporting of test results contained in USEPA, SW 846, "Test Methods for Evaluating Solid Waste," Volume II: Field Manual Physical/Chemical, Chapter Nine, Section 9.1. The plan shall contain, but not be limited to the following elements:

- A. Excavation schedule (by location and date),
- B. Temporary locations of stockpiled material,

- C. Sampling and analysis plans for areas after removal of a stockpile,
 - 1. Location and number of samples,
 - 2. Analytical laboratory,
- D. Sampling and analysis plan for soil cover,
- E. Sampling and analysis plan for post excavation from Station 152+00 to Station 155+70 as shown on the plans,
- F. Dust control measures,
- G. Air monitoring,
 - 1. Location and type of equipment,
 - 2. Sampling frequency,
 - 3. Analytical laboratory,
- H. Transportation equipment and routes,
- I. Method for preventing spills and tracking material onto public roads,
- J. Truck waiting and staging areas,

DUST CONTROL

Excavation, transportation, placement, and handling of material containing aurally deposited lead shall result in no visible dust migration. The Contractor shall have a water truck or tank on the job site at all times while clearing and grubbing and performing earthwork operations in work areas containing aurally deposited lead.

STOCKPILING

Stockpiles of material containing aurally deposited lead shall not be placed where affected by surface run-on or run-off. Stockpiles shall be covered with plastic sheeting 0.33 mm minimum thickness or 0.3 m of non-hazardous material. Stockpiles shall not be placed in environmentally sensitive areas. Stockpiled material shall not enter storm drains, inlets, or waters of the State.

MATERIAL TRANSPORTATION

Prior to traveling on public roads, loose and extraneous material shall be removed from surfaces outside the cargo areas of the transporting vehicles and the cargo shall be covered with tarpaulins or other cover, as outlined in the approved Excavation and Transportation Plan. The Contractor shall be responsible for costs due to spillage of material containing lead during transport.

The Department will not consider the Contractor a generator of the hazardous material, and the Contractor will not be obligated for further cleanup, removal, or remedial action for such material handled or disposed of in conformance with the requirements specified in these special provisions and the appropriate State and Federal laws and regulations and county and municipal ordinances and regulations regarding hazardous waste.

Sampling, analyzing, transporting, and disposing of material containing aurally deposited lead excavated outside the pay limits of roadway excavation, structural excavation (retaining wall) and structure excavation (bridge) will be at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of roadway excavation (aurally deposited lead) and structure excavation (aurally deposited lead), of the types shown in the Engineer's Estimate, will be measured and paid for in the same manner specified for roadway excavation and structure excavation, respectively, in Section 19, "Earthwork," of the Standard Specifications.

Full compensation for preparing an approved Excavation and Transportation Plan, transporting material containing aurally deposited lead reused in the work from location to location, and transporting and disposing of material containing aurally deposited lead shall be considered as included in the contract prices paid per cubic meter for the items of roadway excavation (aurally deposited lead) and structure excavation (aurally deposited lead) of the types involved, and no additional compensation will be allowed therefor.

No payment for stockpiling of material containing aurally deposited lead will be made, unless the stockpiling is ordered by the Engineer.

10-1.42 EROSION CONTROL (BLANKET)

Erosion control (blanket) shall conform to the details shown on the plans, the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Erosion control (blanket) work shall consist of applying seed and installing erosion control blanket to embankment slopes, and biofiltration swales shown on the plans.

MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed shall conform to the provisions in Section 20-2.10, "Seed," of the Standard Specifications. Individual seed species shall be measured and mixed in the presence of the Engineer.

Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists.

Seed shall contain not more than 1.0 percent total weed seed by weight.

Seed shall be delivered to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted.

For each seed lot greater than 1 kg, a sample of approximately 30 g or 60 ml of seed will be taken from the seed lot by the Engineer.

Seed shall consist of the following:

| Seed | | |
|---|----------------------------------|---|
| Botanical Name (Common Name) | Percent Germination (Minimum) | Kilograms Pure Live Seed Per Hectare (Slope Measurement) |
| Agrostis pallens (Siskiyou Thingrass) | 35 | 10 |
| Elymus glaucus (Blue Wildrye) | 40 | 8 |
| Hordeum californicum Prostrate (Prostrate California Barley) | 35 | 6 |
| Poa secunda (Pine Bluegrass) | 40 | 4 |
| Vulpia microstachys (small- Fescue) | 40 | 12 |

*Seed produced in California only.

Seed Sampling Supplies

At the time of seed sampling, the Contractor shall provide to the Engineer individual glassine lined bag and custody seal tag for sealing each seed sample.

Erosion Control Blanket

Erosion control blanket shall consist of wood excelsior mats secured in place with wire staples and shall conform to the following:

1. Excelsior blanket material shall consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The erosion control blanket shall be of consistent thickness and the wood fiber shall be evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with extruded photodegradable plastic netting or lightweight nonsynthetic netting. The blanket shall be smolder resistant without the use of chemical additives and shall be non-toxic and non-injurious to plant and animal life. Erosion control blanket shall be furnished in rolled strips, 1220 mm ±25 mm in width, and shall have an average mass of 0.5-kg/m² ±10 percent at the time of manufacture.
2. Staples for erosion control blankets shall be made of 11-gage minimum steel wire and shall be U-shaped with 200-mm legs and 50-mm crown.

APPLICATION

Erosion control (blanket) materials shall be placed in separate applications as follows:

1. The 1st application shall consist of applying seed at the rates shown in the following table. If hydro-seeding equipment is used to apply seed, the mixture shall be applied within 60 minutes after the seed has been added to the mixture.

| Material | Kilograms Per Hectare (Slope Measurement) |
|----------|--|
| Seed | 40 |

2. The 2nd application shall consist of installing the erosion control blanket over the seed application. Erosion control blanket strips shall be placed loosely on the slope with the longitudinal joints perpendicular to the slope contour lines. Longitudinal and transverse joints of blankets shall be butted snugly against adjacent strips or overlapped according to the manufacturer's recommendations and stapled. Staples shall be driven perpendicular to the slopes and shall be located and spaced in conformance with the manufacturer's instructions. Ends of the blankets shall be secured in place in conformance with the manufacturer's instructions.

MEASUREMENT AND PAYMENT

The quantity of erosion control (blanket) will be determined by the square meter from actual slope measurement of the area covered by the erosion control blanket.

The contract price paid per square meter for erosion control (blanket) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing erosion control blanket, complete in place, including furnishing and applying pure live seed, and the materials for the erosion control blanket, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.43 MOVE-IN/MOVE-OUT (EROSION CONTROL)

Move-in/move-out (erosion control) shall include moving onto the project when an area is ready to receive erosion control as determined by the Engineer, setting up all required personnel and equipment for the application of erosion control materials and moving out all personnel and equipment when erosion control in that area is completed.

When areas are ready to receive applications of erosion control (Type D), as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of the Engineer's notification to perform the erosion control work.

Attention is directed to the requirements of erosion control (Type D) elsewhere in these special provisions.

Quantities of move-in/move-out (erosion control) will be determined as units from actual count as determined by the Engineer. For measurement purposes, a move-in followed by a move-out will be considered as one unit.

The contract unit price paid for move-in/move-out (erosion control) shall include full compensation for furnishing all labor, materials (excluding erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of erosion control (Type D), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of move-in/move-out (erosion control) required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the item of move-in/move-out (erosion control).

10-1.44 EROSION CONTROL (TYPE D)

Erosion control (Type D) includes applying erosion control materials to embankment and excavation slopes and other areas disturbed by construction activities excluding erosion control blanket. Erosion control (Type D) must comply with Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Apply erosion control (Type D) when an area is ready to receive erosion control as determined by the Engineer and under "Move-in/Move-out (Erosion Control)" of these special provisions.

Before applying erosion control materials, prepare soil surface under Section 19-2.05, "Slopes," of the Standard Specifications, except that rills and gullies exceeding 50 mm in depth or width must be leveled. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control.

Before applying erosion control materials, the Engineer designates the ground location of erosion control (Type D) in increments of one hectare or smaller for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish all tools, labor and materials required to adequately indicate the various locations.

MATERIALS

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed must comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must contain at most 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag attached are not accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Seed must comply with the following:

| Seed | | |
|--|----------------------------------|---|
| Botanical Name (Common Name) | Percent Germination (Minimum) | Kilograms Pure Live Seed Per Hectare (Slope Measurement) |
| Lotus scoparius (Deerweed) | 30 | 8.00 |
| Lupinus succulentus (Arroyo Lupine) | 40 | 8.00 |
| Lupinus bicolor Pigmy-Leaved Lupine | 40 | 4.00 |
| Vulpia microstachys Three Week Fescue | 40 | 10.00 |

Seed Sampling Supplies

At the time of seed sampling, provide the Engineer a glassine lined bag and custody seal tag for each seed lot sample.

Commercial Fertilizer

Commercial fertilizer must comply with Section 20-2.02, "Commercial Fertilizer," of the Standard Specifications.

Compost

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in United States Composting Council's Seal of Testing Assurance program.

Compost may be derived from any single, or mixture of any of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials to reduce weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminants. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed in Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Compost must comply with the following:

Physical/Chemical Requirements

| Property | Test Method | Requirement |
|------------------------|--|---------------------------------------|
| pH | *TMECC 04.11-A, Elastometric pH 1:5 Slurry Method, pH Units | 6.0–8.0 |
| Soluble Salts | TMECC 04.10-A, Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm) | 0-10.0 |
| Moisture Content | TMECC 03.09-A, Total Solids & Moisture at 70+/- 5 deg C, % Wet Weight Basis | N/A |
| Organic Matter Content | TMECC 05.07-A, Loss-On-Ignition Organic Matter Method (LOI), % Dry Weight Basis | 30–65 |
| Maturity | TMECC 05.05-A, Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control | 80 or Above 80 or Above |
| Stability | TMECC 05.08-B, Carbon Dioxide Evolution Rate mg CO ₂ -C/g OM per day | 8 or below |
| Particle Size | TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis | 95% Passing 16 mm 70% Passing 9 mm |
| Pathogen | TMECC 07.01-B, Fecal Coliform Bacteria < 1000 MPN/gram dry wt. | Pass |
| Pathogen | TMECC 07.01-B, Salmonella < 3 MPN/4 grams dry wt. | Pass |
| Physical Contaminants | TMECC 02.02-C, Man Made Inert Removal and Classification: Plastic, Glass and Metal, % > 4mm fraction | Combined Total: < 1.0 |
| Physical Contaminants | TMECC 02.02-C, Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles), % > 4mm fraction | None Detected |

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

Before compost application, provide the Engineer with a copy of the compost producer's compost technical data sheet and a copy of the compost producers Seal of Testing Assurance certification. The compost technical data sheet includes:

1. Laboratory analytical test results
2. Directions for product use
3. List of product ingredients

Before compost application, provide the Engineer with a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Stabilizing Emulsion

Stabilizing emulsion must comply with Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions.

Stabilizing emulsion:

1. Must be in a dry powder form
2. Must be a processed organic adhesive used as a soil tackifier
3. May be reemulsifiable

APPLICATION

Apply erosion control materials in separate applications in the following sequence:

1. Apply the following mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

| Material | Kilograms Per Hectare (Slope Measurement) |
|-----------------------|--|
| Seed | 30.00 |
| Fiber | 800 |
| Commercial Fertilizer | 150 |

| Material | Cubic Meter Per Hectare (Slope Measurement) |
|----------|---|
| Compost | 125 |

- Compost may be dry applied at the total of the rates specified in the preceding table and the following table instead of including it as part of the hydro-seeding operations. In areas where the compost is dry applied, all compost for that area must be applied before the next operation.
- Apply the following mixture with hydro-seeding equipment at the corresponding rates:

| Material | Kilograms Per Hectare (Slope Measurement) |
|-------------------------------|--|
| Fiber | 800 |
| Stabilizing Emulsion (Solids) | 200 |

| Material | Cubic Meter Per Hectare (Slope Measurement) |
|----------|---|
| Compost | 125 |

The ratio of total water to total stabilizing emulsion in the mixture must be as recommended by the manufacturer. The Engineer may change the rates of erosion control materials to meet field conditions.

MEASUREMENT AND PAYMENT

Erosion control (Type D) will be measured by the square meter or by the hectare, whichever is designated in the Engineer's Estimate. The area will be calculated on the basis of actual or computed slope measurements.

The contract price paid per square meter or hectare for erosion control (Type D) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Type D) complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.45 FIBER ROLLS

Fiber rolls shall be furnished and installed in conformance with details shown on the plans and these special provisions and as directed by the Engineer.

Fiber rolls shall be installed on excavation and embankment slopes and other disturbed soil areas.

At the option of the Contractor, fiber rolls shall be Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be either:

- Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.

2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

INSTALLATION

Fiber rolls shall be installed as follows:

1. Fiber rolls (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Fiber rolls (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Fiber rolls shall be placed 3 m apart along the slope for slope inclination (vertical:horizontal) of 1:2 and steeper, 4.5 m apart along the slope for slope inclination between 1:2 and 1:4, 6.0 m apart along the slope for slope inclination between 1:4 and 1:10, and a maximum of 15 m apart along the slope for slope inclination of 1:10 and flatter.
4. The bedding area for the fiber rolls shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Fiber rolls shall be installed approximately parallel to the slope contour.
6. Fiber rolls shall be installed before the application of other erosion control or soil stabilization materials in the same area.

If the intended function of the fiber rolls to disperse concentrated water runoff and to reduce runoff velocities is impaired, the Contractor shall take action to repair or replace the fiber rolls. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Quantities of fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fiber rolls, complete in place, including furrow excavation and backfill, repairing or replacing fiber rolls as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

10-1.46 ROCK BLANKET

Rock blanket shall be placed as shown on the plans and in conformance with these special provisions.

MATERIALS

Rock for the rock blanket shall be clean, smooth multi colored cobble type rock naturally colored reddish brown in overall appearance after placement and shall be obtained from a single source.

Rock shall conform to the following sizing:

| Rock Size (Millimeters) | Percentage |
|-------------------------|------------|
| 330 x 380 | 10 |
| 150 x 330 | 80 |
| 130 x 150 | 10 |

A sample of the rock shall be submitted to the Engineer for approval prior to delivery of the rock to the project site.

Rock shall be secured in place with Class 2 concrete conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions. Concrete aggregate size shall be 9.5 mm maximum. Gaps between the rocks shall be filled with dry applied mortar. Mortar shall be thoroughly mixed to one part portland cement and two parts sand by volume. Sand shall be of a size that passes a 2.4 mm sieve.

Test Panel. A test panel at least 2m x 2m in size shall be successfully completed at a location approved by the Engineer before beginning work on placing rock blanket. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used for finished rock blanket. If ordered by the engineer, additional test panels shall be constructed until the specified placement, finish, and texture are obtained, as determined by the Engineer.

In the event more than two test panels are required by the Engineer, each additional sample will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of placing rock blanket.

SITE PREPARATION

Areas to receive rock blanket shall be cleared of trash and debris. Weeds shall be removed to the ground level. Cleared trash, debris and removed weeds shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

After clearing, the areas shall be excavated to the depth shown on the plans, graded to a smooth uniform surface and compacted to a minimum relative compaction of 90 percent on slopes of 1:3 or flatter and 80 percent on slopes steeper than 1:3. Excess material shall be removed and disposed of outside the highway right of way in accordance with the provisions specified in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

After compaction, the areas including openings at existing sign posts, fence posts and panel markers shall be sterilized with dichlobenil. The sterilant shall be applied at the maximum label rate and shall not be applied more than 300 mm beyond the rock blanket limits. Soil sterilant shall conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specifications, except recommendations from a licensed Pest Control Adviser will not be required.

PLACEMENT

Rock shall be placed randomly mixing the various sizes of rock while concrete is still plastic. Concrete shall be formed by wood headers and metal stake anchors. The Contractor shall remove concrete adhering to the exposed surfaces of the rock. Loose rocks, shall be reset at the Contractor's expense by methods determined by the Engineer.

Gaps between the rocks shall be filled with dry applied mortar and apply water lightly to the mortared areas. Excess mortar shall be removed from the face of the rock.

Wood headers will not be required at locations where rock blanket borders the edge of pavement. Finished rock blanket surfacing shall be uniform and shall maintain existing, or as designated by the engineer, flow lines, slope gradients and contours of the project site.

MEASUREMENT AND PAYMENT

Rock blanket will be measured by the square meter as determined from actual measurements made parallel to the ground slope.

The contract price paid per square meter for rock blanket shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing rock blanket, complete in place,

including furnishing and applying soil sterilant, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.47 IRRIGATION CROSSOVERS

Irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Conduits shall be placed in open trenches or under existing paving as shown on the plans in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Conduits placed in open trenches shall be corrugated steel pipe.

Conduits installed under existing paving shall be welded steel pipe and shall be installed by jacking or drilling methods.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers," of the Standard Specifications.

Sprinkler control crossovers shall conform to the provisions in Section 20-5.027D, "Sprinkler Control Crossovers," of the Standard Specifications.

Installation of pull boxes shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduit and Pull Boxes," of the Standard Specifications. When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

10-1.48 WATER SUPPLY LINE (BRIDGE)

Water supply lines identified on the plans as supply line (bridge) shall be of the size shown and shall conform to the details shown on the plans, the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications, and these special provisions.

GENERAL

Unless otherwise shown on the plans, casings shall be installed at each abutment and shall be extended to the greater of: (1) 1.5 m beyond the approach slab, (2) 1.5 m beyond the end of the adjacent wingwall, or (3) 6 m beyond the abutment.

Working Drawings

The Contractor shall submit complete working drawings for the temporary support of the casing at the abutments to the Offices of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

MATERIALS

Pipe and Fittings for Supply Lines Less Than NPS 4

Pipe and fittings for supply lines less than NPS 4 shall conform to the provisions in Section 20-2.15A, "Steel Pipe," of the Standard Specifications.

Air Release Valve Assemblies for Supply Lines Less Than NPS 4

Each air release valve assembly for supply lines less than NPS 4 shall consist of a threaded tee of the same diameter as the supply line or pipe saddle, an NPS 1 ball valve, an automatic air release valve, and a tank vent. The air release valve shall have a cast iron body with stainless steel trim and float, an NPS 1 inlet pipe connection, and a 4.8 mm orifice. The tank vent shall be the size of the air release valve outlet and shall have a double opening facing down with screen cover.

Casing Insulators for Supply Lines Less Than NPS 4

Casing insulators for supply lines less than NPS 4 shall be designed for the size of casing and the supply line shown on the plans. Casing insulators for supply lines shall be high density, injection molded polyethylene, 2-piece construction with cadmium plated nuts and bolts and shall have a nonconductive inner liner. Casing insulators shall be factory constructed to ensure the supply line is centered in the casing to avoid any pipe to pipe contact and shall have at least 2 runners seated on the bottom of the casing.

Pipe End Seals for Supply Lines Less Than NPS 4

Pipe end seals for supply lines less than NPS 4 shall cover the space between the supply line and the end of the casing. Pipe end seals shall be made with 50 mm thick construction grade redwood and cut to fit the supply line.

Expansion Assemblies for Supply Lines Less Than NPS 4

Expansion assemblies for supply lines less than NPS 4 shall be the hose type. Hose shall be medium or heavy weight, oil resistant, flexible, reinforced with a minimum of 2-ply synthetic yarn or steel wire, equipped with steel flanges, and shall have rubber or synthetic rubber cover and tube. The hose and flange assembly shall have the same nominal inside diameter as the supply line and shall be rated for a minimum working pressure of 1.4 MPa. Hoses carrying potable water shall meet Food and Drug Administration standards.

Insulated Flange Connections

Each insulated flange connection shall consist of a dielectric flange gasket, insulating washers, and sleeves held in place with steel bolts and nuts. The gasket shall have a minimum dielectric rating of 500 V/0.025 mm.

Casings

Casings shall be welded steel pipe and shall conform to the provisions in Section 70-1.02B, "Welded Steel Pipe," of the Standard Specifications and these special provisions. Prior to shipping, exterior surfaces of welded steel pipe shall be cleaned and coated in conformance with the requirements in ANSI/AWWA C213, or at the option of the Contractor, cleaned, primed, and coated in conformance with the requirements in ANSI/AWWA C214.

Pipe Wrapping Tape

Wrapping tape for pipe in contact with the earth shall be a pressure sensitive polyvinyl chloride or polyethylene tape with a minimum thickness of 1.27 mm.

Concrete Pipe Supports

Each concrete pipe support shall consist of either a precast or cast-in-place concrete pipe cradle, a galvanized steel pipe clamp, anchor bolts, and where shown on the plans, a stainless steel pipe protection shield.

Concrete pipe supports and pipe stops shall conform to the dimensions shown on the plans and shall be constructed of minor concrete and commercial quality wire mesh. Minor concrete shall conform to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications, except that it shall contain not less than 350 kilograms of cementitious material per cubic meter. The concrete for pipe supports and pipe stops shall be moist cured for not less than 3 days.

Steel anchor bolts, nuts, pipe clamps, pipe protection shields, and other fittings shall be suitable for the type and size of the supply line or casing and shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Epoxy Adhesive

Epoxy adhesive shall conform to the provisions in Section 95, "Epoxy," of the Standard Specifications and one of the following:

- A. Section 95-2.01, "Binder (Adhesive), Epoxy Resin Base," for load bearing applications.
- B. Section 95-2.04, "Rapid Set Epoxy Adhesive for Pavement Markers."
- C. Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers."

INSTALLATION

Water supply lines in bridge structures shall be supported as shown on the plans and in conformance with these special provisions.

If a blockout is provided in the bridge abutment wall for casing, the space between the casing and bridge abutment wall shall be filled with mortar conforming to the provisions in Section 51-1.135, "Mortar," of the Standard Specifications.

When the bridge superstructure is to be prestressed, the space around supply lines through abutments shall not be filled until the prestressing has been completed.

Openings for supply lines through bridge superstructure concrete shall either be formed or shall consist of pipe sleeves.

Cleaning and Closing of Pipe

The interior of the pipe shall be cleaned before installation. Openings shall be capped or plugged as soon as the pipe is installed to prevent the entrance of foreign material. The caps or plugs shall remain in place until the adjacent pipe sections are to be installed.

Wrapping and Coating Pipe

Damaged coating on supply line pipe in contact with the earth shall be wrapped with tape as follows:

- A. Pipe to be wrapped shall be thoroughly cleaned and primed as recommended by the tape manufacturer.
- B. Tape shall be tightly applied with one-half uniform lap, free from wrinkles and voids to provide not less than a 2.5 mm thickness.
- C. Field joints and fittings for wrapped pipe shall be covered by double wrapping 1.27 mm thick tape. Wrapping at joints shall extend a minimum of 150 mm over adjacent pipe coverings. Width of tape for wrapping fittings shall not exceed 50 mm. Adequate tension shall be applied so that the tape will conform closely to the contours of the joint.

TESTING

Water supply lines less than NPS 4 shall be tested in conformance with the provisions in Section 20-5.03H(1), "Method A," of the Standard Specifications, except that the testing period shall be 4 hours minimum with no leakage or pressure drop.

The Contractor shall furnish pipe anchorages to resist thrust forces occurring during testing. Leaks shall be repaired and defective materials shall be replaced by the Contractor at the Contractor's expense.

Pressure testing and necessary repairing of water lines shall be completed prior to backfilling, placing deck slabs over supply lines in box girder cells, or otherwise covering the supply lines.

Each end of the supply line shall be capped prior to and after the testing.

The supply line shall be tested as one unit. The limits of the unit shall be 1.5 m beyond the casing at each end of the bridge.

MEASUREMENT AND PAYMENT

Measurement and payment for NPS 3 supply line (bridge) shall be made in the same manner as galvanized steel pipe and plastic pipe supply lines in Section 20-5.04, "Measurement," and Section 20-5.05, "Payment," of the Standard Specifications.

Full compensation for furnishing and installing air release valve assemblies, steel brackets and other fittings, casings and casing insulators, pipe end seals, concrete supports, pipe anchorages, concrete pipe stops, pipe wrapping tape, epoxy adhesives, and expansion assemblies; for cleaning, closing, wrapping, and coating pipe; and for pressure testing shall be considered as included in the contract prices paid per meter for NPS 3 supply line (bridge), and no additional compensation will be allowed therefor.

10-1.49 AGGREGATE BASE

Aggregate base must comply with Section 26, "Aggregate Bases," of the Standard Specifications and these special provisions.

Aggregate base must be Class 2.

Do not store reclaimed asphalt concrete or aggregate base with reclaimed asphalt concrete within 30 m measured horizontally of any culvert, watercourse, or bridge.

10-1.50 LEAN CONCRETE BASE

Lean concrete base shall conform to the provisions in Section 28, "Lean Concrete Base," of the Standard Specifications and these special provisions.

The finished surface of lean concrete base shall not be above the grade established by the Engineer, or more than 15 mm below the grade established by the Engineer.

10-1.51 HOT MIX ASPHALT

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) Type A using the Quality Control / Quality Assurance (QC/QA) process.

Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submittals

Quality Control / Quality Assurance Projects

With the job mix formula (JMF) submittal, submit:

1. California Test 204 plasticity index results
2. California Test 371 tensile strength ratio results for untreated HMA
3. California Test 371 tensile strength ratio results for treated HMA if untreated HMA tensile strength ratio is below 70

At project start-up and once during production, submit samples split from your HMA production sample for California Test 371 to the Engineer and the Transportation Laboratory, Attention: Moisture Test.

With the JMF submittal, at project start-up, and each 5000 tonnes, submit the California Test 371 test results for mix design and production to the Engineer and electronically to:

Moisture_Tests@dot.ca.gov

Data Cores

Three business days before starting coring, submit proposed methods and materials for backfilling data core holes. Submit to the Engineer and electronically to Coring@dot.ca.gov:

1. A summary of data cores taken
2. A photograph of each data core

For each data core, the summary must include:

1. Project identification number
2. Date cored
3. Core identification number
4. Type of materials recovered
5. Type and approximate thickness of unstabilized material not recovered
6. Total core thickness
7. Thickness of each individual material to within:

7.1 For recovered material, 12.5 mm

7.2 For unstabilized material, 25 mm

8. Location including:

- 8.1. County
- 8.2. Route
- 8.3. Post mile
- 8.4. Lane number
- 8.5. Lane direction
- 8.6. Station

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

1. The core
2. Project identification number
3. Core identification number
4. Date cored
5. County
6. Route
7. Post mile
8. Lane number
9. Lane direction

After data core summary and photograph submittal, dispose of cores under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Quality Control and Assurance

Quality Control / Quality Assurance Projects

For the mix design, determine the plasticity index of the aggregate blend under California Test 204. Choose an antistripping treatment and use the corresponding laboratory procedure for the mix design in compliance with:

Antistrip Treatment Lab Procedures for Mix Design

| Antistrip Treatment | Lab Procedure |
|--|---------------|
| Plasticity index from 4 to 10 ^a | |
| Dry hydrated lime with marination | LP-6 |
| Lime slurry with marination | LP-7 |
| Plasticity index less than 4 | |
| Liquid | LP-5 |
| Dry hydrated lime without marination | LP-6 |
| Dry hydrated lime with marination | LP-6 |
| Lime slurry with marination | LP-7 |

Notes:

^a If the plasticity index is greater than 10, do not use that aggregate blend.

For the mix design, determine tensile strength ratio under California Test 371 on untreated HMA. If the tensile strength ratio is less than 70:

1. Choose from the antistrip treatments specified based on plasticity index.
2. Test treated HMA under California Test 371.
3. Treat to a minimum tensile strength ratio of 70.

On the first production day and at least every 5000 tonnes, sample HMA and test under California Test 371.

The Department does not use California Test 371 test results for JMF verification and production to determine specification compliance.

MATERIALS

Asphalt Binder

The grade of asphalt binder mixed with aggregate for HMA Type A must be PG 64-28 PM for the ramps, arterials, collector-distributor roads, connectors, 27th Street, Little Mountain Drive, Massachusetts Avenue, and Highland Avenue. Asphalt binder grade PG 64-10 should be used for local roads other than arterials, HMA dikes, HMA bond breakers, and HMA in miscellaneous areas.

Aggregate

The aggregate for HMA Type A must comply with the 19 mm grading. The aggregate for HMA dikes, HMA in miscellaneous areas, and HMA bond breakers must comply with the 9.5-mm grading.

CONSTRUCTION

Vertical Joints

Before opening the lane to public traffic, pave shoulders and median borders adjacent to a lane being paved.

Place HMA on adjacent traveled way lanes so that at the end of each work shift, the distance between the ends of HMA layers on adjacent lanes is between 1.5 m and 3.0 m. Place additional HMA along the transverse edge at each lane's end and along the exposed longitudinal edges between adjacent lanes. Hand rake and compact the additional HMA to form temporary conforms. You may place Kraft paper or another approved bond breaker under the conform tapers to facilitate the taper removal when paving operations resume.

Conform Tapers

Place additional HMA along the pavement's edge to conform to road connections and private drives. Hand rake, if necessary, and compact the additional HMA to form a smooth conform taper.

Data Cores

Take data cores that include the completed HMA pavement, underlying base, and subbase material. Protect data cores and surrounding pavement from damage.

Take 100-mm or 150-mm diameter data cores:

1. At the beginning, end, and every 800 m within the paving limits of each route on the project
2. After all paving is complete

3. From the center of the specified lane

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. You may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

1. Granular material
2. Crumbled or cracked stabilized material
3. Sandy or clayey soil

PAYMENT

The contract lump sum price paid for data cores includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in data coring, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.52 HOT MIX ASPHALT Type A (Bond Breaker)

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) Type A (Bond Breaker) (HMABB) using the Standard process.

HMA Type A (Bond Breaker) must comply with the requirements for HMA Type A of Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Quality Control and Assurance.

Do not test HMABB aggregate for tensile strength ratio.

MATERIALS

The grade of asphalt binder mixed with aggregate for HMA Type A (Bond Breaker) must be PG 64-10.

The amount of asphalt binder mixed with aggregate for HMA Type A (Bond Breaker) shall be increased by one percent by weight of the dry aggregate over the amount of asphalt binder determined for use in HMA Type A under California Test 367.

Aggregate for HMA Type A (Bond Breaker) must comply with the 9.5-mm grading.

Antistrip Treatment

Treat HMABB aggregate with the same anti-strip treatment used for HMA Type A.

JOB MIX FORMULA AND HMA TYPE A (BOND BREAKER) EVALUATION

Prior to the addition of the additional 1 percent of asphalt binder, HMA will conform to the requirements of Hot Mix Asphalt for Job Mix Formula. The JMF for HMA Type A (Bond Breaker) will not be verified. HMA Type A (Bond Breaker) will be evaluated in the first day of production during the start up evaluation.

QUALITY CONTROL TESTING

Perform sampling and testing at the specified frequency for the following quality characteristics:

Minimum Quality Control

| Quality Characteristic | Test Method | Minimum Sampling and Testing Frequency | Requirement |
|---|----------------------|---|------------------------------|
| Aggregate gradation ^a | CT 202 | 1 per 750 tonnes and any remaining part | JMF ± Tolerance ^b |
| Sand equivalent (min.) ^c | CT 217 | | 47 |
| Asphalt binder content | CT 379 or 382 | | JMF ± 0.45% |
| HMA moisture content (max.) | CT 370 | 1 per 2500 tonnes but not less than 1 per paving day | 1.0% |
| Percent of maximum theoretical density ^{d, e} | Quality control plan | 2 per business day (min.) | > 98% |
| Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants ^f | CT 226 or CT 370 | 2 per day during production | -- |
| Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min) (Passing 4.75 mm sieve and retained on 2.38 mm sieve.) One fractured face | CT 205 | As necessary and designated in the QCP. At least once per project | 90 75 70 |
| Los Angeles Rattler (% max.) Loss at 500 rev. | CT 211 | | 45 |

Notes:

^a Determine combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

^b The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

^c Report the average of 3 tests from a single split sample.

^d Required if the total paved thickness is at least 45-mm.

^e Determine maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

^f For adjusting the plant controller at the HMA plant.

Apply white pigmented curing compound to the finished surface of the HMA Type A (Bond Breaker) prior to placement of the portland cement concrete pavement. Pigmented curing compound must conform to the requirements of ASTM Designation C 309, Type 2, Class A. Curing compound must be applied in 2 separate applications to the area to be surfaced with portland cement concrete pavement. Apply curing compound at the rate of 3.7 m² per liter.

ENGINEER'S ACCEPTANCE

The Engineer samples for acceptance testing and tests for:

HMA Acceptance

| Quality Characteristic | Test Method | Requirement |
|---|----------------------|------------------------------|
| Aggregate gradation ^a | CT 202 | JMF ± Tolerance ^b |
| Sand equivalent (min.) ^c | CT 217 | 47 |
| Asphalt binder content | CT 379 or 382 | JMF ± 0.45% |
| HMA moisture content (max.) | CT 370 | 1.0% |
| Percent of maximum theoretical density ^{d,e} | Quality control plan | > 98% |
| Percent of crushed particles coarse aggregate (% min.) | CT 205 | |
| One fractured face | | 90 |
| Two fractured faces | | 75 |
| Fine aggregate (% min.) (Passing 4.75 mm sieve and retained on 2.38 mm sieve.) | CT 211 | |
| One fractured face | | 70 |
| Los Angeles Rattler (% max.) Loss at 500 rev. | | 45 |

Notes:

^a The Engineer determines combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

^b The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

^c The Engineer reports the average of 3 tests from a single split sample.

^d Required if the total paved thickness is at least 45-mm.

^e The Engineer determines maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

HMA Type A (Bond Breaker) will be measured and paid for in the same manner specified for HMA in conformance with the requirements of Section 39-5, "Measurement and Payment," of the Standard Specifications.

Full compensation for the additional one percent of asphalt binder used in HMA Type A (Bond Breaker) and for furnishing and applying white pigmented curing compound to the surface of the HMA Type A (Bond Breaker) shall be considered as included in the contract price paid per ton for HMA Type A (Bond Breaker).

10-1.53 HOT MIX ASPHALT (MISCELLANEOUS AREAS)

GENERAL

Summary

This work includes producing hot mix asphalt (HMA) and placing it on miscellaneous areas. Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

MEASUREMENT AND PAYMENT

If there is a contract item for place hot mix asphalt (miscellaneous area) paid for by the square meter, this item is limited to the areas listed on the plans and is in addition to the contract items for the materials involved.

10-1.54 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - SLURRY METHOD

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the slurry method and placing it in stockpiles to marinate.

Treat aggregate for HMA Type A and HMA Type A (Bond Breaker) with lime slurry.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submit the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit a treatment data log from the slurry proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured

3. Aggregate size being treated
4. Wet aggregate flow rate collected directly from the aggregate weigh belt
5. Moisture content of the aggregate just before treatment, expressed as a percent of the dry aggregate mass
6. Dry aggregate flow rate calculated from the wet aggregate flow rate
7. Lime slurry flow rate measured by the slurry meter
8. Dry lime flow rate calculated from the slurry meter output
9. Approved lime ratio for each aggregate size being treated
10. Actual lime ratio calculated from the aggregate weigh belt and the slurry meter output, expressed as a percent of the dry aggregate mass
11. Calculated difference between the approved lime ratio and the actual lime ratio
12. Dry lime and water proportions at the slurry treatment time

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

Your quality control plan (QCP) must include aggregate quality control sampling and testing during aggregate lime treatment. Perform sampling and testing in compliance with:

Aggregate Quality Control During Lime Treatment

| Quality Characteristic | Test Method | Minimum sampling and testing frequency |
|------------------------------|------------------------|--|
| Sand Equivalent | CT 217 | Once per 1 000 tonnes of aggregate treated with lime |
| Percent of crushed particles | CT 205 | As necessary and as designated in the QCP |
| Los Angeles Rattler | CT 211 | |
| Fine aggregate angularity | AASHTO T 304, Method A | |
| Flat and elongated particles | ASTM D 4791 | |

Note:

During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log.
2. Do not submit the aggregate quality control data.
3. Submit incomplete, untimely, or incorrectly formatted data.
4. Do not take corrective actions.
5. Take late or unsuccessful corrective actions.
6. Do not stop treatment when proportioning tolerances are exceeded.
7. Use malfunctioning or failed proportioning devices.

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

For the aggregate to be treated, determine the moisture content at least once during each 2 hours of treatment. Calculate moisture content under California Test 226 or California Test 370 and report it as a percent of dry aggregate mass. Use the moisture content calculations as a set point for the proportioning process controller.

MATERIALS

High-calcium hydrated lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer at least 24 hours before the start of aggregate treatment.

Treat aggregate separate from HMA production.

Do not treat reclaimed asphalt pavement.

Add lime to the aggregate as slurry consisting of mixed dry lime and water at a ratio of 1 part lime to between 2 parts and 3 parts water by mass. The slurry must completely coat the aggregate.

Lime treat and marinate coarse and fine aggregates separately.

Immediately before mixing lime slurry with aggregate, water must not visibly separate from aggregate.

Treat aggregate and stockpile for marination only once.

The lime ratio is the kilograms of dry hydrated lime per 100 kg of dry aggregate expressed as a percent. Water content of slurry or untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

| Aggregate Gradation | Lime Ratio |
|---------------------|------------|
| Coarse | 0.4 to 1.0 |
| Fine | 1.5 to 2.0 |
| Combined | 0.8 to 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 approved lime ratio when you combine the individual aggregate sizes in the JMF proportions.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's total treatment in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

Lime Slurry Proportioning

Proportion lime and water with a continuous or batch operation.

The device controlling slurry proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by the data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the contract's duration, collected data must be stored by the controller.

Proportioning and Mixing Lime Slurry Treated Aggregate

Treat HMA aggregate by proportioning lime slurry and aggregate by mass in a continuous operation.

Marinate treated aggregate in stockpiles from 24 hours to 60 days before using in HMA. Do not use aggregate marinated longer than 60 days.

MEASUREMENT AND PAYMENT

Full compensation for lime slurry treated aggregates shall be considered as included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.55 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - DRY LIME METHOD

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the dry lime method either with marination or without.

Treat aggregate for HMA Type A with dry lime.

Marinate aggregate if the plasticity index determined under California Test 204 is from 4 to 10.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

If marination is required, submit in writing the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit in writing a treatment data log from the dry lime and aggregate proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. HMA type and mix aggregate size
5. Wet aggregate flow rate collected directly from the aggregate weigh belt
6. Aggregate moisture content, expressed as a percent of the dry aggregate mass
7. Flow rate of dry aggregate calculated from the flow rate of wet aggregate
8. Dry lime flow rate
9. Lime ratio from the accepted JMF for each aggregate size being treated
10. Lime ratio from the accepted JMF for the combined aggregate
11. Actual lime ratio calculated from the aggregate weigh belt output, the aggregate moisture input, and the dry lime meter output, expressed as a percent of the dry aggregate mass
12. Calculated difference between the approved lime ratio and the actual lime ratio

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

If marination is required, the quality control plan (QCP) specified in Section 39-4, "Quality Control / Quality Assurance," must include aggregate quality control sampling and testing during lime treatment. Perform sampling and testing in compliance with:

| Quality Characteristic | Test Method | Minimum sampling and testing frequency |
|------------------------------|------------------------|--|
| Sand Equivalent | CT 217 | Once per 1 000 tonnes of aggregate treated with lime |
| Percent of crushed particles | CT 205 | As necessary and as designated in the QCP |
| Los Angeles Rattler | CT 211 | |
| Fine aggregate angularity | AASHTO T 304, Method A | |
| Flat and elongated particles | ASTM D 4791 | |

Note: During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log
2. Do not submit the aggregate quality control data for marinated aggregate
3. Submit incomplete, untimely, or incorrectly formatted data
4. Do not take corrective actions
5. Take late or unsuccessful corrective actions
6. Do not stop treatment when proportioning tolerances are exceeded
7. Use malfunctioning or failed proportioning devices

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

MATERIALS

Lime must be high-calcium hydrated lime. Lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate. Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer in writing at least 24 hours before the start of aggregate treatment.

Do not treat reclaimed asphalt pavement.

If marination is required:

1. Treat and marinate coarse and fine aggregates separately.
2. Treat aggregate and stockpile for marination only once.
3. Treat aggregate separate from HMA production.

The lime ratio is the kilograms of dry hydrated lime per 100 kg of dry aggregate expressed as a percent. Water content of untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

| Aggregate Gradation | Lime Ratio |
|---------------------|------------|
| Coarse | 0.4 to 1.0 |
| Fine | 1.5 to 2.0 |
| Combined | 0.8 to 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 approved lime ratio when you combine the individual aggregate sizes in the JMF proportions.

Proportion dry lime by mass with a continuous operation.

The device controlling dry lime and aggregate proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by a data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the controller.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's treated aggregate in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

If you use a batch-type proportioning operation for HMA production, control proportioning in compliance with the specifications for continuous mixing plants. Use a separate dry lime aggregate treatment operation from HMA batching operations including:

1. Pugmill mixer
2. Controller
3. Weigh belt for the lime
4. Weigh belt for the aggregate

If using a continuous mixing operation for HMA without lime marinated aggregates, use a controller that measures the blended aggregate mass after any additional water is added to the mixture. The controller must determine the amount of lime added to the aggregate from the aggregate weigh belt input in connection with the manually input total aggregate moisture, the manually input target lime content, and the lime proportioning system output. Use a continuous aggregate weigh belt and pugmill mixer for the lime treatment operation in addition to the weigh belt for the aggregate proportioning to asphalt binder in the HMA plant. If you use a water meter for moisture control for lime treatment, the meter must comply with California Test 109.

At the time of mixing dry lime with aggregate, the aggregate moisture content must ensure complete lime coating. The aggregate moisture content must not cause aggregate to be lost between the point of weighing the combined aggregate continuous stream and the dryer. Add water for mixing and coating aggregate to the aggregate before dry lime addition. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate.

The HMA plant must be equipped with a bag house dust system. Material collected in the dust system must be returned to the mix.

Mixing Dry Lime and Aggregate

Mix aggregate, water, and dry lime with a continuous pugmill mixer with twin shafts. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate. Store dry lime in a uniform and free flowing condition. Introduce dry lime to the pugmill in a continuous operation. The introduction must occur after the aggregate cold feed and before the point of proportioning across a weigh belt and the aggregate dryer. Prevent loss of dry lime.

If marination is required, marinate treated aggregate in stockpiles between 24 hours and 60 days before using in HMA. Do not use aggregate marinated more than 60 days.

The pugmill must be equipped with paddles arranged to provide sufficient mixing action and mixture movement. The pugmill must produce a homogeneous mixture of uniformly coated aggregates at mixer discharge.

If the aggregate treatment operation is stopped longer than 1 hour, clean the equipment of partially treated aggregate and lime.

Aggregate must be completely treated before introduction into the mixing drum.

MEASUREMENT AND PAYMENT

Full compensation for dry lime treating HMA aggregate including marination shall be considered as included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.56 LIQUID ANTISTRIP TREATMENT

GENERAL

Summary

This work includes treating asphalt binder with liquid antistrip (LAS) treatment to bond the asphalt binder to aggregate in hot mix asphalt (HMA) for HMA Type A and HMA Type A (Bond Breaker).

Submittals

For LAS, submit with the proposed job mix formula (JMF) submittal under Section 39, "Hot Mix Asphalt," of the Standard Specifications:

1. Materials Safety Data Sheet (MSDS)
2. One 1/2-L sample
3. Infrared analysis including copy of absorption spectra

Submit a certified copy of test results and a MSDS for each LAS lot.

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each LAS shipment. With each certificate also submit:

1. Your signature and printed name
2. Shipment number
3. Material type
4. Material specific gravity
5. Refinery
6. Consignee

7. Destination
8. Quantity
9. Contact or purchase order number
10. Shipment Date

Submit proportions for LAS as part of the JMF submittal specified in Section 39-1.03, "Hot Mix Asphalt Mix Design Requirements," of the Standard Specifications. If you change the brand or type of LAS, submit a new JMF.

For each job site delivery of LAS, submit one 1/4-L sample to the Transportation Laboratory. Submit shipping documents to the Engineer. Label each LAS sampling container with:

1. LAS type
2. Application rate
3. Sample date
4. Contract number

At the end of each day's production shift, submit production data in electronic and printed media. Present data on electronic media in tab delimited format. Use line feed carriage return with one separate record per line for each production data set. Allow sufficient fields for the specified data. Include data titles at least once per report. For each mixing operation type, submit in order:

1. Batch Mixing:

- 1.1. Production date
- 1.2. Time of batch completion
- 1.3. Mix size and type
- 1.4. Each ingredient's mass
- 1.5. Asphalt binder content as percentage of dry aggregate mass
- 1.6. LAS content as percentage of asphalt binder mass

2. Continuous Mixing:

- 2.1. Production date
- 2.2. Data capture time
- 2.3. Mix size and type
- 2.4. Flow rate of wet aggregate collected directly from the aggregate weigh belt
- 2.5. Aggregate moisture content as percentage of dry aggregate mass
- 2.6. Flow rate of asphalt binder collected from the asphalt binder meter
- 2.7. Flow rate of LAS collected from the LAS meter
- 2.8. Asphalt binder content as percentage of dry aggregate mass calculated from:
 - 2.8.1. Aggregate weigh belt output
 - 2.8.2. Aggregate moisture input
 - 2.8.3. Asphalt binder meter output
- 2.9. LAS content as percentage of asphalt binder mass calculated from:
 - 2.9.1. Asphalt binder meter output
 - 2.9.2. LAS meter output

Quality Control and Assurance

For continuous mixing and batch mixing operations, sample asphalt binder before adding LAS. For continuous mixing operations, sample combined asphalt binder and LAS after the static mixer.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit data
2. Submit incomplete, untimely, or incorrectly formatted data
3. Do not take corrective actions
4. Take late or unsuccessful corrective actions

5. Do not stop production when proportioning tolerances are exceeded
6. Use malfunctioning or failed proportioning devices

If you stop production, notify the Engineer of any corrective actions taken before resuming.

MATERIALS

LAS-treated asphalt binder must comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications. LAS does not substitute for asphalt binder.

LAS total amine value must be 325 minimum when tested under ASTM D 2074.

Use only 1 LAS type or brand at a time. Do not mix LAS types or brands.

Store and mix LAS under the manufacturer's recommendations.

CONSTRUCTION

LAS must be between 0.5 and 1.0 percent by mass of asphalt binder.

If 3 consecutive sets of recorded production data show actual delivered LAS mass is more than ± 1 percent of the approved mix design LAS weight, stop production and take corrective action.

If a set of recorded production data shows actual delivered LAS mass is more than ± 2 percent of the approved mix design LAS weight, stop production. If the LAS mass exceeds 1.2 percent of the asphalt binder mass, do not use the HMA represented by that data.

The continuous mixing plant controller proportioning the HMA must produce a production data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily production. The data must be a production activity register and not a summation. The material represented by the data is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the plant controller or a computer's memory at the plant.

MEASUREMENT AND PAYMENT

Full compensation for LAS is included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.57 PRIME COAT

GENERAL

Summary

This work includes applying liquid asphalt prime coat. The Engineer designates areas receiving prime coat. Comply with Section 93, "Liquid Asphalts," of the Standard Specifications.

MATERIALS

Liquid asphalt for prime coat must be Grade SC-70.

CONSTRUCTION

Apply at least 0.9 L of prime coat per square meter of designated area. Do not apply more prime coat than can be absorbed completely by the aggregate base in 24 hours.

You may request in writing the Engineer's approval to modify prime coat application rates.

Before paving, prime coat must cure for 48 hours.

Close public traffic to areas receiving prime coat. Do not track prime coat onto pavement surfaces beyond the job site.

MEASUREMENT AND PAYMENT

The Engineer determines prime coat quantities under the specifications for liquid asphalt in Section 93-1.04, "Measurement," of the Standard Specifications.

The contract price paid per tonne for liquid asphalt (prime coat) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in prime coat complete in place as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If there is no contract item for liquid asphalt (prime coat), full compensation for furnishing and applying the prime coat is included in the contract price paid per tonne for hot mix asphalt as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.58 JOINTED PLAIN CONCRETE PAVEMENT

GENERAL

Jointed plain concrete pavement shall be constructed in conformance with the provisions in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions, and as shown on the plans.

Insert method for forming joints in pavement shall not be used.

PREPAVING CONFERENCE

Supervisory personnel of the Contractor and subcontractors who are to be involved in the concrete paving work shall meet with the Engineer at a prepaving conference, at a mutually agreed time, to discuss methods of accomplishing the paving work.

The Contractor shall provide a facility for the prepaving conference within 5 km of the construction site or at a nearby location agreed to by the Engineer. Attendance at the prepaving conference is mandatory for the Contractor's project superintendent, paving construction foreman, subcontractor's workers, including foremen and personnel performing saw cutting, joint sealing, concrete plant manager, and concrete plant operator. Conference attendees shall sign an attendance sheet provided by the Engineer. Production and placement shall not begin nor proceed unless the above-mentioned personnel have attended the mandatory prepaving conference.

JUST-IN-TIME TRAINING

Attending a 4-hour Just-In-Time Training (JITT) shall be mandatory, and consist of a formal joint training class on portland cement concrete and paving techniques. Construction operations for portland cement concrete paving shall not begin until the Contractor's and the Engineer's personnel have completed the mandatory JITT. The Contractor's personnel included in the list of participants for the prepaving conference as well as the Engineer's representatives shall attend JITT. JITT shall be in addition to the prepaving conference.

The JITT class will be conducted for not less than 4 hours on portland cement concrete pavement and paving techniques. The training class may be an extension of the prepaving conference and shall be conducted at a project field location convenient for both the Contractor and the Engineer. The JITT class shall be completed at least 15 days, not including Saturdays or holidays, prior to the start of portland cement concrete paving operations. The class shall be held during normal working hours.

The JITT instructor shall be experienced in the construction methods, materials, and test methods associated with construction of portland cement concrete pavement and paving techniques. The instructor shall not be an employee of the Contractor or a member of the Engineer's field staff. A copy of the course syllabus, handouts, and presentation material shall be submitted to the Engineer at least 7 days before the day of the training. The Contractor and the Engineer shall mutually agree to course instructor, the course content, and training site. The instructor shall issue a certificate of completion to the participants upon completion of the class. The certificate of completion shall include the course title, date and location of the class, the name of the participant, instructor's name, location and telephone number.

The Contractor's or Engineer's personnel involved with portland cement concrete paving operations will not be required to attend JITT if they have completed equivalent training within the previous 12 months of the date of the JITT for this project. The Contractor shall provide a certificate of class completion as described above for each staff member to be excluded from the JITT class. The Engineer will provide the final determination for exclusion of staff member's participation. Attendees of the JITT shall complete, and submit to the Engineer, an evaluation of the training. The Engineer will provide the course evaluation form.

Just-In-Time Training shall not relieve the Contractor of responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications.

TEST STRIP

At the beginning of paving operations, the Contractor shall construct a test strip of concrete pavement from 200 m to 300 m in length. The paving width for the test strip shall be the same as that intended by the Contractor for production work. The Contractor shall use the same equipment to construct the test strip for the remainder of the paving operations, except as specified in this section. The Contractor shall not begin paving operations until the test strip has been evaluated in conformance with the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications regarding surface straight edge requirements, and "Profile Index" in this section; for dowel and tie bar alignment verification; concrete quality (except modulus of rupture); and pavement thickness. Additional test strips will be required when:

1. A portion of a test strip fails to conform to the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications for straight edge requirements;
2. A portion of the test strip fails to conform to profile requirements;

3. The Contractor proposes different paving equipment, including a batch plant, paver, dowel bar inserter, tie bar inserter, tining, or curing equipment;
4. The dowel bar tolerances are not met;
5. The pavement thickness deficiency is greater than 15 mm after grinding; or
6. A change in concrete mix proportions has occurred.

The Contractor shall perform coring of the test strips as part of the dowel and tie bar placement tolerance verification, and pavement thickness verification. The Engineer will select a minimum of six dowel bars that will be cored for each test strip. The Engineer will have the option of selecting up to 6 tie bars that will be cored for each test strip. After removal of cores, voids in concrete pavement shall be cleaned and filled with hydraulic cement grout conforming to the provisions in "Core Drilling for Dowel Placement Alignment Assurance Testing" in this section.

Before mechanical dowel bar inserters are used, the Contractor shall demonstrate that the insertion equipment will not leave surface irregularities such as depressions, dips, or high areas adjacent to the dowel bar insertion point, or voids or segregation around dowel bars.

Before placement of the test strip, the Contractor shall submit a written procedure to locate transverse weakened plane joints that will coincide with the center of the dowel bars being placed and locating the tie bars along the longitudinal joints. This procedure shall be submitted prior to the prepping conference, and shall describe the control of inadvertent covering of paint markings after applying curing compound, excessive paint spray producing too large a paint dot marking for the accuracy required, misalignment by transferring marking spots, and inadequate staking of joints.

Construction of concrete pavement shall not proceed until the Engineer has completed an evaluation of the test strip. The Engineer shall be allowed 3 business days to evaluate the test strip. If, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the Engineer not completing the evaluation of the test strip within the time specified, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. Test strips failing to conform to the specifications for concrete pavement shall be removed. Additional test strips shall be constructed until the Contractor constructs a test strip that conforms to the specifications for concrete pavement. Additional test strips shall conform to the requirements in this section, except the test strip shall be 200 m in length.

Prior to constructing additional test strips, the Contractor shall change methods or equipment to construct a test strip that conforms to the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications, "Profile Index" of this section, and dowel bar alignment verification, without grinding or other corrective work.

The Engineer may waive the initial test strip if the Contractor proposes to use a batch plant mixer and paving equipment with the same personnel that were satisfactorily used on a Department project within the preceding 12 months. The personnel shall be individuals listed in the prepping conference used on a preceding Department project.

Materials resulting from the construction and removal of rejected test strips shall become the property of the Contractor and shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MATERIALS

Concrete

Attention is directed to Section 90, "Portland Cement Concrete," of the Standard Specifications, regarding mix proportions for concrete being determined by the Contractor.

Primary aggregate gradings shall conform to the gradation requirements of Section 90-3, "Aggregate Gradings," of the Standard Specifications. When combined in the proportions determined by the Contractor, the percent passing the 9.5 mm sieve and retained on the 2.36 mm sieve shall not be less than 16 percent of the total aggregate.

The cementitious material content shall not exceed 400 kg/m³.

Tie Bars

Tie bars shall be deformed reinforcing steel bars conforming to the requirements of ASTM Designation: A 615/A 615M (Grade 280 or 420), A 996/A 996M or A 706/A 706M. Tie bars shall be epoxy-coated in conformance with the requirements in ASTM Designation: A 934/A 934M or A 775/A 775M and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except the epoxy-coating thickness after curing shall be between 175 micrometers to 400 micrometers and epoxy coating must be purple or gray when coated under ASTM A 934/ A 934M. Fabrication, sampling and jobsite handling shall conform to the requirements in ASTM Designation: D 3963/ D 3963M and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except the 2 samples shall be 750-mm long. Epoxy-coated tie bars shall not be bent.

Epoxy (Drill and Bond)

Epoxy for bonding tie bars and dowel bars to portland cement concrete shall be a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C 881, Type V, Grade 3 (Non-Sagging), Class A, B or C. The class used shall be dependent on the internal temperature of the hardened concrete at the time the epoxy is to be applied. Class A shall be used when the internal temperature is below 4°C, but not lower than recommended by the manufacturer. Class B shall be used when the internal temperature is from 4°C to 15°C. Class C shall be used when the internal temperature is above 15°C, but not higher than recommended by the manufacturer. A Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished with the epoxy. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 7 days prior to the start of work. Epoxy shall be applied in conformance with the manufacturer's recommendations.

Dowel Bars

Dowel bars shall be plain round smooth, epoxy-coated steel conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420, the details shown on the plans and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that epoxy coating of dowel bars shall conform to the provisions in ASTM Designation: A 884/A 884M, Class A, Type 1 or Type 2, bend test shall not apply and epoxy coating reinforcement shall be purple or gray when coated under ASTM A 884/ A 884M, Class A, Type 2. Fabrication, sampling and jobsite handling shall conform to the requirements in ASTM Designation: D 3963/ D 3963M and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except the 2 samples shall be 460-mm long.

Dowel bars shall be free from burrs or other deformations detrimental to free movement of the bars in the concrete.

Bond Breaker

Dowel bars shall be lubricated with a bond breaker over the entire bar. A bond breaker application of petroleum paraffin-based lubricant or white-pigmented curing compound shall be used to coat the dowel bars completely prior to placement. Oil and asphalt based bond breakers shall not be used. Paraffin-based lubricant shall be Dayton Superior DSC BB-Coat or Valvoline Tectyl 506 or an approved equal. Paraffin-based lubricant shall be factory applied. White pigmented curing compound shall conform to the requirements of ASTM Designation: C 309, Type 2, Class A, and shall contain 22 percent minimum nonvolatile vehicles consisting of at least 50 percent paraffin wax. Curing compound shall be applied in 2 separate applications, the last application not more than 8 hours prior to placement of the dowel bars. Each application of curing compound shall be applied at the approximate rate of one liter per 3.7 m².

Dowel Bar Baskets

Dowel bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963/D 3963M and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M.

Concrete fasteners shall be used for anchoring dowel bar baskets to lean concrete base, hot mix asphalt used as base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or hot mix asphalt used as base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or hot mix asphalt used as base shall have a minimum shank diameter of 4 mm with a minimum shank length of 64 mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with dowel bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

Tie Bar Baskets

Tie bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Tie bar baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M.

Concrete fasteners shall be used for anchoring tie bar baskets to lean concrete base, hot mix asphalt used as base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or hot mix asphalt used as base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or hot mix asphalt used as base shall have a minimum shank diameter of 4 mm with a minimum shank length of 64 mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with tie bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005 mm.

Reinforcement

Reinforcement shall be epoxy coated and shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications.

Silicone Joint Sealant

Low modulus silicone joint sealant shall be furnished in a one-part silicone formulation. Acid cure sealant shall not be used. The compound shall be compatible with the surface to which it is applied and shall conform to the following requirements:

| Property | Test Method | Requirement |
|--|------------------------|--|
| Tensile stress, 150% elongation, 7-day cure at 25°± 1°C and 45% to 55% R.H.e | ASTM D 412 (Die C) | 310 kPa max. |
| Flow at 25° ± 1°C | ASTM C 639a | Shall not flow from channel |
| Extrusion Rate at 25° ± 1°C | ASTM C 603b | 75-250 g/min. |
| Specific Gravity | ASTM D 792 Method A | 1.01 to 1.51 |
| Durometer Hardness, at –18°C, Shore A, cured 7 days at 25° ± 1°C | ASTM C 661 | 10 to 25 |
| Ozone and Ultraviolet Resistance, after 5000 hours | ASTM C 793 | No chalking, cracking or bond loss |
| Tack free at 25° ± 1°C and 45% to 55% R.H.e | ASTM C 679 | Less than 75 minutes |
| Elongation, 7 day cure at 25° ± 1°C and 45% to 55% R.H.e | ASTM D 412 (Die C) | 500 percent min. |
| Set to Touch, at 25° ± 1°C and 45% to 55% R.H.e | ASTM D 1640 | Less than 75 minutes |
| Shelf Life, from date of shipment | — | 6 months min. |
| Bond, to concrete mortar-concrete briquettes, air cured 7 days at 25° ± 1°C | AASHTO T 132c | 345 kPa min. |
| Movement Capability and Adhesion, 100% extension at –18°C after, air cured 7 days at 25° ± 1°C, and followed by 7 days in water at 25° ± 1°C | ASTM C 719d | No adhesive or cohesive failure after 5 cycles |

Notes:

- a. ASTM Designation: C 639 Modified (15 percent slope channel A).
- b. ASTM Designation: C 603, through 3-mm opening at 345 kPa.
- c. Mold briquettes in conformance with AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with AASHTO Designation: T 132. Briquettes shall be dried to constant mass at 100 ± 5° C.
- d. Movement Capability and Adhesion: Prepare 305 mm x 25 mm x 75 mm concrete blocks in conformance with ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50 mm of block leaving 12.5 mm on each end of specimen unsealed. The depth of sealant shall be 9.5 mm and the width 12.5-mm.
- e. R.H. equals relative humidity.

The silicone joint sealant shall be formulated to cure rapidly enough to prevent flow after application on grades of up to 15 percent.

A Certificate of Compliance for the silicone sealant shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project.

Preformed Compression Joint Sealant

Preformed compression seals shall conform to the requirements of ASTM Designation: D 2628. Preformed compression seals shall have 5 or 6 cells. Preformed compression seals for Types A2 and B joints shall have 4 or more cells. Lubricant adhesive used with preformed compression seals shall conform to the requirements of ASTM Designation: D 2835. Compression seals and lubricant adhesive shall be installed in conformance with the manufacturer's recommendations and these special provisions. The manufacturer's recommendations shall be submitted to the Engineer at the prepping conference.

Each lot of compression seal and lubricant adhesive shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and shall be accompanied with storage instructions and precautionary instructions for use. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the preformed compression joint sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of joint seal prior to use on the project. The Contractor shall submit the manufacturer's data sheet with installation instructions and recommended type of preformed compression seal for the joint size and depth as shown on the plans. The manufacturer's selected compression seal shall show evidence that the seal is being compressed at level between 40 percent and 50 percent for the joint width and depth shown on the plans.

Joint Filler Material

Joint filler material shall be reformed expansion joint filler for concrete (bituminous type), conforming to the requirements of ASTM Designation: D 994.

A Certificate of Compliance for the joint filler material shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall be accompanied with a certified test report of the results of the required tests performed on the joint filler material within the previous 12 months prior to proposed use. The certificate and accompanying test report shall be provided for each lot of joint filler material prior to use on the project.

Hydraulic Cement Grout (non-shrink)

Hydraulic cement grout (non-shrink) shall conform to the requirements in ASTM Designation: C 1107. At the Contractor's option, clean, uniformly rounded aggregate filler may be used to extend the grout. The extension of grout shall not exceed 60 percent of the mass of the grout or the maximum amount of grout extension recommended by the manufacturer, whichever is less. The moisture content of the aggregate filler shall not exceed 0.5 percent. Grading of the aggregate filler shall conform to the following:

| Sieve Size | Percentage Passing |
|------------|--------------------|
| 12.5 mm | 100 |
| 9.5 mm | 85-100 |
| 4.75 mm | 10-30 |
| 2.36 mm | 0-10 |
| 1.10 mm | 0-5 |

PAVEMENT CONCRETE MIX PROPORTIONS

The Contractor shall determine the mix proportions for pavement concrete. The laboratory used to develop the mix proportions shall meet the requirements of ASTM Designation: C 1077, and shall have current AASHTO accreditation for test methods AASHTO Designation: T 97 or ASTM Designation: C 78, and AASHTO Designation: T 126 or ASTM Designation: C 192.

The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be determined in conformance with the requirements in California Test 559. Trial mixtures shall be made no more than 24 months before field qualification. The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be that determined from the trial mixtures curve to produce a minimum modulus of rupture of 3.9 MPa at 28 days age and 4.5 MPa at 42 days age. To account for variances in materials, production of concrete, and modulus of rupture testing, the Contractor shall include as part of the proposed mix proportions an increase to the cementitious material content or a decrease to the water to cementitious materials ratio, determined from trial mixtures, to ensure that portland cement concrete produced during paving operations conforms to the requirements in "Modulus of Rupture," in this section.

At least 15 days prior to field qualification, the Contractor shall submit the proposed pavement concrete mix proportions with laboratory test reports. Laboratory test reports shall include modulus of rupture determined for each trial mixture at ages of 10, 21, 28 and 42 days in conformance with the applicable portions of California Test 559.

Field Qualification

Field qualification of proposed mix proportions will be required prior to placement of pavement concrete. The Contractor shall perform field qualification and submit certified test data to the Engineer. Field qualification data shall be based upon the proposed use of materials, mix proportions, mixing equipment, procedures and size of batch.

Proposed concrete mix proportions will be field qualified when the test results of five beams from a single batch of concrete indicate the average modulus of rupture is at least 3.9 MPa with no single beam lower than 3.8 MPa at an age of the Contractor's choice but not later than 28 days. Beams shall be tested for modulus of rupture at a minimum of 10, 21, and 28 days of age. Test specimens shall be made and tested in conformance with the requirements in California Test 523.

The certified field qualification test data reports shall include the following:

1. Date of mixing,
2. Mixing equipment and procedures used,
3. Volume of batch in cubic meters and the mass or volume,
4. Type and source of ingredients used,
5. Penetration and slump of the concrete,

6. The air content of the concrete, and
7. The age at time of testing and strength of concrete specimens tested.

Field qualification test data reports shall be signed by a certified representative in charge of the laboratory that performed the tests.

If the Contractor changes a source of supply or proportions, the Contractor shall submit a new proposed mix design and furnish samples from the new source, or sources, at least 60 days prior to their intended use. The new mix proportions shall be trial batched and field qualified, unless, the Engineer determines the change is not substantive. No extension of contract time will be allowed for the time required to perform the sampling, testing, preparing and qualifying new mix proportions for new aggregate sources proposed by the Contractor.

MODULUS OF RUPTURE

The Engineer will test portland cement concrete pavement for modulus of rupture in conformance with the requirements in California Test 523. Acceptance will be on a lot basis. Each lot shall not to exceed 750 m³ of concrete pavement. The Engineer will determine sample locations. A minimum of six beam specimens shall be made from each sample. Beam specimens will be tested for modulus of rupture at 10, 21, and 28 days. The modulus of rupture for each lot will be calculated by averaging the results of two beams representing that lot tested at 28 days of age. The difference in modulus of rupture between each individual beam result shall not exceed 0.44 MPa.

The Contractor shall perform sampling and testing of beam specimens to determine if concrete pavement has achieved a modulus of rupture of 2.4 MPa when requesting early use of concrete pavement in conformance with the provisions in Section 90-8.03, "Protecting Concrete Pavement," of the Standard Specifications. Beam specimens shall be made and tested in conformance with the requirements in California Test 523.

INSTALLING TIE BARS

Tie bars shall be installed at longitudinal contact joints and longitudinal weakened plane joints as shown on the plans. Contiguous width of new portland cement concrete pavement tied together with tie bars shall not exceed 15 m. Tie bars shall not be installed at joints between portland cement concrete and hot mix asphalt pavements.

Tie bars shall be installed at longitudinal joints by one of the following methods:

1. Drilling and bonding tie bars with two-component, epoxy-resin that conforms to this section. Drilled holes shall be cleaned in conformance with the epoxy manufacturer's instructions and shall be dry at the time of placing the epoxy and tie bars. Tie bars will be rotated 180° while being inserted into the epoxy filled holes. Immediately after inserting the tie bars into the epoxy, the tie bars shall be supported as necessary to prevent movement during curing and shall remain undisturbed until the epoxy has cured as specified by the manufacturer instructions. Tie bars that are improperly placed or bonded, as determined by the Engineer, will be rejected. If rejected, new holes shall be drilled and new tie bars shall be placed and securely bonded to the concrete. Rejected tie bars shall be cut flush with the joint face. Exposed ends of tie bars shall be epoxy coated. The center of the new holes shall be offset 75 mm horizontally from the center of the rejected hole to maintain the minimum clearance to the dowel bar. Work necessary to correct improperly bonded tie bars shall be performed at the Contractor's expense.
2. Inserting tie bars into the plastic slipformed concrete before finishing the concrete. Inserted tie bars shall have full contact between the bar and the concrete. When tie bars are inserted through the pavement surface, the concrete over the tie bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been an insertion performed. Loose tie bars shall be replaced by drilling and bonding as described in A above, at the Contractor's expense.
3. Using threaded dowel splice couplers fabricated from deformed bar reinforcement material, free of external welding or machining. Threaded dowel splice couplers shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and shall be accompanied with installation instructions. Installation of threaded dowel splice couplers shall conform to the requirements of the manufacturer's recommendations.
4. Using tie bar baskets that conform to these special provisions

Tie bars shall be oriented perpendicular to the pavement joint and parallel with the surface of the pavement at mid-slab depth. Tie bar alignment tolerances shall conform to the requirements for dowel bars except embedment length tolerance shall be ± 50 mm.

If tie bar baskets are used, they shall be anchored to the base to hold the tie bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each basket (4 per lower runner wire). Temporary spacer wires shall be cut or removed after the baskets are anchored into position before concrete placement. Concrete pavement shall not be placed if the baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor in areas where access is restricted or other construction limitations are encountered. The Contractor shall demonstrate that the baskets are anchored and shall not shift during concrete placement. The Contractor shall provide longer concrete nails than the minimum lengths for the varying bases beneath the portland cement concrete when baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

DOWEL PLACEMENT

Dowel bars shall be centered on the joint within a tolerance of ±50 mm in the longitudinal direction directly over the contact joint or sawcut for the transverse weakened plane joints, as shown on the plans. Prior to placement of dowel bars, the Contractor shall submit to the Engineer a written procedure to identify the transverse weakened plane joint locations relative to the middle of the dowel bars and the procedure for consolidating concrete around the dowel bars.

Dowel bars shall be placed at transverse weakened plane joints within shoulder areas except at drainage inlets.

Dowel bars shall be placed as shown on the plans by using dowel bar baskets or by mechanical insertion.

When dowel bars are placed by mechanical insertion, the concrete over the dowel bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been any insertion performed. When drill and bonding of dowel bars is performed at contact joints, a grout retention ring shall be used. When dowel bar baskets are used, they shall be anchored to the base to hold the dowel bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each 3.6-m dowel bar basket (4 per lower runner wire). At least 10 concrete fasteners shall be used for basket sections greater than 3.6 m and less than or equal to 4.9 m. Temporary spacer wires connecting dowel bar baskets shall be cut or removed after the dowel bar baskets are anchored into position prior to concrete placement. Paving shall be suspended when dowel bar baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor, in areas, where access is restricted, or other construction limitations are encountered. The Contractor shall demonstrate to the Engineer's satisfaction that dowel bar baskets are adequately anchored and not shift during concrete placement. The Contractor shall provide longer concrete nails than the minimum lengths for the varying bases beneath the portland cement concrete when anchored dowel bar baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

| Dowel bar placement at transverse and longitudinal weakened plane joints | |
|--|--|
| Horizontal offset | ±25 mm |
| Longitudinal translation | ±50 mm |
| Horizontal skew | 9 mm |
| Vertical skew | 9 mm |
| Vertical depth | (d/3 +12 mm) from pavement surface to top of dowel bar or -15 mm below planned placement |

Note: d = pavement thickness in mm

CORE DRILLING FOR DOWEL BAR AND TIE BAR PLACEMENT ALIGNMENT ASSURANCE TESTING

Coring to confirm dowel bar and tie bar placement, alignment, and concrete consolidation shall be provided by the Contractor throughout the project, at locations determined by the Engineer. Each day's paving shall be cored within 2 days by performing a minimum of 2 and a maximum of 4 tests for dowel bar placement and position for every 1670 m² of doweled pavement or fraction thereof and one test for tie bar placement and position for every 3340 m² of pavement with tie bars. One test shall consist of drilling two cores, one on each end of a dowel bar to expose both ends and allow measurement for proper alignment. The minimum core hole diameter shall be 127 mm. If the cores indicate that dowel bars or tie bars are not within the allowable tolerances or if air voids exist surrounding the dowel bars or tie bars, additional cores will be required to determine the limits and severity of unacceptable work.

The holes shall be cored by methods that will not damage the concrete adjacent to the holes. Immediately after coring, the concrete cores shall be submitted to the Engineer for inspection, and the cores shall be identified by the Contractor with a location description.

After removal of cores, core hole voids in concrete pavement shall be cleaned and filled with hydraulic cement grout (non-shrink). After placement of hydraulic cement grout, the material while still plastic shall be finished and textured to match the adjacent pavement surface. The backfill material shall be the same level as the pavement surface.

Water for core drilling operations shall be from a local domestic water supply, and shall contain not more than 1000 parts per million of chlorides as CL, nor more than 1300 parts per million of sulfates as SO₄, nor shall it contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

Water from core drilling operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into gutters or other drainage facilities.

Dowel bar and tie bar alignment shall be within the specified tolerances. If dowel bars or tie bars are found to be installed improperly, the paving operations shall not continue until the Contractor has demonstrated to the Engineer that the problem which caused the improper dowel bar or tie bar positioning has been corrected.

Dowel bars in rejected joints shall be replaced by the Contractor by saw cutting on each side of the rejected joint a minimum of 0.9 m, lifting out concrete to be removed, installing new dowel bars at the new transverse joints, installing dowel bars and preformed sponge rubber expansion joint filler along the longitudinal joints, placing concrete, and installing new joints. Preformed sponge rubber expansion joint filler shall conform to the requirements in ASTM Designation: D 1752. New dowel bar holes shall be drilled, not more than 3 mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowels to be installed at the contact joints. Dowel bars shall be placed, as shown on the plans, for the 2 new transverse contact joints. Original exposed tie bars, located within the slab replacement area, shall be cut flush with the lane or pavement edge and dowel bars shall be installed to replace the tie bars at an offset of 75 mm, horizontally from the tie bar location. Holes for dowel bars to be placed along the longitudinal joint shall be drilled, not more than 3 mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowel bars to be installed at the contact joints.

When requested by the Contractor and approved by the Engineer, dowel bars which are more than ± 50 mm but less than ± 75 mm from being centered directly over the sawcut for the transverse weakened plane joint, may remain in place, and the Contractor shall pay to the State the amount of \$32.30 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect dowel bar alignment or improper concrete consolidation around dowels. The quantity of concrete pavement area used to determine the amount of payment to the State will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect dowel bar alignment or improper concrete consolidation around dowel bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under the contract. This reduced compensation shall be in addition to other adjustments for incorrect tie bar alignment or improper concrete consolidation around tie bars as specified in these special provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate," of the Standard Specifications.

Tie bars which are not within the specified tolerance for placement and position, as determined from inspection and measurements of cores, may remain in place when requested by the Contractor and approved by the Engineer. The Contractor shall pay to the State the amount of \$23.92 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect tie bar alignment or improper concrete consolidation around tie bars. The quantity of concrete pavement area used to determine the amount of payment to the State will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect tie bar alignment or improper concrete consolidation around tie bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under the contract. This reduced compensation will be in addition to other adjustments for incorrect dowel bar alignment or improper concrete consolidation around dowel bars as specified in these special provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate," of the Standard Specifications.

LIQUID JOINT SEALANT INSTALLATION

The joint sealant detail for longitudinal isolation joints shall be as shown on the plans. Should grinding or grooving be required over or adjacent to joints after sealant has been placed, the joint materials shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, and replaced at the Contractor's expense.

Seven days after the concrete pavement placement and not more than 4 hours before placing joint sealant materials, the joint walls shall be cleaned by the dry sand blast method and other means as necessary to remove from the joint objectionable material such as soil, asphalt, curing compound, paint and rust. Sand blasting shall be performed in at least 2 passes, one for each side of the joint, with the nozzle held at an angle to the joint within 25 mm to 51 mm of the pavement. After cleaning

the joint, traces of sand, dust and loose material shall be removed from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Surface moisture or dampness shall be removed at the joints by means of compressed air or moderate hot compressed air or other means approved by the Engineer. Drying procedures that leave a residue or film on the joint wall shall not be used. Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1 -mm and a minimum pressure of 0.62 MPa.

Joint sealant shall be placed in the clean, dry, prepared joints as shown on the plans. The joint sealant shall be applied using a mechanical device with a nozzle shaped to fit inside the joint to introduce the sealant from inside the joint. Adequate pressure shall be applied to the sealant to ensure that the sealant material is extruded evenly and that full continuous contact is made with the joint walls. After application of the sealant, the surface of the sealant shall be recessed as shown on the plans.

Failure of the joint material in either adhesion or cohesion will be cause for rejection of the joint. The finished surface of joint sealant shall conform to the dimensions and allowable tolerances shown on the plans. Rejected joint materials or joint material whose finished surface does not conform to the dimensions shown on the plans, as determined by the Engineer, shall be repaired or replaced, at the Contractor's expense, with joint material that conforms to the requirements.

After each joint is sealed, surplus joint sealer on the pavement surface shall be removed. Traffic shall not be permitted over the sealed joints until the sealant is tack free and set sufficiently to prevent embedment of roadway debris into the sealant.

PREFORMED COMPRESSION JOINT SEAL INSTALLATION

The compression seal alternative joint detail for transverse and longitudinal joints, as shown on the plans, shall apply only to weakened plane joints. Weakened plane joints shall be constructed by the sawing method. Should grinding or grooving be required over or adjacent to any joint after the compression seal has been placed, the joint materials shall be removed and disposed of, and replaced at the Contractor's expense. Compression seals shall be recessed below the final finished surface as shown on the plans.

Transverse weakened plane joints shall be Type A1 or B as shown on the plans. Longitudinal weakened plane joints shall be Type A2 or B as shown on the plans.

Seven days after the concrete pavement placement and not more than 4 hours before placing preformed compression joint seals, the joint walls shall be cleaned by the dry sand blast method and other means as necessary to remove from the joint objectionable material such as soil, asphalt, curing compound, paint and rust. After cleaning the joint, traces of sand, dust and loose material shall be removed from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Surface moisture or dampness shall be removed at the joints by means of compressed air or moderate hot compressed air or other means approved by the Engineer. Drying procedures that leave a residue or film on the joint wall shall not be used. Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1 mm and a minimum pressure of 0.62 MPa.

Longitudinal seals shall be installed before installing transverse seals. Longitudinal seals shall be continuous except at intersections with transverse seals. Transverse seals shall be installed in one continuous piece throughout each transverse joint. After the longitudinal seal is completed and the transverse seal is ready to be installed, a single cut with a sharp instrument or saw shall be made across the longitudinal seal at the middle of the intersection with the transverse seal. After the initial cut of the longitudinal seal, if the longitudinal joint material does not relax enough to allow proper installation of the transverse seal, the longitudinal joint material shall be trimmed precisely to accommodate the transverse seal and form a tight seal between the 2 joints.

An installation machine specifically designed for the installation of preformed compression joint seals shall be used to install the seal at the specified depth without cutting, nicking, or twisting the seal. The installation machine shall install the seal with no more than 4 percent stretch in the installed seal. Hand installation methods of installing seals will not be permitted.

The percentage of stretch shall be determined by laying a length of the preformed compression joint seal material cut to the exact length of the pavement joint to be sealed. The length shall then be measured. The cut length of preformed compression joint seal material shall then be installed in the joint. Excess amount of seal material remaining at the end of the joint shall be measured as the amount of stretch. The measured amount of stretch shall be divided by the original measured length to determine the percentage of stretch.

The completed seal shall not be twisted or have deformities that prevent the seal from making complete continuous contact with the joint walls. Seals installed that are twisted or deformed, or do not make continuous contact with joint walls or with greater than 4 percent stretch of the joint material will be rejected and removed.

CONSTRUCTING TRANSVERSE CONTACT JOINTS

A transverse contact (construction) joint shall be constructed, including dowel bars, at the end of each day's work or where concrete placement is interrupted for more than 30 minutes, to coincide with the next weakened plane joint location.

If sufficient concrete has not been mixed to form a slab to match the next weakened plane joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of excess concrete shall be at the Contractor's expense. Excess material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of dowel bars.

CONSTRUCTING LONGITUDINAL ISOLATION JOINTS

Final alignment of perpendicular transverse weakened plane joints in pavement shall not be made to match the spacing or skew of the weakened plane joints in the existing parallel concrete pavement. Tie bars shall not be placed across longitudinal isolation joints. The edge of the existing pavement shall be saw cut a width 3 mm and to the full depth of the existing concrete pavement to produce a flat vertical face. Prior to placing concrete, joint filler material shall be placed as shown on the plans. The joint filler shall be secured to the face of the existing pavement joint face by a method that will hold the joint filler in place and prevent the new concrete from adhering to the existing concrete, during placement of concrete.

Sealant for longitudinal isolation joints shall be silicone and placed in conformance with the requirements for liquid joint sealant installation as specified above.

CONSTRUCTING TRANSVERSE JOINT CONNECTIONS AND ANCHORS

Concrete pavement joints at transitions to hot mix asphalt pavement, pavement end anchors and bridge approach slabs shall conform to the details as shown on the plans. Paint binder shall be applied to the concrete surface that hot mix asphalt pavement will contact. Paint binder shall be applied in conformance with the provisions in Section 39, "Hot Mix Asphalt," of the Standard Specifications.

PROFILE INDEX

The pavement surface shall be profiled, by the Contractor not more than 10 days following concrete placement, in the presence of the Engineer, using a California Profilograph or equivalent in conformance with the requirements in California Test 526, except a blanking band of zero (null) shall be used to determine the Profile Index. Two profiles shall be made within each traffic lane, one meter from and parallel with each lane line.

Profiled pavement shall conform to the following Profile Index requirements:

1. Pavement on tangent alignment and pavement on horizontal curves having a centerline radius of curve 600 m or more shall have a Profile Index of 64 mm or less for each 0.1-km.
2. Pavement on horizontal curves having a centerline radius of curve 300 m or more but less than 600 m and pavement within the superelevation transition of those curves shall have a Profile Index of 128 mm or less for each 0.1-km.

Individual high points in excess of 7.5 mm, as determined by measurements of the profilogram in conformance with the requirements in California Test 526, except using a blanking band of zero (null), shall be reduced by grinding in conformance with the requirements in Section 40-1.10, "Final Finishing," of the Standard Specifications until the high points as indicated by reruns of the profilograph do not exceed 7.5 mm.

Pavement grinding shall not be performed before 10 days have elapsed after concrete placement, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa.

CONSTRUCTING WEAKENED PLANE JOINTS (EARLY ENTRY SAW METHOD)

The Contractor may construct weakened plane joints using lighter weight concrete saws (early entry saws) specifically designed for sawing fresh concrete without the use of water. The early entry saws shall be capable of sawing joints within 2 hours of cure time after placement of the concrete pavement without ravelling or tearing, as defined in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications. Joints sawed with early entry saws that develop random cracking shall be removed to the nearest controlled joint and replaced with concrete pavement containing dowel bars and tie bars in conformance with these special provisions and as shown on the plans. The removal and replacement work shall be at the Contractor's expense. Weakened plane joints not sawed within 2 hours of placing concrete pavement shall be sawed by conventional power driven wet-type concrete saws in conformance with the requirements of Section 40-1.08B(1), "Sawing Method," of the Standard Specifications.

Sawed grooves shall be cut to a maximum of 3 mm in width for longitudinal and transverse weakened plane joints made with early entry saws. The minimum depth of cut shall be calculated utilizing the formula in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications except $d = t/4$.

TIE BARS ALONG LONGITUDINAL JOINT FOR SHORT RADIUS CURVES

When paving along short radius curves, the transverse joints shall be maintained in a single continuous straight line across lanes, through the radius point. Tie bars shall maintain minimum clearance from the transverse joint as shown on the plans. If the inside or outside curve of the panel does not allow equal uniform spacing of tie bars at 710 mm between tie bars, then the tie bars shall be equally spaced so that a minimum spacing of 375 mm to a maximum spacing of 710 mm is maintained between tie bars. Additional tie bars shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If dowel bars are specified along longitudinal joint for short radius curves, then dowel bars shall conform to the requirements of this special provision for tie bars spacing and tolerance.

MEASUREMENT AND PAYMENT

Sealing longitudinal and transverse weakened plane joints, and longitudinal isolation joints in portland cement concrete pavement will be measured by the meter. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the sealed pavement joints will be measured and paid for as seal pavement joint.

The contract price paid per meter for seal pavement joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing pavement joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per meter for seal longitudinal isolation joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing longitudinal isolation joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing joint filler material, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Concrete pavement will be measured by the cubic meter in conformance with the provisions in Section 40-1.13, "Measurement," of the Standard Specifications. No deduction will be made for the volume of epoxy-coated dowel bars, epoxy-coated tie bars and, when used, tie bar baskets with fasteners and dowel bar baskets with fasteners, in the concrete pavement. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the concrete will be measured and paid for as concrete pavement.

The contract price paid per cubic meter for concrete pavement shall include full compensation for furnishing all labor, materials (including cementitious material in the amount determined by the Contractor), tools, equipment, and incidentals, and for doing all the work involved in constructing the portland cement concrete pavement complete in place, including furnishing and placing epoxy-coated dowel bars, epoxy-coated tie bars and, when used, any tie bar baskets and dowel bar baskets with fasteners, submittal to the Engineer all test data for determination of mix proportions of concrete for concrete pavement and for providing the facility, Contractor personnel and all the work involved in arranging and holding the prepaving conference, for constructing and repairing all joints; for performing all profile checks for Profile Index and furnishing final profilograms to the Engineer; for grooving and grinding required for final finishing; and for removing, and replacing pavement for deficient thickness, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for drilling holes and bonding tie bars with epoxy resin shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for coring test strips for evaluation by the Engineer and for backfilling core holes with hydraulic cement grout when the test strip remains in place as part of the concrete pavement; and for constructing, coring and removing and disposing of test strips that are rejected shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Costs for providing JITT will be determined in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications, except no markups shall be added, and the Contractor will be paid for one half of the JITT cost. Costs for providing JITT shall include training materials, class site, and the JITT instructor including the JITT instructor's travel, lodging, meals and presentation materials. All costs incurred by the Contractor or Engineer for attending JITT shall be borne by the party incurring the costs.

Full compensation for core drilling for dowel bar or tie bar alignment and backfilling with hydraulic cement grout shall be considered as included in the contract price per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are out of alignment tolerances and the Engineer orders additional dowel bar or tie bar coring, full compensation for drilling the additional cores shall be considered as included in the contract price per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are within alignment tolerances and the Engineer orders more dowel bar coring the additional cores will be paid for as extra work in conformance with the provisions in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Full compensation for drilling holes and bonding dowel bars with epoxy resin shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for furnishing and placing epoxy coated reinforcement for transition end panel shall be considered as included in the contract price paid per cubic yard for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for furnishing and placing paint binder (tack coat) for transition end panel shall be considered as included in the contract price paid per cubic yard for concrete pavement and no additional compensation will be allowed therefor.

10-1.59 REPAIR SPALLED JOINTS

This work shall consist of removing unsound or damaged concrete from spalled areas at transverse or longitudinal joints as directed by the Engineer and filling the area with a fast-setting patching grout in conformance with these special provisions.

MATERIALS

Fast-Setting Grout

Fast-setting grout shall be, at the option of the Contractor, any of the following:

1. Either of the following magnesium phosphate grouts:
 - 1.1 Single component water activated, or
 - 1.2 Dual component with a prepackaged liquid activator
2. Modified high alumina based grout, or
3. Hydraulic cement based grout.

The Contractor may use accelerating admixtures conforming to the requirements in ASTM Designation: C 494/C 494M, Type C and to the provisions in Section 90-4, "Admixtures," of the Standard Specifications, except that the chloride content of the accelerating admixture shall be less than one percent by mass. Fast-setting grout shall conform to the following requirements:

| Property | Test Method | Requirements |
|------------------------------------|----------------------------|--------------|
| Compressive Strength | | |
| at 3 hours, MPa | California Test 551 | 21 min. |
| at 24 hours, MPa | California Test 551 | 35 min. |
| Flexural Strength | | |
| at 24 hours, MPa | California Test 551 | 3.5 min. |
| Bond Strength: at 24 hours | | |
| SSD Concrete, MPa | California Test 551 | 2.1 min. |
| Dry Concrete, MPa | California Test 551 | 2.8 min. |
| Water Absorption, % | California Test 551 | 10 max. |
| Abrasion Resistance | | |
| at 24 hours, grams | California Test 550 | 25 max. |
| Drying Shrinkage at 4 days, % | ASTM Designation: C 596 | 0.13 max. |
| Soluble Chlorides by mass, % | California Test 422 | 0.05 max. |
| Water Soluble Sulfates* by mass, % | California Test 417 | 0.25 max. |

* Test to be a cube specimen, fabricated in conformance with the requirements in ASTM Designation: C 109/C 109M, cured at least 14 days and then pulverized to 100% passing the 300 µm sieve.

Clean, uniformly rounded aggregate filler may be used to extend the prepackaged grout. The moisture content of the aggregate filler shall not exceed 0.5-percent by mass. Grading of the aggregate filler shall conform to the following:

| Sieve Size | Percentage Passing |
|------------|--------------------|
| 6.5 mm | 100 |
| 1.18 mm | 0-5 |

The amount of aggregate filler shall conform to the fast-setting grout manufacturer's recommendation, but in no case shall the amount of aggregate filler exceed 50 percent of the volume of the grout mix.

Fast-setting grout shall be formulated for a minimum initial set time of 15 minutes and a minimum final set time of 25 minutes at 21°C. The materials, prior to use, shall be stored in a cool, dry environment.

Mix water used with water activated material shall be free from oil and shall not contain more than 2000 parts per million of chlorides as Cl, nor more than 1500 parts per million of sulfates as SO₄.

Water for curing shall not contain impurities in sufficient amounts to cause discoloration of the concrete surface or produce etching of the surface.

The quantity of water or liquid activator to be blended with the dry component for magnesium phosphate grout shall conform to the limits recommended by the manufacturer.

Addition of retarders, when needed, shall conform to the fast-setting grout manufacturer's recommendations.

Silicone Joint Sealant

Silicone joint sealant shall be low modulus and shall be furnished in a one-part silicone formulation. Acid cure sealants shall not be used. The Contractor shall use the same brand of silicone joint sealant throughout the project. The silicone joint sealant shall conform to the following requirements:

| Property | Test Method | Requirement |
|--|--|--|
| Tensile stress, 150% elongation, 7-day cure at 25°C±1°C and 45% to 55% R.H. ^e | ASTM Designation: D 412 (Die C) | 310 kPa max. |
| Flow at 25°C ±1°C | ASTM Designation: C 639 ^a | Shall not flow from channel |
| Extrusion Rate at 25°C ±1°C | ASTM Designation: C 603 ^b | 75-250 g/min |
| Specific Gravity | ASTM Designation: D 792 Method A | 1.01 to 1.51 |
| Durometer Hardness, at -18°C, Shore A, cured 7 days at 25°C ±1°C | ASTM Designation: C 661 | 10 to 25 |
| Ozone and Ultraviolet Resistance, After 5000 hours | ASTM Designation: C 793 | No chalking, cracking or bond loss |
| Tack free at 25°C ±1°C and 45% to 55% R.H. ^e | ASTM Designation: C 679 | Less than 75 minutes |
| Elongation, 7 day cure at 25°C ±1°C and 45% to 55% R.H. ^e | ASTM Designation: D 412 (Die C) | 500 percent min. |
| Set to Touch, at 25°C ±1°C and 45% to 55% R.H. ^e | ASTM Designation: D 1640 | Less than 75 minutes |
| Shelf Life, from date of shipment | — | 6 months min. |
| Bond, to concrete mortar-concrete briquettes, air cured 7 days at 25° ± 1°C | AASHTO Designation: T 132 ^c | 345 kPa min. |
| Movement Capability and Adhesion, 100% extension at -18°C after, air cured 7 days at 25°C ±1°C, and followed by 7 days in water at 25°C ±1°C | ASTM Designation: C 719 ^d | No adhesive or cohesive failure after 5 cycles |

Notes:

- a. ASTM Designation: C 639 Modified (15 percent slope channel A).
- b. ASTM Designation: C 603, through 3-mm opening at 345 kPa.
- c. Mold briquettes in conformance with AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with AASHTO Designation: T 132. Briquettes shall be dried to constant mass at 100 C ±5° C.
- d. Movement Capability and Adhesion: Prepare 305 mm x 25 mm x 75 mm concrete blocks in accordance with ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50 mm of block leaving 12.5 mm on each end of specimen unsealed. The depth of sealant shall be 9.5 mm and the width 12.5 mm.
- e. R.H. equals relative humidity.

Silicone joint sealant shall be formulated to cure after application on grades up to 15 percent.

A Certificate of Compliance for silicone joint sealant shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate shall be accompanied with a certified test report of the results for the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project.

Backer Rods

Backer rods shall have a diameter prior to placement at least 25 percent greater than the width of the sealant reservoir and shall be expanded, cross linked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. The Contractor shall submit a manufacturer's data sheet verifying that the backer rod is compatible with the sealant to be used.

Joint Bond Breaker

Joint bond breaker material shall be either corrugated cardboard with a 0.15-mm polyethylene covering or expanded polystyrene material.

Bonding Agent

Bonding agent shall be as recommended by the fast-setting grout manufacturer.

SPALL REPAIR PROCEDURE

Concrete Removal

Outlines of rectangular areas, as marked by the Engineer, shall be cut with a diamond bladed saw to a minimum depth of 50 mm. Unsound and damaged concrete between the saw cut and the joint, and to the depth of the saw cut, shall be removed by methods that will not damage the concrete pavement that is to remain in place. Damage to the concrete pavement beyond the limits to be removed shall be repaired at the Contractor's expense. A pneumatic hammer greater than 7 kg shall not be used for removal of concrete.

Concrete pavement removed to repair spalled joints shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way," of the Standard Specifications.

Cleaning

After the repair area has been cleared of unsound concrete, the exposed faces of the concrete shall be thoroughly cleaned. Cleaning shall be by abrasive blasting, either sand blasting or high pressure water blasting. Water blasting equipment for concrete cleaning shall be capable of producing a blast pressure of 20 MPa to 40 MPa.

After abrasive blasting, the exposed concrete area shall be cleaned with moisture-free, oil-free compressed air to remove debris. Air compressors shall deliver air at a minimum of 3.4 m³ per minute and develop 0.63-MPa of nozzle pressure.

Joint Bond Breaker Installation

A joint bond breaker shall be placed along the joint, and extend 25 mm beyond the edges of the patch. Joint bond breaker shall be the same width as the existing joint.

Bonding Agent Application

Bonding agent shall be mixed on site in small quantities and mixed in conformance with the manufacturer's instructions. Bonding agent shall be applied in a thin, even coat by using a stiff bristle brush scrubbing the entire area including the patch walls.

Mixing Fast-Setting Grout

Fast-setting grout shall be mixed in a small mobile drum or paddle mixer in conformance with the manufacturer's instructions and these special provisions.

The components of prepackaged, dual component magnesium phosphate grout with a prepackaged liquid activator shall be as supplied by the manufacturer. Portions of components shall not be used. Water shall not be added to dual component magnesium phosphate grout.

Magnesium phosphate grout shall not be mixed in containers or worked with tools containing zinc, cadmium, aluminum, or copper. Modified high alumina based grout shall not be mixed in containers or worked with tools containing aluminum.

Placement of Fast-Setting Grout

Magnesium phosphate grout shall be placed on a dry surface. The grout shall air cure with no curing medium applied. The repaired area shall be protected from public traffic for at least 2 hours after the grout sets.

High alumina based grout and hydraulic cement based grout may be placed on either a dry or damp surface, in conformance with the manufacturer's instructions. Curing shall be in conformance with the manufacturer's instructions. When curing compound is recommended by the manufacturer, either curing compound (1) or (2) that conforms to Section 90-7.01B, "Curing Compound Method," of the Standard Specifications may be used. The repaired area shall be protected from public traffic for at least 2 hours after the grout sets.

Resealing Joints

Existing joints where sealant was removed shall be cleaned, resealed and recessed below the final surface as shown on the plans in conformance with the joint sealant manufacturer's instructions and these special provisions.

MEASUREMENT AND PAYMENT

Repairing spalled joints will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

10-1.60 GRIND EXISTING CONCRETE PAVEMENT

This work shall consist of grinding existing portland cement concrete as shown on the plans, as specified in Section 42-2, "Grinding," of the Standard Specifications and these special provisions, and as directed by the Engineer.

Grinding equipment for grinding concrete pavements shall use diamond blades mounted on a self-propelled machine designed for grinding and texturing concrete pavements. Grinding equipment that causes raveling, aggregate fracturing, or spalling, or that damages the transverse or longitudinal joints shall not be used.

Grinding shall be performed in the longitudinal direction of the traveled way and shall be done full lane width so that the grinding begins and ends at lines perpendicular to the pavement centerline.

Grinding concrete pavement shall result in a parallel corduroy texture consisting of grooves 2 mm to 3 mm wide with 183 to 193 grooves per meter width of grinding. Tops of ridges shall be between 1.5 mm and 2.0 mm from the bottom of the blade grooves.

The ground surface at transverse joints or cracks will be tested with a 3.6 m \pm 0.06-m long straightedge laid on the pavement parallel with the centerline with its midpoint at the joint or crack. The surface shall not vary by more than 2 mm from the lower edge of the straightedge.

Cross-slope uniformity and positive drainage shall be maintained across the entire traveled way and shoulder. The cross-slope shall be uniform so that when tested with a 3.6 m \pm 0.06-m long straightedge placed perpendicular to the centerline, the ground pavement surface shall not vary more than 6 mm from the lower edge of the straightedge.

Full compensation for grinding existing concrete pavement will be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

10-1.61 DISPOSAL OF PORTLAND CEMENT CONCRETE (PCC) PAVEMENT GROOVING AND GRINDING RESIDUES

Disposal of portland cement concrete (PCC) pavement grooving and grinding residues shall be in conformance with the provisions in Section 42, "Groove and Grind Pavement," of the Standard Specifications and these special provisions.

The Contractor shall include water pollution control measures to address the handling of the grinding pavement residue within the Storm Water Pollution Prevention Plan or Water Pollution Control Program, as specified in "Water Pollution Control," of these special provisions.

Temporary storage of PCC pavement grooving and grinding residues shall not be allowed within the highway right of way. The Contractor may transport liquid PCC pavement grooving and grinding residues to an offsite drying location if the Engineer provides written approval. The offsite drying location shall be identified and protected in conformance with "Water Pollution Control," of these special provisions.

A Materials Information Handout is not available for disposal of PCC pavement grooving or grinding residues. The Contractor shall dispose of PCC pavement grooving and grinding residues in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside of the Right of Way," of the Standard Specifications. The facilities listed below were permitted by Regional Water Quality Control Board (RWQCB) or other agencies that may accept PCC pavement grinding and grooving residues as of July 1, 2004. If the Contractor is planning to use one of these sites, the Contractor shall determine if the facility has a current permit to accept PCC pavement grooving and grinding residues and if the facility can accept the waste at the time of generation.

| SITE NAME | LOCATION | TELEPHONE | WASTE TYPES / RESTRICTIONS |
|---|--|----------------------------------|---|
| Clean Harbors Environmental Services Buttonwillow | 2500 West Lokern Road Buttonwillow, CA | (562) 432-5445 | Hazardous Solids and Non-Hazardous Liquids and Solids |
| Clean Harbors Environmental Services San Jose | 1021 Berryessa San Jose, CA | (408) 451-5000 | Hazardous and Non-Hazardous Liquids |
| Crosby & Overton, Inc. | 1610 W. 17th Street Long Beach, CA | (562) 432-5445 | Hazardous and Non-Hazardous Liquids |
| D/K Environmental | 3650 East 26th Street Vernon, CA | (323) 268-5056 | Hazardous and Non-Hazardous Liquids and Solids |
| DeMenno-Kerdoon | 200 N. Alameda Street Compton, CA | (323) 268-5057 (310) 537-7100 | Hazardous and Non-Hazardous Liquids and Solids |
| Filter Recycling Services, Inc. | 180 West Monte Avenue Rialto, CA | (909) 424-1630 | Hazardous and Non-Hazardous Liquids |
| K-Pure Water Works | 8910 Rochester Ave Rancho Cucamonga, CA | (909) 476-2308 | Non-Hazardous Liquids |
| Liquid Waste Management McKittrick | 56533 Highway 58 McKittrick, CA | (559) 386 - 6104 | Non-Hazardous Liquids and Solids |
| Onyx Environmental Services LLC | 1704 W. First Street Azusa, CA | (626) 334-5117 | Hazardous and Non-Hazardous Liquids and Solids |
| Phibro-Tech, Inc. | 8851 Dice Road Santa Fe Springs, CA | (562) 698-8036 | Hazardous and Non-Hazardous Liquids and Solids |
| Romic Environmental Technologies Corporation | 2081 Bay Road East Palo Alto, CA | (650) 324-1638 | Hazardous and Non-Hazardous Liquids |
| Seaport Environmental | 700 Seaport Boulevard Redwood City, CA | (650) 364-8154 | Non-Hazardous Liquids |
| Southwest Treatment Systems, Inc. | 4120 Bandini Boulevard Los Angeles, CA | (800) 900-3366 | Non-Hazardous Liquids |
| US Filter Recovery Services, Inc. | 5375 S. Boyle Avenue Vernon, CA | (323) 277-1495 | Hazardous and Non-Hazardous Liquids and Solids |
| Waste Management Kettleman City | 35251 Old Skyline Road Kettleman City, CA | (559) 386 - 6104 | Hazardous and Non-Hazardous Liquids and Solids |

If the Contractor disposes of PCC pavement grooving and grinding residues at locations not listed above, the disposal shall be in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, and the following:

1. If the disposal facility is located within the State of California, the facility must be permitted by the RWQCB or other applicable agency, or the Contractor must obtain written approval from the RWQCB or other applicable agency.
2. If located outside of the State of California, the facility must be permitted by the applicable local, state, or federal agencies, or the Contractor must obtain written approval from the applicable local, state, or federal agencies.

The following shall be delivered to the Engineer at least 5 days before disposal of PCC pavement grooving and grinding residues:

1. The name, address, and telephone number of the disposal facility.
2. If the facility is not listed above:
 - A. Copy of the facility's RWQCB or other applicable agency permit, or
 - B. RWQCB's or other applicable agency's approval, or
 - C. Copy of the applicable agency permit if the final disposal location is located outside of the State of California.

The Contractor shall deliver landfill receipts and weight ticket of disposal of residues from PCC pavement grooving and grinding to the Engineer within 5 days of completing of PCC pavement grooving and grinding activities.

The Contractor shall make all arrangements and agreements for the disposal at the time of bidding. Costs related to obtaining approval for disposal within the State of California from the RWQCB or other applicable agency, or the applicable agency if the disposal location is located outside of the State of California, shall be borne by the Contractor and no additional payment shall be made therefore. Full compensation for all costs involved in disposing of PCC pavement grooving or grinding residues as specified in this section, including all costs of handling, temporary storage, hauling and disposal fees, shall be considered as included in the price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

10-1.62 PILING

GENERAL

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Unless otherwise specified, welding of any work performed in conformance with the provisions in Section 49, "Piling," of the Standard Specifications, shall be in conformance with the requirements in AWS D1.1.

Difficult pile installation is anticipated due to the presence of overlying dense soils, caving soils ground water, cobbles and gravel, underground utilities, hard driving, sound control, and traffic control.

Jetting and Drilling

Jetting or drilling to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications shall not be used for driven type piles.

Predrilled Holes

Piles shall be driven in oversized drilled holes in conformance with the provisions in Section 49-1.06, "Predrilled Holes," of the Standard Specifications at the locations and to the corresponding bottom of hole elevations listed in the following table:

| Bridge Name or Number | Abutment Number | Bent Number | Elevation of Bottom of Hole |
|--|-----------------|-------------|---|
| MASSACHUSETTS AVE OC (REPLACE) (Bridge Number 54-1265) | 6 | -- | OG elevation varies. Drill to OG elevation for piles in fill area only. |

CAST-IN-DRILLED-HOLE CONCRETE PILES

Cast-in-drilled-hole concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles," of the Standard Specifications and these special provisions.

The provisions of "Welding" of these special provisions shall not apply to temporary steel casings.

Cast-in-drilled-hole concrete piles 600 mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

Materials

Concrete deposited under slurry shall have a nominal penetration equal to or greater than 90 mm. Concrete shall be proportioned to prevent excessive bleed water and segregation.

Concrete deposited under slurry shall contain not less than 400 kg of cementitious material per cubic meter.

The combined aggregate grading used in concrete for cast-in-drilled-hole concrete piling shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading and shall conform to the requirements in Section 90-3, "Aggregate Gradings," of the Standard Specifications.

Mineral Slurry

Mineral slurry shall be mixed and thoroughly hydrated in slurry tanks, and slurry shall be sampled from the slurry tanks and tested before placement in the drilled hole.

Slurry shall be recirculated or continuously agitated in the drilled hole to maintain the specified properties.

Recirculation shall include removal of drill cuttings from the slurry before discharging the slurry back into the drilled hole. When recirculation is used, the slurry shall be sampled and tested at least every 2 hours after beginning its use until tests show that the samples taken from the slurry tank and from near the bottom of the hole have consistent specified properties. Subsequently, slurry shall be sampled at least twice per shift as long as the specified properties remain consistent.

Slurry that is not recirculated in the drilled hole shall be sampled and tested at least every 2 hours after beginning its use. The slurry shall be sampled mid-height and near the bottom of the hole. Slurry shall be recirculated when tests show that the samples taken from mid-height and near the bottom of the hole do not have consistent specified properties.

Slurry shall also be sampled and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete. Samples shall be taken from mid-height and near the bottom of the hole. Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken from mid-height and near the bottom of the hole have consistent specified properties.

Mineral slurry shall be tested for conformance to the requirements shown in the following table:

| MINERAL SLURRY | | |
|--|--|--|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³) - before placement in the drilled hole - during drilling - prior to final cleaning - immediately prior to placing concrete | 1030* to 1110* 1030* to 1200* | Mud Weight (Density) API 13B-1 Section 1 |
| Viscosity (seconds/liter) bentonite attapulgate | 29 to 53 29 to 42 | Marsh Funnel and Cup API 13B-1 Section 2.2 |
| pH | 8 to 10.5 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent) - prior to final cleaning - immediately prior to placing concrete | less than or equal to 4.0 | Sand API 13B-1 Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested. | | |

Any caked slurry on the sides or bottom of hole shall be removed before placing reinforcement. If concrete is not placed immediately after placing reinforcement, the reinforcement shall be removed and cleaned of slurry, the sides of the drilled hole cleaned of caked slurry, and the reinforcement again placed in the hole for concrete placement.

Synthetic Slurry

Synthetic slurries shall be used in conformance with the manufacturer's recommendations and these special provisions. The following synthetic slurries may be used:

| PRODUCT | MANUFACTURER |
|-----------------|--|
| SlurryPro CDP | KB Technologies Ltd. 3648 FM 1960 West Suite 107 Houston, TX 77068 (800) 525-5237 |
| Super Mud | PDS Company c/o Champion Equipment Company 8140 East Rosecrans Ave. Paramount, CA 90723 (562) 634-8180 |
| Shore Pac GCV | CETCO Drilling Products Group 1350 West Shure Drive Arlington Heights, IL 60004 (847) 392-5800 |
| Novagel Polymer | Geo-Tech Drilling Fluids 220 N. Zapata Hwy, Suite 11A Laredo, TX 78043 (210) 587-4758 |

Inclusion of a synthetic slurry on the above list may be obtained by meeting the Department's requirements for synthetic slurries. The requirements can be obtained from the Office of Structure Design, P.O. Box 942874, Sacramento, CA 94274-0001.

Synthetic slurries listed may not be appropriate for a given site.

Synthetic slurries shall not be used in holes drilled in primarily soft or very soft cohesive soils as determined by the Engineer.

A manufacturer's representative, as approved by the Engineer, shall provide technical assistance for the use of their product, shall be at the site prior to introduction of the synthetic slurry into a drilled hole, and shall remain at the site until released by the Engineer.

Synthetic slurries shall be sampled and tested at both mid-height and near the bottom of the drilled hole. Samples shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. Samples shall be taken and tested when drilling is complete, but prior to final cleaning of the bottom of the hole. When samples are in conformance with the requirements shown in the following tables for each slurry product, the bottom of the hole shall be cleaned and any loose or settled material removed. Samples shall be obtained and tested after final cleaning and immediately prior to placing concrete.

SlurryPro CDP synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| SLURRYPRO CDP KB Technologies Ltd. | | |
|--|--|--|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³) - during drilling - prior to final cleaning - just prior to placing concrete | less than or equal to 1075* less than or equal to 1025* | Mud Weight (Density) API 13B-1 Section 1 |
| Viscosity (seconds/liter) - during drilling -prior to final cleaning - just prior to placing concrete | 53 to 127 less than or equal to 74 | Marsh Funnel and Cup API 13B-1 Section 2.2 |
| pH | 6 to 11.5 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent) - prior to final cleaning - just prior to placing concrete | less than or equal to 0.5 | Sand API 13B-1 Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested. | | |

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| SUPER MUD PDS Company | | |
|--|--|--|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³) - prior to final cleaning - just prior to placing concrete | less than or equal to 1025* | Mud Weight (Density) API 13B-1 Section 1 |
| Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete | 34 to 64 less than or equal to 64 | Marsh Funnel and Cup API 13B-1 Section 2.2 |
| pH | 8 to 10.0 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent) - prior to final cleaning -just prior to placing concrete | less than or equal to 0.5 | Sand API 13B-1 Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested. | | |

Shore Pac GCV synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| Shore Pac GCV CETCO Drilling Products Group | | |
|--|--|--|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³) - prior to final cleaning - just prior to placing concrete | less than or equal to 1025* | Mud Weight (Density) API 13B-1 Section 1 |
| Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete | 35 to 78 less than or equal to 60 | Marsh Funnel and Cup API 13B-1 Section 2.2 |
| pH | 8.0 to 11.0 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent) - prior to final cleaning -just prior to placing concrete | less than or equal to 0.5 | Sand API 13B-1 Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested. | | |

Novagel Polymer synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| NOVAGEL POLYMER Geo-Tech Drilling Fluids | | |
|--|--|--|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³) - during drilling - prior to final cleaning - just prior to placing concrete | less than or equal to 1075* less than or equal to 1025* | Mud Weight (Density) API 13B-1 Section 1 |
| Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete | 48 to 110 less than or equal to 110 | Marsh Funnel and Cup API 13B-1 Section 2.2 |
| pH | 6.0 to 11.5 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent) - prior to final cleaning -just prior to placing concrete | less than or equal to 0.5 | Sand API 13B-1 Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested. | | |

Water Slurry

At the option of the Contractor, water may be used as slurry when casing is used for the entire length of the drilled hole. Water slurry shall be tested for conformance to the requirements shown in the following table:

| WATER SLURRY | | |
|--|---------------------------|--|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³) - prior to final cleaning - just prior to placing concrete | 1017 * | Mud Weight (Density) API 13B-1 Section 1 |
| Sand Content (percent) - prior to final cleaning -just prior to placing concrete | less than or equal to 0.5 | Sand API 13B-1 Section 5 |
| *When approved by the Engineer, salt water slurry may be used, and the allowable densities may be increased up to 32 kg/m ³ . | | |

Construction

The Contractor shall submit a placing plan to the Engineer for approval prior to producing the test batch for cast-in-drilled-hole concrete piling and at least 10 working days prior to constructing piling. The plan shall include complete descriptions, details, and supporting calculations as listed below:

A. Requirements for all cast-in-drilled-hole concrete piling:

1. Concrete mix design, certified test data, and trial batch reports.
2. Drilling or coring methods and equipment.
3. Proposed method for casing installation and removal when necessary.
4. Plan view drawing of pile showing reinforcement.
5. Methods for placing, positioning, and supporting bar reinforcement.
6. Methods and equipment for accurately determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
7. Methods and equipment for verifying that the bottom of the drilled hole is clean prior to placing concrete.
8. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

B. Additional requirements when concrete is placed under slurry:

1. Plan view drawing of pile showing inspection pipes.
2. Concrete batching, delivery, and placing systems, including time schedules and capacities therefor. Time schedules shall include the time required for each concrete placing operation at each pile.
3. Concrete placing rate calculations. When requested by the Engineer, calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
4. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
5. Slurry testing equipment and procedures.
6. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
7. Methods and equipment for slurry agitating, recirculating, and cleaning.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before use by producing a test batch. The test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during the placement of concrete in the piles. Concrete for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow for testing as specified herein. Depositing of test batch concrete under slurry will not be required. In addition to meeting the specified nominal penetration, the test batch shall meet the following requirements:

- A. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be 2 hours or less, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after twice that time has elapsed.
- B. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be more than 2 hours, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after that time plus 2 hours has elapsed.

The time period shall begin at the start of placement. The concrete shall not be vibrated or agitated during the test period. Penetration tests shall be performed in conformance with the requirements in California Test 533. Slump tests shall be performed in conformance with the requirements in ASTM Designation: C 143. Upon completion of testing, the concrete shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The concrete deposited under slurry shall be carefully placed in a compact, monolithic mass and by a method that will prevent washing of the concrete. Concrete deposited under slurry need not be vibrated. Placing concrete shall be a continuous operation lasting not more than the time required for each concrete placing operation at each pile, as submitted in the placing plan, unless otherwise approved in writing by the Engineer. The concrete shall be placed with concrete pumps and delivery tube system of adequate number and size to complete the placing of concrete in the time specified. The delivery tube system shall consist of one of the following:

- A. A tremie tube or tubes, each of which are at least 250 mm in diameter, fed by one or more concrete pumps.
- B. One or more concrete pump tubes, each fed by a single concrete pump.

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. If only one delivery tube is utilized to place the concrete, the tube shall be placed near the center of the drilled hole. Multiple tubes shall be uniformly spaced in the hole. Internal bracing for the steel reinforcing cage shall accommodate the delivery tube system. Tremies shall not be used for piles without space for a 250-mm tube.

Spillage of concrete into the slurry during concrete placing operations shall not be allowed. Delivery tubes shall be capped with a watertight cap, or plugged above the slurry level with a good quality, tight fitting, moving plug that will expel the slurry from the tube as the tube is charged with concrete. The cap or plug shall be designed to be released as the tube is charged. The pump discharge or tremie tube shall extend to the bottom of the hole before charging the tube with concrete. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end. During concrete placement, the tip of the delivery tube shall be maintained as follows to prevent reentry of the slurry into the tube. Until at least 3 m of concrete has been placed, the tip of the delivery tube shall be within 150 mm of the bottom of the drilled hole, and then the embedment of the tip shall be maintained at least 3 m below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. If the seal is lost or the delivery tube becomes plugged and must be removed, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the slurry, and the operation restarted by pushing the capped tube 3 m into the concrete and then reinitiating the flow of concrete.

When slurry is used, a fully operational standby concrete pump, adequate to complete the work in the time specified, shall be provided at the site during concrete placement. The slurry level shall be maintained within 300 mm of the top of the drilled hole.

A log of concrete placement for each drilled hole shall be maintained by the Contractor when concrete is deposited under slurry. The log shall show the pile location, tip elevation, dates of excavation and concrete placement, total quantity of concrete deposited, length and tip elevation of any casing, and details of any hole stabilization method and materials used. The log shall include a 215 mm x 280 mm sized graph of the concrete placed versus depth of hole filled. The graph shall be plotted continuously throughout placing of concrete. The depth of drilled hole filled shall be plotted vertically with the pile tip oriented at the bottom and the quantity of concrete shall be plotted horizontally. Readings shall be made at least at each 1.5 m of pile depth, and the time of the reading shall be indicated. The graph shall be labeled with the pile location, tip elevation, cutoff elevation, and the dates of excavation and concrete placement. The log shall be delivered to the Engineer within one working day of completion of placing concrete in the pile.

After placing reinforcement and prior to placing concrete in the drilled hole, if drill cuttings settle out of the slurry, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

If temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 m above the bottom of the casing. The withdrawal of casings shall not cause contamination of the concrete with slurry.

Acceptance Testing and Mitigation

Vertical inspection pipes for acceptance testing shall be provided in all cast-in-drilled-hole concrete piles that are 600 mm in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing to control ground water.

Inspection pipes shall be Schedule 40 polyvinyl chloride pipes with a nominal inside diameter of 50 mm. Each inspection pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50-mm diameter clear opening from 1.0 m above the pile cutoff down to the bottom of the reinforcing cage.

Inspection pipes shall be placed around the pile, inside the outermost spiral or hoop reinforcement, and 75 mm clear of the vertical reinforcement, at a uniform spacing not exceeding 840 mm measured along the circle passing through the centers of inspection pipes. A minimum of 2 inspection pipes per pile shall be used. When the vertical reinforcement is not bundled and each bar is not more than 26 mm in diameter, inspection pipes may be placed 50 mm clear of the vertical reinforcement. The inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the clear spacing required herein. The pipes shall be installed in straight alignment, parallel to the main reinforcement, and securely fastened in place to prevent misalignment during installation of the reinforcement and placing of concrete in the hole.

The Contractor shall log the location of the inspection pipe couplers with respect to the plane of pile cut off, and these logs shall be delivered to the Engineer upon completion of the placement of concrete in the drilled hole.

After placing concrete and before requesting acceptance tests, each inspection pipe shall be tested by the Contractor in the presence of the Engineer by passing a 48.3-mm diameter rigid cylinder 610 mm long through the complete length of pipe. If the 48.3-mm diameter rigid cylinder fails to pass any of the inspection pipes, the Contractor shall attempt to pass a 32.0-mm diameter rigid cylinder 1.375 m long through the complete length of those pipes in the presence of the Engineer. If an inspection pipe fails to pass the 32.0-mm diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

The Contractor shall replace each inspection pipe that does not pass the 32.0-mm diameter cylinder with a 50.8-mm diameter hole cored through the concrete for the entire length of the pile. Cored holes shall be located as close as possible to the inspection pipes they are replacing and shall be no more than 150 mm inside the reinforcement. Coring shall not damage the pile reinforcement. Cored holes shall be made with a double wall core barrel system utilizing a split tube type inner barrel. Coring with a solid type inner barrel will not be allowed. Coring methods and equipment shall provide intact cores for the entire length of the pile concrete. The coring operation shall be logged by an Engineering Geologist or Civil Engineer licensed in the State of California and experienced in core logging. Coring logs shall include complete descriptions of inclusions and voids encountered during coring, and shall be delivered to the Engineer upon completion. Concrete cores shall be preserved, identified with the exact location the core was recovered from within the pile, and made available for inspection by the Engineer.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging. Tests may also include crosshole sonic logging and other means of inspection selected by the Engineer. The Contractor shall not conduct operations within 8.0 m of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piling, the Contractor shall allow 25 days for the Engineer to conduct these tests and make determination of acceptance if the 48.3-mm diameter cylinder passed all inspection pipes, and 30 days if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete these tests within the time allowance, and if in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All inspection pipes and cored holes in a pile shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Placement and removal of water in the inspection pipes shall be at the Contractor's expense. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. The inspection pipes and holes shall be filled using grout tubes that extend to the bottom of the pipe or hole or into the grout already placed.

If acceptance testing performed by the Engineer determines that a pile does not meet the requirements of the specifications, then that pile will be rejected and all depositing of concrete under slurry or concrete placed using temporary casing for the purpose of controlling groundwater shall be suspended until written changes to the methods of pile construction are approved in writing by the Engineer.

The Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected cast-in-drilled-hole concrete pile, and this plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Prior to submitting this mitigation plan, the Engineer will hold a repair feasibility meeting with the Contractor to discuss the feasibility of repairing rejected piling. The Engineer will consider the size of the defect, the location of the defect, and the design information and corrosion protection considerations for the pile. This information will be made available to the Contractor, if appropriate, for the development of the mitigation plan. If the Engineer determines that it is not feasible to repair the rejected pile, the Contractor shall not include repair as a means of mitigation and shall proceed with the submittal of a mitigation plan for replacement or supplementation of the rejected pile.

If the Engineer determines that a rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, the Contractor may elect to 1) repair the pile per the approved mitigation plan, or 2) not repair anomalies found during acceptance testing of that pile. For such unrepaired piles, the Contractor shall pay to the State, \$400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meters, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment to the State for any such pile be less than \$400. The Department may deduct the amount from any moneys due, or that may become due the Contractor under the contract.

Pile mitigation plans shall include the following:

- A. The designation and location of the pile addressed by the mitigation plan.
- B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
- C. A step by step description of the mitigation work to be performed, including drawings if necessary.
- D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.
- E. Methods for preservation or restoration of existing earthen materials.
- F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
- G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor's (and Subcontractor's if applicable) name on each sheet.
- H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
- I. The seal and signature of an engineer who is licensed as a Civil Engineer by the State of California.

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. An assessment of the nature and size of the anomalies in the rejected pile.
- B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. The proposed location and size of additional piling.
- B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piling.

All provisions for cast-in-drilled-hole concrete piling shall apply to replacement piling.

The Contractor shall allow the Engineer 25 days to review the mitigation plan after a complete submittal has been received.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor (and subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

MEASUREMENT AND PAYMENT (PILING)

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications and these special provisions.

Payment for cast-in-place concrete piling shall conform to the provisions in Section 49-6.02, "Payment," of the Standard Specifications and these special provisions except that, when the diameter of cast-in-place concrete piling is shown on the plans as 600 mm or larger, reinforcement in the piling will be paid for by the kilogram as bar reinforcing steel (bridge).

Full compensation for slurry, depositing concrete under slurry, test batches, inspection pipes, filling inspection holes and pipes with grout, drilling oversized cast-in-drilled-hole concrete piling, filling cave-ins and oversized piles with concrete, and re-drilling through concrete, shall be considered as included in the contract prices paid per meter for cast-in-drilled-hole concrete piling of the types and sizes listed in the Engineer's Estimate, and no additional compensation will be allowed therefor.

10-1.63 PRESTRESSING CONCRETE

Prestressing concrete shall conform to the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

The details shown on the plans for cast-in-place prestressed box girder bridges are based on a bonded full length draped tendon prestressing system. For these bridges the Contractor may, in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, propose an alternative prestressing system utilizing bonded partial length tendons provided the proposed system and associated details meet the following requirements:

- A. The proposed system and details shall provide moment and shear resistances at least equal to those used for the design of the structure shown on the plans.
- B. The concrete strength shall not be less than that shown on the plans.
- C. Not less than 35 percent of the total prestressing force at any section shall be provided by full length draped tendons.
- D. Anchorage blocks for partial length tendons shall be located so that the blocks will not interfere with the placement of the utility facilities shown on the plans or of any future utilities to be placed through openings shown on the plans.
- E. Temporary prestressing tendons, if used, shall be detensioned, and the temporary ducts shall be filled with grout before completion of the work. Temporary tendons shall be either removed or fully encased in grout before completion of the work.
- F. All details of the proposed system, including supporting checked calculations, shall be included in the drawings submitted in conformance with the provisions in Section 50-1.02, "Drawings," of the Standard Specifications.

Moments and shears for loads used in the design shown on the plans will be made available to the Contractor upon written request to the Engineer.

10-1.64 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

GENERAL

Shotcrete shall not be used as an alternative construction method for reinforced concrete members.

Neoprene strip shall be furnished and installed at abutment backwall joint protection in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

Furnishing and installing neoprene strip shall conform to the requirements for strip waterstops as provided in Section 51-1.145, "Strip Waterstops," of the Standard Specifications, except that the protective board will not be required.

Forms used to support the deck of cast-in-place box girders or to form the voids of precast members for the following structures may remain in place, provided the portions of the forms that obstruct access openings or conflict with utility facilities are removed, the forming system employed leaves no sharp projections into the cells or voids, and forms between hinges and 1.5 m beyond access openings adjacent to hinges are removed:

MASSACHUSETTS AVENUE OC (REPLACE), Bridge Number: 54-1265

Materials for access opening covers in soffits of new cast-in-place concrete box girder bridges shall conform to the provisions for materials in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Plastic pipe located at vertical drains used behind retaining walls, including horizontal or sloping drains down slopes and across sidewalk areas, shall be polyvinyl chloride (PVC) plastic pipe, Schedule 80, conforming to the provisions for pipe for edge drains and edge drain outlets in Section 68-3.02, "Materials," of the Standard Specifications. The vertical drain pipe shall be rigidly supported in place during backfilling operations.

Vertical, horizontal, radial, or normal dimensions shown on the Typical Section in the plans are for zero percent cross slope. At the Contractor's option, the Typical Section of superelevated concrete box girder structures with (1) sloping exterior girders, (2) a straight uninterrupted cross slope between edges of deck, and (3) a single profile grade line, may be rotated around the profile grade line in superelevation areas. The horizontal distances between the profile grade line and the edges of deck shall remain unchanged. The planned girder widths and slab thicknesses shall remain unchanged and the interior girder stems shall remain vertical at the planned locations.

DECK CRACK TREATMENT

When methacrylate resin work is to be conducted within 31 meters of a residence, business, or public space, including sidewalks under a structure, the Contractor shall notify the public at least 7 days before starting work and monitor airborne emissions during the work. Public notification and monitoring of airborne emissions shall conform to the following:

- A. The public safety plan required in Section 51-1.17A, "Deck Crack Treatment," of the Standard Specifications shall include a copy of the notification letter and a list of addresses and locations where the letter will be delivered and posted. The letter shall state the methacrylate resin work locations, dates, times, and what to expect. The letter shall be delivered to each residence and each business within 31 meters of the methacrylate resin work. The letter shall be delivered to local fire and police responders, and it shall be posted at the job site.
- B. The public safety plan shall include an airborne emissions monitoring plan prepared by a certified industrial hygienist and a copy of the hygienist's certification. Airborne emissions shall be monitored at a minimum of 4 points including the point of mixing, the point of application, and the point of nearest public contact, as determined by the Engineer. At the completion of methacrylate resin work, a report by the certified industrial hygienist with results of the airborne emissions monitoring plan shall be submitted to the Engineer.

DRILL AND BOND DOWELS

Drilling and bonding dowels shall conform to the details shown on the plans, the provisions in Section 83-2.02D(1), "General," of the Standard Specifications, and these special provisions.

Dowels shall conform to the provisions for bar reinforcement in "Reinforcement" of these special provisions.

If reinforcement is encountered during drilling before the specified depth is attained, the Engineer shall be notified. Unless the Engineer approves coring through the reinforcement, the hole will be rejected and a new hole, in which reinforcement is not encountered, shall be drilled adjacent to the rejected hole to the depth shown on the plans.

Unless otherwise provided, full compensation for dowels to be bonded into drilled holes shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge, and no separate payment will be made therefore.

FALSEWORK

Falsework shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Attention is directed to "Railroad Relations and Insurance" of these special provisions for additional requirements for falsework over railroads.

In addition to the provisions in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications, the time to be provided for the Engineer's review of the working drawings for specific structures, or portions thereof, shall be as follows:

| Structure or Portion of Structure | Total Review Time - Weeks |
|--|---------------------------|
| MASSACHUSETTS AVE OC (REPLACE) (BRIDGE NO. 54-1265) | 9 |
| HIGHLAND AVE OC (REPLACE) (BRIDGE NO. 54-1266) | 9 |
| CAJON BLVD OH (BRIDGE NO. 54-0945G) | 9 |
| N215-W210 CONNECTOR (BRIDGE NO. 54-1234) | 9 |

The work performed in connection with the construction of falsework for Bridge No. 54-1234 that involves removal and reconstruction of portions of existing Bridge No. 54-0947R for deck access openings shall conform to the details shown on the plans, "Bridge Removal" and "Deck Closure Pours" of these special provisions, and Section 51, "Concrete Structures," of the Standard Specifications. Falsework design and drawings shall include temporary removal and reconstruction work.

The Contractor's engineer who signs the falsework drawings shall also certify in writing that the falsework is constructed in conformance with the approved drawings and the contract specifications prior to placing concrete. This certification shall include performing any testing necessary to verify the ability of the falsework members to sustain the stresses required by the falsework design. The engineer who signs the drawings may designate a representative to perform this certification. Where falsework contains openings for railroads, vehicular traffic, or pedestrians, the designated representative shall be qualified to perform this work, shall have at least three years of combined experience in falsework design or supervising falsework construction, and shall be registered as a Civil Engineer in the State of California. For other falsework, the designated representative shall be qualified to perform this work and shall have at least three years of combined experience in falsework design or supervising falsework construction. The Contractor shall certify the experience of the designated representative in writing and provide supporting documentation demonstrating the required experience if requested by the Engineer.

Welding and Nondestructive Testing

Welding of steel members, except for previously welded splices and except for when fillet welds are used where load demands are less than or equal to 175 N/mm for each 3 mm of fillet weld, shall conform to AWS D1.1 or other recognized welding standard. The welding standard to be utilized shall be specified by the Contractor on the working drawings. Previously welded splices for falsework members are defined as splices made prior to the member being shipped to the project site.

Splices made by field welding of steel beams at the project site shall undergo nondestructive testing (NDT). At the option of the Contractor, either ultrasonic testing (UT) or radiographic testing (RT) shall be used as the method of NDT for each field weld and any repair made to a previously welded splice in a steel beam. Testing shall be performed at locations selected by the Contractor. The length of a splice weld where NDT is to be performed, shall be a cumulative weld length equal to 25 percent of the original splice weld length. The cover pass shall be ground smooth at the locations to be tested. The acceptance criteria shall conform to the requirements of AWS D1.1, Section 6, for cyclically loaded nontubular connections subject to tensile stress. If repairs are required in a portion of the weld, additional NDT shall be performed on the repaired sections. The NDT method chosen shall be used for an entire splice evaluation including any required repairs.

For all field welded splices, the Contractor shall furnish to the Engineer a letter of certification which certifies that all welding and NDT, including visual inspection, are in conformance with the specifications and the welding standard shown on the approved working drawings. This letter of certification shall be signed by an engineer who is registered as a Civil Engineer in the State of California and shall be provided prior to placing any concrete for which the falsework is being erected to support.

For previously welded splices, the Contractor shall determine and perform all necessary testing and inspection required to certify the ability of the falsework members to sustain the stresses required by the falsework design. This welding certification shall (1) itemize the testing and inspection methods used, (2) include the tracking and identifying documents for previously welded members, (3) be signed by an engineer who is registered as a Civil Engineer in the State of California, (4) and shall be provided prior to erecting the members.

COST REDUCTION INCENTIVE PROPOSALS FOR CAST-IN-PLACE PRESTRESSED BOX GIRDER BRIDGES

Except as provided herein, cast-in-place prestressed box girder bridges shall be constructed in conformance with the details shown on the plans and the provisions in Section 50, "Prestressing Concrete," and Section 51, "Concrete Structures," of the Standard Specifications.

If the Contractor submits cost reduction incentive proposals for cast-in-place prestressed box girder bridges, the proposals shall be in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications and these special provisions.

The Engineer may reject any proposal which, in the Engineer's judgment, may not produce a structure which is at least equivalent to the planned structure.

At the time the cost reduction incentive proposal (CRIP) is submitted to the Engineer, the Contractor shall also submit 4 sets of the proposed revisions to the contract plans, design calculations, and calculations from an independent checker for all changes involved in the proposal, including revisions in camber, predicted deck profile at each construction stage, and falsework requirements to the Office of Structure Design, Documents Unit, P.O. Box 942874, Sacramento, CA 94274-0001 (1801 30th Street, Sacramento, CA 95816), telephone (916) 227-8230. When notified in writing by the Engineer, the Contractor shall submit 12 sets of the CRIP plan revisions and calculations to the Office of Structure Design for final

approval and use during construction. The calculations shall verify that all requirements are satisfied. The CRIP plans and calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The CRIP plans shall be either 279 mm x 432 mm, or 559 mm x 864 mm in size. Each CRIP plan sheet and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. Each CRIP plan sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Within 3 weeks after final approval of the CRIP plan sheets, one set of the corrected good quality prints on 75-g/m² (minimum) bond paper, 559 mm x 864 mm in size, of all CRIP plan sheets prepared by the Contractor for each CRIP shall be furnished to the Office of Structure Design, Documents Unit.

Each CRIP shall be submitted prior to completion of 25 percent of the contract working days and sufficiently in advance of the start of the work that is proposed to be revised by the CRIP to allow time for review by the Engineer and correction by the Contractor of the CRIP plans and calculations without delaying the work. The Contractor shall allow a minimum of 12 weeks for the review of a CRIP. In the event that several CRIPs are submitted simultaneously, or an additional CRIP is submitted for review before the review of a previously submitted CRIP has been completed, the Contractor shall designate the sequence in which the CRIPs are to be reviewed. In this event, the time to be provided for the review of any proposal in the sequence shall be not less than the review time specified herein for that proposal, plus 2 weeks for each CRIP of higher priority which is still under review.

Should the review not be complete by the date specified in the Contractor's CRIP, or such other date as the Engineer and Contractor may subsequently have agreed to in writing and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review of CRIP plans and calculations, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications except that the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications shall not apply.

Permits and approvals required of the State have been obtained for the structures shown on the plans. Proposals which result in a deviation in configuration may require new permits or approvals. The Contractor shall be responsible for obtaining the new permits and approvals before the Engineer will reach a decision on the proposal. Delays in obtaining permits and approvals will not be reason for granting an extension of contract time.

All proposed modifications shall be designed in conformance with the bridge design specifications and procedures currently employed by the Department. The proposal shall include all related, dependent or incidental changes to the structure and other work affected by the proposal. The proposal will be considered only when all aspects of the design changes are included for the entire structure. Changes, such as but not limited to, additional reinforcement and changes in location of reinforcement, necessary to implement the CRIP after approval by the Engineer, shall be made at the Contractor's expense.

Modifications may be proposed in (1) the thickness of girder stems and deck slabs, (2) the number of girders, (3) the deck overhang dimensions as specified herein, (4) the amount and location of reinforcing steel, (5) the amount and location of prestressing force in the superstructure, and (6) the number of hinges, except that the number of hinges shall not be increased. The strength of the concrete used may be increased but the strength employed for design or analysis shall not exceed 42 MPa.

Modifications proposed to the minimum amount of prestressing force which must be provided by full length draped tendons are subject to the provisions in "Prestressing Concrete" of these special provisions.

No modifications will be permitted in (1) the foundation type, (2) the span lengths or (3) the exterior dimensions of columns or bridge superstructure, except that the overhang dimension from face of exterior girder to the outside edge of roadway deck may be uniformly increased or decreased by 25 percent on each side of the box girder section. Fixed connections at the tops and bottoms of columns shown on the plans shall not be eliminated.

The Contractor shall be responsible for determining construction camber and obtaining the final profile grade as shown on the plans.

The Contractor shall reimburse the State for the actual cost of investigating CRIPs for cast-in-place prestressed box girder bridges submitted by the Contractor. The Department will deduct this cost from any moneys due, or that may become due the Contractor under the contract, regardless of whether or not the proposal is approved or rejected.

DECK CLOSURE POURS

Where a deck closure pour is shown on the plans, reinforcement protruding into the closure space and forms for the closure pour shall conform to the following:

- A. During the time of placement of concrete in the deck, other than for the closure pour itself, reinforcing steel which protrudes into the closure space shall be completely free from any connection to the reinforcing steel, concrete, or other attachments of the adjacent structure, including forms. The reinforcing steel shall remain free of any connection for a period of not less than 24 hours following completion of the pour.
- B. Forms for the closure pour shall be supported from the superstructure on both sides of the closure space.

BALLAST

Ballast shall be Class 2 aggregate base and shall conform to the provisions in Section 26-1.02A, "Class 2 Aggregate Base," of the Standard Specifications, or similar material as approved by the Engineer. Ballast shall have a unit weight of approximately 19 kN/m³.

Ballast shall be placed inside bridge cells to the limits shown on the plans.

The Contractor shall provide suitable means, approved by the Engineer, for measuring the weight of ballast before placement inside the box girder. A record of the weight of ballast placed shall be submitted to the Engineer within 10 working days of completing ballast placement.

The Contractor shall submit a plan for furnishing and placing ballast and means of measuring the weight of ballast. The Contractor's submittal shall conform to the provisions in Section 5-1.02 "Working Drawings," of these Standard Specifications. The number of sets of drawings and design calculations shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications.

Ballast plan shall include, at a minimum, the following:

- A. Methods to safely place ballast in bridge cells. Placement methods shall not damage nor overstress the girders or diaphragms. Ballast shall not be dropped from a height of more than 3 meters.
- B. Suitable means to prevent ballast from existing vent holes.
- C. Impacts to falsework resulting from the placement methods.

Ballast will be measured and paid for by the cubic meter.

The contract price paid per cubic meter for ballast shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, measuring and placing ballast, including means for measuring the weight of the ballast complete in place, as shown on the plans, as specified in the Standard Specification and these special provisions, and as directed by the Engineer.

SLIDING BEARINGS

Sliding bearings consisting of elastomeric bearing pads lubricated with grease and covered with sheet metal shall conform to the following requirements:

- A. Grease shall conform to the requirements of Society of Automotive Engineers AS 8660. A uniform film of grease shall be applied to the upper surface of the pads prior to placing the sheet metal.
- B. Sheet metal shall be commercial quality galvanized sheet steel. The sheet metal shall be smooth and free of kinks, bends, or burrs.
- C. Construction methods and procedures shall prevent grout or concrete seepage into the sliding bearing assembly.

ELASTOMERIC BEARING PADS

Elastomeric bearing pads shall conform to the provisions in Section 51-1.12H, "Elastomeric Bearing Pads," of the Standard Specifications.

MINOR CONCRETE

Concrete for water quality outlet riser, low flow channel and emergency spillway shall conform to the provisions for minor concrete in Section 90, "Portland Cement Concrete," of the Standard Specifications and shall be in conformance with the details shown on the plans and these special provisions.

Reinforcing steel shall conform to the provisions for minor structures in Section 52, "Reinforcement," of the Standard Specifications.

The combined aggregate grading shall be the 1-inch maximum grading and shall conform to the requirements in Section 90-3 "Aggregate Gradings," of the Standard Specifications.

Concrete for water quality outlet riser, low flow channel and emergency spillway and water quality outlet riser footings shall be constructed such that the excavation methods and the concrete placement procedures shall provide for placing the concrete against undisturbed or compacted embankment materials.

Class 2 aggregate base shall conform to the provisions for aggregate base in Section 26, Aggregate Bases," of the Standard Specifications.

Expansion joints shall be constructed as shown on the plans. Expansion joints shall be sealed in accordance with the requirements in Section 51-1.12F "Sealed Joints," of the Standard Specifications except that saw cutting of joints is not required.

Earthen berms shall be constructed as specified in Section 19 "Earthwork" of the Standard Specifications.

Full compensation for furnishing and placing seals at expansion joint locations shall be considered as included in the contract price paid per cubic meter for minor concrete (Minor Structures) of the types shown on the plans and no separate payment will be made therefore.

MEASUREMENT AND PAYMENT

Measurement and payment for concrete in structures shall conform to the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for furnishing and installing access opening covers in soffits of new cast-in-place box girder bridges shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for furnishing and installing plastic pipe located at vertical drains used behind retaining walls and bridge abutments, including horizontal or sloping drains down slopes and across sidewalk areas, including excavation and backfill involved in placing the plastic pipe, shall be considered as included in the contract price paid per cubic meter for the various items of concrete work involved and no separate payment will be made therefor.

Full compensation for public notification and airborne monitoring for deck crack treatment shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge, and no additional compensation will be allowed therefor.

Full compensation for drilling holes, including coring through reinforcement when approved by the Engineer, and bonding dowels shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

10-1.65 PTFE BEARING

PTFE bearings, consisting of steel reinforced elastomeric bearing pads, polytetrafluoroethylene (PTFE) surfacing, and stainless steel and steel plates, shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

The Contractor shall submit working drawings for the PTFE bearings to the Offices of Structure Design, (OSD) for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. For initial review, 4 sets shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to OSD for final approval and for use during construction.

Working drawings shall be 279 mm x 432 mm, and each drawing and calculation sheet shall include the name of the structure as shown on the contract plans, District-County-Route, bridge number, and contract number.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. The time shall be proportional to the complexity of the work but in no case shall the time be less than 42 days after complete drawings and all support data are submitted. The location of match marks on plate edges shall be shown on the working drawings.

At the completion of each structure on the contract, one set of 279 mm x 432 mm prints on 75-g/m² (minimum) bond paper of the corrected original tracings of all working drawings for each structure shall be furnished to the Engineer. Prints of drawings that are common to more than one structure shall be submitted for each structure. An index prepared specifically for the drawings for each structure containing sheet numbers and titles shall be included on the first print in the set for each structure. Prints for each structure shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided as near to the upper left side of each page as is feasible within the original print to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

The manufacturer shall furnish Certificates of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the PTFE bearings.

The shear modulus of the elastomer in the elastomeric bearing pads shall be 750±75 kPa.

PTFE sheet shall be made from unfilled PTFE resin and shall conform to the following requirements:

| Test | Test Method | Requirements |
|-------------------------------|--------------------------|--------------|
| Tensile strength (Minimum) | ASTM D 4894 or D 4895 | 19.3 MPa |
| Elongation (Minimum) | ASTM D 4894 or D 4895 | 200 % |

The PTFE resin shall be virgin material (not reprocessed) meeting the requirements of ASTM Designation: D 4894 or D 4895, with a minimum thickness of 6 mm. Specific gravity shall be from 2.13 to 2.19. Melting point shall be 327±10°C.

The PTFE sliding surface shall be provided with lubricant dimples with a maximum diameter of 8 mm, a minimum depth of 2 mm, and a maximum depth of one half of the PTFE sheet thickness. The dimples shall be uniformly distributed within the area 6 mm from the edges of the PTFE sheet and occupy between 20 percent and 30 percent of the PTFE sheet area.

Stainless steel plates shall conform to the requirements of ASTM Designation: A 240, Type 304, with a minimum thickness of 3 mm.

Steel plates, except stainless steel, shall conform to the requirements of ASTM Designation: A 709/A 709M.

Stud connectors shall conform to the provisions in Section 55-2, "Materials," of the Standard Specifications.

Welding of structural steel shall conform to the requirements of AWS D1.1. Welding of structural steel to stainless steel shall conform to the requirements of AWS D1.6.

The PTFE sheet shall be adhesive bonded in the recess of steel plate under controlled factory conditions. The adhesive material shall be an epoxy resin conforming to the requirements of Federal Specification: MMM-A-134.

Contact surfaces of PTFE sheet and steel plate to be bonded shall be uniformly roughened to a minimum roughness height value of 6.3 µm.

The side of the PTFE sheet to be bonded shall be factory treated by the sodium naphthalene or sodium ammonia process, after the contact surface is roughened.

After completion of the bonding operation the PTFE surface shall be smooth and free from bubbles. The PTFE sheet shall show no signs of delamination and shall be fully bonded within the recess.

The stainless steel plate shall be attached by perimeter welding using Type 309L electrodes. After completion of the weld operation, the stainless steel plate shall be smooth and free from waves.

The flatness of the bearing elements shall be controlled such that upon completion of the bearing assembly, the PTFE/stainless steel sliding interface shall be in full bearing.

The mating surface of the stainless steel plate with the PTFE surfacing shall have a minimum #8 mirror finish determined according to ANSI Standard B46.1. The sliding element of the production bearings shall have a first movement static coefficient of friction not exceeding 0.06 when tested without the coating of silicone grease.

Steel reinforced elastomeric bearing pads shall be fully vulcanized to the steel plates under factory controlled conditions, and the bond shall have a peel-strength of at least 5.3 newtons per millimeter as determined by California Test 663.

Metal surfaces of bearings exposed to the atmosphere and in contact with the structure in the completed work, except stainless steel surfaces, shall be cleaned and painted in conformance with the provisions in "Clean and Paint Joint Seal Assemblies, PTFE Bearings and PTFE Spherical Bearings" of these special provisions.

After installation, the top of the assembly shall be removed and a 1.5 mm thick coating of silicone grease shall be applied to the entire PTFE surface and the bearing reassembled without damage to the mating sliding surfaces. Silicone grease shall conform to the requirements in Military Specification: MIL-S-8660.

Damaged bearings and bearings with scratched mating surfaces shall be returned to the factory for replacement or resurfacing.

Prior to proof testing or painting, all individual components shall be permanently die-stamped on 2 of 4 sides with markings consisting of bearing number and contract number. Each bearing shall have a unique bearing number and match marks on plate edges to insure correct assembly at the job site.

Full sized PTFE bearings shall be proof tested and evaluated for compression and coefficient of initial static friction in the presence of the Engineer. The proof tests shall be performed on samples randomly selected by the Engineer from the production bearings to be used in the work. Proof testing shall be performed by the Contractor at the manufacturer's plant or at an approved laboratory. If proof tests cannot be performed at the specified load, the Contractor shall submit to the Engineer for review and approval a testing plan listing additional physical tests. These tests shall be performed in the presence of the Engineer, and shall demonstrate that the requirements for proof testing at the specified load are satisfied. The Contractor shall give the Engineer at least 7 days notice before beginning proof testing. Proof testing of PTFE bearings shall conform to the following requirements:

- A. One bearing per lot of production PTFE bearings shall be proof tested. A lot is defined as 25 PTFE bearings or fraction thereof of the same type, within a load category.

- B. A load category shall consist of bearings of differing vertical load capacity within a range defined as follows:
 1. Bearings with less than or equal to 2225 kN maximum vertical load capacity.
 2. Bearings with greater than 2225 kN but less than or equal to 8900 kN maximum vertical load capacity.
- Bearings with greater than 8900 kN maximum vertical load capacity.
- C. Bearings shall be proof tested for compression and coefficient of friction.
- D. Proof tests for compression: The bearing shall be held for one hour at 1.5 times the maximum vertical load shown on the plans for the bearing.
- E. Proof tests for coefficient of friction: The tests shall be performed at the minimum dead load shown on the plans for the bearing with the test load applied for 12 hours continuously and the test load shall not be reduced or removed prior to friction measurement and the following:
 1. The tests shall be arranged to allow measurement of the static coefficient of friction on the first movement of the bearing.
 2. The first movement static and dynamic coefficients of friction shall be measured at a sliding speed not exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.
 3. The test bearings shall be subjected to a minimum of 100 movements of at least 25 mm of relative movement at a sliding speed not exceeding 300 millimeters per minute. After cycling, the first movement static and dynamic coefficients of friction shall be measured again at a sliding speed not exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.
- F. The bearing surfaces shall be cleaned prior to testing.
- G. Proof testing of bearings shall be done after conditioning specimens for 12 hours at 24°±3°C.
- H. The proof tested bearings shall show no visible sign of: (1) bond failure of bearing surfaces, (2) separation or lift-off of plates from each other or from PTFE surfaces, (3) excessive transfer of PTFE to the stainless steel surface, or (4) other defects. When a proof tested bearing fails to comply with these specifications, all bearings in that lot shall be individually tested for acceptance.
- I. Proof test results shall be certified correct and signed by the testing laboratory personnel who conducted the test and interpreted the test results. Proof test results shall include the bearing numbers of the bearings tested.

One sample of elastomeric bearing pad, 57±3 mm high and not less than 200 mm x 300 mm in plan, shall be cut by the manufacturer from one of the thickest production elastomeric bearing pads, as directed by the Engineer, and furnished to the Transportation Laboratory. The Contractor shall allow 21 days for testing and obtaining satisfactory results after the sample elastomeric bearing pad has been received.

A test specimen taken from the sample furnished to the Transportation Laboratory will be tested in conformance with the requirements in California Test 663 for 10,000 cycles at the design load and 0.5 T (T = total thickness of elastomer) translation. The testing speed shall not exceed 115 millimeters per minute. Specimens tested shall show no indication of deterioration of elastomer or loss of bond between the elastomer and steel laminates.

PTFE bearing sole plates shall be temporarily supported during concrete placement. Temporary supports shall prevent the rotation or displacement of the bearings during concrete placing operations. Temporary supports shall not inhibit the functioning of the PTFE bearings after concrete is placed. Temporary supports shall not restrict the movement at bridge joints due to temperature changes and shortening from prestress forces. Materials for temporary supports within the limits for placing concrete shall conform to the requirements for form fasteners.

PTFE and stainless steel surfaces shall be protected from contamination and weather damage.

Quantities of PTFE bearings will be determined as units from actual count in the completed work. A PTFE bearing with more than one disc shall be considered a single PTFE bearing.

The contract unit price paid for PTFE bearing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the bearing, complete in place, including temporary supports, proof testing, and cleaning and painting of PTFE bearings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for furnishing the sample of elastomeric bearing pad shall be considered as included in the contract unit price paid for PTFE bearing, and no separate payment will be made therefor.

If a portion or all of PTFE bearings are either fabricated or tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for PTFE bearings will be reduced \$5,000 for each fabrication or testing site located more than 480 air line

kilometers from both Sacramento and Los Angeles and an additional \$10,000 (\$15,000 total) for each fabrication or testing site located more than 4800 air line kilometers from both Sacramento and Los Angeles.

10-1.66 PTFE SPHERICAL BEARING

PTFE spherical bearings, consisting of polytetrafluoro-ethylene (PTFE) and stainless steel bearing surfaces, structural steel plates and anchors, shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

PTFE spherical bearings shall be expansion type with spherical and sliding bearing surfaces.

The manufacturer of the PTFE spherical bearings shall show evidence that PTFE spherical bearings furnished by the same manufacturer and used in conditions similar to this application have had at least 3 years of satisfactory service at each of 2 projects.

A qualified representative of the manufacturer shall be present during installation of the first bearing and shall be available for advice during any remaining installations.

The Contractor shall submit working drawings of the PTFE spherical bearings to the Offices of Structure Design (OSD) for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. For initial review, 4 sets shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to OSD for final approval and for use during construction.

Working drawings shall be 279 mm x 432 mm or 559 mm x 864 mm in size and each drawing and calculation sheet shall include the name of the structure as shown on the contract plans, District-County-Route, bridge number, and contract number.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. The time shall be proportional to the complexity of the work but in no case shall the time be less than 42 days after complete drawings and all support data are submitted.

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

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided as near to the upper left side of each page as is feasible within the original print to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

PTFE spherical bearings shall be installed on surfaces prepared in conformance with the provisions in Section 55-3.19, "Bearings and Anchorages," of the Standard Specifications.

The manufacturer shall furnish Certificates of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the PTFE spherical bearings. The certification shall be supported by a copy of the results of all proof tests performed on the bearings.

PTFE surfaces of PTFE spherical bearings shall be unfilled PTFE fabric made from virgin PTFE oriented multifilament and other fibers. The resin in the filaments shall be virgin PTFE material (not reprocessed) in conformance with the requirements of ASTM Designation: D 4441.

At the highest point of substrate and after compression, the PTFE fabric shall have a minimum thickness of 1.6 mm and a maximum thickness of 3.2 mm.

Flat stainless steel surfaces shall be a weld overlay on structural steel plate, or solid or sheet stainless steel conforming to the requirements of ASTM Designation: A 240, Type 304 with a minimum thickness of 3.2 mm.

Curved stainless steel surfaces shall be solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 304.

Curved stainless steel surfaces with dimensions shown on the plans exceeding 101.6 mm in thickness shall be either a weld overlay on structural steel plate or solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 304. Stainless steel sheet will not be allowed.

When a weld overlay is used for stainless steel surfacing, the overlay shall be placed by submerged arc welding using Type 309L electrodes. The finished overlay shall have a 2.38 mm minimum thickness after welding, grinding, and polishing.

When stainless steel sheets are used for stainless steel surfacing, the sheets shall be attached by perimeter arc welding using Type 309L electrodes. After completion of the weld operation, the stainless steel surface shall be smooth and free from waves.

Steel plates, except stainless steel, shall conform to the requirements of ASTM Designation: A 709/A 709M, Grade 36 [250], 50 [345], or 50W [345W].

Stud connectors shall conform to the provisions in Section 55-2, "Materials," of the Standard Specifications.

Welding of structural steel shall conform to the requirements of AWS D1.1. Welding of structural steel to stainless steel shall conform to the requirements of AWS D1.6.

Convex plate radius dimension tolerances shall be 0.000 to -250 μm . Concave plate radius dimensions shall be +250 to 0.000 μm .

The bearing manufacturer shall have full size convex and concave metal templates for the 2 spherical surfaces of each bearing radius. The templates shall be available to the inspector during all bearing inspections.

The PTFE fabric on spherical or sliding bearing surfaces shall be epoxy bonded and mechanically interlocked to the steel substrate. All bonding shall be done under controlled factory conditions. The mechanical interlock on the spherical concave surface must be integrally machined into the steel substrate. Welded retention grids will not be allowed on the concave surface. Any edges other than the selvage shall be oversown or recessed so that no cut fabric edges are exposed.

After completion of the bonding operation the PTFE surface shall be smooth and free from bubbles.

The surface of the bearing elements shall be controlled such that upon completion of the bearing assembly the PTFE to stainless steel interface shall be in full bearing.

The mating surface of the flat stainless steel with the PTFE surfacing shall have a minimum #8 mirror finish as determined in conformance with the requirements in ANSI Standard B46.1. The mating surface of the curved stainless steel with the PTFE surfacing shall have a finish of less than 0.4 μm root-mean-square (rms), as determined in conformance with the requirements in ANSI Standard B46.1.

Metal surfaces of bearings exposed to the atmosphere and in contact with the structure of the completed work, except stainless steel surfaces, shall be cleaned and painted in conformance with the provisions in "Clean and Paint Joint Seal Assemblies, PTFE Bearings and PTFE Spherical Bearings" of these special provisions.

PTFE spherical bearing assemblies shall be assembled at the factory. Each assembly shall have a minimum of 4 temporary steel straps that are bolted to threaded holes in the masonry and sole plates so that the entire assembly is shipped as a unit and remains intact when uncrated and installed. Welding of the steel straps will not be allowed. Straps must be adequate for vertical lifting purposes. Bearing dismantling will only be allowed under the direction and in the presence of the Engineer.

During fabrication, the maximum temperature of bonded PTFE surfaces shall be 150°C.

Damaged bearings and bearings with scratched mating surfaces shall be returned to the factory for replacement or resurfacing.

PTFE spherical bearing sole plates shall be temporarily supported during concrete placement. Temporary supports shall prevent the rotation or displacement of the bearing during concrete placing operations. Temporary supports shall not inhibit the functioning of the PTFE spherical bearing after concrete is placed. Temporary supports shall not restrict the movement at bridge joints due to temperature changes and shortening from prestress forces. Materials for temporary supports within the limits for placing concrete shall conform to the requirements for form fasteners.

PTFE spherical bearings shall have a first movement static coefficient of friction not exceeding 0.06.

Prior to proof testing, all bearings shall be permanently die-stamped on 2 of 4 sides with markings consisting of bearing number and contract number. Each bearing shall have a unique bearing number and match marks on plate edges to insure correct assembly at the job site.

Full sized PTFE spherical bearings shall be proof tested and evaluated for compression and coefficient of friction in the presence of the Engineer. The proof tests shall be performed on samples randomly selected by the Engineer from the production bearings to be used in the work. Proof testing shall be performed by the Contractor at the manufacturer's plant or at an approved laboratory. If proof tests cannot be performed at the specified load, the Contractor shall submit to the Engineer for review and approval a testing plan listing additional physical tests. These tests shall be performed in the presence of the Engineer and shall demonstrate that the requirements for proof testing at the specified load are satisfied. The Contractor shall give the Engineer at least 7 days notice before beginning proof testing. Proof testing of PTFE spherical bearings shall conform to the following requirements:

- A. One bearing per lot of production bearings shall be proof tested. A lot is defined as 25 bearings or fraction thereof of the same type, within a load category. Bearings in 2 load categories with vertical load capacities within 800 kN of each other will be considered in one load category for testing.
- B. The bearing types and proof tests required for each type shall be as follows:
 1. Expansion type bearings shall be proof tested for compression and coefficient of friction.
- C. A load category shall consist of bearings of differing vertical load capacity within a range defined as follows:

1. Bearings with less than or equal to 2225 kN maximum vertical load capacity.
 2. Bearings with greater than 2225 kN but less than or equal to 8900 kN maximum vertical load capacity.
 3. Bearings with more than 8900 kN maximum vertical load capacity.
- D. Proof tests for compression: The bearing shall be held at the design rotation or 0.02 radians, whichever is greater, for one hour at 1.5 times the maximum vertical load shown on the plans for the bearing. The device shall be in a rotated position during the test. The rotation may be imposed on the bearing by inserting a beveled plate between the bearing and the restraining surface prior to loading.
- E. Proof tests for coefficient of friction: The tests shall be performed at the minimum vertical load shown on the plans for the bearing with the test load applied for 12 hours prior to friction measurement and the following:
1. The tests shall be arranged to allow measurement of the static coefficient of friction on the first movement of the bearing.
 2. The first movement static and dynamic coefficients of friction shall be measured at a sliding speed not exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.
 3. The test bearings shall be subjected to a minimum of 100 movements of at least 25 mm of relative movement at a sliding speed not exceeding 300 millimeters per minute. After cycling, the first movement static and dynamic coefficients of friction shall be measured again at a sliding speed not exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.
- F. The bearing surfaces shall be cleaned prior to proof testing.
- G. Proof testing of bearings shall be done after conditioning specimens for 12 hours at 21±8°C.
- H. The proof tested bearings shall show no visible sign of: (1) bond failure of bearing surfaces, (2) separation or lift-off of plates from each other or from PTFE surfaces, or (3) other defects. When a proof tested bearing fails to comply with these specifications, all bearings in that lot shall be individually tested for acceptance.
- I. Proof test results shall be certified correct and signed by the testing laboratory personnel who conducted the test and interpreted the test results. Proof test results shall include the bearing numbers of the bearings tested.

Quantities of PTFE spherical bearings will be determined as units from actual count in the completed work. A PTFE spherical bearing with more than one PTFE surface shall be considered a single PTFE spherical bearing.

The contract unit price paid for PTFE spherical bearing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the bearing, complete in place, including masonry and sole plates, anchor bolts and sleeves, mortaring of bolts, temporary supports, proof testing, and cleaning and painting of PTFE spherical bearings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If a portion or all of PTFE spherical bearings are either fabricated or tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for PTFE spherical bearings will be reduced \$5,000 for each fabrication or testing site located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional \$10,000 (\$15,000 total) for each fabrication or testing site located more than 4800 air line kilometers from both Sacramento and Los Angeles.

10-1.67 STRUCTURE APPROACH SLABS (TYPE N)

This work shall consist of constructing reinforced concrete approach slabs, structure approach drainage system, and treated permeable base at structure approaches in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

GENERAL

Attention is directed to "Engineering Fabrics" of these special provisions.

STRUCTURE APPROACH DRAINAGE SYSTEM

Geocomposite Drain

Geocomposite drain shall consist of a manufactured core not less than 6.35 mm thick nor more than 50 mm thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain shall produce a flow rate through the drainage void of at least 25 liters per minute per meter of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 168 kPa. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for the geocomposite drain certifying that the

drain complies with these special provisions. The Certificate of Compliance shall be accompanied by a flow capability graph for the geocomposite drain showing flow rates and the externally applied pressures and hydraulic gradients. The flow capability graph shall be stamped with the verification of an independent testing laboratory.

Filter fabric for the geocomposite drain shall conform to the provisions for filter fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications.

The manufactured core shall be either a preformed grid of embossed plastic, a mat of random shapes of plastic fibers, a drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels, or a system of plastic pillars and interconnections forming a semirigid mat.

The core material and filter fabric shall be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric shall be integrally bonded to the side of the core material with the drainage void. Core material manufactured from impermeable plastic sheeting having non-connecting corrugations shall be placed with the corrugations approximately perpendicular to the drainage collection system.

The geocomposite drain shall be installed with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side shall overlap a minimum of 75 mm at all joints and wrap around the exterior edges a minimum of 75 mm beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wraparound at edges, the added fabric shall overlap the fabric on the geocomposite drain at least 150 mm and be attached thereto.

Should the fabric on the geocomposite drain be torn or punctured, the damaged section shall be replaced completely or repaired by placing a piece of fabric that is large enough to cover the damaged area and provide a 150 mm overlap.

Plastic Pipe

Plastic pipe shall conform to the provisions for pipe for edge drains and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications.

Drainage Pads

Concrete for use in drainage pads shall be minor concrete, except the concrete shall contain not less than 300 kilograms of cementitious material per cubic meter.

Treated Permeable Base At Bottom Of Geocomposite Drains

Treated permeable base to be placed around the slotted plastic pipe at the bottom of geocomposite drains shall conform to the provisions in "Treated Permeable Base Under Approach Slab." If asphalt treated permeable base is used, it shall be placed at a temperature of not less than 82°C nor more than 110°C.

The filter fabric to be placed over the treated permeable base at the bottom of geocomposite drains shall conform to the provisions for filter fabric for edge drains in Section 88, "Engineering Fabrics," of the Standard Specifications.

ENGINEERING FABRICS

Filter fabric to be placed between the structure approach embankment material and the treated permeable base shall conform to the provisions for filter fabric for edge drains in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

The subgrade to receive the filter fabric, immediately prior to placing, shall conform to the compaction and elevation tolerance specified for the material involved.

Filter fabric shall be aligned, handled, and placed in a wrinkle-free manner in conformance with the manufacturer's recommendations.

Adjacent borders of the filter fabric shall be overlapped from 300 to 450 mm or stitched. The preceding roll shall overlap the following roll in the direction the material is being spread or shall be stitched. When the fabric is joined by stitching, it shall be stitched with yarn of a contrasting color. The size and composition of the yarn shall be as recommended by the fabric manufacturer. The number of stitches per 25 mm of seam shall be 5 to 7.

Equipment or vehicles shall not be operated or driven directly on the filter fabric.

TREATED PERMEABLE BASE UNDER APPROACH SLAB

Treated permeable base under structure approach slabs shall consist of constructing either an asphalt treated permeable base or a cement treated permeable base in accordance with Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.

The type of treatment to be used shall be at the option of the Contractor.

The Contractor shall notify the Engineer in writing, not less than 30 days prior to the start of placing the treated permeable base, which type of treated permeable base will be furnished. Once the Contractor has notified the Engineer of the selection, the type to be furnished shall not be changed without a prior written request to do so and approval thereof in writing by the Engineer.

Asphalt treated permeable base shall be placed at a temperature of not less than 93°C nor more than 121°C. Material stored in excess of 2 hours shall not be used in the work.

Asphalt treated permeable base material may be spread in one layer. The base material shall be compacted with a vibrating shoe type compactor or rolled with a roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Rolling shall begin as soon as the mixture has cooled sufficiently to support the weight of the rolling equipment without undue displacement.

Cement treated permeable base material may be spread in one layer. The base material shall be compacted with either a vibrating shoe type compactor or with a steel-drum roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Compaction shall begin within one-half hour after the spreading operation and shall consist of 2 complete coverages of the treated material.

APPROACH SLABS

Concrete for use in approach slabs shall contain not less than 400 kilograms of cementitious material per cubic meter.

Structure approach slabs shall be cured for not less than 5 days prior to opening to public traffic, unless, at the option of the Contractor, the structure approach slabs are constructed using concrete with a nonchloride Type C chemical admixture conforming to these special provisions.

Portland cement for use in concrete using a nonchloride Type C chemical admixture shall be Type II or Type III conforming to the provisions in Section 90-2.01, "Cementitious Materials," of the Standard Specifications. Mortar containing the Type II portland cement to be used and Ottawa sand shall not contract in air more than 0.053 percent when tested in conformance with California Test 527.

The nonchloride Type C chemical admixture, approved by the Engineer, shall conform to the requirements in ASTM Designation: C 494/C 494M and Section 90-4, "Admixtures," of the Standard Specifications.

The concrete with nonchloride Type C chemical admixture shall be prequalified prior to placement in conformance with the provisions for prequalification of concrete specified by compressive strength in Section 90-9.01, "General," of the Standard Specifications and the following:

- A. Immediately after fabrication of the 5 test cylinders, the cylinders shall be stored in a temperature medium of 21°C ± 1.5°C until the cylinders are tested.
- B. The 6-hour average strength of the 5 test cylinders shall not be less than 5.85 MPa. Not more than 2 test cylinders shall have a strength of less than 5.5 MPa.

The top surface of approach slabs shall be finished and treated in conformance with the provisions for decks in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications. Edges of slabs shall be edger finished.

Approach slabs shall be cured with pigmented curing compound (1) in conformance with the provisions for curing structures in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

Structure approach slabs constructed using concrete with a nonchloride Type C chemical admixture shall be cured for not less than 6 hours prior to opening to public traffic. The curing period shall be considered to begin at the start of discharge of the last truckload of concrete to be used in the slab.

If the ambient temperature is below 18°C during the curing period for approach slabs using concrete with a nonchloride Type C chemical admixture, an insulating layer or blanket shall be used to cover the surface. The insulating layer or blanket shall have an R-value rating given in the table below. At the Contractor's option, a heating tent may be used in lieu of or in combination with the insulating layer or blanket.

| Temperature Range During Curing Period | R-value, minimum |
|--|------------------|
| 13°C to 18°C | 1 |
| 7°C to 13°C | 2 |
| 4°C to 7°C | 3 |

JOINTS

Hardboard and expanded polystyrene shall conform to the provisions in Section 51-1.12D, "Sheet Packing, Preformed Pads, and Board Fillers," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Structural concrete, approach slab (Type N) will be measured and paid for in conformance with the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for the structure approach drainage system including geocomposite drain, plastic pipe, and drainage pads, treated permeable base, filter fabric, miscellaneous metal, and waterstops shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab of the type shown in the Engineer's Estimate, and no additional compensation will be allowed therefor.

10-1.68 SOUND WALL

DESCRIPTION

This work shall consist of constructing sound walls of masonry block. Sound walls shall be supported on concrete barriers, retaining walls, or pile caps, over cast-in-drilled-hole piling, as shown on the plans.

SOUND WALL (MASONRY BLOCK)

Sound wall (masonry block), consisting of a reinforced hollow unit masonry block stem, shall be constructed in conformance with the provisions in Section 19, "Earthwork," Section 52, "Reinforcement," and Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

Sound wall masonry unit stems shall be constructed with joints of mortar. Wall stems shall be constructed with hand laid block. Wall stems shall not be constructed with preassembled panels.

Concrete for sound wall footings, pile caps, and grade beams, if required, shall be minor concrete.

The angle of internal friction (ϕ) to be used with Standard Plan drawings for the soils at sound wall Nos. 1, 2 and 189 is 30 and sound wall No. 150 is 35.

Concrete masonry units shall be hollow, load bearing, lightweight or medium weight class units conforming to the requirements in ASTM Designation: C 90. Standard or open-end units may be used. Open-end units, if used, shall not reduce the spacing of the bar reinforcement as shown on the plans.

The mass of concrete masonry units for walls on bridges shall not exceed 17.2 kg.

The masonry units shall be nominal size and texture and of uniform color. The color shall be federal color chip #30450 for Segment 5 and #33440 for Segment 11, Book No. 595-B, selected from the manufacturer's standards.

When high strength concrete masonry units with $f_m=17.24$ MPa are shown on the plans, the high strength masonry units shall have a minimum compressive strength of 25.86 MPa based on net area. When high strength concrete masonry units with $f_m=13.79$ MPa are shown on the plans, the high strength masonry units shall have a minimum compressive strength of 19.31 MPa based on net area. Each high strength concrete masonry unit shall be identified with a groove embedded in an interior corner. The groove shall extend from a mortar surface for a length of about 50 mm and shall have a depth of about 5 mm. When regular strength concrete masonry units with $f_m=10.34$ MPa are shown on the plans, the regular strength masonry units shall have a minimum compressive strength of 13.1 MPa based on net area.

Expansion joint filler shall conform to the requirements in ASTM Designation: D 1751 or ASTM Designation: D 2000 M2AA 805.

Mortar shall be colored to match the units. Coloring shall be chemically inert, fade resistant mineral oxide or synthetic type.

Cementitious material for wall stems shall conform to the provisions in Section 90-2.01, "Cementitious Materials," of the Standard Specifications.

Hydrated lime shall conform to the requirements in ASTM Designation: C 207, Type S.

Mortar sand shall be commercial quality.

Mortar for laying masonry units shall consist, by volume, of one part cementitious material, zero to 0.5 part hydrated lime, and 2.25 to 3 parts mortar sand. Sufficient water shall be added to make a workable mortar. Each batch of mortar shall be accurately measured and thoroughly mixed. Mortar shall be freshly mixed as required. Mortar shall not be retempered more than one hour after mixing.

Prepackaged mortar materials and mortar containing admixtures may be used when approved in writing by the Engineer, provided the mortar shall not contain more than 0.05 percent soluble chlorides when tested in conformance with California Test 422 or more than 0.25 percent soluble sulfates, as SO_4 , when tested in conformance with California Test 417.

Before laying masonry units using prepackaged mortar materials or mortar containing admixtures, the Contractor shall submit to the Engineer the proposed sources of the materials together with test data from an independent testing laboratory for mortar tested in conformance with California Test 551. The test data shall be from specimens having a moist cure, except that the sample shall not be immersed in lime water. The average 28-day compressive strength of the mortar shall be not less than 17.2 MPa.

Aggregate for grout used to fill masonry units shall consist of fine aggregate and coarse aggregate conforming to the provisions in Section 90-2.02, "Aggregates," of the Standard Specifications. At least 20 percent of the aggregate shall be coarse aggregate. The Contractor shall determine the grading except that 100 percent of the combined grading shall pass the 12.5 mm sieve.

When lightweight aggregate is shown on the plans, the aggregate for grout used to fill masonry units shall conform to the requirements in ASTM Designation: C 330 and the following requirements:

- A. Lightweight aggregates shall be rotary kiln expanded shale or clay having a surface sealed by firing. The coarse aggregate shall not be crushed after firing except that aggregate that is 19 mm in size and smaller may be crushed to the extent necessary to produce the required coarse aggregate grading. The final coarse aggregate size shall not exceed 19 mm.
- B. The splitting tensile strength and the drying shrinkage requirements of ASTM Designation: C 330 shall not apply.
- C. The shrinkage characteristics of lightweight aggregates shall be such that the drying shrinkage of lightweight concrete produced there from, when tested in conformance with the requirements in California Test 537, shall be not more than 0.040 percent after 14 days of drying.
- D. Lightweight aggregates shall have not more than 5 percent loss when tested for soundness in conformance with the requirements in California Test 214.
- E. Natural sand and manufactured sand fine aggregates, cementitious material, water, and admixtures shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications.

At the option of the Contractor, grout for filling masonry units may be proportioned either by volume or mass. Grout shall contain only enough water to cause the grout to flow and fill the voids without segregation. The maximum amount of free water shall not exceed 0.7 times the weight of the cementitious material for regular strength masonry. The maximum amount of free water shall not exceed 0.6 times the mass of the cementitious material for high strength masonry.

Grout proportioned by volume for regular strength masonry shall consist of at least one part cementitious material and 4.5 parts aggregate. Grout proportioned by volume for high strength masonry shall consist of at least one part cementitious material and 3.5 parts aggregate. Aggregate volumes shall be based on a loose, air-dry condition.

Grout proportioned by mass for regular strength masonry shall contain not less than 325 kilograms of cementitious material per cubic meter. Grout proportioned by mass for high strength masonry shall contain not less than 400 kilograms of cementitious material per cubic meter.

Reinforced concrete masonry unit wall stems shall be constructed with mortar joints in conformance with the following:

- A. Concrete masonry unit construction shall be true and plumb in the lateral direction and shall conform to the grade shown on the plans in the longitudinal direction. Bond beam units or recesses for horizontal reinforcement shall be provided.
- B. Mortar joints shall be approximately 13 mm wide. Walls and cross webs forming cells to be filled with grout shall be full bedded in mortar to prevent leakage of grout. All head and bed joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells. Head joints shall be shoved tight.
- C. Mortared joints around cells to be filled shall be placed so as to preserve the unobstructed vertical continuity of the grout filling. Any overhanging mortar or other obstruction or debris shall be removed from the inside of such cells.
- D. Reinforcement shall be securely held in position at top and bottom with either wire ties or spacing devices and at intervals not exceeding 192 bar diameters before placing any grout. Wire shall be 16 gage(1.57 mm) or heavier. Wooden, aluminum, or plastic spacing devices shall not be used.
- E. Splices in vertical reinforcement shall be made only at the locations shown on the plans.
- F. Only those cells containing reinforcement shall be filled solidly with grout. All grout in the cells shall be consolidated at the time of placement by vibrating and reconsolidated after excess moisture has been absorbed but before plasticity is lost. Grout shall not be sliced with a trowel.
- G. Walls shall be constructed in 1.2 m maximum height lifts. Grouting of each lift shall be completed before beginning masonry unit construction for the next lift. The top course of each lift shall consist of a bond beam.
- H. A construction joint shall be constructed at the top of the top course to permit placement of the mortar cap. The mix design for the mortar cap shall be as approved by the Engineer.
- I. Construction joints shall be made when the placing of grout, in grout filled cells, is stopped for more than one hour. The construction joint shall be approximately 12 mm below the top of the last course filled with grout.
- J. Bond beams shall be continuous. The top of unfilled cells under horizontal bond beams shall be covered with metal or plastic lath.
- K. When fresh masonry joins masonry that is partially or totally set, the contact surface shall be cleaned, roughened, and lightly wetted.
- L. Surfaces of concrete on which the masonry walls are to be constructed shall be roughened and cleaned, exposing the aggregate, and shall be flushed with water and allowed to dry to a surface dry condition immediately before laying the masonry units.

- M. Where cutting of masonry units is necessary, all cuts shall be made with a masonry saw to neat and true lines. Masonry units with cracking or chipping of the finished exposed surfaces will not be acceptable.
- N. Masonry shall be protected in the same manner specified for concrete structures in Section 90-8, "Protecting Concrete," of the Standard Specifications and these special provisions.
- O. During erection, all cells shall be kept dry in inclement weather by covering partially completed walls. The covering shall be waterproof fabric, plastic or paper sheeting, or other approved material. Wooden boards and planks shall not be used as covering materials. The covering shall extend down each side of masonry walls approximately 0.6 m.
- P. Splashes, stains, or spots on the exposed faces of the wall shall be removed.

MEASUREMENT AND PAYMENT

Sound walls of the types designated in the Engineer's Estimate will be measured by the square meter of the area of wall projected on a vertical plane between the elevation lines shown on the plans and length of wall.

The contract price paid per square meter for sound wall or sound wall (barrier) (masonry block) of the types designated in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the sound wall, complete in place, including all anchorages, excavation, backfill, grade beams, 3 mm galvanized cover plate, and reinforcement, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. Sound wall supports will be measured and paid for as separate items of work.

10-1.69 SEALING JOINTS

Joints in concrete bridge decks and joints between concrete structures and concrete approach slabs must be sealed in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

When ordered by the Engineer, a joint seal larger than called for by the Movement Rating shown on the plans must be furnished and installed. Payment to the Contractor for furnishing the larger seal and for saw cutting the increment of additional depth of groove required will be determined as provided in Section 4-1.03, "Changes," of the Standard Specifications.

10-1.70 JOINT SEAL ASSEMBLIES (MAXIMUM MOVEMENT RATING, 100 mm)

Joint seal assemblies shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

All metal parts of the joint seal assembly shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. Bolts, nuts, and washers shall conform to the requirements in ASTM Designation: A 325 or A 325M.

At the Contractor's option, cleaning and painting of all new metal surfaces of the joint seal assembly, except stainless steel and anchorages embedded in concrete, may be substituted for galvanizing. Cleaning and painting shall be in conformance with the provisions in "Clean and Paint Joint Seal Assemblies, PTFE Bearings and PTFE Spherical Bearings" of these special provisions.

Certification in conformance with the requirements in SSPC-QP 1, SSPC-QP 2, and SSPC-QP 3 of the "SSPC: The Society for Protective Coatings" will not be required for cleaning and painting joint seal assemblies.

Finish coats will not be required on joint seal assemblies.

Sheet neoprene shall conform to the provisions for neoprene in Section 51-1.14, "Waterstops," of the Standard Specifications. The sheet neoprene shall be fabricated to fit the joint seal assembly accurately.

Metal parts of the joint seal assembly shall be pre-assembled before installation to verify the geometry of the completed seal.

The bridge deck surface shall conform to the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications prior to placing and anchoring the joint seal assembly.

The assembly shall be placed in a blocked out recess in the concrete deck surface. The depth and width of the recess shall permit the installation of the assembly anchorage components or anchorage bearing surface to the lines and grades shown on the plans.

Sheet neoprene shall be installed at such time and in such manner that the sheet neoprene will not be damaged by construction operations. The joint shall be cleaned of all dirt, debris and other foreign material immediately prior to installation of the sheet neoprene.

ALTERNATIVE JOINT SEAL ASSEMBLY

At the Contractor's option, an alternative joint seal assembly may be furnished and installed provided: (1) that the quality of the alternative and its suitability for the intended application are at least equal to that of the joint seal assembly shown on the plans, (2) that acceptable working drawings and a Certificate of Compliance are furnished as specified herein and (3) that the alternative conforms to the following requirements:

- A. The determination as to the quality and suitability of a joint seal assembly will be made in the same manner as provided in Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications. The factors to be considered will include: the ability of the assembly to resist the intrusion of foreign material and water throughout the full range of movement for the application, and the ability to function without distress to any component.
- B. Joint seal assemblies will not be considered for approval unless it can be proven that the assembly has had at least one year of satisfactory service under conditions similar to this application.
- C. The Contractor shall submit complete working drawings for each joint seal assembly to the Division of Structure Design (DSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall show complete details of the joint seal assembly and anchorage components and the method of installation to be followed, including concrete blockout details and additions or rearrangements of the reinforcing steel from that shown on the plans. For initial review, 5 sets of working drawings shall be submitted. After review, between 6 and 12 sets of working drawings, as requested by the Engineer, shall be submitted to DSD for final approval and use during construction.
- D. The working drawings shall be supplemented with calculations for each proposed joint seal assembly, as requested by the Engineer. Working drawings shall be either 279 mm x 432 mm or 559 mm x 864 mm in size. Each drawing and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. The design firm's name, address, and telephone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.
- E. Calculations, when requested, and working drawings, shall be stamped and signed by an engineer who is registered as a Civil Engineer. The Contractor shall allow the Engineer 4 weeks to review the drawings after a complete set has been received.
- F. Within 3 weeks after final working drawing approval, one set of the corrected good quality prints on 75 g/m² (minimum) bond paper (559 mm x 864 mm in size) of all working drawings prepared by the Contractor for each joint seal assembly shall be furnished to DSD.
- G. Each shipment of joint seal materials shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall state that the materials and fabrication involved comply in all respects to the specifications and data submitted in obtaining the approval.
- H. The elastomer portion of the joint seal assembly shall be neoprene conforming to the requirements in Table 1 of ASTM Designation: D 2628 and the following, except that no recovery tests or compression-deflection tests will be required:

| PROPERTY | TEST METHOD | REQUIREMENT |
|--|------------------------|-------------|
| Hardness, Type A Durometer, points | ASTM D 2240 (Modified) | 55-70 |
| Compression set, 70 hours at 100°C, maximum, percent | ASTM D 395 (Modified) | 40 |

- I. All metal parts of an alternative joint seal assembly shall conform to the requirements above for the joint seal assembly shown on the plans. At the Contractor's option, metal parts may conform to the requirements in ASTM Designation: A 572/A 572M.
- J. The assembly and its components shall be designed to support the AASHTO HS20-44 loading with 100 percent impact. The tire contact area used to distribute the tire loads shall be 244 mm, measured normal to the longitudinal axis of the assembly, by 508 mm wide. The assembly shall provide a smooth riding joint without slapping of components or wheel tire rumble.
- K. The Movement Rating of the assembly shall be measured normal to the longitudinal axis of the assembly. The dimensions for positioning the assembly within the Movement Rating during installation shall be measured normal to the longitudinal axis, disregarding any skew of the deck expansion joint.
- L. The assembly shall have cast-in-place anchorage components forming a mechanical connection between the joint components and the concrete deck.

- M. The maximum depth and width of the recess shall be such that the primary reinforcement to provide the necessary strength of the structural members is outside the recess. The maximum depth of the recess at abutments and at hinges shall be 250 mm. The maximum width of the recess on each side of the expansion joint shall be 300 mm.
- N. All reinforcement other than the primary reinforcement shall continue through the recess construction joint into the recess and engage the anchorage components of the assembly.
- O. Horizontal angle points and vertical corners at curbs in assemblies shall consist of either pre-molded sections or standard sections of the joint seal assembly that have been specially miter cut or bent to fit the structure.
- P. The elastomer portion of the assembly shall be installed in conformance with the manufacturer's recommendations at such time and in such a manner that the elastomer portion will not be damaged by construction operations. The joint and blockout shall be cleaned of all dirt, debris, and other foreign material immediately prior to the installation of the elastomer.

Full compensation for additional materials or work required because of the application of the optional cleaning and painting or the use of an alternative type joint seal assembly, shall be considered as included in the contract price paid per meter for the joint seal assembly involved and no additional compensation will be allowed therefor.

10-1.71 JOINT SEAL ASSEMBLIES (MOVEMENT RATING EXCEEDING 100 mm)

Joint seal assemblies with movement ratings greater than 100 mm shall consist of a metal frame system, supporting rails and support bars with intervening neoprene glands and shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and to these special provisions.

Joint seal assemblies will not be considered for approval without satisfactory evidence that the assemblies have had at least one year of satisfactory service under conditions similar to this application.

A qualified representative of the manufacturer shall be present during installation of the first assembly and shall be available for advice during any remaining installations.

The Contractor shall submit complete working drawings for each joint seal assembly to the Offices of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall show complete details of the joint seal assembly and anchorage components and the method of installation to be followed, including concrete blockout details and any additions or rearrangements of the reinforcing steel from that shown on the plans. For initial review, 5 sets of drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to DSD for final approval and use during construction.

The working drawings shall be supplemented with complete calculations for the particular joint seal assembly, when requested by the Engineer. Working drawings shall be either 279 mm x 432 mm in size and each drawing and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. The design firm's name, address, and phone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Calculations, when requested, and working drawings shall be stamped and signed by an engineer who is registered as a Civil Engineer. The Contractor shall allow the Engineer 28 days to review the drawings after a complete set has been received.

Within 21 days after final working drawing approval, one set of corrected 559 mm x 864 mm prints on 75-g/m² (minimum) bond paper of all working drawings prepared by the Contractor for each joint seal assembly shall be furnished to the Engineer.

Each shipment of joint seal assembly materials shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall state that the materials and fabrication involved comply in all respects to the specifications and data submitted in obtaining approval.

The neoprene glands shall conform to the requirements in Table 1 of ASTM Designation: D 2628 and the following, except that no recovery tests or compression-deflection tests will be required:

| Property | Requirement | ASTM Test Method |
|---|-------------|---------------------------|
| Hardness, Type A Durometer, points | 55-70 | D 2240 (Modified) |
| Compression set, 70 hours at 100°C maximum, percent | 40 | D 395 Method B (Modified) |

All metal parts of the joint seal assembly shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. Bolts, nuts and washers shall conform to the provisions for high-strength steel fastener assemblies in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications. At the Contractor's option, metal parts may conform to the requirements of ASTM Designation: A 572/A 572M.

At the Contractor's option, cleaning and painting of all new metal surfaces of the joint seal assembly, except stainless steel and anchorages embedded in concrete, may be substituted for galvanizing. Cleaning and painting shall be in conformance with the provisions in "Clean and Paint Joint Seal Assemblies, PTFE Bearings and PTFE Spherical Bearings" of these special provisions.

If the assembly consists of more than one component, the design of the assembly shall be such that the external components can be removed and reinstalled at any position, within the larger one-half of the movement rating shown on the plans, to permit the inspection of the internal components of the assembly.

Except for components in contact with the tires, the assembly and its components shall be designed to support the AASHTO HS20-44 loading with 100 percent impact. Each component in contact with the tires shall support a minimum of 80 percent of the AASHTO HS20-44 loading with 100 percent impact. The tire contact area used to distribute the tire loads shall be 244 mm, measured normal to the longitudinal axis of the assembly, by 508 mm wide. The assembly shall provide a smooth riding joint without slapping of components or wheel tire rumble.

The movement rating of the assembly shall be measured normal to the longitudinal axis of the assembly. The dimensions for positioning the assembly within the movement rating during installation shall be measured normal to the longitudinal axis, disregarding any skew of the deck expansion joint. The assembly shall be capable of adjustment to the "a" dimension shown on the plans.

The maximum width of unsupported or yielding components or grooves in the roadway surface of the assembly, measured in the direction of vehicular traffic, shall be 75 mm.

The bridge deck surface shall conform to the provisions in Section 51-1.17 "Finishing Bridge Deck," of the Standard Specifications prior to placing joint seal assemblies and anchorage.

The assembly shall be completely shop-assembled and placed in a blocked out recess in the concrete deck surface. The depth and width of the recess shall permit the installation of the assembly anchorage components or anchorage bearing surface to the planned line and grade.

The maximum depth and width of the recess shall be such that the primary reinforcement to provide the necessary strength of the structural members is outside the recess. The maximum depth of the recess at abutments and at hinges shall be 300 mm. The maximum width of recess on each side of the expansion joint shall be 600 mm.

All reinforcement other than primary reinforcement shall continue through the recess construction joint into the recess and engage the anchorage components of the assembly.

The vertical expansion joint in barrier shall be available for inspection after placement of the recess concrete around the anchorage components of the assembly.

The assembly shall make a watertight, continuous return 150 mm up into the barrier at the low side of the deck joint. Neoprene glands shall be continuous without field splices or joints, including the return up into the barrier.

Full compensation for any additional materials or work required because of application of the optional cleaning and painting shall be considered as included in the contract price paid per linear meter for the joint seal assembly involved, and no additional compensation will be allowed therefor.

10-1.72 ARCHITECTURAL TREATMENT

Architectural treatment for concrete surfaces shall conform to the details shown on the plans and the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Architectural treatments listed below are required at concrete surfaces shown on the plans:

- A. Fractured rib texture
- B. Formed relief texture

The fractured rib texture shall be an architectural texture simulating the appearance of straight ribs of concrete with a fractured concrete texture imparted to the raised surface between the ribs. Grooves between ribs shall be continuous with no apparent curves or discontinuities. Variation of the groove from straightness shall not exceed 6 mm for each 3 m of groove. The architectural texture shall have random shadow patterns. Broken concrete at adjoining ribs and groups of ribs shall have a random pattern. The architectural texture shall not have secondary patterns imparted by shadows or repetitive fractured surfaces.

The formed relief texture shall simulate a formed relief constructed to the dimensions and shapes shown on the plans. Corners at the intersection of plane surfaces shall be sharp and crisp without easing or rounding. A Class 1 surface finish shall be applied to the formed relief texture.

REFEREE SAMPLE

The fractured rib architectural textures shall match the respective textures, and pattern of the respective referee samples available for inspection by bidders at the District 8 Landscape Architecture Unit Office of, 464 West Fourth Street, 10th Floor, San Bernardino, California.

WORKING DRAWINGS

Prior to constructing any architectural treatment, the Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 3 copies of working drawings. Separate working drawings shall be submitted for each facility requiring architectural treatment. As a minimum, each working drawing shall include the following:

- A. Placement of all joint lines, including but not limited to: expansion joints, weakened plane joints and joints between formliner units.
- B. An electronic copy shall be submitted in ".dgn" format.

The Engineer shall have 15 days to review and approve the architectural treatment submittal after a complete plan has been received. No construction of architectural treatment test panels shall be performed until the architectural working drawings are approved by the Engineer. Should the Engineer fail to complete the review within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in approving the architectural treatment working drawings, the delay will be considered a right of way delay in conformance with the specifications in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

TEST PANEL

Test panels at least 1.25 m x 1.25 m in size for fractured rib and 4 m x 4 m in size for the modified barrier shall be successfully completed and approved by the Engineer before beginning work on architectural textures. The architectural texture test panels shall depict the relief pattern as shown on the plans or as directed by the Engineer and District Landscape Architect. Each test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing the architectural texture, including placement of expansion joints, weakened plane joints and joints between formliner units. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture and color are obtained, as determined by the Engineer and District Landscape Architect. Test Panel shall not be demolished before the completion of the project.

The test panel approved by the Engineer and District Landscape Architect shall be used as the standard of comparison in determining acceptability of architectural texture for concrete-surfaces.

FORM LINERS

Form liners shall be used for textured concrete surfaces and shall be installed in conformance with the manufacturer's recommendations, unless other methods of forming textured concrete surfaces are approved by the Engineer. Form liners shall be manufactured from an elastomeric material or a semi-elastomeric polyurethane material by a manufacturer of commercially available concrete form liners. No substitution of other types of formliner material will be allowed. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Textured concrete surfaces with such recurring textural configurations shall be reworked to remove such patterns as approved by the Engineer or the concrete shall be replaced.

Form liners shall have the following properties:

| Description | ASTM Designation: | Range |
|-------------------------------|-------------------|------------|
| Elastomeric material | | |
| Shore A hardness | D 2240 | 20 to 65 |
| Tensile strength (MPa) | D 412 | 0.9 to 6.2 |
| Semi-elastomeric polyurethane | | |
| Shore D hardness | D 2240 | 55 to 65 |
| Tensile strength (MPa) | D 2370 | 18 minimum |

Cuts and tears in form liners shall be sealed and repaired in conformance with the manufacturer's recommendations. Form liners that are delaminated from the form shall not be used. Form liners with deformations to the manufactured surface caused by improper storage practices or any other reason shall not be used.

Form liners shall extend the full vertical length of texturing with no horizontal lines with transverse joints at 2.5 m minimum spacing. Small pieces of form liners shall not be used. Grooves shall be aligned straight and true. Grooves shall match at joints between form liners. Joints in the direction of grooves in grooved patterns shall be located only in the depressed portion of the textured concrete. Adjoining liners shall be butted together without distortion, open cracks or offsets at the joints. Joints between liners shall be cleaned before each use to remove any mortar in the joint. There shall not be any horizontal joints between two form liners with the same texture.

The Contractor shall be responsible for coordinating the final aesthetic design of the form liner pattern with the Engineer, District Landscape Architect, Roadway Contractor, Design Team Representative, and the Project Artist. The cost to perform the coordination for the final design shall be incidental to the cost of the form liners.

The Contractor shall inform the Engineer and District Landscape Architect to present on the job site for the mock-up and first production use of graphic artwork panels and forms. No concrete shall be poured before they review the preparation of the graphic art and form liners on site. Their recommendations shall be followed by the Contractor at all times to assure the continued acceptance of the graphic art formed concrete pouring. They may periodically visit the job site to assure compliance with the intent, methodology, use and care of the form liners.

Adhesives shall be compatible with the form liner material and with concrete. Adhesives shall be approved by the liner manufacturer. Adhesives shall not cause swelling of the liner material.

RELEASING FORM LINERS

Products and application procedures for form release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the liner material or delamination from the forms. Release agents shall not stain the concrete or react with the liner material. For reliefs simulating fractured concrete or wood grain surfaces the application method shall include the scrubbing method using a natural bristle scrub brush in the direction of grooves or grain. The release agent shall coat the liner with a thin film. Following application of form release agent, the liner surfaces shall be cleaned of excess amounts of agent using compressed air. Buildup of form release agent caused by the reuse of a liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of liner material on the concrete and without pulling or breaking concrete from the textured surface. The concrete surfaces exposed by removing forms shall be protected from damage.

ABRASIVE BLASTING

The architectural texture shall be abrasive blasted with fine abrasive to remove the sheen without exposing coarse aggregate.

CURING

Concrete surfaces with architectural texture shall be cured only by the forms-in-place or water methods. Seals and curing compounds shall not be used.

MEASUREMENT AND PAYMENT

Fractured rib texture on abutments and retaining walls will be measured and paid for by the square meter.

The contract price paid per square meter for architectural texture of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in architectural texture, complete in place, including test panels and working drawings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for architectural treatment on concrete barriers shall be considered as included in the contract price paid per meter for concrete barrier of the types listed in the Engineer's Estimate and no separate payment will be made therefor.

10-1.73 REINFORCEMENT

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

The Department's mechanical splices prequalified list can be found at the following internet site:

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

The provisions of "Welding Quality Control" of these special provisions shall not apply to resistance butt welding.

When joining new reinforcing bars to existing reinforcement, sample splices shall be made using only the deformation pattern of the new reinforcement to be spliced.

Reinforcement shown on the plans to be galvanized shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Measurement and payment for reinforcement in structures shall conform to the provisions in Section 52-1.10, "Measurement," and Section 52-1.11, "Payment," of the Standard Specifications and these special provisions.

Full compensation for galvanizing steel reinforcement shall be considered as included in the prices paid for the various items of work involved and no additional compensation will be allowed therefor.

10-1.74 HEADED BAR REINFORCEMENT

GENERAL

Headed bar reinforcement shall consist of bar reinforcement with heads attached to one or both ends and shall conform to the provisions of Section 52, "Reinforcement," of the Standard Specifications, the details shown on the plans, and these special provisions. The type of headed bar reinforcement to be used on this project shall be selected from the Department's Pre-Qualified Products List at:

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

The provisions of "Welding Quality Control" of these special provisions shall not apply to headed bar reinforcement.

The Contractor shall perform inspection and testing before, during, and after manufacturing headed bar reinforcement and as necessary to ensure that materials and workmanship conform to the requirements of the specifications.

A daily production log for the manufacture of headed bar reinforcement shall be maintained by the manufacturer for each production lot. The log shall clearly indicate the production lot numbers, the heats of bar material and head material used in the manufacture of each production lot, the number of bars in each production lot, and manufacturing records, including tracking and production parameters for welds or forgings. The data from the daily production log shall be available to the Engineer on request.

A production lot of headed bar reinforcement is defined as 150 reinforcing bars, or fraction thereof, of the same bar size, with heads of the same size and type, and manufactured by the same method, produced from bar material of a single heat number and head material of a single heat number. If one reinforcing bar has a head on both ends, it will be counted as 2 reinforcing bars for the purposes of establishing and testing production lots. A new production lot shall be started if the heat number of either the bar material or the head material changes before the maximum production lot size of 150 units is reached.

The Contractor shall furnish Certificates of Compliance accompanied by a copy of the mill test report, the Production Tests Reports specified herein, and the corresponding daily production logs to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each shipment of headed bar reinforcement delivered to the jobsite.

Welding, welder qualifications, and inspection of welding shall conform to the requirements for friction welding in ANSI/AWS C6.1.

Equipment used to perform friction welding shall be fitted with an effective in-process monitoring system to record essential production parameters that describe the process of welding the head onto the reinforcement. The parameters to be recorded shall include friction welding force, forge force, rotational speed, friction upset distance and time, and forge upset distance and time. The data from this monitoring shall be recorded and preserved by the manufacturer until acceptance of the contract and shall be provided to the Engineer upon request.

PRODUCTION TESTS

Production tests shall be performed at the Contractor's expense, at an independent qualified testing laboratory. The independent qualified testing laboratory used to perform the testing of headed bar reinforcement samples shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project, and shall have the following:

1. A tensile testing machine capable of breaking the largest size of reinforcing bar to be tested.
2. Operators who have received formal training for performing the testing requirements of ASTM A 970/A 970M.
3. A record of annual calibration of testing equipment performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology, and 2) a formal reporting procedure, including published test forms.

The Engineer shall be notified in writing when any lots of headed bar reinforcement are ready for testing. The notification shall include the number of lots to be tested and the location where the tests are to be conducted. After notification has been received, test samples will be randomly selected by the Engineer from each production lot of headed bar reinforcement that is ready for shipment to the jobsite. If epoxy coating is required, test samples will be taken after the headed bar reinforcement has been prepared for epoxy coating.

A minimum of 3 samples from each production lot shall be tested. One tensile test shall be conducted on each sample.

Tensile tests shall conform to the requirements specified in ASTM A 970/A 970M, Section 6, Class A, except that at rupture, there shall be visible signs of necking in the reinforcing bar 1) at a minimum distance of one bar diameter away from the head to bar connection for friction welded headed bar reinforcement, or 2) outside the affected zone for integrally forged headed bar reinforcement.

The affected zone for integrally forged headed bar reinforcement is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered during the manufacturing process.

If one of the test specimens fails to meet the specified requirements, one retest shall be performed on one additional sample, selected by the Engineer, from the same production lot. If the additional test specimen, or if more than one of the original test specimens fail to meet these requirements, all headed bar reinforcement in the lot represented by the tests will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory and submitted to the Engineer as specified herein. The report shall be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include the following information for each set of samples: contract number, bridge number, lot number, bar size, type of headed bar reinforcement, physical condition of test sample, any notable defects, limits of affected zone, location of visible necking area, and the ultimate strength of each headed bar.

Each unit of headed bar reinforcement in a production lot to be shipped to the site shall be tagged in a manner such that production lots can be accurately identified at the jobsite. All unidentified headed bar reinforcement received at the jobsite will be rejected.

MEASUREMENT AND PAYMENT

Quantities of headed bar reinforcement will be measured as units determined from the number of heads shown on the plans or as directed by the Engineer.

The contract unit price paid for headed bar reinforcement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing headed bar reinforcement, including conforming to all testing requirements, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Bar reinforcement to be used in the manufacture of headed bar reinforcement and placing the completed headed bar reinforcement into the work will be measured and paid for as specified in Section 52, "Reinforcement," of the Standard Specifications, except that the lengths to be used in the computation of calculated mass of bar reinforcement shall be the entire length of the completed headed bar, including heads.

10-1.75 STRAY CURRENT PROTECTION

This work shall consist of connecting reinforcing bars. The work shall be in accordance with the details shown on the plans and as specified in these special provisions.

COPPER CABLE TO BAR REINFORCING STEEL CONNECTION

The copper cable shall be fusion welded to the bar reinforcing steel by an exothermic type welding process as shown on the plans. Materials used shall be in accordance with the manufacturer's recommendations regarding the mold size and shape, and the charge size and alloy mixture for the powder.

The copper cable shall conform to the provisions in Section 86-2.08B, "Multiple Circuit Conductors," of the Standard Specifications.

Rubber splicing compound, commercially available, shall be applied to the welded connection.

Apply 2 layers of tape, each half lapped. The tape shall be commercially available vinyl electrical tape with minimum thickness of 175 μm .

The test box cover and anchorage devices shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. The gasket shall be of commercially available neoprene.

PAYMENT

Except as otherwise provided, full compensation for connecting reinforcing bars shall be considered as included in the contract prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

10-1.76 CLEAN AND PAINT JOINT SEAL ASSEMBLIES, PTFE BEARINGS AND PTFE SPHERICAL BEARINGS

Joint seal assemblies, PTFE Bearings and PTFE Spherical Bearings shall be cleaned and painted with a single coat of inorganic zinc in conformance with the provisions in Sections 59-2, "Painting Structural Steel," 59-3, "Painting Galvanized Surfaces," and 91, "Paint," of the Standard Specifications and these special provisions.

Prior to performing any painting, the Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 3 copies of a separate Painting Quality Work Plan (PQWP) for each item of work for which painting is to be performed. As a minimum, each PQWP shall include the following:

- A. The name of each Contractor or subcontractor to be used.
- B. One copy each of all current ASTM and "SSPC: The Society for Protective Coatings" specifications or qualification procedures applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
- C. A copy of the coating manufacturer's guidelines and recommendations for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel, including testing methods and maximum allowable levels for soluble salts.
- D. Proposed methods and equipment to be used for paint application.
- E. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
- F. Proposed methods to protect the coating during curing, shipping, handling, and storage.
- G. A detailed paint repair plan for the repair of damaged areas.

Certification in conformance with the requirements in SSPC-QP 1, SSPC-QP 2, and SSPC-QP 3 of the "SSPC: The Society for Protective Coatings" will not be required for cleaning and painting of joint seal assemblies, PTFE bearings and PTFE Spherical Bearings.

The Engineer shall have 14 days to review the PQWP submittal after a complete plan has been received. No painting shall be performed until the PQWP for that work is approved by the Engineer. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the PQWP, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Fresh, potable water with a maximum chloride content of 75 mg/L and a maximum sulfate content of 200 mg/L shall be used for water rinsing or pressure washing operations. No continuous recycling of rinse water will be permitted. If rinse water is collected into a tank and subsequent testing determines the collected water conforms to the specified requirements, reuse may be permitted by the Engineer if no collected water is added to the tank after sample collection for determination of conformance to specified requirements.

Metal surfaces to be painted shall be dry blast cleaned in conformance with the requirements in SSPC-SP 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of not less than 40 μm nor more than 86 μm as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning metal surfaces shall conform to the requirements for Class A, Grade 2 to 3 abrasives contained in SSPC-AB 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings," and shall not contain hazardous material.

Steel abrasives used for blast cleaning metal surfaces shall comply with the requirements of SSPC-AB 3, "Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings." If steel abrasive is recycled through shop or field abrasive blast cleaning units, the recycled abrasive shall conform to the requirements of SSPC-AB 2, "Specification for Cleanliness of Recycled Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings."

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished prior to use for each shipment of blast cleaning material.

Abrasive blast cleaned surfaces shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the coating manufacturer's written recommendations or 10 micrograms per square centimeter. Each joint seal assembly, PTFE bearing and PTFE Spherical Bearing shall be tested for soluble salts. If levels of soluble salts exceed the maximum allowed by these special provisions, the Contractor shall perform additional cleaning and testing of blast cleaned surfaces until soluble salt levels conform to these requirements.

Corners shall be chamfered to remove sharp edges.

Thermal cut edges (TCEs) to be painted shall be conditioned before blast cleaning by shallow grinding or other method approved by the Engineer to remove the thin, hardened layer of material resulting from resolidification during cooling.

Visually evident base metal surface irregularities and defects shall be removed in accordance with ASTM Designation: A 6 or AASHTO Designation: M 160 prior to blast cleaning steel. When material defects exposed by blast cleaning are removed, the blast profile shall be restored by either blast cleaning or by using mechanical tools in accordance with SSPC-SP 11, "Power Tool Cleaning to Bare Metal," of the "SSPC: The Society for Protective Coatings."

Blast cleaned surfaces shall receive a single undercoat, and a final coat where specified, consisting of an inorganic zinc coating conforming to the requirements in AASHTO Designation: M 300, Type I or Type II, except that:

1. The first 3 sentences of Section 5.6, "Primer Field Performance Requirements," shall not apply for Type II coatings, and
2. The entire Section 5.6.1 shall not apply for either type of inorganic zinc coating.

If the Contractor proposes to use a Type I coating, the Contractor shall furnish to the Engineer for review documentation as required in Section 5.6 of AASHTO Designation: M 300. The Contractor shall allow the Engineer 14 days to review the proposal.

If the Contractor proposes to use a Type II coating, the coating shall be selected from the qualified products list, which may be obtained from the Transportation Laboratory.

The color of the inorganic zinc coating shall match Federal Standard 595B, No. 36373.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Stainless steel surfaces of PTFE bearings and PTFE spherical bearings shall be masked off completely prior to application of inorganic zinc coating.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single coat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 8 hours of the start of blast cleaning. Abrasive blast cleaned steel shall not be exposed to relative humidity exceeding 85 percent prior to application of inorganic zinc.

The total dry film thickness of all applications of inorganic zinc, including the surfaces of outside existing members within the grip under bolt heads, nuts, and washers, shall be not less than 100 μm nor more than 200 μm , except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25 μm and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc coatings used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Metal surfaces coated with Type II inorganic zinc coating shall be protected from conditions that may cause the coating film to dissolve. The Contractor, at the Contractor's expense, shall repair areas where the coating has dissolved by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed prior to application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The Contractor shall test the inorganic zinc coating at locations determined by the Engineer. The Contractor shall determine the sequence of the testing operations. The testing for adhesion and hardness shall be performed no sooner than 72 hours after application of the inorganic zinc coating. Satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc coating shall pass the following tests:

- A. The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Engineer shall select 2 locations per assembly and bearing for adhesion testing. If either of the locations tested fails to meet adhesion requirements, the assembly and bearing will be rejected. The Contractor, at the Contractor's expense, shall repair the rejected item by blast cleaning and repainting with inorganic zinc to the specified thickness. Test locations for areas of inorganic zinc meeting adhesion testing requirements shall be repaired by application of organic zinc primer as specified in Section 91-1.04, "Materials," of the Standard Specifications to the specified minimum dry film thickness.
- B. The inorganic zinc coating shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.
- C. Dry to solvent insolubility for inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent used for testing of water borne inorganic zinc primers. The resistance rating shall be not less than 4. Each assembly and bearing shall be tested for dry to solvent insolubility. Inorganic zinc coating that does not meet the solvent insolubility requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.
- D. Surface hardness of inorganic zinc shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Each assembly and bearing shall be tested for surface hardness. Inorganic zinc coating that fails to meet the surface hardness requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of inorganic zinc coating after repairs have been completed.

Full compensation for cleaning and painting of joint seal assemblies shall be considered as included in the contract unit price paid for joint seal assemblies, and no separate payment will be made therefor.

Full compensation for cleaning and painting of PTFE Bearings shall be considered as included in the contract unit price paid for PTFE Bearings, and no separate payment will be made therefor.

Full compensation for cleaning and painting of PTFE Spherical Bearings shall be considered as included in the contract unit price paid for PTFE Spherical Bearings, and no separate payment will be made therefor.

10-1.77 STEEL STRUCTURES

Construction of steel structures shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

Attention is directed to "Welding" in Section 8, "Materials," of these special provisions.

The following substitutions of high-strength steel fasteners shall be made:

| METRIC SIZE SHOWN ON THE PLANS | SIZE TO BE SUBSTITUTED |
|--|---|
| ASTM Designation: A 325M (Nominal bolt diameter (mm)) | ASTM Designation: A 325 (Nominal bolt diameter (inch)) |
| 13, 12.70, or M12 | 1/2 |
| 16, 15.88, or M16 | 5/8 |
| 19, 19.05, or M20 | 3/4 |
| 22, 22.22, or M22 | 7/8 |
| 24, 25, 25.40, or M24 | 1 |
| 29, 28.58, or M27 | 1 1/8 |
| 32, 31.75, or M30 | 1 1/4 |
| 38, 38.10, or M36 | 1 1/2 |

MATERIALS

Structural steel rolled shapes used in overhead sign structures shall conform to the Charpy V-notch impact values specified for steel plate in Section 55-2, "Materials," of the Standard Specifications.

High-strength fastener assemblies and other bolts attached to structural steel with nuts and washers shall be zinc-coated. When direct tension indicators are used in these assemblies, the direct tension indicator and all components of the fastener assembly shall be zinc-coated by the mechanical deposition process.

ROTATIONAL CAPACITY TESTING PRIOR TO SHIPMENT TO JOB SITE

Rotational capacity tests shall be performed on all lots of high-strength fastener assemblies prior to shipment of these lots to the project site. Zinc-coated assemblies shall be tested after all fabrication, coating, and lubrication of components has been completed. One hardened washer shall be used under each nut for the tests.

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates.

Each combination of bolt production lot, nut lot, and washer lot shall be tested as an assembly.

A rotational capacity lot number shall be assigned to each combination of lots tested. Each shipping unit of fastener assemblies shall be plainly marked with the rotational capacity lot number.

Two fastener assemblies from each rotational capacity lot shall be tested.

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of long bolts. Fasteners are considered to be long bolts when full nut thread engagement can be achieved when installed in a bolt tension measuring device:

A. Long Bolt Test Equipment:

1. Calibrated bolt tension measuring device with adequate tension capacity for the bolts being tested.
2. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Long Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.
4. Steel beam or member, such as a girder flange or cross frame, to which the bolt tension measuring device will be attached. The device shall be accessible from the ground.

B Long Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Insert the bolt into the bolt tension measuring device and install the required number of washers, and additional spacers as needed, directly beneath the nut to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug tension shall not be less than the Table A value but may exceed the Table A value by a maximum of 2 kips.

Table A

| High-Strength Fastener Assembly Tension Values to Approximate Snug-Tight Condition | |
|--|---------------------|
| Bolt Diameter (inches) | Snug Tension (kips) |
| 1/2 | 1 |
| 5/8 | 2 |
| 3/4 | 3 |
| 7/8 | 4 |
| 1 | 5 |
| 1 1/8 | 6 |
| 1 1/4 | 7 |
| 1 3/8 | 9 |
| 1 1/2 | 10 |

5. Match-mark the assembly by placing a heavy reference start line on the face plate of the bolt tension measuring device which aligns with 1) a mark placed on one corner of the nut, and 2) a radial line placed across the flat on the end of the bolt, or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make an additional mark on the face plate, either 2/3 of a turn, one turn, or 1 1/3 turn clockwise from the heavy reference start line, depending on the bolt length being tested as shown in Table B.

Table B

| Required Nut Rotation for Rotational Capacity Tests ^(a,b) | |
|---|--------------------------|
| Bolt Length (measured in Step 1) | Required Rotation (turn) |
| 4 bolt diameters or less | 2/3 |
| Greater than 4 bolt diameters but no more than 8 bolt diameters | 1 |
| Greater than 8 bolt diameters, but no more than 12 bolt diameters ^(c) | 1 1/3 |
| <p>(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance shall be plus or minus 45 degrees.</p> <p>(b) Applicable only to connections in which all material within grip of the bolt is steel.</p> <p>(c) When bolt length exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.</p> | |

- Turn the nut to achieve the applicable minimum bolt tension value listed in Table C. After reaching this tension, record the moving torque, in foot-pounds, required to turn the nut, and also record the corresponding bolt tension value in pounds. Torque shall be measured with the nut in motion. Calculate the value, T (in ft-lbs), where $T = [(the\ measured\ tension\ in\ pounds) \times (the\ bolt\ diameter\ in\ inches) / 48\ in/ft]$.

Table C

| Minimum Tension Values for High-Strength Fastener Assemblies | |
|--|------------------------|
| Bolt Diameter (inches) | Minimum Tension (kips) |
| 1/2 | 12 |
| 5/8 | 19 |
| 3/4 | 28 |
| 7/8 | 39 |
| 1 | 51 |
| 1 1/8 | 56 |
| 1 1/4 | 71 |
| 1 3/8 | 85 |
| 1 1/2 | 103 |

- Turn the nut further to increase bolt tension until the rotation listed in Table B is reached. The rotation is measured from the heavy reference line made on the face plate after the bolt was snug-tight. Record this bolt tension.
- Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Long Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque (Step 6) shall be less than or equal to the calculated value, T (Step 6), 2) the bolt tension measured in Step 7 shall be greater than or equal to the applicable turn test tension value listed in Table D, 3) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 4) the bolt does not shear from torsion or fail during the test, and 5) the assembly does not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head is expected and will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

Table D

| Turn Test Tension Values | |
|---------------------------|-----------------------------|
| Bolt Diameter (inches) | Turn Test Tension (kips) |
| 1/2 | 14 |
| 5/8 | 22 |
| 3/4 | 32 |
| 7/8 | 45 |
| 1 | 59 |
| 1 1/8 | 64 |
| 1 1/4 | 82 |
| 1 3/8 | 98 |
| 1 1/2 | 118 |

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of short bolts. Fasteners are considered to be short bolts when full nut thread engagement cannot be achieved when installed in a bolt tension measuring device:

A. Short Bolt Test Equipment:

1. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Short Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
2. Spud wrench or equivalent.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.
4. Steel plate or girder with a hole to install bolt. The hole size shall be 1.6 mm greater than the nominal diameter of the bolt to be tested. The grip length, including any plates, washers, and additional spacers as needed, shall provide the proper number of threads within the grip, as required in Step 2 of the Short Bolt Test Procedure.

B. Short Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Install the bolt into a hole on the plate or girder and install the required number of washers and additional spacers as needed between the bearing face of the nut and the underside of the bolt head to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug condition shall be the full manual effort applied to the end of a 305 mm long wrench. This applied torque shall not exceed 20 percent of the maximum allowable torque in Table E.

Table E

| Maximum Allowable Torque for High-Strength Fastener Assemblies | |
|--|-----------------|
| Bolt Diameter (inches) | Torque (ft-lbs) |
| 1/2 | 145 |
| 5/8 | 285 |
| 3/4 | 500 |
| 7/8 | 820 |
| 1 | 1220 |
| 1 1/8 | 1500 |
| 1 1/4 | 2130 |
| 1 3/8 | 2800 |
| 1 1/2 | 3700 |

5. Match-mark the assembly by placing a heavy reference start line on the steel plate or girder which aligns with 1) a mark placed on one corner of the nut and 2) a radial line placed across the flat on the end of the bolt or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make 2 additional small marks on the steel plate or girder, one 1/3 of a turn and one 2/3 of a turn clockwise from the heavy reference start line on the steel plate or girder.
6. Using the torque wrench, tighten the nut to the rotation value listed in Table F. The rotation is measured from the heavy reference line described in Step 5 made after the bolt was snug-tight. A second wrench shall be used to prevent rotation of the bolt head during tightening. Measure and record the moving torque after this rotation has been reached. The torque shall be measured with the nut in motion.

Table F

| Nut Rotation Required for Turn-of-Nut Installation ^(a,b) | |
|--|--------------------------|
| Bolt Length (measured in Step 1) | Required Rotation (turn) |
| 4 bolt diameters or less | 1/3 |
| (a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees. | |
| (b) Applicable only to connections in which all material within grip of the bolt is steel. | |

7. Tighten the nut further to the 2/3-turn mark as indicated in Table G. The rotation is measured from the heavy reference start line made on the plate or girder when the bolt was snug-tight. Verify that the radial line on the bolt end or on the exposed portions of the threads of tension control bolts is still in alignment with the start line.

Table G

| Required Nut Rotation for Rotational Capacity Test | |
|--|--------------------------|
| Bolt Length (measured in Step 1) | Required Rotation (turn) |
| 4 bolt diameters or less | 2/3 |

8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Short Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque from Step 6 shall be less than or equal to the maximum allowable torque from Table E, 2) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 3) the bolt does not shear from torsion or fail during the test, and 4) the assembly shall not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

INSTALLATION TENSION TESTING AND ROTATIONAL CAPACITY TESTING AFTER ARRIVAL ON THE JOB SITE

Installation tension tests and rotational capacity tests on high-strength fastener assemblies shall be performed by the Contractor prior to acceptance or installation and after arrival of the fastener assemblies on the project site. Installation tension tests and rotational capacity tests shall be performed at the job-site, in the presence of the Engineer, on each rotational capacity lot of fastener assemblies.

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates.

Installation tension tests shall be performed on 3 representative fastener assemblies in conformance with the provisions in Section 8, "Installation," of the RCSC Specification. For short bolts, Section 8.2, "Pretensioned Joints," of the RCSC Specification shall be replaced by the "Pre-Installation Testing Procedures," of the "Structural Bolting Handbook," published by the Steel Structures Technology Center, Incorporated.

The rotational capacity tests shall be performed in conformance with the requirements for rotational capacity tests in "Rotational Capacity Testing Prior to Shipment to Job Site" of these special provisions.

At the Contractor's expense, additional installation tension tests, tests required to determine job inspecting torque, and rotational capacity tests shall be performed by the Contractor on each rotational capacity lot, in the presence of the Engineer, if 1) any fastener is not used within 3 months after arrival on the jobsite, 2) fasteners are improperly handled, stored, or subjected to inclement weather prior to final tightening, 3) significant changes are noted in original surface condition of threads, washers, or nut lubricant, or 4) the Contractor's required inspection is not performed within 48 hours after all fasteners in a joint have been tensioned.

Failure of a job-site installation tension test or a rotational capacity test will be cause for rejection of unused fasteners that are part of the rotational capacity lot.

When direct tension indicators are used, installation verification tests shall be performed in conformance with Appendix Section X1.4 of ASTM Designation: F959, except that bolts shall be initially tensioned to a value 5 percent greater than the minimum required bolt tension.

SEALING

When zinc-coated tension control bolts are used, the sheared end of each fastener shall be completely sealed with non-silicone type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be gray in color and shall have a minimum thickness of 1.3 mm. The sealant shall be applied to a clean sheared surface on the same day that the splined end is sheared off.

WELDING

Table 2.2 of AWS D1.5 is superseded by the following table:

| Base Metal Thickness of the Thicker Part Joined, mm | Minimum Effective Partial Joint Penetration Groove Weld Size, * mm |
|--|--|
| Over 6 to 13 inclusive | 5 |
| Over 13 to 19 inclusive | 6 |
| Over 19 to 38 inclusive | 8 |
| Over 38 to 57 inclusive | 10 |
| Over 57 to 150 inclusive | 13 |
| Over 150 | 16 |

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

Dimensional details and workmanship for welded joints in tubular and pipe connections shall conform to the provisions in Part A, "Common Requirements of Nontubular and Tubular Connections," and Part D, "Specific Requirements for Tubular Connections," in Section 2 of AWS D1.1.

The requirement of conformance with AWS D1.5 shall not apply to work conforming to Section 56-1, "Overhead Sign Structures," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

10-1.78 SIGN STRUCTURES

Sign structures and foundations for overhead signs shall conform to the provisions in Section 56-1, "Overhead Sign Structures," of the Standard Specifications, "Steel Structures" of these special provisions, and the following requirements.

Before commencing fabrication of sign structures, the Contractor shall submit 2 sets of working drawings to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall include sign panel dimensions, span lengths, post heights, anchorage layouts, proposed splice locations, a snugging and tensioning pattern for anchor bolts and high-strength bolted connections, and details for permanent steel anchor bolt templates. The working drawings shall be supplemented with a written quality control program that includes methods, equipment, and personnel necessary to satisfy the requirements specified herein.

Working drawings shall be 559 mm x 864 mm or 279 mm x 432 mm in size and each drawing and calculation sheet shall include the State assigned designations for the sign structure type and reference as shown on the contract plans, District-County-Route-Kilometer Post, and contract number.

The Engineer shall have 30 days to review the sign structure working drawings after a complete submittal has been received. No fabrication or installation of sign structures shall be performed until the working drawings are approved in writing by the Engineer.

Should the Engineer fail to complete the review within the time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the sign structure working drawings, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Steel bolts not designated on the plans as high strength (HS) or stainless steel shall be for general applications and shall conform to the requirements in ASTM Designation: A 307.

A permanent steel template shall be used to maintain the proper anchor bolt spacing.

One top nut, one leveling nut, and 2 washers shall be provided for the upper threaded portion of each anchor bolt.

Flatness of surfaces for the following shall conform to the requirements in ASTM Designation: A 6/A 6M:

1. Base plates that are to come in contact with concrete, grout, or washers and leveling nuts
2. Plates in high-strength bolted connections

No holes shall be made in members unless the holes are shown on the plans or are approved in writing by the Engineer.

Longitudinal seam welds shall have 60 percent minimum penetration, except that within 150 mm of circumferential welds, longitudinal seam welds shall be complete joint penetration (CJP) groove welds. In addition, longitudinal seam welds on structures having telescopic pole segment splices shall be CJP groove welds on the female end for a length on each end equal to the designated slip fit splice length plus 150 mm.

Steel members used for overhead sign structures shall receive nondestructive testing (NDT) in conformance with AWS D1.1 and the following:

1.

| Weld Location | Weld Type | Minimum Required NDT |
|--|--|---|
| Splice welds around the perimeter of tubular sections, poles, and arms. | CJP groove weld with backing ring | 100% UT ^a or RT ^b |
| Longitudinal seam welds | CJP or PJP ^c groove weld | Random 25% MT ^d |
| Longitudinal seam welds within 150 mm of a circumferential splice. | CJP groove weld | 100% UT or RT |
| Welds attaching base plates, flange plates, or pole or mast arm plates, to poles or arm tubes. | CJP groove weld with backing ring and reinforcing fillet | t > 4.5 mm: 100% UT and MT t < 4.5 mm: 100% MT after root weld pass & final weld pass t = pole or arm thickness |
| | External (top) fillet weld for socket-type connections | 100% MT |

^a ultrasonic testing

^b radiographic testing

^c partial joint penetration

^d magnetic particle testing

2. The acceptance and repair criteria for UT of welded joints where any of the members are less than 8 mm thick or where tubular sections are less than 325 mm in diameter shall conform to the requirements in AWS D1.1, Section 6.13.3.1. A written procedure approved by the Engineer shall be used when performing this UT. These written procedures shall conform to the requirements in AWS D1.1, Annex K. The acceptance and repair criteria for other welded joints receiving UT shall conform to the requirements in AWS D1.1, Section 6, Table 6.3 for cyclically loaded nontubular connections.
3. The acceptance and repair criteria for radiographic or real time image testing shall conform to the requirements of AWS D1.1 for tensile stress welds.
4. For longitudinal seam welds, the random locations for NDT will be selected by the Engineer. The cover pass shall be ground smooth at the locations to be tested. If repairs are required in a portion of a tested weld, the repaired portion shall receive NDT, and additional NDT shall be performed on untested portions of the weld. The additional NDT shall be performed on 25 percent of that longitudinal seam weld. After this additional NDT is performed and if more repairs are required, then that entire longitudinal seam weld shall receive NDT.

Circumferential welds and base plate to post welds may be repaired only one time without written permission from the Engineer.

All ferrous metal parts of tubular sign structures shall be galvanized and shall not be painted.

Full compensation for furnishing anchor bolt templates and for testing of welds shall be considered as included in the contract price paid per kilogram for furnish sign structure, and no additional compensation will be allowed therefor.

10-1.79 CLEAN AND PAINT SIGN STRUCTURES

Sign structures shall be cleaned and painted in conformance with the provisions in Section 56-1.05, "Surface Finish," and Section 91, "Paint," of the Standard Specifications and these special provisions.

Prior to performing any painting or paint removal, the Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 3 copies of a separate Painting Quality Work Plan (PQWP) for each item of work for which painting or paint removal is to be performed. As a minimum, each PQWP shall include the following:

- A. The name of each Contractor or subcontractor to be used.
- B. One copy each of all current ASTM and "SSPC: The Society for Protective Coatings" specifications or qualification procedures applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
- C. A copy of the coating manufacturer's guidelines and recommendations for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel, including testing methods and maximum allowable levels for soluble salts.
- D. Proposed methods and equipment to be used for any paint application.

- E. Proof of each of any required certifications, SSPC-QP 1, SSPC-QP 2, SSPC-QP 3. Where SSPC-QP 3 certification is required, an enclosed shop facility shall be required. Certification of AISC Sophisticated Paint Endorsement Quality Program, P-1 Enclosed endorsement, will be considered equivalent to SSPC-QP 3.
 - 1. In lieu of certification in conformance with the requirements in SSPC-QP 1 for this project, the Contractor may submit written documentation showing conformance with the requirements in Section 3, "General Qualification Requirements," of SSPC-QP 1.
 - 2. In lieu of certification in conformance with the requirements in SSPC-QP 2 for this project, the Contractor may submit written documentation showing conformance with the requirements in Sections 4.2 through 4.6 of SSPC-QP 2.
 - 3. In lieu of certification in conformance with the requirements in SSPC-QP 3 for this project, the Contractor may submit written documentation showing conformance with the requirements in Section 3, "General Qualification Requirements," of SSPC-QP 3.
- F. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
- G. Proposed methods to protect the coating during curing, shipping, handling, and storage.
- H. Proposed rinse water collection plan.
- I. A detailed paint repair plan for the repair of damaged areas.
- J. Procedures for containing blast media and water during application of coatings and coating repair of erected steel.
- K. Examples of proposed daily reports for all testing to be performed, including type of testing, location, lot size, time, weather conditions, test personnel, and results.

The Engineer shall have 3 weeks to approve the PQWP submittal after a complete plan has been received. No painting or paint removal shall be performed until the PQWP for that work is approved by the Engineer. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in approving the PQWP, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

It is understood that the Engineer's approval of the Contractor's PQWP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the plans and specifications.

CLEAN AND PAINT UNGALVANIZED SURFACES

Ungalvanized steel surfaces to be cleaned and painted shall be dry blast cleaned in conformance with the requirements of SSPC-SP 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of no less than 40 μm nor more than 86 μm as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning steel surfaces shall conform to the requirements for Class A, Grade 2 to 3 abrasives contained in SSPC-AB 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings," and shall not contain hazardous material.

Steel abrasives used for blast cleaning steel surfaces shall comply with the requirements of SSPC-AB 3, "Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings." If steel abrasive is recycled through shop or field abrasive blast cleaning units, the recycled abrasive shall conform to the requirements of SSPC-AB 2, "Specification for Cleanliness of Recycled Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings."

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished prior to use for each shipment of blast cleaning material for steel.

Abrasive blast cleaned surfaces shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the coating manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of abrasive blast cleaned steel shall be tested at the rate of 3 tests for the first 100 square meters prepared per day, and one test for each additional 100 square meters or portion thereof, at locations selected by the Engineer. When less than 100 square meters of surface area is prepared in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.

Blast cleaned surfaces shall receive a single undercoat consisting of an inorganic zinc coating conforming to the requirements in AASHTO Designation: M 300, Type I or Type II, except that: 1) the first 3 sentences of Section 5.6, "Primer Field Performance Requirements," shall not apply for Type II coatings, and 2) the entire Section 5.6.1 shall not apply for either type of inorganic zinc coating.

If the Contractor proposes to use a Type I coating, the Contractor shall furnish to the Engineer for review documentation as required in Section 5.6 of AASHTO Designation: M 300. The Contractor shall allow the Engineer 4 weeks to review the proposal.

If the Contractor proposes to use a Type II coating, the coating shall be selected from the qualified products list, which may be obtained from the Transportation Laboratory.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single undercoat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 8 hours of the start of blast cleaning. Abrasive blast cleaned steel shall not be exposed to relative humidity exceeding 85 percent prior to application of inorganic zinc coating.

The total dry film thickness of all applications of the inorganic zinc undercoat, including the surfaces of outside existing members within the grip under bolt heads, nuts, and washers, shall be not less than 100 μm nor more than 200 μm , except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25 μm and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc coatings used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Steel surfaces coated with Type II inorganic zinc coating shall be protected from conditions that may cause the coating film to dissolve. The Contractor, at the Contractor's expense, shall repair areas where the coating has dissolved by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed prior to application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The Contractor shall test the inorganic zinc coating prior to application of finish coats. The locations of the tests will be determined by the Engineer. The Contractor shall determine the sequence of the testing operations. The testing for adhesion and hardness will be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc coating. At the Contractor's expense, satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc coating shall pass the following tests:

- A. The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Engineer will select 3 locations per girder or 100 square meters of painted surface, whichever is less, for adhesion testing. If less than 100 square meters of steel is painted in a work shift, the Engineer will select 3 areas painted during the work shift for testing. If 2 or more of the locations tested fail to meet adhesion requirements, the entire area represented by the tests will be rejected. If one of the locations tested fails to meet adhesion requirements, an additional 3 locations shall be tested. Should any of the additional locations fail to meet adhesion requirements, the entire area represented by the tests will be rejected. The Contractor, at the Contractor's expense, shall repair the rejected area by blast cleaning and repainting with inorganic zinc to the specified thickness. Test locations for areas of inorganic zinc meeting adhesion testing requirements shall be repaired by application of organic zinc primer as specified in Section 91-1.04, "Materials," of the Standard Specifications to the specified minimum dry film thickness.

- B. Areas of inorganic zinc coating where finish coats are to be applied shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of inorganic zinc coating shall be tested at the rate of 3 tests for the first 100 square meters to be painted per day and one test for each additional 100 square meters or portion thereof at locations selected by the Engineer. When less than 100 square meters of surface area is painted in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.
- C. Prior to application of finish coats, the inorganic zinc coating shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface, as determined by the Engineer, shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Water Borne Inorganic Zinc Primers

- A. The surface pH of the inorganic zinc primer shall be tested by wetting the surface with de-ionized water for a minimum of 15 minutes but no longer than 30 minutes and applying pH paper with a capability of measuring in increments of 0.5 pH units. At least 2 surface pH readings shall be taken for every 50 square meters or portion thereof. If less than 50 square meters of steel is coated in a single shift or day, at least 2 surface pH readings shall be taken for primer applied during that period. Application of finish coats will not be permitted until the surface pH is less than or equal to 7.
- B. Dry to solvent insolubility for water borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Solvent Borne Inorganic Zinc Primers

- A. Dry to solvent insolubility for solvent borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.
- B. Surface hardness of solvent borne inorganic zinc shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Areas of inorganic zinc coating shall be tested at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating that fails to meet the surface hardness requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of inorganic zinc coating after repairs have been completed.

All areas of inorganic zinc coating shall be water rinsed in conformance with the requirements in Section 59-1.03, "Application," of the Standard Specifications and these special provisions. Areas of the coating removed by water rinsing shall be reapplied in conformance with the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications and these special provisions. Except as approved by the Engineer, a minimum time of 72 hours shall be allowed between application of inorganic zinc coating and water rinsing.

Exposed area of inorganic zinc coating shall receive a minimum of 2 finish coats of an exterior grade latex paint supplied by the manufacturer of the inorganic zinc coating.

The first finish coat shall be applied within 48 hours following water rinsing and passing the soluble salt testing requirements herein.

The finish coat paint shall be formulated for application to inorganic zinc coating, shall meet the requirements for SSPC-Paint 24, "Latex Semi-Gloss Exterior Topcoat," of the "SSPC: The Society for Protective Coatings," and shall conform to the following:

- A. No visible color change in the finish coats shall occur when tested in conformance with the requirements of ASTM Designation: G 53 using FS 40 UV-B bulbs for a minimum of 38 cycles. The cycle shall be 4 hours of ultraviolet (UV) exposure at 60°C and 4 hours of condensate exposure at 40°C.
- B. The vehicle shall be an acrylic or modified acrylic copolymer with a minimum of necessary additives.

The first finish coat shall be applied in 2 applications. The first application shall consist of a spray applied mist application. The second application shall be applied after the mist application has dried to a set to touch condition as determined by the procedure described in Section 7 of ASTM Designation: D1640. The total dry film thickness of both applications of the first finish coat shall be not less than 50 µm.

Except as approved by the Engineer, a minimum drying time of 12 hours shall be allowed between finish coats.

The second finish coat color shall match Federal Standard 595B, No. 24491. The total dry film thickness of the applications of the second finish coat shall be not less than 50 µm.

The 2 finish coats shall be applied in 3 or more applications to a total dry film thickness of not less than 100 µm nor more than 200 µm.

The total dry film thickness of all applications of inorganic zinc coating and finish coat paint shall be not less than 200 µm nor more than 350 µm.

PAYMENT

Full compensation for water rinsing shall be considered as included in the contract price paid per kilogram for furnish sign structure of the type involved and no additional compensation will be allowed therefor.

Full compensation for conforming to the requirements in SSPC-QP 1, SSPC-QP 2, and SSPC-QP 3 of the "SSPC: The Society for Protective Coatings" shall be considered as included in the contract lump sum price paid per kilogram for furnish sign structure of the type involved, and no additional compensation will be allowed therefor.

PAINT GALVANIZED SURFACES

Galvanized steel surfaces shall be prepared and painted in conformance with Section 56-1.05, "Surface Finish," and Section 59-3, "Painting Galvanized Surfaces," of the Standard Specifications and these special provisions.

Galvanized steel surfaces shall receive a minimum of 2 finish coats of paint conforming to the provisions for finish coat paint on ungalvanized surfaces in "Clean and Paint Ungalvanized Surfaces" of these special provisions.

Paint shall be applied to galvanized steel surfaces to the thicknesses and in conformance with the provisions for finish coats on ungalvanized surfaces in "Clean and Paint Ungalvanized Surfaces" of these special provisions.

The total dry film thickness of all applications on galvanized steel surfaces shall be not less than 100 µm nor more than 200 µm, except that the total dry film thickness on each contact surface of high strength bolted connections shall be between 25 µm and 100 µm and may be applied in one application.

10-1.80 ROADSIDE SIGNS

Roadside signs shall be furnished and installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

The Contractor shall furnish roadside sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and AWP A Use Category System: UC4A, Commodity Specification A or B.

Type N, Type P, and Type R marker panels mounted on a post with a roadside sign shall be considered to be sign panels and will not be paid for as markers.

10-1.81 FURNISH SIGN

Signs shall be fabricated and furnished in accordance with details shown on the plans, the Traffic Sign Specifications, and these special provisions.

Traffic Sign Specifications for California sign codes are available for review at:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm>

Traffic Sign Specifications for signs referenced with Federal MUTCD sign codes can be found in Standard Highway Signs Book, administered by the Federal Highway Administration, which is available for review at:

http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

Information on cross-referencing California sign codes with the Federal MUTCD sign codes is available at:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm>

Temporary or permanent signs shall be free from blemishes that may affect the serviceability and detract from the general sign color and appearance when viewing during daytime and nighttime from a distance of 8 m. The face of each finished sign shall be uniform, flat, smooth, and free of defects, scratches, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of the sign panels shall be free of router chatter marks, burns, sharp edges, loose rivets, delaminated skins, excessive adhesive over spray and aluminum marks.

QUALITY CONTROL FOR SIGNS

The requirements of "Quality Control for Signs" in this section shall not apply to construction area signs.

No later than 14 days before sign fabrication, the Contractor shall submit a written copy of the quality control plan for signs to the Engineer for review. The Engineer will have 10 days to review the quality control plan. Sign fabrication shall not begin until the Engineer approves the Contractor's quality control plan in writing. The Contractor shall submit to the Engineer at least 3 copies of the approved quality control plan. The quality control plan shall include, but not be limited to the following requirements:

- A. Identification of the party responsible for quality control of signs,
- B. Basis of acceptance for incoming raw materials at the fabrication facility,
- C. Type, method and frequency of quality control testing at the fabrication facility,
- D. List (by manufacturer and product name) of process colors, protective overlay film, retroreflective sheeting and black non-reflective film,
- E. Recommended cleaning procedure for each product, and
- F. Method of packaging, transport and storage for signs.

No legend shall be installed at the project site. Legend shall include letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters. The style, font, size, and spacing of the legend shall conform to the Standard Alphabets published in the FHWA Standard Highway Signs Book. The legend shall be oriented in the same direction in accordance with the manufacturer's orientation marks found on the retroreflective sheeting.

On multiple panel signs, legend shall be placed across joints without affecting the size, shape, spacing, and appearance of the legend. Background and legend shall be wrapped around interior edges of formed panel signs as shown on plans to prevent delamination.

The following notation shall be placed on the lower right side of the back of each sign where the notation will not be blocked by the sign post or frame:

- A. PROPERTY OF STATE OF CALIFORNIA,
- B. Name of the sign manufacturer,
- C. Month and year of fabrication,
- D. Type of retroreflective sheeting, and
- E. Manufacturer's identification and lot number of retroreflective sheeting.

The above notation shall be applied directly to the aluminum sign panels in 6-mm upper case letters and numerals by die-stamp and applied by similar method to the fiberglass reinforced plastic signs. Painting, screening, or engraving the notation will not be allowed. The notation shall be applied without damaging the finish of the sign.

Signs with a protective overlay film shall be marked with a dot of 10 mm diameter. The dot placed on white border shall be black, while the dot placed on black border shall be white. The dot shall be placed on the lower border of the sign before application of the protective overlay film and shall not be placed over the legend and bolt holes. The application method and exact location of the dot shall be determined by the manufacturer of the signs.

For sign panels that have a minor dimension of 1220 mm or less, no splice will be allowed in the retroreflective sheet except for the splice produced during the manufacturing of the retroreflective sheeting. For sign panels that have a minor dimension greater than 1220 mm, only one horizontal splice will be allowed in the retroreflective sheeting.

Unless specified by the manufacturer of the retroreflective sheeting, splices in retroreflective sheeting shall overlap by a minimum of 25 mm. Splices shall not be placed within 50 mm from edges of the panels. Except at the horizontal borders, the splices shall overlap in the direction from top to bottom of the sign to prevent moisture penetration. The retroreflective sheeting at the overlap shall not exhibit a color difference under the incident and reflected light.

Signs exhibiting a significant color difference between daytime and nighttime shall be replaced immediately.

Repairing sign panels will not be allowed except when approved by the Engineer.

The Department will inspect signs at the Contractor's facility and delivery location, and in accordance with Section 6, "Control of Materials," of the Standard Specifications. The Engineer will inspect signs for damage and defects before and after installation.

Regardless of kind, size, type, or whether delivered by the Contractor or by a common carrier, signs shall be protected by thorough wrapping, tarping, or other methods to ensure that signs are not damaged by weather conditions and during transit. Signs shall be dry during transit and shipped on pallets, in crates, or tier racks. Padding and protective materials shall be placed between signs as appropriate. Finished sign panels shall be transported and stored by method that protects the face of signs from damage. The Contractor shall replace wet, damaged, and defective signs.

Signs shall be stored in dry environment at all times. Signs shall not rest directly on the ground or become wet during storage. Signs, whether stored indoor or outdoor, shall be free standing. In areas of high heat and humidity signs shall be stored in enclosed climate-controlled trailers or containers. Signs shall be stored indoor if duration of the storage will exceed 30 days.

Screen processed signs shall be protected, transported and stored as recommended by the manufacturer of the retroreflective sheeting.

When requested, the Contractor shall provide the Engineer test samples of signs and materials used at various stages of production. Sign samples shall be 300 mm x 300 mm in size with applied background, letter or numeral, and border strip.

The Contractor shall assume the costs and responsibilities resulting from the use of patented materials, equipment, devices, and processes for the Contractor's work.

SHEET ALUMINUM

Alloy and temper designations for sheet aluminum shall be in accordance with ASTM Designation: B209.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the sheet aluminum.

Sheet aluminum shall be pretreated in accordance to ASTM Designation: B449. Surface of the sheet aluminum shall be cleaned, deoxidized, and coated with a light and tightly adherent chromate conversion coating free of powdery residue. The conversion coating shall be Class 2 with a mass between 108 mg/m² and 377 mg/m², and an average mass of 269 mg/m². Following the cleaning and coating process, the sheet aluminum shall be protected from exposure to grease, oils, dust, and contaminants.

Sheet aluminum shall be free of buckles, warps, dents, cockles, burrs, and defects resulting from fabrication.

Base plate for standard route marker shall be die cut.

RETROREFLECTIVE SHEETING

The Contractor shall furnish retroreflective sheeting for sign background and legend in accordance with ASTM Designation: D4956 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Retroreflective sheeting shall be applied to sign panels as recommended by the retroreflective sheeting manufacturer without stretching, tearing, and damage.

Class 1, 3, or 4 adhesive backing shall be used for Type II, III, IV, VII, VIII, and IX retroreflective sheeting. Class 2 adhesive backing may also be used for Type II retroreflective sheeting. The adhesive backing shall be pressure sensitive and fungus resistant.

When the color of the retroreflective sheeting determined from instrumental testing is in dispute, the Engineer's visual test will govern.

PROCESS COLOR AND FILM

The Contractor shall furnish and apply screened process color, non-reflective opaque black film, and protective overlay film of the type, kind, and product that are approved by the manufacturer of the retroreflective sheeting.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the screened process color, non-reflective opaque black film, and protective overlay film.

The surface of the screened process color shall be flat and smooth. When the screened process colors determined from the instrumental testing in accordance to ASTM Designation: D4956 are in dispute, the Engineer's visual test will govern.

The Contractor shall provide patterns, layouts, and set-ups necessary for the screened process.

The Contractor may use green, red, blue, and brown reverse-screened process colors for background and non-reflective opaque black film or black screened process color for legend. The coefficient of retroreflection for reverse-screened process colors on white retroreflective sheeting shall not be less than 70 percent of the coefficient of retroreflection specified in ASTM Designation: D4956.

The screened process colors and non-reflective opaque black film shall have the same outdoor weatherability as that of the retroreflective sheeting.

After curing, screened process colors shall withstand removal when tested by applying 3M Company Scotch Brand Cellophane Tape No. 600 or equivalent tape over the color and removing with one quick motion at 90° angle.

SINGLE SHEET ALUMINUM SIGN

Single sheet aluminum signs shall be fabricated and furnished with or without frame. The Contractor shall furnish the sheet aluminum in accordance to "Sheet Aluminum" of these special provisions. Single sheet aluminum signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H38.

Single sheet aluminum signs shall not have a vertical splice in the sheet aluminum. For signs with depth greater than 1220 mm, one horizontal splice will be allowed in the sheet aluminum.

Framing for single sheet aluminum sign shall consist of aluminum channel or rectangular aluminum tubing. The framing shall have a length tolerance of ± 3 mm. The face sheet shall be affixed to the frame with rivets of 5-mm diameter. Rivets shall be placed within the web of channels and shall not be placed less than 13 mm from edges of the sign panels. Rivets shall be made of aluminum alloy 5052 and shall be anodized or treated with conversion coating to prevent corrosion. The exposed portion of rivets on the face of signs shall be the same color as the background or legend where the rivets are placed.

Finished signs shall be flat within a tolerance of ± 3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within ± 3 mm of the detailed dimensions.

Aluminum channels or rectangular aluminum tubings shall be welded together with the inert gas shielded-arc welding process using E4043 aluminum electrode filler wires as shown on the plans. Width of the filler shall be equal to wall thickness of smallest welded channel or tubing.

FIBERGLASS REINFORCED PLASTIC PANEL SIGN

The Contractor shall furnish fiberglass reinforced plastic sign in accordance with ASTM Designation: D3841 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Fiberglass reinforced plastic shall be acrylic modified and ultraviolet stabilized for outdoor weatherability. The plastic shall contain additives designed to suppress fire ignition and flame propagation. When tested in accordance with the requirements in the ASTM Designation: D635, the extent of burning shall not exceed 25 mm.

Fiberglass reinforced plastic shall be stabilized to prevent the release solvents and monomers. The front and back surfaces of the laminate shall be clean and free of constituents and releasing agents that can interfere with the bonding of retroreflective sheeting.

The fiberglass reinforced plastic panel sign shall be weather resistant Grade II thermoset polyester laminate.

The fiberglass reinforced plastic panels shall be minimum 3.4 mm thick. Finished fiberglass reinforced plastic panel signs shall be flat within a tolerance of ± 3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within ± 3 mm of the specified dimensions.

Color of fiberglass reinforced plastic panels shall be uniform gray within Munsel range of N7.5 to N8.5.

Fiberglass reinforced plastic panels shall be cut from a single piece of laminate. Bolt holes shall be predrilled. The predrilled bolt holes, panel edges, and the front and back surfaces of the panels shall be true and smooth. The panel surfaces shall be free of visible cracks, pinholes, foreign inclusions, warping and wrinkles that can affect performance and serviceability.

LAMINATED PANEL SIGN

Laminated panel signs shall consist of two sheet aluminum laminated to a honeycomb core and extruded aluminum frame to produce flat and rigid panels of 25.4-mm or 63.5-mm nominal thickness.

The face of laminated panel signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H32 of 1.6-mm thickness. The back of laminated panel signs shall be fabricated from sheet aluminum alloy 3003-H14 of 1.0-mm thickness. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

The core material shall be phenolic impregnated kraft paper honeycomb and fungus resistant in accordance to Military Specification MIL-D-5272. The honeycomb cell size shall be 13 mm. Weight of the kraft paper shall be 300 g/m² and impregnated minimum 18 percent by weight.

A laminating adhesive that can produce a resilient oil and water-resistant bond shall be used to adhere the extruded aluminum frame and the honeycomb core to the sheet aluminum. Edge and interior delamination occur when a 0.25-mm thick feeler gauge of 13 mm in length can be inserted into a depth of more than 13 mm between the extruded aluminum frame and the sheet aluminum. Laminated panel sign with delamination will be rejected.

Laminated panels shall be able to resist a wind load of 161 kg/m² for the following simple span lengths with a bending safety factor of 1.25:

| Panel Type | Nominal Panel Thickness | Simple Span Length |
|------------|-------------------------|--------------------|
| A | 25.4 mm | 2.7 m |
| B | 25.4 mm | 2.7 m |
| | 63.5 mm | 4.42 m |
| H | 63.5 mm | 4.42 m |

The tensile strength of laminated panels shall be at least 138 kPa when tested in accordance with the following modification and with ASTM Designations: C297 and C481, Cycle B after aging. Instead of spraying with hot water, the specimen shall be totally immersed in 70°C hot water. When requested by the Engineer or the Transportation Laboratory, at least one test sample of 300 mm x 300 mm in size shall be taken for every 186 m² of the panel production cycle or of the total factory production order, whichever occurs first.

Rivets used to secure the sheet aluminum to the perimeter frame shall be fabricated from aluminum alloy 5052 and anodized or treated with a conversion coating to prevent corrosion. Size of the aluminum rivets shall be 5 mm in diameter and placed at the corners of the laminated panels. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed. Rivets or stainless steel screws shall be placed in holes drilled during fabrication in the perimeter frame.

On laminated multiple panel signs, a closure H-Section shall be placed in the top channel of the bottom panel. Perimeter frame of adjoining panel shall accommodate the closure H-Section in the closed position.

For signs with a depth of 1524 mm or less, the laminated panels shall be fabricated with no horizontal joints, splices or seams. For signs with a depth of greater than 1524 mm, the laminated panels may be fabricated in two panels.

The face of laminated panels shall be flat with a tolerance of ±8 mm per meter when measured across the plane of each panel in all directions. Where laminated panels adjoin, the gap between adjoining edges from one corner to the other corner shall not deviate by more than 1 mm. Non-adjoining edges from one corner to the other corner shall not deviate by more than 3 mm from a straight plane. The front and back sheet aluminum shall be flush with the perimeter frame. The panel edges shall be smooth.

Laminated panel signs shall be within +3 mm or -13 mm of the detailed dimensions. The difference in length between adjoining panels of multiple panel signs shall not be greater than 13 mm.

Roadside laminated panel signs shall be Type B. Type B panels shall have a nominal thickness of 25.4 mm or 63.5 mm.

The perimeter frame of Type B panels shall consist of extruded channel edges. The interior and exterior sides of the channels, except the sides touching the face and back sheet aluminum, shall be welded at the joint. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration.

Each side of the vertical tube spacers of Type B panels shall be welded to the perimeter frame, except the sides touching the front and back sheet aluminum.

The Contractor shall furnish mounting hardware for roadside laminated panel signs, such as closure H-sections, lags, bolts, nuts, and washers.

Overhead laminated panel signs shall be Type A and have a nominal thickness of 25.4 mm.

For overhead laminated signs with a length of 7315 mm or less, the laminated panels shall be fabricated with no vertical joints, splices or seams. For signs with a length of greater than 7315 mm, the length of each adjoining panel shall be as determined by the Engineer or as shown on the plans.

The perimeter frame of Type A overhead laminated panels shall be connected by self-tapping hex head stainless steel screws. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration. The perimeter frame of Type A panels shall consist of extruded channel edges on the vertical sides and consist of modified "H" section extrusion on the horizontal sides. The modified "H" section extrusion acts as an integral retainer track for affixing the bolts to provide blind fastening of panels to the structure support.

The Contractor shall furnish mounting hardware for overhead laminated panel signs, such as closure H-sections, clamps, bolts, nuts, and washers. The clamps shall be cast aluminum alloy with a minimum tensile strength of 170 MPa. Bolt torque used for installing clamps shall not exceed 12 N-m.

FORMED PANEL SIGN

Formed panel signs shall be fabricated from one continuous sheet aluminum alloy 5052-H32 of 1.6-mm thickness. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

The aluminum frame shall be affixed to the panel with aluminum rivets through the face of the sign panels. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed.

The face of finished formed panel sign shall be flat with a tolerance of 10 mm per meter when measured across the plane of each panel in all directions.

The Contractor shall furnish mounting hardware for roadside and overhead formed panel signs. Hardware for the overhead formed panel signs shall include bolts, nuts, and washers.

The length and depth of the overhead formed panel signs shall be within ± 2 mm of the detailed dimension.

The formed edges of the overhead panel signs shall be square. The mounting holes shall be straight and perpendicular to the front and back surfaces of the formed edges at the spacing shown on the plans. Holes that are improperly spaced and placed at the wrong angle will be rejected.

MEASUREMENT AND PAYMENT

Furnishing signs (except for construction area signs) will be measured by the square meter and the quantity to be paid for will be the total area, in square meters, of the sign panel types installed in place.

The contract price paid per square meter for furnish sign of the types specified in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in fabricating and furnishing the signs, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for furnishing and installing protective overlay on signs shall be considered as included in the contract price paid per square meter for furnish sign of the various types and no separate payment will be made therefor.

10-1.82 CLEAN AND PAINT STRUCTURAL STEEL

New metal surfaces shall be cleaned and painted in conformance with the provisions in Section 59-2, "Painting Structural Steel," Section 59-3, "Painting Galvanized Surfaces," and Section 91, "Paint," of the Standard Specifications and these special provisions.

GENERAL

Before performing any painting or paint removal, the Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 3 copies of a separate Painting Quality Work Plan (PQWP) for each item of work for which painting or paint removal is to be performed. As a minimum, each PQWP shall include the following:

- A. The name of each Contractor or subcontractor to be used.
- B. One copy each of all current ASTM and "SSPC: The Society for Protective Coatings" specifications or qualification procedures applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
- C. A copy of the coating manufacturer's guidelines and recommendations for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel, including testing methods and maximum allowable levels for soluble salts.
- D. Proposed materials, methods, and equipment to be used for any paint application.
- E. Proof of each of any required certifications, SSPC-QP 1, SSPC-QP 2, SSPC-QP 3. Where SSPC-QP 3 certification is required, an enclosed shop facility shall be required. Certification of AISC Sophisticated Paint Endorsement Quality Program, P-1 Enclosed endorsement, will be considered equivalent to SSPC-QP 3.
 1. In lieu of certification in conformance with the requirements in SSPC-QP 3 for this project, the Contractor may submit written documentation showing conformance with the requirements in Section 3, "General Qualification Requirements," of SSPC-QP 3.
- F. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
- G. Proposed methods to protect the coating during curing, shipping, handling, and storage.
- H. Proposed rinse water collection plan.
- I. A detailed paint repair plan for the repair of damaged areas.
- J. Procedures for containing blast media and water during application of coatings and coating repair of erected steel.

- K. Examples of proposed daily reports for all testing to be performed, including type of testing, location, lot size, time, weather conditions, test personnel, and results.

Before submitting the PQWP, a prepainting meeting between the Engineer, the Contractor, and a representative from each entity performing painting for this project shall be held to discuss the requirements for the PQWP.

The Engineer shall have 20 days to review the PQWP submittal after a complete plan has been received. No painting or paint removal shall be performed until the PQWP for that work is approved by the Engineer. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the PQWP, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Engineer's approval of the Contractor's PQWP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the plans and specifications.

The Contractor shall provide enclosures to permit cleaning and painting during inclement weather. Provisions shall be made to control atmospheric conditions inside the enclosures within specified limits during cleaning and painting operations, drying to solvent insolubility, and throughout the curing period in accordance with the manufacturer's recommendations and these special provisions. Full compensation for providing and maintaining such enclosures shall be considered as included in the prices paid for the various contract items of work requiring paint and no additional compensation will be allowed therefor.

Fresh, potable water with a maximum chloride content of 75 mg/L and a maximum sulfate content of 200 mg/L shall be used for water rinsing or pressure washing operations. No continuous recycling of rinse water will be permitted. If rinse water is collected into a tank and subsequent testing determines the collected water conforms to the specified requirements, reuse may be permitted by the Engineer if no collected water is added to the tank after sample collection for determination of conformance to specified requirements.

CLEANING

New metal surfaces, except where galvanized, shall be dry blast cleaned in conformance with the requirements in SSPC-SP 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of not less than 40 μm nor more than 86 μm as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning steel surfaces shall conform to the requirements for Class A, Grade 2 to 3 abrasives contained in SSPC-AB 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings," and shall not contain hazardous material.

Steel abrasives used for blast cleaning steel surfaces shall comply with the requirements of SSPC-AB 3, "Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings." If steel abrasive is recycled through shop or field abrasive blast cleaning units, the recycled abrasive shall conform to the requirements of SSPC-AB 2, "Specification for Cleanliness of Recycled Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings."

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished before use for each shipment of blast cleaning material for steel.

Abrasive blast cleaned surfaces shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the coating manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of abrasive blast cleaned steel shall be tested at the rate of 3 tests for the first 100 square meters prepared per day, and one test for each additional 100 square meters or portion thereof, at locations selected by the Engineer. When less than 100 square meters of surface area is prepared in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.

Corners shall be chamfered to remove sharp edges.

Thermal cut edges (TCEs) to be painted shall be conditioned before blast cleaning by shallow grinding or other method approved by the Engineer to remove the thin, hardened layer of material resulting from resolidification during cooling.

Visually evident base metal surface irregularities and defects shall be removed in accordance with ASTM Designation: A 6 or AASHTO Designation: M 160 before blast cleaning steel. When material defects exposed by blast cleaning are removed, the blast profile shall be restored by either blast cleaning or by using mechanical tools in accordance with SSPC-SP 11, "Power Tool Cleaning to Bare Metal," of the "SSPC: The Society for Protective Coatings."

PAINTING

Blast cleaned surfaces shall receive a single undercoat consisting of an inorganic zinc coating conforming to the requirements in AASHTO Designation: M 300, Type I or Type II, except that: 1) the first 3 sentences of Section 5.6, "Primer Field Performance Requirements," shall not apply for Type II coatings, and 2) the entire Section 5.6.1 shall not apply for either type of inorganic zinc coating.

If the Contractor proposes to use a Type I coating, the Contractor shall furnish to the Engineer for review documentation as required in Section 5.6 of AASHTO Designation: M 300. The Contractor shall allow the Engineer 30 days to review the proposal. Type I coatings selected for use shall meet the current applicable volatile organic compound limits for the air quality district in which the project is located.

If the Contractor proposes to use a Type II coating, the coating shall be selected from the qualified products list, which may be obtained from the Transportation Laboratory.

The color of the final application of inorganic zinc coating shall match Federal Standard 595B No. 36373.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single undercoat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 8 hours of the start of blast cleaning. Abrasive blast cleaned steel shall not be exposed to relative humidity exceeding 85 percent before application of inorganic zinc coating.

The total dry film thickness of all applications of the inorganic zinc undercoat shall be not less than 100 μm nor more than 200 μm .

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Steel surfaces coated with Type II inorganic zinc coating shall be protected from conditions that may cause the coating film to dissolve. The Contractor, at the Contractor's expense, shall repair areas where the coating has dissolved by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed before application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The Contractor shall test the inorganic zinc coating before application of final coats. The locations of the tests will be determined by the Engineer. The Contractor shall determine the sequence of the testing operations. The testing for adhesion and hardness shall be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc coating. Satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc coating shall pass the following tests:

- A. The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Engineer will select 3 locations per girder or 100 square meters of painted surface, whichever is less, for adhesion testing. If less than 100 square meters of steel is painted in a work shift, the Engineer will select 3 areas painted during the work shift for testing. If 2 or more of the locations tested fail to meet adhesion requirements, the entire area represented by the tests will be rejected. If one of the locations tested fails to meet adhesion requirements, an additional 3 locations shall be tested. Should any of the additional locations fail to meet adhesion requirements, the entire area represented by the tests will be rejected. The Contractor, at the Contractor's expense, shall repair the rejected area by blast cleaning and repainting with inorganic zinc to the specified thickness. Test locations for areas of inorganic zinc meeting adhesion testing requirements shall be repaired by application of organic zinc primer as specified in Section 91-1.04, "Materials," of the Standard Specifications to the specified minimum dry film thickness.
- B. Areas of inorganic zinc coating where finish coats are to be applied shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of inorganic zinc coating shall be tested at the rate of 3 tests for the first 100 square meters to be painted per day and one test for each additional 100 square meters or portion thereof at locations selected by the Engineer. When less than 100 square meters of surface area is painted in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.

- C. Before application of final coats, the inorganic zinc coating shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface, as determined by the Engineer, shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Water Borne Inorganic Zinc Primers

- A. The surface pH of the inorganic zinc primer shall be tested by wetting the surface with de-ionized water for a minimum of 15 minutes but no longer than 30 minutes and applying pH paper with a capability of measuring in increments of 0.5 pH units. At least 2 surface pH readings shall be taken for every 50 square meters or portion thereof. If less than 50 square meters of steel is coated in a single shift or day, at least 2 surface pH readings shall be taken for primer applied during that period. Application of finish coats will not be permitted until the surface pH is less than or equal to 7.
- B. Dry to solvent insolubility for water borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Solvent Borne Inorganic Zinc Primers

- A. Dry to solvent insolubility for solvent borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.
- B. Surface hardness of solvent borne inorganic zinc shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Areas of inorganic zinc coating shall be tested at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating that fails to meet the surface hardness requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of inorganic zinc coating after repairs have been completed.

Finish coats will not be required.

The finish coat paint shall be formulated for application to inorganic zinc coating and shall conform to the following:

10-1.83 PREPARE AND PAINTING CONCRETE MEDIAN BARRIER SURFACE

All exposed surfaces of concrete median barriers, including median barriers on bridge decks shall be prepared and painted in conformance with the provisions in Section 59, "Painting," and Section 91, "Paint," of the Standard Specifications, and these special provisions.

The paint shall be a light-stable, alkali-resistant, acrylic latex or acrylic latex copolymer emulsion, commercially manufactured for use as an exterior concrete coating.

The paint to be applied to concrete surfaces shall conform to the provisions in Section 91-4.05, "Paint; Acrylic Emulsion, Exterior White and Light and Medium Tints," of the Standard Specifications. The color of the paint shall be Federal Standard 595B No. 30450

Prior to painting the concrete median barrier, a 1 by 1 meter test panel to demonstrate the color to be placed on the concrete barrier shall be submitted to the Engineer for written approval. If ordered by the Engineer, additional test panels shall be constructed and finished until the color panel is approved by the Engineer.

Full compensation for painting concrete median barriers (including up to 3 test panels) shall be considered as included in the contract price paid per square meter for prepare and paint concrete median barrier surface designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.84 ALTERNATIVE PIPE

Alternative pipe culverts must comply with Section 62, "Alternative Culverts," of the Standard Specifications.

PAYMENT

Full compensation for cleanout and outlet drain, complete in place, as shown on the plans, shall be considered as included in the contract price paid per meter for alternative pipe culvert of the sizes designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.85 REINFORCED CONCRETE PIPE

Reinforced concrete pipe shall conform to the provisions in Section 65, "Reinforced Concrete Pipe," of the Standard Specifications and these special provisions.

GENERAL

Where embankment will not be placed over the top of the pipe, a relative compaction of not less than 85 percent shall be required below the pipe spring line for pipe installed using Method 1 backfill in trench, as shown on Standard Plan A62D. Where the pipe is to be placed under the traveled way, a relative compaction of not less than 90 percent shall be required unless the minimum distance between the top of the pipe and the pavement surface is the greater of 1.2 meters or one half of the outside diameter of the pipe.

Except as otherwise designated by classification on the plans or in the specifications, joints for culvert and drainage pipes shall conform to the plans or specifications for standard joints.

When reinforced concrete pipe is installed in conformance with the details shown on Standard Plan A62DA, the fifth paragraph of Section 19-3.04, "Water Control and Foundation Treatment," of the Standard Specifications shall not apply.

When solid rock or other unyielding material is encountered at the planned elevation of the bottom of the bedding, shown on Standard Plan A62DA, the material below the bottom of the bedding shall be removed to a depth of 1/50 of the height of the embankment over the top of the culvert, but not less than 150 mm nor more than 300 mm. The resulting trench below the bottom of the bedding shall be backfilled with structure backfill material in conformance with the provisions in Section 19-3.06, "Structure Backfill," of the Standard Specifications. The Outer Bedding shall not be compacted prior to placement of the pipe.

MATERIALS

The concrete for reinforced concrete pipe must contain not less than 280 kg of cementitious material per cubic meter with a water-cementitious material ratio not to exceed 0.35 by weight. Supplementary cementitious material is optional. Reinforcement shall have a minimum cover of 25 mm.

MEASUREMENT AND PAYMENT

The excavation and backfill below the planned elevation of the bottom of the bedding shown on Standard Plan A62DA will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

10-1.86 CORRUGATED STEEL PIPE

Corrugated steel pipe culverts shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications and these special provisions.

Corrugated steel pipe shall be fabricated from zinc-coated steel sheet.

Universal coupling bands constructed with dimples, as shown on the Standard Plans, shall not be used in the work, except as otherwise provided herein.

When any corrugated steel pipe has been cut in the field, the connections shall be made with a coupling band and a portland cement concrete collar. The coupling band shall be the universal type constructed with dimples or the helical type. The concrete collar shall encase each pipe as shown on the plans. Collars for pipe 600 millimeter and larger in diameter shall be reinforced in accordance with the details shown on the plans.

10-1.87 SPIRAL RIB PIPE

GENERAL

Summary

Manufactured spiral rib pipe must comply with Section 66, "Corrugated Metal Pipe," of the Standard Specifications, except for profile and fabrication requirements, and must comply with these special provisions.

MATERIALS

You must use spiral rib pipe fabricated with either:

1. Three rectangular ribs spaced midway between seams with ribs 19 mm wide x 19 mm high at a maximum rib pitch of 190 mm,
2. Two rectangular ribs and one half-circle rib equally spaced between seams with ribs 19 mm wide x 25 mm high at a maximum rib pitch of 290 mm with the half-circle rib diameter spaced midway between the rectangular ribs, or
3. Two rectangular ribs equally spaced between seams with ribs 19 mm wide x 25 mm high at a maximum rib pitch of 215 mm.

Rib pitch measured at right angles to the direction of the ribs may vary ± 13 mm.

Corrugated steel spiral rib pipe must be fabricated by continuous helical lock seam under Section 66-3.03C(1), "Fabrication by Continuous Lock Seam," of the Standard Specifications.

JOINTS

Coupling bands for spiral rib pipe must comply with Section 66-1.07, "Coupling Bands," of the Standard Specifications. A coupling band shown on the plans or approved by the Engineer under Section 61-1.02, "Performance Requirements for Culvert and Drainage Pipe Joints," of the Standard Specifications, for use on a pipe corrugation of 70 mm x 13 mm for corrugated metal pipe may be used on spiral rib pipe having 70 mm x 13 mm rerolled annular ends.

10-1.88 MISCELLANEOUS FACILITIES

Flared end sections, pipe riser, pipe inlets and manholes shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

900 mm corrugated steel pipe risers will be measured and paid for as 900 mm corrugated steel pipe inlet.

10-1.89 DRAINAGE INLET MARKER

The Contractor shall furnish and install plastic drainage inlet markers in conformance with the details and locations shown on the plans, as specified in these special provisions, and as directed by the Engineer.

The Contractor shall furnish a Certificate of Compliance to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for plastic drainage inlet markers. In addition, samples of each type of drainage inlet marker shall be submitted to the Engineer 10 days before placement of the markers.

Plastic drainage inlet markers shall conform to ASTM Designations: G-53 and D-60 and the requirements as follow. The plastic material shall be white with ultraviolet inhibitors. When placed on the vertical face of a concrete curb, the plastic drainage inlet markers shall have a dome-shaped cover consisting of clear and non-yellowing polyurethane cover. Plastic drainage inlet markers shall be cemented to the surface of drainage inlet with adhesives as recommended by the manufacturer of the marker.

| Property | Specifications | Requirements |
|-----------------------------------|------------------------------|---|
| Thickness, mm | | 0.65 – 1.5 |
| Thickness (with dome), mm | | 1.4 – 3.0 |
| Legend color (non-reflective) | FHWA's Color Tolerance Chart | Blue or Green (PR Color Number 3 or 4) |
| Background color (non-reflective) | AASHTO Designation: M249-78 | White |
| Weathering Resistance | ASTM Designation: G-53 | 1500 hours without yellowing or pit |

The Contractor shall mechanically clean the surface before placing plastic drainage inlet markers.

Drainage inlet marker will be measured as units determined from actual count in place.

The contract unit price paid for drainage inlet marker shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing drainage inlet markers, complete in place, as shown on the plans, as specified in the Standard Specifications, and these special provisions, and as directed by the Engineer.

10-1.90 GRATED LINE DRAIN

This work shall consist of furnishing and installing precast grated line drain, with necessary fittings, coupling systems, frames, grates and associated items as shown on the plans and in conformance with these special provisions.

The interior surface of the grated line drain, below the level of the frame and grate and associated connections, shall be smooth. Grated line drain channel sections shall be manufactured of monolithic polymer concrete with no side extensions.

Monolithic polymer concrete shall be made from a composition of aggregate and polyester resin or vinyl ester resin and shall have the following properties when tested as follows:

| PROPERTY | ASTM TEST METHOD | VALUE |
|---|------------------|-----------|
| Tensile Strength, MPa | C 307 | 10 min. |
| Compressive Strength, MPa | C 579 | 80 min. |
| Bending Strength, MPa | C 580 | 20 min. |
| Moisture Absorption, % | C 140 | 0.5 max. |
| Chemical Resistance | C 267 | Pass |
| Freeze/Thaw, number of cycles w/o weight loss | C 666 | 1600 min. |

The manufacturer of the grated line drain shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Grated line drain frames and grates shall be manufactured of ductile iron conforming to the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications. The frames and grates need not be galvanized or coated with asphalt paint. Bolts, nuts, frame anchors, and other connecting hardware shall conform to the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications.

Frames and grates, when installed in conformance with the manufacturer's recommendations and these special provisions, shall be classified as heavy duty (112 kN proof load) when tested in accordance with Commercial Item Description A-A-60005 for "Frames, Covers, Gratings, Steps, Manhole, Sump and Catch Basin." Frames and grates shall be matchmarked in pairs before delivery to the work and grates shall fit into the frames without rocking.

Frames shall be secured to the surrounding concrete backfill with steel anchoring rods as shown on the plans. Other methods may be used to secure the frame to the concrete backfill or grated line drain wall provided that a minimum pullout resistance of 10 kN per meter of length of grated line drain frame is maintained.

Grates and frames shall be one piece or the grates shall be removable. Removable grates shall be held in place by locking devices that are tamper resistant. Removable grates shall provide a minimum repetitive pullout resistance of 5 kN per meter of length after completion of 1000 hours of salt spray testing in conformance with the requirements in ASTM Designation: B 117. When a combination of one piece frame and grate and removable grates are used, the locations of the removable grates shall be shown on the plans.

Except for grates installed within designated pedestrian paths of travel, grates shall accept inflow of runoff through openings. The openings shall consist of a minimum of 60 percent of the total top surface area of the grate, with individual openings or slots having a dimension not greater than 50 mm measured in the direction of the grated line drain flow line. Grates installed within designated pedestrian paths of travel shall be certified as conforming to the requirements of the "Americans with Disabilities Act."

Grated line drains shall be installed in trenches excavated to the lines and grades established by the Engineer. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the grated line drain.

Grated line drains shall be installed and jointed in conformance with the manufacturer's recommendations.

Grated line drains shall be installed to the lines and grades with sections closely jointed and secured to ensure that no separation of the line drains occurs during backfilling.

The frame or grate of the grated line drain shall not extend above the level of the surrounding concrete backfill.

Grated line drains shall be connected to new or existing drainage facilities as shown on the plans.

Excavation and backfill shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications.

Backfill for the grated line drains shall be either minor concrete or Class 3 concrete conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications. Minor concrete shall contain not less than 300 kg of cementitious material per cubic meter.

Concrete backfill shall be placed in the trench as shown on the plans. Concrete backfill shall be placed against undisturbed material at the sides and bottom of the trench and in a manner that will prevent floating or shifting of the grated line drain and voids in, or segregation of, the concrete. Foreign material which falls into the trench, before or during placement of the concrete, shall be immediately removed. Where necessary, earth plugs shall be constructed and compacted at the ends of the planned concrete backfill to contain the concrete within the trench.

Concrete backfill shall be finished flush with the adjacent surfacing.

The surface of the concrete shall be textured with a broom or burlap drag to produce a durable skid-resistant surface.

The length the grated line drain to be paid for will be the length measured by the meter along the pavement surface as designated by the Engineer. No payment will be made for grated line drain placed in excess of the designated length.

The contract price paid per meter for grated line drain shall include full compensation for furnishing all labor, materials (including frames and grates), tools, equipment, and incidentals, and for doing all the work involved in installing grated line drains, complete in place, including excavation and backfill, connecting grated line drains to new or existing facilities, concrete collars, reinforcement, and other connecting devices, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.91 WELDED STEEL PIPE CASING (BRIDGE)

Welded steel pipe casings through bridges and under approach slabs shall be of the size shown and shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

Unless otherwise shown on the project plans, casings shall be installed at each abutment, and casings shall be extended to the greater of: (1) 1.5 m beyond the approach slab, (2) 1.5 m beyond the end of the adjacent wingwall or (3) 6 m beyond the abutment.

WORKING DRAWINGS

Working drawings for temporary support of casing pipe at the abutments shall be submitted for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings" of the Standard Specifications.

MATERIALS

Casing pipe

Casing pipe shall be welded steel pipe conforming to the provisions in Section 70-1.02B, "Welded Steel Pipe," of the Standard Specifications, except that the pipe shall be treated in accordance with the following requirements, prior to shipping. Exterior surfaces of welded steel pipe shall be cleaned and coated in conformance with the requirements in ANSI/AWWA C213 or at the option of the Contractor, cleaned, primed, and coated in accordance with specifications of ANSI/AWWA C214.

Pipe wrapping tape

Wrapping tapes for pipe in contact with the ground shall be a pressure sensitive polyvinyl chloride or polyethylene tape having thickness of 1.27 mm, minimum.

CONSTRUCTION

If a blockout is provided in the bridge abutment wall for casing pipe, the space between the casing pipe and bridge abutment wall shall be filled with portland cement mortar conforming to the provisions in Section 51-1.135, "Mortar," of the Standard Specifications.

Openings for utilities through bridge superstructure concrete shall either be formed or shall consist of pipe sleeves.

Wrapping and coating pipe

Damaged coating on steel pipe casing in contact with earth shall be wrapped as follows:

- A. Pipe to be wrapped shall be thoroughly cleaned and primed as recommended by the tape manufacturer.
- B. Tapes shall be tightly applied with 1/2 uniform lap, free from wrinkles and voids to provide not less than 2.5 mm thickness.
- C. Field joints and fittings for wrapped pipe shall be covered by double wrapping 1.27 mm thick tape. Wrapping at joints shall extend a minimum of 150 mm over adjacent pipe coverings. Width of tape for wrapping fittings shall not exceed 50 mm. Adequate tension shall be applied so tape will conform closely to contours of joint.

Where a welded steel pipe casing passes through the abutment wall, the welded steel pipe casing shall be additionally wrapped with 2 layers of No. 15 asphalt-felt building paper, securely taped or wired in place.

MEASUREMENT AND PAYMENT

Measurement and payment for welded steel pipe casing for each size listed in the Engineers Estimate shall conform to the provisions in Sections 70-1.04, "Measurement," and 70-1.05, "Payment," of the Standard Specifications.

Full compensation for furnishing and installing mortar and building paper, and casing shall be considered as included in the contract prices paid per meter for the sizes of welded steel pipe casing involved and no additional compensation will be allowed therefor.

10-1.92 INLET DEPRESSION

This work consists of constructing inlet depressions and depressed aprons around drainage inlets.

Isolation joints between hot mix asphalt shoulders and hot mix asphalt inlet depressions will not be required.

Hot mix asphalt used in the construction of inlet depressions in shoulder areas of roadways shall conform to the requirements for hot mix asphalt shoulder in Section 39, "Hot Mix Asphalt," of the Standards Specifications.

Portland cement concrete used in the construction of inlet depressions placed in the shoulder areas of roadways shall conform to the requirements for portland concrete cement shoulders in Section 51, "Concrete Structures," of the Standard Specifications.

Where portland cement concrete pavement is to be placed around or next to inlet depressions, the inlet depressions shall not be constructed to final grade until after the pavement has been constructed adjacent to the inlet depression.

Portland cement concrete for inlet depression shall be placed on prepared base material compacted to not less than 95 percent relative compaction. After placement to the lines and grades shown on the plans, the surface shall be finished with a float and troweled smooth. Concrete adjacent to isolation joints shall be finished with an edger. The surface of the concrete shall then be broom finished to create a surface having a coefficient of friction of not less than 0.30 as determined by California Test 342. If water is necessary, the water shall be applied to the surface immediately in advance of the brooming. The concrete shall be cured as provided in Section 90-7.02, "Curing Pavement," of the Standard Specifications.

Hot mix asphalt used in the construction of inlet depressions will be measured and paid for as hot mix asphalt (miscellaneous area).

Full compensation for handwork used in the construction of inlet depressions shall be considered as included in the contract price paid for square meter for place hot mix asphalt (miscellaneous area) and no additional compensation will be allowed therefor.

Concrete used in the construction of inlet depressions will be measured and paid for as minor concrete (minor structure).

Full compensation for forming and constructing inlet depression, including any necessary soil compaction or disposal of forming materials shall be considered as included in the contract price paid per cubic meter for minor concrete (minor structure) and no additional compensation will be allowed therefor.

10-1.93 SLOPE PROTECTION

Slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications and these special provisions.

Rock slope protection fabric shall be woven or nonwoven type fabric, Type A or Type B, at the option of the Contractor.

10-1.94 SLOPE PAVING

Slopes under the bridge ends where shown on the plans shall be paved in conformance with the provisions in Section 72-6, "Slope Paving," of the Standard Specifications and these special provisions.

Masonry block for slope paving (concrete pavers) shall conform to ASTM Designation: C 90, Type-II. The surface exposed to view shall have split face texture.

The rocks for slope paving (concrete) (rock blanket) shall conform to the grading and quality requirements for rock in Section 72-5, "Concreted-Rocked Slope Protection," of the Standard Specifications and these special provisions. The Contractor shall submit a sample of rocks for approval by the Engineer a minimum of 15 working days prior to placing the rock blanket surface of slope paving.

The nominal size of concrete pavers shall be 200 mm x 50 mm x 400 mm. Head and bed mortar joints shall be 13 mm thick.

Portland cement shall conform to the provisions in Section 90-2.01, "Portland Cement," of the Standard Specifications.

Hydrated lime shall conform to ASTM Designation: C 207, Type S.

Mortar sand shall be commercially produced for masonry work and free of organic impurities and lumps of clay and shale.

Mortar for laying concrete pavers shall consist, by volume, of one part portland cement, 0 to 1/2 part of hydrated lime, and 2 1/4 to 3 parts of mortar sand. Sufficient water shall be added to make a workable mortar. Each batch of mortar shall be accurately measured and thoroughly mixed. Mortar shall be freshly mixed as required. Mortar shall not be retempered more than one hour after mixing. The amount of lime shall be reduced as necessary to prevent leaching and efflorescence on finished surfaces.

A proprietary, premixed packaged blend of cement, lime, and sand, without color, that requires only water to prepare for use as brick mortar or grout may be furnished for mortar. Packages of premix shall bear the manufacturer's name, brand, weight, and color identification. The manufacturer's recommended mixing proportions and procedures shall be furnished to the Engineer.

The top surface of the air-blown mortar or concrete base shall be lightly and evenly scored horizontally and vertically with a metal scratcher having grooves not more than 25 mm apart.

The air-blown mortar or concrete base shall be cured by the water method for at least 2 days.

Concrete pavers shall be laid and embedded in approximately 25 mm thick mortar. Embedment shall be shoved tight so that mortar is flushed into the joints to a depth of approximately 13 mm.

Rocks shall be laid and embedded in approximately 75 mm thick mortar. Embedment shall be shoved tight so that the mortar is flushed into the joints to a depth of approximately 25 mm. Space remaining between placed rocks shall not exceed 40 mm unless otherwise approved by the Engineer. After completion of placing rocks on any 3-meter strip, no load shall be permitted on the surface for a period of at least 24 hours, or longer if so ordered by the Engineer.

Joints shall be straight and of uniform and equal width.

Surfaces of completed masonry, concrete, and other such materials exposed to view shall be protected from spillage, splatters and other deposits of cementitious materials from masonry construction. All such deposits shall be removed without damage to the materials or exposed surfaces. Stains, efflorescence, laitance, splashes or spots on the faces of masonry exposed to view shall be removed. Cleaning agents shall conform to the concrete paver manufacturers recommendations. Cleaning agents shall be applied to a sample area acceptable to the Engineer, and their performance and the cleaning methods approved by the Engineer before proceeding with cleaning beyond the sample area.

The location of construction joints shall be subject to the approval of the Engineer. Placement of slope paving shall be scheduled so that the work, including placement, finishing, and application of curing, is completed in any section bounded by permissible construction joints on the same day that the work is started in that section.

Areas of slope paving shown on the plans to have a grooved finish shall be scored by dragging a finishing tool over the struck-off surface or by any other means which will result in a surface conforming to the details shown on the plans.

Prior to placing the permanent slope paving of the types listed in the Engineer's Estimate, the Contractor shall construct a test panel at least 1.2 m by 1.8 m at the site for approval by the Engineer. The test panel shall be constructed of the same materials as are proposed for the permanent work and shall be finished and cured as specified for the permanent work. Additional test panels shall be constructed as necessary until a panel is produced which conforms to the requirements herein, before constructing other slope paving.

Slope paving of the types listed in the Engineer's Estimate will be measured by the cubic meter.

The contract price paid per cubic meter for slope paving of the types listed in the Engineer's Estimate, shall include full compensation for furnishing all labor, materials (including bar reinforcing steel, reinforcing steel anchors, weld wire fabric, timber spacers, concrete pavers and rocks), tools, equipment, and incidentals and for doing all the work involved in slope paving, complete in place (including excavation, backfill, installing timber spacers, and placing pavers and rocks), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Concrete for curbs integral with slope paving and joint seals specified on the plans will be paid for at the contract price per cubic meter for slope paving of the types listed in the Engineer's Estimate and no separate payment will be made therefor.

10-1.95 MISCELLANEOUS CONCRETE CONSTRUCTION

Minor Concrete (Gutter), Minor Concrete (Curb and Gutter), Minor Concrete (Curb and Gutter) (Type B), Minor Concrete (Sidewalk), Minor Concrete (Driveway), Minor Concrete (Curb Ramp), Minor Concrete (Gutter Depression), and Minor Concrete (Stamped Concrete) shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps in conformance with the details shown on the plans and these special provisions. At the option of the Contractor, the detectable warning surface shall be prefabricated, cast-in-place, or stamped into the surface of the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard 595B, Color No. 33538.

Prefabricated detectable warning surface shall be in conformance with the requirements established by the Department of General Services, Division of State Architect and be attached in conformance with the manufacturer's recommendations.

Cast-in-place and stamped detectable warning surfaces shall be painted in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

The finished surfaces of the detectable warning surface shall be free from blemishes.

Prior to constructing the cast-in-place or stamping the detectable warning surface, the Contractor shall demonstrate the ability to produce a detectable warning surface conforming to the details shown on the plans and these special provisions by constructing a 600-mm by 600-mm test panel.

The manufacturer shall provide a written 5-year warranty for prefabricated detectable warning surfaces, guaranteeing replacement when there is defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience, or attachment. The warranty period shall begin upon acceptance of the contract.

Full compensation for constructing or furnishing and installing curb ramp detectable warning surfaces shall be considered as included in the contract price paid per cubic meter for minor concrete (curb ramp) and no separate payment will be made therefor.

Where overside drain joins concrete ditch, full compensation for conforming to concrete ditch shall be considered as included in the contract price paid per cubic meter for minor concrete (Ditch Lining) and no separate payment will be made therefor.

If the Contractor elects to use the curing compound method for curing concrete for minor concrete for curb, gutter, sidewalk, driveway or curb ramp, the curing compound shall be curing compound (6) conforming to the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

The curing compound shall be sprayed uniformly providing a complete coating of all exposed faces of the concrete surface, prior to the evaporation of surface water.

10-1.96 MISCELLANEOUS METAL (BRIDGE)

Miscellaneous metal (bridge) shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Attention is directed to "Welding" of these special provisions.

10-1.97 ISOLATION CASING

Isolation casing shall consist of furnishing and installing corrugated steel pipe isolation casing in conformance with the details shown on the plans, the provisions in Section 66, "Corrugated Metal Pipe," and Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Corrugated steel pipe shall be fabricated from zinc-coated steel sheet.

Steel cover plates, angle brackets and concrete anchorage devices shall conform to the provisions in Section 75, "Miscellaneous Bridge Metal," of the Standard Specifications and shall be galvanized.

Corrugated steel pipe edges shall be free of torn metal, burrs, and sharp edges. Sharp edges and edges that are marred, cut or roughened in handling or installation, shall be slightly rounded by grinding or other suitable means prior to cleaning and painting.

All edges of the corrugated steel pipe shall be cleaned as specified in Section 59-2.06 "Hand Cleaning," of the Standard Specifications and painted with at least 2 applications of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint." Aerosol cans shall not be used.

Neoprene strips shall conform to the provisions for strip waterstops in Section 51-1.145, "Strip Waterstops," of the Standard Specifications, except that protective board will not be required.

Structure backfill placed outside the isolation casing as shown on the plans shall be compacted to a relative compaction of not less than 95 percent. Ponding and jetting of the structure backfill will not be permitted.

MEASUREMENT AND PAYMENT

Isolation casings will be measured and paid for in conformance with the provisions in Section 75-1.06, "Measurement," of the Standard Specifications and these special provisions.

The contract price paid per kilogram for isolation casing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in furnishing and installing isolation casing, complete in place, including corrugated steel pipe, edge preparation, galvanized steel cover plates, angles and concrete anchorage devices; neoprene strips; and structure backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.98 MISCELLANEOUS METAL (WATER QUALITY OUTLET RISER)

Miscellaneous metal (Water Quality Outlet Riser) shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Miscellaneous metal (Water Quality Outlet Riser) shall include the following items:

- A. Steel Ladders
- B. Debris Rack Cages & Associated Hardware
- C. Anchor Bolts & Associated Hardware
- D. Wire Mesh Support Frame
- E. Welded Stainless Steel Wire Mesh
- F. Guide Angles
- G. Steel Band Clamps & Associated Hardware

Bolt holes at ladder and wire mesh support frame connection locations shall be sealed with an asphalt mastic in accordance with the details shown on the plans.

Miscellaneous Metal (Water Quality Outlet Riser) is measured and paid for by the kilogram in the same manner as specified for miscellaneous metal (bridge) in Section 75-1.06, "Measurement," and Section 75-1.07, "Payment," of the Standard Specifications.

Full compensation for furnishing and placing asphalt mastic at ladder and wire mesh support frame locations shall be considered as included in the contract price paid per kilogram for Miscellaneous Metal (Water Quality Outlet Riser) and no additional compensation will be made therefore.

10-1.99 BRIDGE DECK DRAINAGE SYSTEM

Bridge deck drainage systems shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Self-tapping screws used for sleeve connections shall be hex-head stainless steel, installed in holes drilled to fit the self-tapping screws, conforming to the requirements of ASTM Designation: A 276, Type 304.

At the Contractor's option, fiberglass pipes and fittings with the same diameter and minimum bend radius as those shown on the plans, may be substituted for welded steel pipe in deck drain systems.

Fiberglass pipe and fittings shall conform to the requirements in ASTM Designation: D 2996, and shall have a minimum short-term rupture strength of 207 MPa. The adhesive type recommended by the manufacturer shall be used for joining pipe and fittings. Fiberglass pipe not enclosed in a box girder cell or encased in concrete shall be manufactured from ultraviolet-resistant resin pigmented with concrete-gray color, or be coated with a concrete-gray resin-rich exterior coating. Paint shall not be used. Fiberglass pipe treated with ultraviolet protection shall withstand a minimum of 2500 hours of accelerated weathering when tested in conformance with the requirements in ASTM Designation: G 154. Lamps shall be UV-B (313 nm wavelength). The resting cycle shall be 4 hours of ultraviolet exposure at 60°C, and then 4 hours of condensate exposure at 50°C. After testing, the surface of the pipe shall exhibit no fiber exposure, crazing, or checking, and only a slight chalking or color change.

Support spacing for fiberglass pipe shall be the same as shown on the plans for welded steel pipe. Pipe supports shall have a width of not less than 38 mm.

A Certificate of Compliance for fiberglass pipe and fittings shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall include all laboratory test results conforming to the provisions specified herein.

For drainage piping NPS 8 or smaller, which is: (1) enclosed in a box girder cell and exposed for a length not greater than 6 m within the cell, or (2) encased in concrete, the Contractor shall have the option of substituting polyvinyl chloride (PVC) plastic pipe and fittings, with the same diameter and minimum bend radius as shown on the plans, for welded steel pipe.

The PVC plastic pipe and fittings shall be Schedule 40 conforming to the requirements of ASTM Designations: D 1785. The maximum support spacing for PVC plastic pipe shall be 2 m.

Couplings used to connect PVC plastic pipe or fiberglass pipe to steel shall be threaded or flanged. The sleeve connections shown on the plans shall not be used for either PVC plastic pipe or fiberglass pipe.

If PVC plastic pipe or fiberglass pipe is substituted for welded steel pipe, the quantity of drainage piping will be computed on the basis of the dimensions and details shown on the plans, and no change in the quantities to be paid for will be made because of the use of PVC plastic pipe or fiberglass pipe.

Bridge deck drainage systems will be measured and paid for by the kilogram in the same manner specified for miscellaneous metal (bridge) in Section 75-1.06, "Measurement," and Section 75-1.07, "Payment," of the Standard Specifications.

10-1.100 MISCELLANEOUS METAL (RESTRAINER-CABLE TYPE)

Miscellaneous metal (restrainer-cable type) shall conform to the provisions for bridge joint restrainer units in Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications and these special provisions.

New concrete adjacent to restrainers shall be placed prior to installing restrainers.

Miscellaneous metal (restrainer-cable type) will be measured and paid for by the kilogram in the same manner specified for miscellaneous metal (restrainer) in Sections 75-1.06, "Measurement," and 75-1.07, "Payment," of the Standard Specifications.

10-1.101 WROUGHT IRON FENCE

Wrought iron fence is measured and paid for by the meter in the same manner specified for chain link fence in Section 80-4.03, "Measurement," and Section 80-4.04, "Payment," of the Standard Specifications.

10-1.102 MONUMENTS

Survey monuments shall be constructed in conformance with the provisions in Section 81, "Monuments," of the Standard Specifications and these special provisions.

Concrete shall be Class 3 or minor concrete at the option of the Contractor.

The cast steel and gray cast iron frames and covers, including hardware, shall conform to the provisions in Section 55-2, "Materials," of the Standard Specifications.

10-1.103 MARKERS AND DELINEATORS

Markers and delineators shall conform to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Markers and delineators on flexible posts shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Flexible posts shall be made from a flexible white plastic which shall be resistant to impact, ultraviolet light, ozone, and hydrocarbons. Flexible posts shall resist stiffening with age and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability.

Retroreflective sheeting for metal and flexible target plates shall be the retroreflective sheeting designated for channelizers, markers, and delineators conforming to the requirements in ASTM Designation: D 4956-95 and in conformance with the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

10-1.104 METAL BEAM GUARD RAILING

Metal beam guard railing shall be constructed in conformance with the provisions in Section 83-1, "Railings," of the Standard Specifications and these special provisions.

Attention is directed to "Order of Work" of these special provisions.

Line posts shall be wood. Blocks shall be wood.

TERMINAL SYSTEM (TYPE CAT)

Terminal system (Type CAT) and terminal system (Type CAT) backup shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Terminal system (Type CAT) shall be a CAT-350 Crash Cushion Attenuating Terminal as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type CAT) shown on the plans.

Terminal system (Type CAT) backup shall consist of items detailed for terminal system (Type CAT) backup shown on the plans, and shall conform to the provisions in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications.

Excluding the terminal system (Type CAT) backup, arrangements have been made to ensure that any successful bidder can obtain the CAT-350 Crash Cushion Attenuating Terminal from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone 1-800-772-7976. The price quoted by the manufacturer for the CAT-350 Crash Cushion Attenuating Terminal, FOB Centerville, Utah is \$3000, not including sales tax.

The above price will be firm for orders placed on or before June 1, 2009, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the terminal system (Type CAT) conforms with the contract plans and specifications, conforms to the prequalified design and material requirements, and was manufactured in conformance with the approved quality control program.

The terminal system (Type CAT) shall be installed in conformance with the manufacturer's installation instructions and these requirements. The steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system (Type CAT) and backup have been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for terminal system (Type CAT) backup shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing terminal system (Type CAT) backup, complete in place, including excavation, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

ALTERNATIVE IN-LINE TERMINAL SYSTEM

Alternative in-line terminal system shall be furnished and installed as shown on the plans and in conformance with these special provisions.

The allowable alternatives for an in-line terminal system shall consist of one of the following or a Department approved equal.

- (1) **TERMINAL SYSTEM (TYPE SKT)** - Terminal system (Type SKT) shall be a SKT 350 Sequential Kinking Terminal manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type SKT) shown on the plans. The SKT 350 Sequential Kinking Terminal can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, Telephone (801) 785-0505 or from the distributor, Gregory Highway Products, 4100 13th Street, S.W., Canton, OH 44708, Telephone (330) 477-4800.
- (2) **TERMINAL SYSTEM (TYPE ET)** - Terminal system (Type ET) shall be an ET-2000 PLUS (4-tube system) extruder terminal as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type ET) shown on the plans. The ET-2000 PLUS (4-tube system) extruder terminal can be obtained from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone (800) 772-7976.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems furnished conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

Terminal systems shall be installed in conformance with the manufacturer's installation instructions and these requirements. Each terminal system installed shall be identified by painting the type of terminal system in neat black letters and figures 60 mm high on the backside of the rail element between system posts numbers 4 and 5.

For terminal system (Type ET) the steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For terminal system (Type SKT) the soil tubes shall be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for alternative in-line terminal system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing alternative in-line terminal system, complete in place, including excavation, backfill and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

ALTERNATIVE FLARED TERMINAL SYSTEM

Alternative flared terminal system shall be furnished and installed as shown on the plans and in conformance with these special provisions.

The allowable alternatives for a flared terminal system shall consist of one of the following or a Department approved equal.

- (1) TERMINAL SYSTEM (TYPE FLEAT) - Terminal system (Type FLEAT) shall be a Flared Energy Absorbing Terminal 350 manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type FLEAT) shown on the plans. The Flared Energy Absorbing Terminal 350 can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, Telephone (801) 785-0505 or from the distributor, Gregory Highway Products, 4100 13th Street, S.W., Canton, OH 44708, Telephone (330) 477-4800.
- (2) TERMINAL SYSTEM (TYPE SRT) - Terminal system (Type SRT) shall be an SRT-350 Slotted Rail Terminal (8-post system) as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type SRT) shown on the plans. The SRT-350 Slotted Rail Terminal (8-post system) can be obtained from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone (800) 772-7976.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems furnished conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

Terminal systems shall be installed in conformance with the manufacturer's installation instructions and these requirements. Each terminal system installed shall be identified by painting the type of terminal system in neat black letters and figures 60 mm high on the backside of the rail element between system posts numbers 4 and 5.

For terminal system (Type SRT), the steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For terminal system (Type FLEAT), the soil tubes shall be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for alternative flared terminal system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing alternative flared terminal system, complete in place, including excavation, backfill and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.105 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Concrete barriers shall be constructed on a layer of Class 2 Aggregate Base as shown on the plans. Aggregate base shall conform to the provisions in "Aggregate Base" of these special provisions. When concrete barriers are to be constructed on aggregate base, the height of the barriers shall be adjusted to compensate for irregularities in the surface of the finished aggregate base. The amount of adjustment will be determined by the Engineer and will be ordered before the concrete is placed.

The provisions of the third paragraph in Section 83-2.02D(4), "Finishing," of the Standard Specifications shall not apply.

Concrete barrier markers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. At those locations shown on the plans, concrete barrier markers shall be cemented to the barrier in conformance with the manufacturer's recommendations.

Full compensation for architectural treatments on concrete barriers shall be considered as included in the contract price paid per meter for concrete barrier of the types listed in the Engineer's Estimate and no separate payment will be made therefor.

If reinforcement is encountered during drilling before the specified depth is attained, the Engineer shall be notified. Unless the Engineer approves coring through the reinforcement, the hole will be rejected and the Contractor shall drill a new hole adjacent to the rejected hole to the depth shown on the plans.

10-1.106 PORTABLE CONCRETE BARRIER (TYPE 60K)

Portable concrete barrier (Type 60K) shall consist of constructing and placing interconnected new or undamaged used precast portable concrete barrier units at the locations and in conformance with the details shown on the plans, the Standard Specifications and these special provisions.

Concrete for use in portable concrete barrier (Type 60K) shall conform to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. Load tickets and a Certificate of Compliance will not be required.

Reinforcing steel for use in portable concrete barrier (Type 60K) shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications.

Steel plates shall conform to the requirements in ASTM Designation: A 36/A 36M. The connection pin shall be a round bar conforming to the requirements in ASTM Designation: A 36/A 36M.

The final surface finish of portable concrete barrier (Type 60K) shall conform to the provisions in Section 51-1.18A, "Ordinary Surface Finish," of the Standard Specifications.

Exposed surfaces of concrete elements shall be cured by the water method, the forms-in-place method, or the pigmented curing compound method. The pigmented curing compound shall be curing compound (1) as specified in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

The Contractor shall furnish a Certificate of Compliance to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," for all new or used portable concrete barrier (Type 60K) that is not cast on the project.

Portable concrete barrier (Type 60K) shall have the fabrication date and Contractor's name or logo on each panel. The fabrication date and name or logo shall not be more than 100 mm in height and shall be located not more than 300 mm above the bottom of the rail panel.

Portable concrete barrier (Type 60K) shall be set on firm, stable foundation. The foundation shall be graded to provide a uniform bearing throughout the entire length of the railing.

Any excavation and backfill shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications.

Abutting ends of precast concrete units shall be placed and maintained in alignment without substantial offset to each other. The precast concrete units shall be positioned straight on tangent alignment and on a true arc on curved alignment.

Portable concrete barrier (Type 60K) will be measured by the meter along the top of the barrier.

The contract price paid per meter for portable concrete barrier (Type 60K) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing and placing the portable concrete barrier (Type 60K), complete in place, including bar reinforcing steel, steel plates, excavation and backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.107 THRIE BEAM BARRIER

Thrie beam barrier shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Attention is directed to "Order of Work" of these special provisions.

Existing Oleanders shall be trimmed as directed by the Engineer to clear the work area. Trimmings shall be disposed of as provided in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Full compensation for trimming existing plants and disposing of the trimmings shall be considered as included in the contract price paid per meter for thrie beam barrier and no separate payment will be made therefor.

10-1.108 TRANSITION RAILING (TYPE WB)

Transition railing (Type WB) shall be furnished and installed in conformance with details shown on the plans, the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

The 10-gage rail elements shall conform to the requirements of Class B, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180. End caps shall conform to the requirements of Class A, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180.

Surplus excavated material remaining after the transitional railing (Type WB) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for transition railing (Type WB) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing transition railing (Type WB), complete in place, including drilling holes for wood posts, driving posts, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.109 TRANSITION RAILING (TYPE DTB)

Transition railing (Type DTB) shall be furnished and installed in conformance with details shown on the plans, the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

The 10-gage rail elements shall conform to the requirements of Class B, Type 1 three beam guard railing as shown in AASHTO Designation: M 180. End caps shall conform to the requirements of Class A, Type 1 three beam guard railing as shown in AASHTO Designation: M 180.

Surplus excavated material remaining after the transitional railing (Type DTB) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for transition railing (Type DTB) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing transition railing (Type DTB), complete in place, including drilling holes for wood posts, driving posts, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.110 CRASH CUSHION (TYPE CAT)

Crash cushion (Type CAT) and crash cushion (Type CAT) backup shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Crash cushion (Type CAT) shall be a CAT-350 Crash Cushion Attenuating Terminal as manufactured by Trinity Industries, Inc., and shall include all the items detailed for crash cushion (Type CAT) shown on the plans.

Crash cushion (Type CAT) backup shall consist of items detailed for crash cushion (Type CAT) backup shown on the plans and shall conform to the provisions in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications.

Excluding the crash cushion (Type CAT) backup, arrangements have been made to ensure that any successful bidder can obtain the CAT-350 Crash Cushion Attenuating Terminal from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone 1-800-772-7976. The price quoted by the manufacturer for the CAT-350 Crash Cushion Attenuating Terminal, FOB Centerville, Utah is \$3500, not including sales tax.

The above price will be firm for orders placed on or before June 1, 2009, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that crash cushion (Type CAT) conforms with the contract plans and specifications, conforms to the prequalified design and material requirements, and was manufactured in conformance with the approved quality control program.

The crash cushion (Type CAT) shall be installed in conformance with the manufacturer's installation instructions and these requirements. The steel foundation tubes with soil plates attached, shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the crash cushion (Type CAT) and backup have been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

Crash cushion (Type CAT) and crash cushion (Type CAT) backup will be measured as units determined from actual count in place in the completed work.

The contract unit prices paid for crash cushion (Type CAT) and for crash cushion (Type CAT) backup shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing crash cushion (Type CAT) and crash cushion (Type CAT) backup, complete in place, including excavation, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.111 THERMOPLASTIC PAVEMENT MARKING

Thermoplastic pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic pavement markings shall have a minimum initial retroreflectivity of 250 mcd·m⁻²·lx⁻¹. Yellow thermoplastic pavement markings shall have a minimum initial retroreflectivity of 150 mcd·m⁻²·lx⁻¹.

Thermoplastic pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the thermoplastic pavement markings specified herein. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of thermoplastic pavement markings, the tape will be measured and paid for by the square meter as thermoplastic pavement marking.

10-1.112 THERMOPLASTIC TRAFFIC STRIPE (SPRAYABLE)

Sprayable thermoplastic traffic stripes (traffic lines) shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Sprayable thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification No. PTH-02SPRAY.

Retroreflectivity of the sprayable traffic stripes shall conform to the requirements in ASTM Designation: D 6359-99. White sprayable thermoplastic traffic stripes shall have a minimum initial retroreflectivity of $250 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$. Yellow sprayable thermoplastic traffic stripes shall have a minimum initial retroreflectivity of $150 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the sprayable thermoplastic traffic stripes. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Sprayable thermoplastic material shall be applied to the pavement at a minimum thickness of one millimeter and a minimum rate of 0.2-kg/m. The minimum application rate is based on a solid stripe of 100 mm in width.

Sprayable thermoplastic material shall be applied to the pavement at a temperature between 177°C and 205°C, unless a different temperature is recommended by the manufacturer.

Sprayable thermoplastic traffic stripes shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

If permanent tape is placed instead of sprayable thermoplastic traffic stripes, the tape will be measured and paid for by the meter as thermoplastic traffic stripe (sprayable).

Sprayable thermoplastic traffic stripes will be measured by the meter along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. A double traffic stripe, consisting of two 100-mm wide yellow stripes, will be measured as one traffic stripe.

The contract price paid per meter for thermoplastic traffic stripe (sprayable) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in applying sprayable thermoplastic traffic stripes (regardless of the number, widths, and patterns of individual stripes involved in each traffic stripe) including establishing alignment for stripes, and layout work, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.113 PAINT TRAFFIC STRIPE AND PAVEMENT MARKING

Painted traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Traffic stripe and pavement marking paint shall conform to the requirements in State Specification No. PTWB-01.

The color of the painted traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6628-01.

Retroreflectivity of the paint traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White painted traffic stripes and pavement markings shall have a minimum initial retroreflectivity of $250 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$. Yellow painted traffic stripes and pavement markings shall have a minimum initial retroreflectivity of $150 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$.

Full compensation for removing painted traffic stripes and pavement markings placed for stage construction operations shall be considered as included in the contract price paid per meter for paint traffic stripe (2-coat) and per square meter for paint pavement marking (2-coat) and no separate payment will be made therefor.

10-1.114 PAVEMENT MARKERS

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

Attention is directed to "Traffic Control System For Lane Closure" of these special provisions regarding the use of moving lane closures during placement of pavement markers with bituminous adhesive.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

Full compensation for removing pavement markers placed for stage construction operations shall be considered as included in the contract unit prices paid for pavement marker (non-reflective) and pavement marker (retroreflective) and no separate payment will be made therefor.

SECTION 10-2 HIGHWAY PLANTING AND IRRIGATION SYSTEMS

10-2.01 GENERAL

The work performed in connection with highway planting and irrigation systems shall conform to the provisions in Section 20, "Erosion Control and Highway Planting," of the Standard Specifications and these special provisions.

10-2.02 (BLANK)

10-2.03 (BLANK)

10-2.04 (BLANK)

10-2.05 IRRIGATION SYSTEMS

Irrigation systems shall be furnished and installed in conformance with the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications, except materials containing asbestos fibers shall not be used.

Method A pressure testing shall conform to the provisions in Section 20-5.03H(1), "Method A", of the Standard Specifications, except leaks that develop in the tested portion of the system shall be located and repaired after each test period when a drop of more than 35 kPa is indicated by the pressure gage. After the leaks have been repaired, the one hour pressure test shall be repeated and additional repairs made until the drop in pressure is 35 kPa or less.

PIPE

Steel Pipe

Galvanized steel pipe supply lines installed between water meters and backflow preventer assemblies shall be installed not less than 460 mm below finished grade, measured to the top of the pipe

WATER METER

Water meters for the irrigation systems will be furnished and installed by the serving utility at the locations shown on the plans.

The Contractor shall make the arrangements and pay the costs and fees required by the serving utility.

The City of San Bernardino Water Department has established a fee of \$25,000.00 for furnishing and installing a water meter. If, at the time of installation, this fee has been changed, the State will take a credit for the reduction in the fee, or the State will pay the difference for the increase in the fee. The credit or payment will be taken or paid on the first monthly progress payment made after the meter is installed. The Contractor shall furnish the Engineer with a copy of the invoice for the installation fee.

The quantity of water meters will be measured by the unit as determined from actual count in place.

The contract unit price paid for 40 mm water meter shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing water meters, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

BACKFLOW PREVENTER ASSEMBLIES

Backflow preventers shall conform to the provisions in Section 20-2.25, "Backflow Preventers," of the Standard Specifications and these special provisions.

Backflow preventers shall have current approval from the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC Foundation).

Before backflow preventer assembly installation, the Contractor shall provide the Engineer with the portion of the USC Foundation "List of Approved Backflow Prevention Assemblies" showing type of assembly, manufacturer's name, model number, edition of the manual under which the assembly was approved, approval date and the last renewal date.

The "List of Approved Backflow Prevention Assemblies" is available to Foundation Members. Membership information to join the USC Foundation is available at:

<http://www.usc.edu/dept/fccchr/membership.html>

Questions concerning the USC Foundation "List of Approved Backflow Prevention Assemblies" can be answered by calling the Foundation at toll free (866) 545-6340.

Pressure loss through the backflow preventers shall not exceed the following:

| BACKFLOW PREVENTER SIZE (millimeters) | FLOW RATE (Liters per minute) | PRESSURE LOSS (kPa) |
|--|----------------------------------|------------------------|
| 40 | 151 | 82 |

Steel supply line between water meter and backflow preventer shall be galvanized and shall be 75 mm in size.

Backflow preventer assemblies shall be painted with a minimum of 2 applications of a commercial quality enamel paint. The color of the paint shall be light brown.

When backflow preventer assembly enclosures are specified, the portland cement concrete pads for the enclosures will be paid for in conformance to the provisions in "Backflow Preventer Assembly Enclosures" of these special provisions.

BACKFLOW PREVENTER ASSEMBLY ENCLOSURE

Enclosures shall be fabricated of structural steel angles and flattened expanded metal and shall be installed over backflow preventer assemblies on a portland cement concrete pad as shown on the plans and in conformance with these special provisions.

Expanded metal for sides, ends and top panels shall be fabricated from 1.9 mm (14-gage), minimum thickness, sheet steel. The flattened expanded metal openings shall be approximately 20 mm by 45 mm in size.

Expanded metal panels shall be attached to the steel frames by a series of welds, not less than 6.4 mm in length and spaced not more than 100 mm on centers, along the edges of the enclosure.

Padlocks will be State-furnished in accordance with "State-furnished Materials" of these special provisions.

Enclosures shall be galvanized, after fabrication, in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Concrete for the concrete pad shall conform to Section 90-10, "Minor Concrete," of the Standard Specifications.

Hold down bolt assemblies shall be galvanized and shall be installed when the portland cement concrete pad is still plastic. Nuts shall be hexagonal and washers shall be the lock type.

Enclosures shall be painted with one application of a commercial quality pre-treatment, vinyl wash primer and a minimum of one application of a commercial quality, exterior enamel for metal. The finish color shall be light brown.

All parts of the backflow preventer assembly enclosure, including hold down assemblies, may be constructed of stainless steel instead of standard steel materials specified above. Stainless steel enclosures shall conform to the provisions herein except galvanizing, priming and painting shall not be required. Stainless steel enclosures shall be powder coated a light brown color by the manufacturer.

The minimum clearance between the backflow preventer assembly and the backflow preventer assembly enclosure shall be 50 mm.

The quantity of backflow preventer assembly enclosures will be measured by the unit as determined from actual count in place.

The contract unit price paid for the backflow preventer assembly enclosure shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing a backflow preventer assembly enclosure, complete in place, including constructing the portland cement concrete pad, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

TESTING NEW BACKFLOW PREVENTERS

New backflow preventers shall be tested for proper operation in conformance with the provisions in Section 20-5.03J, "Check and Test Backflow Preventers," of the Standard Specifications and these special provisions.

Tests for new backflow preventers shall be satisfactorily completed after installation.

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

Traffic signals, lighting, sign illumination, electric service (irrigation), ramp metering systems, monitoring stations, maintaining existing traffic management system elements during construction, closed circuit television system, fiber optic system, modify transportation management center and modify communication hub shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Lighting equipment is included in the following structures:

- A. Highland Avenue Overcrossing Structure (Bridge No. 54-1266)
- B. Massachusetts Avenue Overcrossing Structure (Bridge No. 54-1265)
- C. State Route 215 NB to State Route 210 WB Connector (Br. No. 54-1234)
- D. Cajon Blvd OH (Br. No. 54-0946G)
- E. 27th Street OC (Br. No. 54-1221)
- F. State Route 210-S215 Connector (Br. No. 54-1249)

Communication conduit is included in the following structures:

- A. Massachusetts Avenue OC – Bridge No. 54-1265
- B. Highland Avenue OC – Bridge No. 54-1266

Traffic signal work shall be performed at the following locations:

- A. 215 NB Ramp at Highland Avenue (Location 1)
- B. 215 SB Ramp at 27th Street (Location 2)
- C. 215 NB Ramps / 27th Street (Location 3)
- D. 27th Street /Little Mountain Drive (City)
- E. 215 NB Ramp / 27th Street (Remove)

Ramp meter work to be performed at the following locations:

- A. 215 NB Ramps / 27th Street (Location 1)
- B. 215 SB Ramps / 27th Street (Location 2)
- C. 215 NB to WB 210 Connector (Location 3)
- D. 210 EB to 215 SB Connector (Location 4)

Closed circuit television system and traffic monitoring station work to be performed at the following locations:

- A. 215 NB at Highland Avenue (CCTV Location 1)
- B. 215 NB at 27th Street (CCTV Location 2)
- C. 215 NB at 210 WB Connector (CCTV Location 3)
- D. 215 NB north of 210 (CCTV Location 4)
- E. 215 NB south of University Parkway (Station 173+00) (CCTV Location 5)
- F. 215 NB at University Street Exit-Ramp (CCTV Location 6)

Traffic monitoring station work to be performed at the following locations:

- A. 215 NB at 27th Street (Location 1)
- B. 215 NB north of 210 (Location 2)
- C. 215 NB south of University Parkway (Station 173+00) (Location 3)

10-3.02 COST BREAK-DOWN

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

The cost breakdown shall include the following items in addition to those listed in the Standard Specifications:

- A. Tracer wire
- B. Video image vehicle detection
- C. 334 Cabinet (each)
- D. CCTV camera assemblies
- E. Pan/ tilt unit
- F. CCTV standard (each type)
- G. Asynchronous fiber optic modems (AFOM)
- H. Camera transceiver (TCVR)
- I. Camera control receiver (CCR)
- J. Video Multiplexer and Demultiplexer
- K. Interconnect termination unit (ITU)
- L. Fiber Optic Pigtails and Jumpers
- M. RS232 Serial Cables
- N. Traffic signal communication interface system.
- O. Fiber distribution unit
- P. Termination splice
- Q. Fusion splice
- R. Light emitting diode signal module (each type)
- S. Light emitting diode pedestrian signal face modules
- T. Warning tape
- Q. Fiber optic trench delineator

10-3.03 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

Traffic signal system shutdowns shall be limited to periods between the hours of 9:00 a.m. and 3:00 p.m.

10-3.04 MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION

Traffic Management System (TMS) elements include, but are not limited to ramp metering (RM) system, communication system, traffic monitoring stations, video image vehicle detection system (VIVDS), microwave vehicle detection system (MVDS), loop detection system, changeable message sign (CMS) system, extinguishable message sign (EMS) system, highway advisory radio (HAR) system, closed circuit television (CCTV) camera system, roadway weather information system (RWIS), visibility sensor, and fiber optic system.

Existing TMS elements, including detection systems, identified on the plans and located within the project limits shall remain in place, and be protected from damage. If the construction activities require existing TMS elements to be nonoperational or off line, and if temporary or portable TMS elements are not shown on the plans, the Contractor shall provide for temporary or portable TMS elements. The Contractor shall receive the Engineer's approval on the type of temporary or portable TMS elements and installation method.

Before work is performed, the Engineer, the Contractor, and the Department's Traffic Operations Electrical representatives shall jointly conduct a pre-construction operational status check of all existing TMS elements and each element's communication status with the Traffic Management Center (TMC), including existing TMS elements that are not shown on the plans and elements that may not be impacted by the Contractor's activities. The Department's Traffic Operations Electrical representatives will certify the TMS elements' location and status, and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components.

The Contractor shall obtain written approval from the Engineer, at least 72 hours before interrupting existing TMS elements' communication with the TMC that will result in the elements being nonoperational or off line. The Contractor shall notify the Engineer at least 72 hours before starting excavation activities.

Traffic monitoring stations and their associated communication systems which were verified to be operational during the pre-construction operational status check, shall remain operational on freeway/highway mainline at all times, except:

1. for a duration of up to 15 days on any continuous segment of the freeway/highway longer than 4.8 kilometers
2. for a duration of up to 60 days on any continuous segment of the freeway/highway shorter than 4.8 kilometers

If the construction activities require existing detection systems to be nonoperational or off line for a longer time period or the spacing between traffic monitoring stations is more than the specified criteria above, and temporary or portable detection operations are not shown on the plans, the Contractor shall provide provisions for temporary or portable detection operations. The Contractor shall receive the Engineer's approval on the type of detection and installation before installing the temporary or portable detection.

If existing TMS elements shown on the plans or identified during the pre-construction operational status check, except traffic monitoring stations, are damaged or fail due to the Contractor's activity, where the elements are not fully functional, the Engineer shall be notified immediately. If the Contractor is notified by the Engineer that existing TMS elements have been damaged, have failed or are not fully functional due to the Contractor's activity, the damaged or failed TMS elements, excluding Structure-related elements, shall be repaired or replaced, at the Contractor's expense, within 24 hours. For a Structure-related elements, the Contractor shall install temporary or portable TMS elements within 24 hours. For nonstructure-related TMS elements, the Engineer may approve temporary or portable TMS elements for use during the construction activities.

If fiber optic cables are damaged due to the Contractor's activities, the Contractor shall install new fiber optic cables from an original splice point or termination to an original splice point or termination, unless otherwise authorized in writing by the Engineer. Fiber optic cable shall be spliced at the splice vaults if available. The amount of new fiber optic cable slack in splice vaults and the number of new fiber optic cable splices shall be equivalent to the amount of slack and number of splices existing before the damage or as directed by the Engineer. Fusion splicing will be required.

The Contractor shall demonstrate that repaired or replaced elements operate in a manner equal to or better than the replaced equipment or as directed by the Engineer. If the Contractor fails to perform required repairs or replacement work, as determined by the Engineer, the State may perform the repair or replacement work and the cost will be deducted from monies due to the Contractor.

A TMS element shall be considered nonoperational or off line for the duration of time that active communications with the TMC is disrupted, resulting in messages and commands not transmitted from or to the TMS element.

The Contractor shall provide provisions for replacing existing TMS elements within the project limits, including detection systems, that were not identified on the plans or during the pre-construction operational status check that became damaged due to Contractor's activities.

If the pre-construction operational status check identified existing TMS elements, then the Contractor, the Engineer, and the Department's Traffic Operations Electrical representatives shall jointly conduct a post construction operational status check of all existing TMS elements and each element's communication status with the TMC. The Department's Traffic Operations Electrical representatives will certify the TMS elements' status and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components. TMS elements that cease to be functional between pre and post construction status checks shall be repaired at the Contractor's expense and as directed by the Engineer.

The Engineer will approve, in writing, the schedule for final replacement, the replacement methods and the replacement elements, including element types and installation methods before repair or replacement work is performed. The final TMS elements shall be new and of equal or better quality than the existing TMS elements.

PAYMENT

The contract lump sum price paid for maintaining existing traffic management system elements during construction shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in maintaining existing traffic management system elements as shown on the plans, specified in the Standard specifications and these special provisions, and as directed by the Engineer.

If no electrical work exists on the project and no TMS elements are identified within the project limits, the pre-construction operational status check will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements that are not shown on the plans, but are required when an existing TMS element becomes nonoperational or off line due to construction activities, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements and replacing TMS elements that are not shown on the plans nor identified during the pre-construction operational status check and were damaged by construction activities will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

If the Contractor is required to submit provisions for the replacement of TMS elements that were not identified, the provisions will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

10-3.05 CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATIONS

GENERAL

Summary

This work includes constructing cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards. Comply with Section 86-2.03, "Foundations," of the Standard Specifications and piling of these special provisions.

MATERIALS

Concrete must contain not less than 350 kilograms of cementitious material per cubic meter.

CONSTRUCTION

For standards located in sidewalk areas, the pile foundation must be:

1. Placed to final sidewalk grade before the sidewalk is placed
2. Square for the top 100 mm

Use sleeve nuts on Type 1-A standards. The bottom of the base plate of Type 1-A standards must be flush with finished grade.

PAYMENT

Payment for cast-in-drilled-hole concrete pile foundations shall conform to the provisions in Section 86-8, "Payment," of the Standard Specifications.

10-3.06 STANDARDS, STEEL PEDESTALS, AND POSTS

Standards, steel pedestals, and posts for traffic signal and lighting standards shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, "Steel Structures" of these special provisions, and the following requirements.

Steel bolts not designated on the plans as high-strength (HS) or stainless steel shall be for general applications and shall conform to the requirements in ASTM Designation: A 307.

Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted.

The sign mounting hardware shall be installed at the locations shown on the plans.

Mast arm mounted street name signs shall be installed on signal mast arms at the locations shown on the plans. The hanger assembly will be similar to that shown for internally illuminated street name signs. The mounting hardware and sign shall be assembled. The assembly shall be attached to the mast arm using a 19 mm x 0.53 mm stainless steel strap in a manner similar to the strap and saddle bracket method shown on the plans. The band shall be wrapped at least twice around the mast arm, tightened, and secured with a stainless strap seal in the same manner shown for strap and saddle bracket sign mounting. The sign panel shall be leveled and hardware securely tightened.

Handhole reinforcement rings for standards, steel pedestals, and posts shall be continuous around the handholes.

Type 1 standards shall be assembled and set with the handhole on the downstream side of the pole in relation to traffic or as shown on the plans.

All ferrous metal parts of tubular sign structures shall be galvanized and shall not be painted.

10-3.07 CONDUIT

Conduit to be installed underground shall be Type 3 schedule 80 unless otherwise specified.

The conduit in a foundation and between a foundation and the nearest pull box shall be Type 3 schedule 80.

Type 2 conduit shall be used from the bridge to the first pull box.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

| Size Designation for Metallic Type Conduit | Equivalent Size for Rigid Non-metallic Conduit |
|--|--|
| 21 | 20 |
| 27 | 25 |
| 41 | 40 |
| 53 | 50 |
| 63 | 65 |
| 78 | 75 |
| 103 | 100 |

When a standard coupling cannot be used for joining Type 1 conduit, a UL listed threaded union coupling conforming to the provisions in Section 86-2.05C, "Installation," of the Standard Specifications shall be used.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

At those locations where conduit is required to be installed under pavement and existing underground facilities require special precautions in conformance with the provisions in "Obstructions" of these special provisions, conduit shall be placed by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications.

10-3.08 CONDUCTORS AND WIRING

Splices shall be insulated by "Method B".

Signal Interconnect Cable (SIC) shall be the 6-pair type.

10-3.09 BONDING AND GROUNDING

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the Standard Specifications and these special provisions.

Bonding jumpers in standards with handholes and traffic pull box lid covers shall be attached by a UL listed lug using 4.5-mm diameter or larger brass or bronze bolts and shall run to the conduit or bonding wire in the adjacent pull box. The grounding jumper shall be visible after the standard has been installed and the mortar pad and cap have been placed on the foundation.

Standards without handholes shall have bonding accomplished by jumpers attached to UL listed ground clamps on each anchor bolt.

For slip base standards or slip base inserts, bonding shall be accomplished by jumpers attached to UL listed ground clamps on each anchor bolt, or a UL listed lug attached to the bottom slip base plate with a 4.5-mm diameter or larger brass or bronze bolt.

Equipment bonding and grounding conductors are required in all conduits, except when the conduits contain only fiber optic cable. A No. 8 minimum, bare copper wire shall run continuously in circuits. The bonding wire size shall be increased to match the circuit breaker size in conformance with the Code, or shall be as shown on the plans. Conduits to be installed for future conductors, may omit the copper wire.

Bonding of metallic conduits in metal pull boxes shall be by means of bonding bushings and bonding jumpers connected to the bonding wire running in the conduit system.

10-3.10 SERVICE

Continuous welding of exterior seams in service equipment enclosures is not required.

Circuit breakers shall be the plug in type, mounted on non-energized clips. All circuit breakers shall be mounted vertically with the up position of the handle being the "ON" position.

Each service shall be provided with up to 2 main circuit breakers which shall disconnect ungrounded service entrance conductors. Where the "Main" circuit breaker consists of 2 circuit breakers as shown on the plans or required in the special provisions, each of the circuit breakers shall have a minimum interrupting capacity of 10 000 A, rms.

ELECTRIC SERVICE (IRRIGATION)

Electric service (irrigation) shall be from the service points to the pull box adjacent to the future location of the irrigation controller enclosure cabinets (CEC) for irrigation controllers as shown on the plans.

Service disconnects in service equipment enclosures shall be 1-pole, 15-A circuit breaker.

Nameplate inscriptions shall be as follows:

| ITEMS | INSCRIPTION |
|------------------------------|---------------------------|
| Metering Equipment Enclosure | IC CALTRANS |
| Metering Equipment Enclosure | IC CITY OF SAN BERNARDINO |

The inscription on other nameplates shall be the identifying letter designation used on the plans and in these special provisions, or shall be as directed by the Engineer.

Electric service (irrigation) will be paid for on a lump sum basis.

The contract lump sum price paid for electric service (irrigation) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing electric service (irrigation) for the future irrigation controllers, complete in place, including pull rope, conduit and pull boxes to the pull box adjacent to future irrigation controller enclosure cabinets and irrigation controllers, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

10-3.11 CONTROLLER CABINETS

The traffic monitoring station and CCTV cabinets shall conform to the provisions in Section 86-3.03, "Model 170 and Model 2070 Controller Assemblies," of the Standard Specifications and these special provisions.

Cabinets shall be Type 1 and shall consist of a Type 1 housing (A), a mounting cage 1, and the following listed equipment. The equipment shall conform to the provisions of Chapter 6 of the Traffic Signal Control Equipment Specifications (TSCES).

- A. Service panel No. 1
- B. Power distribution assembly
- C. Input file No. 3, upper part
- E. C1 harness
- F. Controller and equipment shelves
- G. Dual fan assembly with thermostatic control
- H. Mechanical armature-type relays

Police panels will not be required.

Prior to shipping to the project site, each traffic monitoring station and CCTV cabinet shall be submitted to the Transportation Laboratory for acceptance testing.

Foundations for Type 1 housing shall conform to the details in the plans for Model 332 and 334 cabinets. The Engineer shall be notified when each traffic monitoring station and CCTV cabinet is ready for the functional test. The functional test will be conducted by State forces.

The following equipment shall be provided with each power distribution assembly:

- A. Two each of Duplex NEMA Type 5-20R controller receptacle
- B. One each of 30 A, 1-pole, 120 V(ac) Main circuit breaker
- C. One each of 15 A, 1- pole, 120 V(ac) circuit breaker
- D. Two each of 20 A, 1- pole, 120 V(ac) circuit breaker

Three shelves shall be furnished as shown on the plans. Each shelf shall be attached to the tops of 2 supporting angles with 4 screws. Supporting angles shall extend from the front to the back rails. Two supporting angles will be State furnished and 4 shall be Contractor furnished. The front of the shelf shall abut the front member of the mounting cage. The shelves shall be arranged as shown on the plans. The angles shall be designed to support a minimum of 23 kilograms each. The horizontal side of each angle shall be a minimum of 76 mm. The angles shall be vertically adjustable.

Three terminal blocks shall be furnished as shown on the plans. Terminal blocks shall conform to the requirements in Chapter 6, Section 5, Subsection 6.5.3, Paragraph 5.3.1 of the TSCES, except that the screw size shall be 8-32.

The power distribution assembly shall consist of the following: one 30 A, 120 V minimum, single pole main breaker; three 15 A, 120 V minimum, single pole secondary breakers; eight standard 120/117 V(ac) receptacles; and one duplex, 3 prong, NEMA Type 5-15R grounded utility type outlet. The power distribution assembly shall protect the equipment powered by the assembly from power transients. Over voltage protection shall be provided for the power distribution assembly and shall contain as a minimum, a surge arrester, which shall reduce the effect of power line voltage transients and be rated as follows:

| | |
|--|--------------|
| Recurrent Peak Voltage | 184 V |
| Energy Rating (Minimum) | 20 J |
| Power Dissipation, Average | 0.85 W |
| Peak Current for pulses less than 7 microseconds | 1250 A |
| Stand-by Current for 60 Hz Sinusoidal | 1 mA or less |

The thermostatically controlled fan shall provide 4.25 cubic meter per minute of ventilation. The fan shall be activated when the temperature inside the cabinet exceeds 24°C and shut off when the temperature is less than 18°C. All vents shall be filtered.

All cabinet assemblies shall be tested to demonstrate the correct function of all controls in the presence of the Engineer.

Surge Protection CCTV Cabinets

The Contractor shall furnish and install AC Protection unit in the Model 334-CCTV cabinets with the following specifications:

The unit shall have diagnostic circuitry and diagnostic lamps indicating:

- LINE OK
- LINE FAULT
- PROTECTION PRESENT

Shall meet UL 1449, UL 1283 and UL 497A specifications.

The AC Protector shall be rated as follows:

- Maximum Energy Absorption: 720 Joules.
- High Voltage Transient Spike Suppression: Up to 36 000 A spikes.
- Transient Response Time: instantaneous (0.1 ns.)
- Protection Modes: All 3: H-N, H-G, N-G.
- High Frequency Noise Suppression: Up to 80 dB from 50 kHz to 1,000 MHz.
- Rated Current and Load Handling: 15 Amperes max. (1,800 W), 15 Amperes per socket (1,800 W) Rated Voltage: 120 V(ac), 50/60 Hz.
- Circuit Breaker: 15 A.
- Receptacles: 6 (NEMA 5-15R).
- Cord: 2 m (78.74 inches) with grounded 3-prong plug.
- Dimensions: 44.45 mm x 82.55 mm x 228.60 mm.
- Weight: 1.36 kg.
- Product Warranty: Lifetime.

Dataline Protection:

- Clamping Voltage: 200 Volts peak ± 10 percent
- Response Time: 5 ns nanoseconds
- Energy Rating: 90 Joules
- Peak Transient Input Voltage: 6000 Volts, 10 microseconds
- Output: RJ 11 modular jack

The Contractor shall furnish and install a Model 170 controller interface in each traffic monitoring station cabinet as indicated on the plans . Attention is directed to the Model 170 controller interface specified elsewhere in these special provisions which includes interface cable, fiber distribution unit, and asynchronous fiber optic modem.

The Contractor shall furnish and install camera transceiver (TCVR) and other equipment as needed for the closed circuit television system in each 334 CCTV cabinet. Attention is directed to the Model 334-CCTV cabinet assembly specified elsewhere in these special provisions to interface with the CCTV camera assembly, and with the fiber optic cable.

Payment

Full compensation for the Model 334 Cabinets shall be considered as included in the contract lump sum price paid for CCTV systems or the traffic monitoring stations at the locations involved and no separate additional compensation will be allowed therefore.

10-3.12 STATE-FURNISHED CONTROLLER ASSEMBLIES

The Model 170 and 2070 controller assemblies, excluding anchor bolts, will be State-furnished as provided under "Materials" of these special provisions.

The Contractor shall construct each controller cabinet foundation as shown on the plans for Model 332A and 334 cabinets (including furnishing and installing anchor bolts), shall install the controller cabinet on the foundation, and shall make field wiring connections to the terminal blocks in the controller cabinet.

A listing of field conductor terminations, in each State-furnished controller cabinet, will be furnished free of charge to the Contractor at the site of the work.

State forces will maintain controller assemblies. The Contractor's responsibility for controller assemblies shall be limited to conforming to the provisions in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications.

For the signal and lighting the Contractor shall furnish and install one traffic signal communication interface system in each cabinet as indicated on the plans. Attention is directed to the traffic signal communication interface system specified elsewhere in these special provisions, which includes Gigabit Ethernet Fiber Switch, Ethernet Extender, Ethernet to Serial Server/Converter, interface cable and a fiber distribution unit

For the ramp metering system the Contractor shall furnish and install one controller interface in each State furnished 334 ramp meter cabinet as indicated on the plans. Attention is directed to the Model 170 controller interface specified elsewhere in these special provisions which includes interface cable, fiber distribution unit, and asynchronous fiber optic modem.

10-3.13 LIGHT EMITTING DIODE SIGNAL MODULE

GENERAL

Summary

This work includes installing LED signal module. Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications.

Location of LED signal module is shown on the plans. The Engineer will approve exact location.

Use LED signal module as the light source for the following traffic signal faces:

1. 300-mm section
2. 200-mm section
3. 300-mm arrow section

Submittals

Before shipping LED signal modules to job site, submit the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing all LED signal module serial numbers anticipated for use
3. LED signal modules

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

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

The State will test LED signal module shipments as specified in ANSI/ASQ Z1.4.. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED signal modules tested or submitted for testing must be representative of typical production units. LED and circular LED signal modules will be tested as specified in California Test 604. Arrow, U-turn, and bicycle LED signal modules will be tested as specified in California Test 3001. All parameters of the specification may be tested on the modules. LEDs must be spread evenly across the module. LED arrow indication must provide the minimum initial luminous intensity listed. Measurements will be performed at the rated operating voltage of 120 V(ac).

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED for retesting and pick up the failed units within 7 days of notification. You must provide new LED signal modules and allow a minimum of 30 days for the retest. You must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are your responsibility and no extra time will be allowed.

After testing, you must pick up the tested LED signal modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED signal modules for a minimum period of 48 months after installation of LED signal modules. Replacement LED signal modules must be provided within 15 days after receipt of failed LED modules at your expense. The State pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED signal modules must be delivered to State Maintenance Electrical Shop at 175 W. Cluster Street, San Bernardino, CA 92401.

MATERIALS

Minimum power consumption for LED signal module must be 5 W.

LED signal module must have an operational lifecycle rating of 48 months. During the operational lifecycle, LED signal module must meet all parameters of this specification.

LED signal module must be designed for installation in the door frame of standard traffic signal housing.

LED signal module must:

1. Be 1.8 kg maximum mass
2. Be manufactured for 300-mm circular, 200-mm circular, arrow, section
3. Be from the same manufacturer
4. Be the same model for each size
5. Be sealed units with:
 - 5.1. 2 color-coded conductors for power connection, except for lane control LED signal modules use 3 color-coded conductors.
 - 5.2. Printed circuit board and power supply contained inside and complying with Chapter 1, Section 6 of TEES published by the Department.
 - 5.3. Lens that is:
 - 5.3.1. Integral to the units
 - 5.3.2. Convex or flat with a smooth outer surface
 - 5.3.3. Made of UV stabilized plastic or glass, and withstands UV exposure from direct sunlight for 48 months without exhibiting evidence of deterioration.
 - 5.4. 1-piece EPDM gasket
6. Include 1-meter long conductors with quick disconnect terminals attached as specified in Section 86-4.01C, "Electrical Components," of the Standard Specifications.
7. Be sealed in door frames.
8. Fit into existing traffic signal section housing and comply with ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads".

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the signal module light output. Failure of an individual LED in a string must not result in loss of entire string or other indication.

No special tools for installation are allowed.

300-mm Arrow

Comply with Section 9.01 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads" for arrow indications.

LED signal module must:

1. Be weather tight and connect directly to electrical wiring.
2. Be capable of optical unit replacement.
3. Be a single, self-contained device, ready for installation into traffic signal housing.
4. Have manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics, including rated voltage, power consumption, and volt-ampere, permanently marked on the back of the module.
5. Have a symbol of module type and color. Symbol must be 25 mm in diameter. Color must be written out in 13 mm high letters next to the symbol.
6. Be AlInGaP technology for red and yellow indications and gallium nitride technology for green indications.
7. Be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.
8. Have a maximum power consumption as follows:

Power Consumption Requirements

| LED Signal Module Type | Power Consumption (Watts) | | | | | |
|------------------------|---------------------------|-------|--------|-------|-------|-------|
| | Red | | Yellow | | Green | |
| | 25 °C | 74 °C | 25 °C | 74 °C | 25 °C | 74 °C |
| 300-mm circular | 11 | 17 | 22 | 25 | 15 | 15 |
| 200-mm circular | 8 | 13 | 13 | 16 | 12 | 12 |
| 300-mm arrow | 9 | 12 | 10 | 12 | 11 | 11 |
| 300-mm U-turn | 9 | 12 | 10 | 12 | 11 | 11 |
| Bicycle | 11 | 17 | 22 | 25 | 15 | 15 |
| Programmed Visibility | 11 | 17 | 22 | 25 | 15 | 15 |
| Lane Control (X) | 9 | 12 | -- | -- | -- | -- |
| Lane Control (Arrow) | -- | -- | -- | -- | 11 | 11 |

Lens may be tinted, or may use transparent film or materials with similar characteristics to enhance "ON/OFF" contrasts. Tinting or other materials to enhance "ON/OFF" contrast must not affect chromaticity and must be uniform across the face of the lens.

If polymeric lens is used, surface coating or chemical surface treatment must be applied for front surface abrasion resistance.

Power supply must be integral to the module.

Internal components must be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Lens and LED signal module material must comply with the ASTM specifications for that material.

Enclosures containing either the power supply or electronic components of LED signal module, except lenses, must be made of UL94VO flame-retardant material.

If a specific mounting orientation is required, the LED signal module must have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing. Markings must include an up arrow, or the word "UP" or "TOP."

LED signal module must meet or exceed the following values when operating at 25 °C:

Minimum Initial Intensities for Circular Indications (cd)

| Angle (v,h) | 200-mm | | | 300-mm | | |
|-------------|--------|--------|-------|--------|--------|-------|
| | Red | Yellow | Green | Red | Yellow | Green |
| 2.5, ±2.5 | 157 | 314 | 314 | 399 | 798 | 798 |
| 2.5, ±7.5 | 114 | 228 | 228 | 295 | 589 | 589 |
| 2.5, ±12.5 | 67 | 133 | 133 | 166 | 333 | 333 |
| 2.5, ±17.5 | 29 | 57 | 57 | 90 | 181 | 181 |
| 7.5, ±2.5 | 119 | 238 | 238 | 266 | 532 | 532 |
| 7.5, ±7.5 | 105 | 209 | 209 | 238 | 475 | 475 |
| 7.5, ±12.5 | 76 | 152 | 152 | 171 | 342 | 342 |
| 7.5, ±17.5 | 48 | 95 | 95 | 105 | 209 | 209 |
| 7.5, ±22.5 | 21 | 43 | 43 | 45 | 90 | 90 |
| 7.5, ±27.5 | 12 | 24 | 24 | 19 | 38 | 38 |
| 12.5, ±2.5 | 43 | 86 | 86 | 59 | 119 | 119 |
| 12.5, ±7.5 | 38 | 76 | 76 | 57 | 114 | 114 |
| 12.5, ±12.5 | 33 | 67 | 67 | 52 | 105 | 105 |
| 12.5, ±17.5 | 24 | 48 | 48 | 40 | 81 | 81 |
| 12.5, ±22.5 | 14 | 29 | 29 | 26 | 52 | 52 |
| 12.5, ±27.5 | 10 | 19 | 19 | 19 | 38 | 38 |
| 17.5, ±2.5 | 19 | 38 | 38 | 26 | 52 | 52 |
| 17.5, ±7.5 | 17 | 33 | 33 | 26 | 52 | 52 |
| 17.5, ±12.5 | 12 | 24 | 24 | 26 | 52 | 52 |
| 17.5, ±17.5 | 10 | 19 | 19 | 26 | 52 | 52 |
| 17.5, ±22.5 | 7 | 14 | 14 | 24 | 48 | 48 |
| 17.5, ±27.5 | 5 | 10 | 10 | 19 | 38 | 38 |

Minimum Luminance for Arrows, Indications(cd/m2)

| | Red | Yellow | Green |
|------------------|-------|--------|--------|
| Arrow Indication | 5,500 | 11,000 | 11,000 |

LED signal module must meet or exceed the following illumination values for 48 months when operating over a temperature range of -40 °C to + 74 °C. Yellow LED signal module must meet or exceed the following illumination values for 48 months, when operating at 25 °C:

Minimum Maintained Intensities for Circular Indications (cd)

| Angle (v,h) | 200-mm | | | 300-mm | | |
|-------------|--------|--------|-------|--------|--------|-------|
| | Red | Yellow | Green | Red | Yellow | Green |
| 2.5, ±2.5 | 133 | 267 | 267 | 339 | 678 | 678 |
| 2.5, ±7.5 | 97 | 194 | 194 | 251 | 501 | 501 |
| 2.5, ±12.5 | 57 | 113 | 113 | 141 | 283 | 283 |
| 2.5, ±17.5 | 25 | 48 | 48 | 77 | 154 | 154 |
| 7.5, ±2.5 | 101 | 202 | 202 | 226 | 452 | 452 |
| 7.5, ±7.5 | 89 | 178 | 178 | 202 | 404 | 404 |
| 7.5, ±12.5 | 65 | 129 | 129 | 145 | 291 | 291 |
| 7.5, ±17.5 | 41 | 81 | 81 | 89 | 178 | 178 |
| 7.5, ±22.5 | 18 | 37 | 37 | 38 | 77 | 77 |
| 7.5, ±27.5 | 10 | 20 | 20 | 16 | 32 | 32 |
| 12.5, ±2.5 | 37 | 73 | 73 | 50 | 101 | 101 |
| 12.5, ±7.5 | 32 | 65 | 65 | 48 | 97 | 97 |
| 12.5, ±12.5 | 28 | 57 | 57 | 44 | 89 | 89 |
| 12.5, ±17.5 | 20 | 41 | 41 | 34 | 69 | 69 |
| 12.5, ±22.5 | 12 | 25 | 25 | 22 | 44 | 44 |
| 12.5, ±27.5 | 9 | 16 | 16 | 16 | 32 | 32 |
| 17.5, ±2.5 | 16 | 32 | 32 | 22 | 44 | 44 |
| 17.5, ±7.5 | 14 | 28 | 28 | 22 | 44 | 44 |
| 17.5, ±12.5 | 10 | 20 | 20 | 22 | 44 | 44 |
| 17.5, ±17.5 | 9 | 16 | 16 | 22 | 44 | 44 |
| 17.5, ±22.5 | 6 | 12 | 12 | 20 | 41 | 41 |
| 17.5, ±27.5 | 4 | 9 | 9 | 16 | 32 | 32 |

Minimum Maintained Luminance for Arrow Indications (cd/m2)

| | Red | Yellow | Green |
|------------------|-------|--------|--------|
| Arrow Indication | 5,500 | 11,000 | 11,000 |

LED signal module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

Chromaticity Standards (CIE Chart)

| | |
|--------|--|
| Red | Y: not greater than 0.308, or less than 0.998 - x |
| Yellow | Y: not less than 0.411, nor less than 0.995 - x, nor greater than 0.452 |
| Green | Y: not less than 0.506 - 0.519x, nor less than 0.150 + 1.068x, nor more than 0.730 - x |

LED signal module must operate:

1. At a frequency of 60 Hz ± 3 Hz, over a voltage range from 95 V(ac) to 135 V(ac), without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
2. Compatible with currently used controller assemblies, including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 mA alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." Electrical connection for each Type 1 LED signal module must be 2 secured, color-coded, 1-meter long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C. LED signal module on-board circuitry must:

1. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
2. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED signal module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED signal module must not exceed 20 percent at an operating temperature of 25 °C.

When power is applied to LED signal module, light emission must occur within 90 ms.

Red and Yellow Flashing LED Signal Module

No external circuitry to flash the LED signal module is allowed. Use 12 V(dc) or 120 V(ac).

Flashing LED signal module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less for alternating current or 5 V(dc) for 12 V(dc) flasher units, is applied to the unit.

Electrical connection for each flashing LED signal module must be 4 secured, color-coded, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wire must comply with NEC, rated for service at +105 °C. Conductors for flashing LED signal module must be 1 meter in length, with quick disconnect terminals attached, and must comply with Section 86-4.01C, "Electrical Components," of the Standard Specifications. The color code is as follows:

Color Code Requirements

| Function | Color |
|-------------------|--------|
| Neutral/DC common | white |
| Steady On | red |
| Flash On | brown |
| Flash Out | orange |

Flashing LED signal module must include all necessary electronics to:

1. Operate in a "Steady On" mode
2. Perform, in "Flash On" mode, 50 to 60 flashes per minute with a 50 percent ± 5 duty cycle
3. Allow alternating flashing operation, wig-wag, if the "Steady On" input of another flashing LED signal module is connected

When power is applied to the "Flash On" control conductor, the control output must allow a 12 V(dc) or 120 V(ac) signal that is switched opposite of the flash state of the module. Output must be able to source a maximum of 2.5 A for 12 V(dc), or 0.3 A for 120 V(ac).

Do not use the power consumption from "Flash Out" output of the flashing LED signal module when determining maximum power consumption.

The flashing LED Signal module must be clearly marked on the back, as "DC FLASHER" or "AC FLASHER", in 13-mm letters.

10-3.14 BATTERY BACKUP SYSTEM

GENERAL

Summary

This work includes installing battery backup system (BBS). Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and TEES.

The State will furnish BBS components as listed in "Materials" of these special provisions.

You must furnish the external cabinet and batteries.

Submittals

Before shipping external cabinets to the jobsite, submit material list including contract number, cabinet serial numbers, and contact information to the Transportation Laboratory.

Submit a Certificate of Compliance for each external cabinet and batteries to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Quality Control and Assurance

The State may test the cabinets.

Functional Testing

After complete installation, BBS functional test must be performed. Test for 30 minutes of continuous, satisfactory operation with utility power turned off. Perform test in the presence of the Engineer.

Warranty

Batteries must be warranted by the manufacturer to operate within a temperature range of -25 °C to +60 °C for 2 years.

Batteries must have a written warranty against defects in materials and workmanship from the manufacturer prorated for a period of 60 months after installation. You must provide the Engineer with all warranty documentation before installation. Replacement batteries must be available within 5 business days after receipt of failed batteries at no cost to the State except the cost of shipping the failed batteries. Replacement batteries must be delivered to Caltrans Maintenance Electrical Shop at 175 W Cluster Street, San Bernardino, CA 92401.

MATERIALS

Batteries must:

1. Be deep cycle, sealed prismatic, lead-calcium-based, absorbed-glass mat and valve-regulated lead acid (AGM/VRLA) type
2. Have voltage rating of 12 V
3. Be group size 24
4. Be commercially available and stocked locally
5. Have a carrying handle
6. Be marked with date code, maximum recharge data, and recharge cycles
7. Have 2 top-mounted, threaded, stud posts that include all washers and nuts required for attaching 9.5-mm ring lugs of a State-furnished BBS battery harness
8. Include rubber insulating protective covers for protecting the lugs, posts, and wiring - red for positive terminal and black for negative terminal
9. Be new and fully-charged when furnished
10. Be free from damage or deformities

External cabinet must be one listed on the Pre-Qualified Products List at:

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

External cabinet must be capable of housing:

1. 8 batteries
2. Inverter/charger unit
3. Power transfer relay
4. Manually-operated bypass switch
5. Required control panels
6. Wiring and harnesses

Dimensions and details for the external cabinet, for attaching the external cabinet to the Model 332A cabinet, and for wiring the State-furnished equipment will be available in an information handout as described in "Project Information" of these special provisions.

The following details must comply with Section 86-3.04, "Controller Cabinets," of the Standard Specifications and TEES:

1. Door construction, including material, thickness, coating, and welds
2. Frame
3. Door seals
4. Continuous stainless steel piano hinge or 4 leaves with 2 bolts on each side of each leaf, used to connect the door to external cabinet
5. Padlock clasp or latch and lock mechanism

The external cabinet must be ventilated by using louvered vents, filter, and a thermostatically controlled fan. Fan must be AC-operated from the same line output as the Model 332A cabinet. A 2-position terminal block must be provided on the fan panel, along with 3 meters of connected hookup wire.

The external cabinet surface must be anodized aluminum. Anti-graffiti paint must not be used.

The external cabinet must include all bolts, washers, nuts, and cabinet-to-cabinet coupler fittings necessary for mounting it to the Model 332A cabinet.

Fasteners for the external cabinet must include:

1. 8 cabinet mounting bolts that are 18-8 stainless steel hex head, fully-threaded, and 9.5 mm – 16 x 25.4 mm
2. 2 washers per bolt designed for 9.5-mm bolt and are 18-8 stainless steel 25.4-mm OD round flat type
3. K-lock nut per bolt: K-lock washer that is 18-8 stainless steel and hex-nut

External cabinet to Model 332A cabinet couplings must include a conduit for power connections between the 2 cabinets. Couplings must include:

1. 51-mm nylon-insulated steel chase nipple, T & B 1947 or equivalent
2. 51-mm sealing, steel locknut, T & B 146SL or equivalent
3. 51-mm nylon-insulated steel bushing, T & B 1227 or equivalent

CONSTRUCTION

Mount external cabinet to either the left or right side of Model 332A cabinet. The typical side-mounting location of external cabinet is flush with the bottom of the Model 332A cabinet and approximately equidistant from the front and rear door edges.

MEASUREMENT AND PAYMENT

Full compensation for assembling and installing battery backup system is included in the contract lump sum price paid for signal and lighting at various locations as shown on the plans, and no separate payment will be made therefor.

10-3.15 LIGHT EMITTING DIODE PEDESTRIAN SIGNAL FACE MODULES

GENERAL

Summary

This work includes installing LED pedestrian signal face (PSF) module into standard Type A pedestrian signal housing. Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications.

Submittals

Before shipping LED PSF modules to job site, submit the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing all LED PSF module serial numbers anticipated for use
3. LED PSF modules

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

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

The State will test LED PSF module shipments as specified in ANSI/ASQ Z1.4.. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED PSF modules tested or submitted for testing must be representative of typical production units. LED PSF modules will be tested as specified in California Test 606. All parameters of the specification may be tested on the modules.

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED for retesting and pick up the failed units within 7 days of notification. You must provide new LED PSF modules and allow a minimum of 30 days for the retest. You must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are your responsibility and no extra time will be allowed.

After successful testing, you must pick up the tested LED PSF modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED PSF modules for a minimum period of 48 months after installation of LED PSF modules. Replacement LED PSF modules must be provided within 15 days after receipt of failed LED PSF modules at your expense. The State pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED PSF modules must be delivered to State Maintenance Electrical Shop at 175 W. Cluster Street, San Bernardino, CA 92401.

MATERIALS

LED PSF module must:

1. Be from the same manufacturer.
2. Be installed in standard Type A pedestrian signal housing, "UPRAISED HAND" and "WALKING PERSON." Do not include reflectors.
3. Use LED as the light source.
4. Be designed to mount behind or replace face plates of standard Type A housing as specified in ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications" and the "California MUTCD."
5. Have a minimum power consumption of 10 W.
6. Use required color and be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.
7. Be able to replace signal lamp optical units and pedestrian signal faces with both LED and incandescent light sources.
8. Fit into pedestrian signal section housings without modifications to the housing. The housing must comply with ITE publication, Equipment and Materials Standards, Chapter 3, "Pedestrian Traffic Control Signal Heads."
9. Be a single, self-contained device, not requiring on-site assembly for installation into standard Type A housing.
10. Have the following information permanently marked on the back of module:
 - 10.1. Manufacturer's name
 - 10.2. Trademark
 - 10.3. Model number
 - 10.4. Serial number
 - 10.5. Lot number
 - 10.6. Month and year of manufacture
 - 10.7. Required operating characteristics, as follows:
 - 10.7.1. Rated voltage
 - 10.7.2. Power consumption
 - 10.7.3. Volt-ampere (VA)
 - 10.7.4. Power factor
11. Have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing if a specific mounting orientation is required. Markings must include an up arrow, or the word "UP" or "TOP." Marking must be a minimum of 25-mm diameter.

Circuit board and power supply must be contained inside the LED PSF modules. Circuit board must comply with Chapter 1, Section 6 of TEES published by the Department.

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the PSF module light output. Failure of an individual LED in a string must not result in the loss of entire string or other indication.

LEDs must be evenly distributed in each indication. Do not use outline forms.

No special tools for installation are allowed.

Installation of the LED PSF module into pedestrian signal face must require only removal of lenses, reflectors, lamps, and existing LED modules.

Power supply for LED PSF module must be integral to the module. Power supply for each symbol must be isolated to avoid turn-on conflict.

Assembly and manufacturing processes for LED PSF module must assure that all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Material used for LED PSF module must comply with ASTM D 3935.

Enclosures containing either the power supply or electronic components of LED PSF module, except lenses, must be made of UL94VO flame-retardant material.

Color of "UPRAISED HAND" symbol must be portland orange.

Color of "WALKING PERSON" symbol must be lunar white.

Each symbol must not be less than 250 mm high and 165 mm wide. Uniformity ratio of illuminated symbols must not exceed 4 to 1 between highest and lowest luminance areas. Symbols must comply with ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications," and the "California MUTCD."

LED PSF module must maintain an average luminance value over 48 months of continuous use in signal operation for a temperature range of -40 °C to +74 °C. In addition, LED PSF modules must meet or exceed the following luminance values upon initial testing at 25 °C.

Luminance Values

| PSF module | Luminance |
|----------------|-------------------------|
| UPRAISED HAND | 3,750 cd/m ² |
| WALKING PERSON | 5,300 cd/m ² |

Color output of LED PSF module must comply with chromaticity requirements in Section 5.3 of ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications."

Measured chromaticity coordinates of LED PSF module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

Chromaticity Standards (CIE Chart)

| | |
|------------------------------------|--|
| UPRAISED HAND (portland orange) | Not greater than 0.390, nor less than 0.331, nor less than 0.997-X |
| WALKING PERSON (lunar white) | X: not less than 0.280, nor greater than 0.320 Y: not less than 1.055*X - 0.0128, nor greater than 1.055*X + 0.0072 |

LED PSF module maximum power consumption must not exceed the following values:

Power Consumption Requirements

| PSF module | Power Consumption @ 24°C | Power Consumption @ 74°C |
|----------------|--------------------------|--------------------------|
| UPRAISED HAND | 10.0 W | 12.0 W |
| WALKING PERSON | 9.0 W | 12.0 W |

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." The LED PSF module must be supplied with spade lugs and 3 secured, color-coded, 1 meter long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C.

LED PSF module must operate:

1. At a frequency of 60 Hz ± 3 Hz over a voltage range from 95 V(ac) to 135 V(ac) without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
2. Compatible with currently used State controller assemblies including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 ma alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

LED PSF module on-board circuitry must:

1. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
2. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED PSF module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED PSF module must not exceed 20 percent at an operating temperature of 25 °C.

The LED PSF module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less is applied to the unit.

When power is applied to LED PSF module, light emission must occur within 90 ms.

The "UPRAISED HAND" and "WALKING PERSON" symbol indications must be electrically isolated from each other. Sharing a power supply or interconnect circuitry between the 2 indications is not allowed.

10-3.16 DETECTORS

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Loop detector lead-in cable shall be Type B.

Type E detector loops, sides of the slot shall be vertical and the minimum radius of the slot entering and leaving the circular part of the loop shall be 40 mm. Slot width shall be a maximum of 16 mm. Loop wire for circular loops shall be Type 2. Slots of circular loops shall be filled with hot melt rubberized asphalt sealant.

The depth of loop sealant above the top of the uppermost loop wire in the sawed slots shall be 50 mm, minimum.

PREFORMED INDUCTIVE LOOPS

Prefomed inductive loops shall be the type shown on the plans.

The loop shall be 1.8 m square unless otherwise shown. The loop shall consist of 4 turns of No. 16, or larger, wire with Type THWN or TFFN insulation.

The loop wires shall be encased in Size 10, minimum, Schedule 40 or Schedule 80 PVC or polypropylene conduit. The conduit shall be sealed to prevent the entrance of water and the movement of wires within the conduit.

The loop wires from the preformed loop to the adjacent pull box shall be twisted together into a pair (at least 7 turns per meter) and encased in Schedule 40 or Schedule 80 PVC or polypropylene conduit between the preformed loop and the adjacent pull box or detector handhole. The lead-in conduit shall be sealed to prevent the entrance of water at the pull box or handhole end.

In new reinforced concrete structure decks, the preformed loops shall be secured to the top of the uppermost layer of reinforcing steel using nylon wire ties. The loop shall be held parallel to the structure deck by using PVC or polypropylene spacers where necessary. Conduit for lead-in conductors shall be placed between the uppermost 2 layers of reinforcing steel.

Prefomed inductive loops shall not be installed in existing structure decks.

10-3.17 LUMINAIRES

Ballasts shall be the lag regulator type.

10-3.18 SOFFIT AND WALL LUMINAIRES

A No. 7 pull box shall be installed adjacent to each soffit luminaire as shown on the plans.

10-3.19 SIGN LIGHTING FIXTURES-INDUCTION

Induction sign lighting fixtures shall conform to the provisions for mercury sign lighting fixtures in Section 86-6.05, "Sign Lighting Fixtures-Mercury," of the Standard Specifications and these special provisions.

Each fixture shall consist of a housing with door, a reflector, refractor or a lens, a lamp, a power coupler, a high frequency generator and a fuse block.

Fixtures shall have a minimum average rating of 60 000 hours. Fixtures shall be for a wattage of 87 W, 120/240 V(ac). The power factor of the fixtures shall be greater than 90 percent and the total harmonic distortion shall be less than 10 percent. Fixtures shall be Underwriter's Laboratories (UL) approved for wet locations and be Federal Communications Commission (FCC) Class A listed.

The mass of the fixture shall not exceed 20 kg. The manufacturer's brand name, trademark, model number, serial number and date of manufacture shall be located on the packaged assembly and permanently marked on the outside and inside of the housing.

MATERIALS

Mounting Assembly

The mounting assembly may be either cast aluminum, hot-dip galvanized steel plate or steel plate that has been galvanized and finished with a polymeric coating system or the same finish that is used for the housing.

Housing

Housings shall have a door designed to hold a refractor or lens. Housing doors shall be designed to be opened without the use of tools. Housings and doors shall have a powder coat or polyester paint finish of a gray color resembling unfinished fabricated aluminum.

Reflector

Reflectors shall be designed to be removed as a unit that includes the lamp and power coupler.

Refractor

Refractors or lenses shall have smooth exteriors. Lenses shall be flat or convex. Convex lenses shall be made from heat resistant, high-impact resistant, tempered glass.

Convex lenses shall be designed or shielded so that no fixture luminance is visible when the fixture is approached directly from the rear and the viewing level is the bottom of the fixture. When a shield is used it shall be an integral part of the door casting.

Lamp

Each fixture shall be furnished with a 85-W induction lamp. Interior lamp walls shall be fluorescent phosphor coated. Lamp light output shall be at least 70 percent at 60 000 hours. Lamps shall have a minimum color-rendering index of 80. Lamps shall be rated at a color temperature of 4000 K. Lamps shall be removable without the use of tools.

Power Coupler

Power couplers shall consist of a construction base with antenna, heat sink and electrical connection cable. The power coupler shall be designed so that it can be removed with common hand tools.

High Frequency Generator

High frequency generators shall start and operate lamps at an ambient temperature of -25 °C or greater for the rated life of the lamp.

Generator output frequency shall be 2.65 MHz \pm 10 percent. The generator radio frequency interference shall meet the requirements of the Federal Communications Commission Title 47, Part 18, regulations concerning harmful interference.

High frequency generators shall operate continuously at ambient air temperatures from -25 °C to +25 °C without reduction in generator life. High frequency generators shall have a design life of at least 100 000 hours at 55 °C.

High frequency generators shall be capable of being replaced with common hand tools. Conductor terminals shall be identified as to the component terminal to which they connect.

High frequency generators shall be mounted to use the fixture upon which they are mounted as a heat sink.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and a copy of the high frequency generator test methods and results shall be submitted by the manufacturer with each lot of fixtures. The certificate shall state that the high frequency generators meet the requirements of this section and the generator specifications of the lamp manufacturer.

10-3.20 PHOTOELECTRIC CONTROLS

Contactors shall be the mechanical armature type.

Photoelectric units for illuminated signs shall have a "turn-on" level of between 215 lux and 323 lux (corresponds to a switching level of approximately 430 lux to 646 lux measured in the horizontal plane). "Turn-off" level shall not exceed 3 times the "turn-on" level.

10-3.21 EXTINGUISHABLE MESSAGE SIGN

Each extinguishable message sign shall be an internally illuminated weathertight and dust tight unit which will produce a clearly visible message only when internally illuminated and shall conform to these special provisions.

The design of each sign shall be as shown on the plans. Minor details of construction shown are typical and may be modified subject to approval by the Engineer.

Six sets of shop drawings shall be submitted to the Engineer for review prior to performing work on the signs.

HOUSING

The housing shall be ruggedly constructed, shall be rigid, weathertight, dust tight and corrosion resistant, and shall be made of durable materials.

Provisions shall be made for ease of maintenance of components.

Sign panels and housing window shall be made of acrylic plastic which, including painted portions, shall be highly resistant to crazing, staining, discoloration, creep, warping, and the long range deleterious effects of vehicle fumes, direct sunlight, heat (up to 90°C), water, oils and aging.

The housing skin shall be made of Type 5052-H32 aluminum alloy sheet with clad finish. The housing reinforcing and miscellaneous parts shall be made of suitable gages and types of aluminum, except external fasteners, machine screw parts, lock washers, hinge pins, and other mechanical parts, which shall be made of Type 316 stainless steel.

Interior metal parts shall be made of suitable gages and types of plated steel or aluminum, except fasteners, machine screw parts, lock washers and other miscellaneous parts shall be made of corrosion resistant metals other than aluminum.

The separable hinge for mounting the reflector shall be brass as shown on the plans or shall be stainless steel.

Gaskets shall be uniform and even textured, and shall be highly resistant to stiffening and setting and the long range deleterious effects of vehicle fumes, direct sunlight, heat (up to 70°C), water, oils and aging.

Terminal strips shall be used for input, output and tie point connections and shall be of the molded phenolic, barrier type.

BALLASTS, CONTROL RELAYS AND TERMINAL BLOCKS

Ballast inductors shall meet the requirements in ANSI Standard: C82.1, "Fluorescent Lamp Ballasts."

The inductors shall have the inductance noted on the plans (± 10 percent), losses not exceeding 15 percent of lamp watts at rated current of inductor and a maximum current crest factor of 1.5 at rated current of inductor. The maximum temperature rise of the inductor coils shall be limited to 40°C above an ambient temperature of 40°C.

Heater transformers shall produce the rated secondary voltage (± 10 percent) at full load and at one-third load. The maximum temperature rise of the transformer coils shall not exceed 40°C above an ambient temperature of 40°C.

Inductors and transformers shall have cores made of a suitable grade of silicon steel lamination material and shall have thorough resin impregnation.

Each mounting chassis shall be fabricated of 3 mm, Type 5052-H32 aluminum alloy sheet. Units shall be mounted on the chassis with plated brass or steel hardware, except for lock washers which shall be beryllium copper, externally toothed.

Capacitors shall be rated 660 V (ac), 60 Hz, for operation down to -20°C with capacity as shown on the plans and shall be oil filled, paper type, hermetically sealed with solder lug terminals. Capacitance shall be within ± 10 percent of rating at 25°C. Each capacitor shall withstand a limited direct current, 15-second breakdown test at 25°C of 3000 V (ac) from each terminal to case. Minimum insulation leakage resistance from terminal to terminal, in megohms, shall be not less than 1500 divided by capacitance in microfarads.

Each magnetic control relay shall be of the heavy-duty, power type with 120-V (ac) coil and double-pole, double-throw contacts with a minimum rating of 2 A at 480 V (ac), 60 Hz. The coil shall consume not more than 10 VA with sealed armature.

The relay coil shall be designed to provide reliable service under the following conditions:

- A. Maximum operating voltage: 10 percent over rated volts.
- B. Ambient temperature: 60°C.

The relay coil shall meet NEMA requirements for temperature rise and voltage breakdown.

Maximum dimensions of the relay shall be: mounting base, 63.5 mm by 102 mm; overall height, 63.5 mm.

Fuseholders shall be the panel mounting type rated at 250 V (ac), complete with a 10.3-mm diameter by 38-mm length, slow blowing, cartridge type fuse.

Surge limiting and ballast resistors shall be ceramic coated, 20-watt, wirewound units. Resistor leads shall have plastic insulation rated 600 V (ac), for operation at 200°C.

Wiring connections from components shall be terminated on 2 molded phenolic, barrier type, terminal block assemblies rated at 15 A, 600 V (ac). Terminal designations shall be marked as indicated on the plans.

LAMP HOLDERS AND LAMPS

Lamp holders shall have silver plated contacts.

Lamps shall be the extra-high output, rapid-start type with T-12 bulb of the length shown on the plans, cool-white color and plated contacts for operation up to 1500 mA.

CONDUCTORS AND WIRING

Ballast and sign conductors shall be No. 16 stranded copper wire and shall be labeled by UL as 105°C appliance wiring material (AWM) for use at 600 V (ac). Ballast conductors shall be secured with easily removable, spring cross straps (not clamped, cabled or served) on the underside of the chassis. Color coding and terminal markings shall be as shown on the plans.

Lead ends shall be fitted with spade lugs.

LUG DISCONNECT

Each plug disconnect shall consist of molded nylon plug and receptacle housings containing plug pins and individual sockets designed to be crimped to conductors and snapped into the housings. Housings shall have integral, molded, polarizing and locking devices. Minimum UL electrical rating shall be 10 A, 600 V (ac). Pins and sockets shall be tin plated phosphor bronze secured to conductors using a ratchet type precision crimping tool.

TESTING

Tests shall verify that the following conditions exist:

- A. Transformer output voltage: 480 V (ac) \pm 10 percent.
- B. Sign input current (daytime level): 4 A maximum.
- C. Lamp current each (daytime level): 1.4 A \pm 15 percent (nighttime level) 30 mA \pm 15 percent.
- D. Cathode filament voltage: 3.6 V (ac) \pm 10 percent and shall be supplied from a steady (non-flashing) source.

SIGN OPERATION

The sign shall operate as follows:

- A. During daytime, the lamps shall operate at full rated brightness.
- B. During nighttime, the lamps shall be dimmed to approximately one-thirty-fifth of daytime brightness.
- C. Starting and flashing shall be positive, without flickering, during daytime and nighttime levels.

10-3.22 MODIFY COMMUNICATION SYSTEM DESCRIPTION

Modification of the communication system between communication hub "H" and the Transportation Management Center (TMC). It consists of all conduit, innerduct and contains fiber optic cable, splice vaults, connections in the splice vaults, pull boxes, connections between the TMC and communication hub "H", as well as between equipment rooms or buildings, and between communication hubs. The term is used interchangeably with "trunk" cable.

10-3.23 FIBER OPTICS GLOSSARY AND DEFINITIONS

The following definitions shall apply to these special provisions:

Breakout.--The cable "breakout" is produced by (1) removing the jacket just beyond the last tie-wrap point, (2) exposing one to 2 m of the cable buffers, aramid strength yarn and central fiberglass strength member, and (3) cutting the aramid yarn, central strength member and the buffer tubes to expose the individual glass fibers for splicing or connection to the appropriate device.

Connector.--A mechanical device used to provide a means for attaching to and decoupling from a transmitter, receiver, or another fiber (such as on a patch panel).

Connectorized.--The termination point of a fiber after connectors have been affixed.

Connector Module Housing (CMH).--A patch panel used to terminate singlemode or multimode fibers with most common connector types. It may include a jumper storage shelf and a hinged door.

Couplers.--Couplers are devices which mate two fiber optic connectors to facilitate the transition of optical light signals from one connector into another. They are normally located within FDFs and ITUs mounted in panels. They may also be used unmounted, to join two simplex fiber runs.

Fiber Distribution Frame (FDF).--A rack mounted system that is usually installed in the TMC and the HUB location, that consists of a standard equipment rack, fiber routing guides, horizontal jumper troughs, fiber distribution units (FDU), connector module housings (CMH), and splice module housings (SMH).

Fiber Distribution Unit (FDU).--An enclosure or rack mountable unit containing both a Connector Module Housing (CMH) and a Splice Module Housing enclosure. The units CMH and SMH may be integrated by a partition.

F/O.--Fiber optic.

FOC.--Fiber optic cable.

FOIP.--Fiber optic inside plant cable.

FOP.--Fiber optic outside plant cable.

FOTP.--Fiber optic test procedure(s) as defined by EIA/TIA standards.

10-3.24 FIBER OPTIC CONDUIT

Fiber optic conduit is defined as conduit that will contain innerduct or fiber optic cable, as shown on the plans. Furnishing and installing fiber optic conduit shall conform to the provision of section "Conduit" of these special provisions, and the following.

All fiber optic conduit to be installed underground shall be Type 3 Schedule 80 except as specified herein.

Type 1 conduit shall be used in bridges.

Type 2 conduit shall be used from the bridge to the first pull box or splice vault.

Minimum conduit bend radius shall be 10 times trade diameter.

Conduit trenches in or adjacent to paved shoulders shall be backfilled within 3 calendar days. Conduit trenches in and across traffic lanes shall be backfilled during the same work period the trench is excavated except that the top 300 mm of asphalt shall be placed within 3 calendar days.

10-3.25 TRACER WIRE

Tracer wire shall be provided and placed in 103mm conduits containing fiber optic cable and as shown on the plans.

Tracer wire shall be a No. 12, minimum, solid copper conductor with Type TW, THW, RHW, or USE insulation. The tracer wire shall form a mechanically and electrically continuous line throughout the length of the trench. A minimum of 1 m of slack shall be extended into each pull box and splice vault from each direction.

Tracer wire may be spliced at intervals of not less than 155 meters. Splices shall conform to Section 86-2.09, "Wiring," of the Standard Specifications.

Full compensation for furnishing and installing tracer wires shall be considered as included in the price or prices paid for the conduit involved and no separate payment will be made therefor.

10-3.26 WARNING TAPE

Warning tape shall be provided and placed in the trench over conduits containing fiber optic cable as shown on the plans. The warning tape shall be 103mm wide with bold printed black letters of an approximate height of 25.4 mm on bright orange color background, and contain the printed warning "CAUTION BURIED FIBER OPTIC CABLE - CALTRANS" repeated at approximately 762 mm intervals.

The printed warning shall be non-erasable and shall be rated to last with the tape for a minimum of 40 years.

The construction of the warning tape shall be such that it will not delaminate when it is wet. It shall be resistant to insects, acid, alkaline and other corrosive elements in the soil. It shall have a minimum of 712 N tensile strength per 6 inch wide strip and shall have a minimum of 700 percent elongation before breakage.

Full compensation for furnishing and installing the warning tape shall be considered as included in the price or prices paid for the conduit involved and no separate payment will be made therefor.

10-3.27 FIBER OPTIC TRENCH DELINEATOR

Fiber optic trench delineators (flexible posts) shall conform to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Delineators on flexible posts shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Flexible posts shall be made from a flexible white plastic which shall be resistant to impact, ultraviolet light, ozone, and hydrocarbons. Flexible posts shall resist stiffening with age and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability.

Non-reflective sheeting for flexible target plates shall be the non-reflective sheeting designated for channelizers, markers, and delineators conforming to the requirements in ASTM Designation: D 4956-95 and in conformance with the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

The following information shall be added to each post by an adhesive sticker which shall be resistant to ultraviolet light, ozone, and hydrocarbons.

UNDERGROUND
FIBER OPTIC
CABLE
IN THIS AREA
**W
A
R
N
I
N
G**
BEFORE EXCAVATING OR
IN AN EMERGENCY
CALL
CALTRANS, SAN BERNARDINO, CA
909-383-2582

Flexible posts shall be installed every 150 meters or at any point that the fiber optic conduit changes direction. The flexible post shall be installed directly above fiber optic conduit (in the same trench) offset enough to not hit the warning tape. Posts shall not be placed in front of pull boxes.

If fiber optic conduit is installed under a paved shoulder, the flexible posts shall be installed in the dirt shoulder, immediately adjacent to the paved shoulder. The message on the post shall indicate (in meters) the distance it is offset from the fiber optic conduit.

The flexible post may be installed by placing it into the trench prior to backfilling and compacting, or by placing it into a 457 mm steel anchor sleeve that is driven into the ground prior to installing the flexible post. The flexible post and anchor shall have locking tabs that prevent removal of the flexible post from the anchor sleeve.

The top of the flexible post (fiber optic trench delineator) shall be set at a height of 48 inches above ground level.

Flexible posts shall extend a minimum of 457 mm below the ground.

Full compensation for furnishing and installing the fiber optic trench delineators shall be considered as included in the price or prices paid for the conduit involved and no separate payment will be made therefor.

10-3.28 FIBER OPTIC SPLICE VAULT

Fiber optic splice vaults shall conform to the Western Underground Committee Guide No. 3.6 "Nonconcrete Enclosures," except where differences are noted here, and the details on the plans. Fiber optic splice vaults shall have minimum inside clearance of 914 mm (W) x 1520 mm (L) x 1520 mm (D).

Covers shall be 2 piece torsion assisted sections. Cover marking shall be "CALTRANS FIBER OPTICS" on each cover section. Each cover section shall have inset lifting pull slots. Cover hold down bolts or cap screws and nuts shall be of brass, stainless steel, or other non-corroding metal material. Covers shall be hot dipped galvanized steel.

Fiber optic splice vaults and covers shall be rated for AASHTO HS 20-44 loads and installed as detailed and where shown on the plans. A concrete encasement ring shall be poured around the splice vault as shown on the plans. Concrete placed around and under traffic splice vaults as shown on the plans shall contain a minimum of 325 kg of portland cement per cubic meter.

Hangers shall be made of a non-corroding material and be free of any sharp edges. A separate hanger shall be provided for each type of fiber optic cable and be securely fastened to the side wall with the slack fiber optic cable neatly coiled in a figure-eight configuration.

A minimum of two "U shaped" knockouts are required on each side of the vault and shall be configured to allow for future removal of the vault without disturbing the existing conduits.

10-3.29 SEALING PLUGS FOR CONDUIT AND INNERDUCT

Except as otherwise noted, all conduits containing fiber optic cables and innerducts shall have their ends sealed with commercial preformed plugs which prevent the passage of gas, dust and water into these conduits and their included innerducts. Sealing plugs shall be installed within each splice vault, pull box, cabinet, or building.

Sealing plugs shall be removable and reusable. Plugs sealing innerducts, conductor or cable shall be the split type that permits installation or removal without removing conductors or cables.

Sealing plugs that seal between the 4 inch fiber optic conduit and innerducts shall seal the conduit and all innerducts simultaneously with one self contained assembly having an adjustable resilient filler of polyurethane elastomer clamped between backing ends and compressed with stainless steel hardware.

Sealing plugs that seal the innerducts shall seal each innerduct individually with appropriate sizes and configuration to accommodate either empty ducts or those containing fiber optic cable. To provide suitable sealing between the varying size cables and the plugs, split polyurethane elastomer adapting sleeves, used singularly or in multiples, shall be inserted within the body of the plugs.

Sealing plugs used to seal 4 inch fiber optic conduit and innerducts shall be capable of withstanding a pressure of 34.5 kPa.

A sealing plug that seals an empty conduit or innerduct shall have an eye or other type of capturing device (on the side of the plug that enters the conduit) to attach onto the pull tape, so the pull tape will be easily accessible when the plug is removed.

Full compensation for conduit and innerduct sealing plugs shall be considered as included in the contract prices paid per meter for conduit and innerduct they are sealing and no separate payment will be made therefor.

10-3.30 FIBER OPTIC CABLE PLANT SPECIFICATIONS

Fiber optic cable shall conform to the details shown on the plans and these special provisions.

10-3.31 FIBER OPTIC OUTSIDE PLANT CABLE

Each fiber optic outside plant cable (FOOP) for this project shall be all dielectric, gel filled or water-blocking material, duct type, with loose buffer tubes and shall conform to these special provisions. Cables shall be singlemode (SM) with dual-window (1310 nm and 1550 nm) fibers. The optical fibers shall be contained within loose buffer tubes. The loose buffer tubes shall be stranded around an all dielectric central member. Aramid yarn or fiberglass shall be used as a primary strength member, and a polyethylene outside jacket shall provide for overall protection.

All fiber optic (F/O) cable on this project shall be from the same manufacturer, who is regularly engaged in the production of this material.

| CABLE TYPE | DESCRIPTION |
|------------|-------------|
| C | 48SMFO |
| D | 12SMFO |
| E | 144SMFO |

Fiber Characteristics

Each optical fiber shall be glass and consist of a doped silica core surrounded by concentric silica cladding. All fibers in the buffer tube shall be usable fibers, and shall be sufficiently free of surface imperfections and occlusions to meet the optical, mechanical, and environmental requirements of these specifications. The required fiber grade shall reflect the maximum individual fiber attenuation, to guarantee the required performance of each and every fiber in the cable.

The coating shall be a dual layered, UV cured acrylate. The coating shall be mechanically or chemically strippable without damaging the fiber.

The cable shall comply with the optical and mechanical requirements over an operating temperature range of -40°C to +70°C. The cable shall be tested in accordance with EIA-455-3A (FOTP-3), "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components." The change in attenuation at extreme operational temperatures (-40°C to +70°C) for singlemode fiber shall not be greater than 0.20 dB/km, with 80 percent of the measured values no greater than 0.10 dB/km. The singlemode fiber measurement is made at 1550 nm.

For all fibers the attenuation specification shall be a maximum attenuation for each fiber over the entire operating temperature range of the cable.

Singlemode fibers within the finished cable shall meet the requirements in the following table:

| Fiber Characteristics Table | |
|--|---|
| Parameters | Singlemode |
| Type | Step Index |
| Core diameter | 8.3 μm (nominal) |
| Cladding diameter | 125 $\mu\text{m} \pm 1.0 \mu\text{m}$ |
| Core to Cladding Offset | $\leq 0.8 \mu\text{m}$ |
| Coating Diameter | 250 $\mu\text{m} \pm 15 \mu\text{m}$ |
| Cladding Non-circularity defined as: [1-(min. cladding dia. \div max. cladding dia.)]x100 | $\leq 1.0\%$ |
| Proof/Tensile Test | 345 MPa, min. |
| Attenuation: (-40°C to +70°C) @1310 nm @1550 nm | $\leq 0.4 \text{ dB/km}$ $\leq 0.3 \text{ dB/km}$ |
| Attenuation at the Water Peak | $\leq 2.1 \text{ dB/km @ } 1383 \pm 3 \text{ nm}$ |
| Chromatic Dispersion: Zero Dispersion Wavelength Zero Dispersion Slope | 1301.5 to 1321.5 nm $\leq 0.092 \text{ ps}/(\text{nm}^2 \cdot \text{km})$ |
| Maximum Dispersion: | $\leq 3.3 \text{ ps}/(\text{nm} \cdot \text{km})$ for 1285 – 1330 nm $< 18 \text{ ps}/(\text{nm} \cdot \text{km})$ for 1550 nm |
| Cut-Off Wavelength | $< 1260 \text{ nm}$ |
| Mode Field Diameter (Petermann II) | 9.3 $\pm 0.5 \mu\text{m}$ at 1300 nm 10.5 $\pm 1.0 \mu\text{m}$ at 1550 nm |

Color Coding

In buffer tubes containing multiple fibers, each fiber shall be distinguishable from others in the same tube by means of color coding according to the following:

- | | |
|----------------|-----------------|
| 1. Blue (BL) | 7. Red (RD) |
| 2. Orange (OR) | 8. Black (BK) |
| 3. Green (GR) | 9. Yellow (YL) |
| 4. Brown (BR) | 10. Violet (VL) |
| 5. Slate (SL) | 11. Rose (RS) |
| 6. White (WT) | 12. Aqua (AQ) |

Buffer tubes containing fibers shall also be color coded with distinct and recognizable colors according to the same table listed above for fibers.

These colors shall be targeted in accordance with the Munsell color shades and shall meet EIA/TIA-598 "Color Coding of Fiber Optic Cables."

The color formulation shall be compatible with the fiber coating and the buffer tube filling compound, and be heat stable. It shall not fade or smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

A. Cable Construction

The fiber optic cable shall consist of, but not be limited to, the following components:

1. Buffer tubes
2. Central member
3. Filler rods
4. Stranding
5. Core and cable flooding
6. Tensile strength member
7. Ripcord
8. Outer jacket

B. Buffer Tubes

Clearance shall be provided in the loose buffer tubes between the fibers and the inside of the tube to allow for expansion without constraining the fiber. The fibers shall be loose or suspended within the tubes. The fibers shall not adhere to the inside of the buffer tube. Each buffer tube shall contain a maximum of 12 fibers.

The loose buffer tubes shall be extruded from a material having a coefficient of friction sufficiently low to allow free movement of the fibers. The material shall be tough and abrasion resistant to provide mechanical and environmental protection of the fibers, yet designed to permit safe intentional "scoring" and breakout, without damaging or degrading the internal fibers.

Buffer tube filling compound shall be a homogeneous hydrocarbon-based gel with anti-oxidant additives and used to prevent water intrusion and migration. The filling compound shall be non-toxic and dermatologically safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive. The filling compound shall be free from dirt and foreign matter and shall be readily removable with conventional nontoxic solvents. Absorbent polymer, which fills voids and swells to block the ingress of water may be used instead of the gel fill.

Buffer tubes shall be stranded around a central member by a method, such as the reverse oscillation stranding process, that will prevent stress on the fibers when the cable jacket is placed under strain.

C. Central Member

The central member which functions as an anti-buckling element shall be a glass reinforced plastic rod with similar expansion and contraction characteristics as the optical fibers and buffer tubes. To ensure the proper spacing between buffer tubes during stranding, a symmetrical linear overcoat of polyethylene may be applied to the central member to achieve the optimum diameter.

D. Filler Rods

Fillers may be included in the cable to maintain the symmetry of the cable cross-section. Filler rods shall be solid medium or high density polyethylene. The diameter of filler rods shall be the same as the outer diameter of the buffer tubes.

E. Stranding

Completed buffer tubes shall be stranded around the overcoated central member using stranding methods, lay lengths and positioning such that the cable shall meet mechanical, environmental and performance specifications. A polyester binding shall be applied over the stranded buffer tubes to hold them in place. Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.

F. Core and Cable Flooding

The cable core interstices shall contain a water blocking material, to prevent water ingress and migration. The water blocking material shall be either a polyolefin based compound which fills the cable core interstices, or an absorbent polymer, which fills voids and swells to block the ingress of water. The flooding compound or material shall be homogeneous, non-hygroscopic, electrically non-conductive, and non-nutritive to fungus. The compound or material shall also be nontoxic, dermatologically safe and compatible with all other cable components.

G. Tensile Strength Member

Tensile strength shall be provided by high tensile strength aramid yarns or fiberglass which shall be helically stranded evenly around the cable core and shall not adhere to other cable components.

H. Ripcord

The cable shall contain at least one ripcord under the jacket for easy sheath removal.

I. Outer Jacket

The jacket shall be free of holes, splits, and blisters and shall be medium or high density polyethylene (PE), or medium density cross-linked polyethylene with minimum nominal jacket thickness of $1 \text{ mm} \pm 0.076 \text{ mm}$. Jacketing material shall be applied directly over the tensile strength members and water blocking material and shall not adhere to the aramid strength material. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The jacket or sheath shall be marked with the manufacturer's name, the words "Optical Cable", the number of fibers, "SM", year of manufacture, and sequential measurement markings every meter. The actual length of the cable shall be within -0/+1 percent of the length marking. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be 2.5 mm ±0.2 mm. The F/O cable samples (1.6 meters in length) shall be submitted to the Engineer, as well as the catalogue.

General Cable Performance Specifications

The F/O cable shall withstand water penetration when tested with a one meter static head or equivalent continuous pressure applied at one end of a one meter length of filled cable for one hour. No water shall leak through the open cable end. Testing shall be done in accordance with EIA-455-82 (FOTP-82), "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable."

A representative sample of cable shall be tested in accordance with EIA/TIA-455-81 (FOTP-81), "Compound Flow (Drip) Test for Filled Fiber Optic Cable". No preconditioning period shall be conducted. The cable shall exhibit no flow (drip or leak) at 70°C as defined in the test method.

Crush resistance of the finished F/O cables shall be 220 N/mm applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with EIA-455-41 (FOTP-41), "Compressive Loading Resistance of Fiber Optic Cables". The average increase in attenuation for the fibers shall be ≤0.10 dB at 1550 nm (singlemode) for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after removal of load. Testing shall be in accordance with EIA-455-41 (FOTP-41), except that the load shall be applied at the rate of 3 mm to 20 mm per minute and maintained for 10 minutes.

The cable shall withstand 25 cycles of mechanical flexing at a rate of 30 ±1 cycles/minute. The average increase in attenuation for the fibers shall be ≤0.20 dB at 1550 nm (singlemode) at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification shall constitute failure. The test shall be conducted in accordance with EIA-455-104 (FOTP-104), "Fiber Optic Cable Cyclic Flexing Test," with the sheave diameter a maximum of 20 times the outside diameter of the cable. The cable shall be tested in accordance with Test Conditions I and II of (FOTP-104).

The cable shall withstand 20 impact cycles, with a total impact energy of 5.9 N•m. Impact testing shall be conducted in accordance with TIA/EIA-455-25B (FOTP-25) "Impact Testing of Fiber Optic Cables and Cable Assemblies." The average increase in attenuation for the fibers shall be <0.20 dB at 1550 nm for singlemode fiber. The cable shall not exhibit evidence of cracking or splitting.

The finished cable shall withstand a tensile load of 2700 N without exhibiting an average increase in attenuation of greater than 0.20 dB (singlemode). The test shall be conducted in accordance with EIA-455-33 (FOTP-33), "Fiber Optic Cable Tensile Loading and Bending Test." The load shall be applied for one-half hour in Test Condition II of the EIA-455-33 (FOTP-33) procedure.

The Contractor shall submit to the Engineer the fiber optic cable test compliant, the fiber optic manufacture catalogue and its samples.

Packaging and Shipping Requirements

Documentation of compliance to the required specifications shall be provided to the Engineer prior to ordering the material. The cable manufacturer shall be ISO 9001 registered.

Attention is directed to "Fiber Optic Testing," elsewhere in these special provisions.

The completed cable shall be packaged for shipment on reels. The cable shall be wrapped in a weather and temperature resistant covering. Both ends of the cable shall be sealed to prevent the ingress of moisture.

Each end of the cable shall be securely fastened to the reel to prevent the cable from coming loose during transit. Four meters of cable length on each end of the cable shall be accessible for testing.

Each cable reel shall have a durable weatherproof label or tag showing the manufacturer's name, the cable type, the actual length of cable on the reel, the Contractor's name, the contract number, and the reel number. A shipping record shall also be included in a weatherproof envelope showing the above information and also include the date of manufacture, cable characteristics (size, attenuation, bandwidth, etc.), factory test results, cable identification number and any other pertinent information. The waterproof envelope shall be only removed by the Engineer upon delivery to the job site for testing.

The minimum hub diameter of the reel shall be at least thirty times the diameter of the cable. The F/O cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable.

Installation procedures and technical support information shall be furnished at the time of delivery.

10-3.32 FIBER OPTIC LABELING

Abbreviation:

| | |
|------------|-------|
| HUB | HUB.X |
| VAULT | VXX.X |
| CAMERA | CXX.X |
| TOS | TXX.X |
| PULLBOX | FXX.X |
| VDS | IXX.X |
| RAMP METER | RXX.X |

The X's denote the kilopost of the above elements.

Pigtails:

| Cable Type | From | To | Fiber No. |
|------------|--------|--------|-----------|
| X | -XXX.X | -XXX.X | -XX |

A label shall be placed on each pigtail near the connector showing the point of origin of the link and the termination of the link. A label with the fiber number being spliced shall be placed on the end of the pigtail near the splice.

Example labeling: C-HUB.A-C44.5-10.

Splice Vaults:

| Cable Type | From | To |
|------------|--------|--------|
| X | -XXX.X | -XXX.X |

A label shall be placed on Type A, B, C, and D cables as they enter and exit each splice vault. A label shall be placed on the cable inside the closed circuit television, traffic signal controller, and ramp meter controller.

Example labeling: C-HUB.A-HUB.C

Example labeling: D-C044.5-V044.8

Jumpers:

| Equipment From | | Equipment To | |
|----------------|----|--------------|----|
| ID No. | by | ID No. | by |

Both ends shall be labeled near the connector. The label shall be the same on both ends and denote where the ends of the jumper are plugged into.

Splice Trays:

A label shall be placed on each splice tray explaining the splices in the tray.

10-3.33 CABLE INSTALLATION

Installation procedures shall be in conformance with the procedures specified by the cable manufacturer for the specific cable being installed. The contractor shall submit the manufacturer's recommended procedures for pulling fiber optic cable at least 20 working days prior to installing cable. Mechanical aids may be used provided that a tension measuring device, and a break away swivel are placed in tension to the end of the cable. The tension in the cable shall not exceed 2225 N or the manufacturer's recommended pulling tension, whichever is less.

During cable installation, the bend radius shall be maintained at a minimum of twenty times the outside diameter. The cable grips for installing the fiber optic cable shall have a ball bearing swivel to prevent the cable from twisting during installation.

F/O cable shall be installed using a cable pulling lubricant recommended by the F/O cable and the innerduct manufacturer, and a pull tape conforming to the provisions described under "conduit" elsewhere in these special provisions. Contractor's personnel shall be stationed at each splice vault and pull box through which the cable is to be pulled to lubricate and prevent kinking or other damage.

F/O cable shall be installed without splices except where specifically allowed on the plans. If splice locations are not shown on the plans, splicing shall be limited to one cable splice every 6 km. Any midspan access splice or FDU termination shall involve only those fibers being spliced as shown on the plans. Cable splices shall be located in splice closures, installed in splice vaults shown on the plans. A minimum of 36 m of slack shall be provided for each F/O cable at each splice vault. Slack shall be divided equally on each side of the F/O splice closure.

Unless shown or provided otherwise, only F/O cable shall be installed in each innerduct. Pulling a separate F/O cable into a spare duct to replace damaged fiber will not be allowed.

At the Contractor's option, the fiber may be installed using the air blown method. If integral innerduct is used, the duct splice points or any temporary splices of innerduct used for installation must withstand a static air pressure of 758 kPa.

The fiber installation equipment must incorporate a mechanical drive unit or pusher, which feeds cable into the pressurized innerduct to provide a sufficient push force on the cable, which is coupled with the drag force created by the high-speed airflow. The unit must be equipped with controls to regulate the flow rate of compressed air entering the duct and any hydraulic or pneumatic pressure applied to the cable. It must accommodate longitudinally ribbed, or smooth wall ducts from nominal 16 mm to 51 mm inner diameter. Mid assist or cascading of equipment must be for the installation of long cable runs. The equipment must incorporate safety shutoff valves to disable the system in the event of sudden changes in pneumatic or hydraulic pressure.

The equipment must not require the use of a piston or any other air capturing device to impose a pulling force at the front end of the cable, which also significantly restricts the free flow of air through the inner duct. It must incorporate the use of a counting device to determine the speed of the cable during installation and the length of the cable installed.

10-3.34 SPLICING

Splices shall be done either in splice vaults or cabinets as shown on the plans. All splices in splice vaults shall be done in splice trays, housed in splice closures. All splices in the cabinets shall be done in splice trays housed in FDU's.

Unless otherwise specified, fiber splices shall be the fusion type. The mean splice loss shall not exceed 0.07 dB per splice. The mean splice loss shall be obtained by measuring the loss through the splice in both directions and then averaging the resultant values. A test of a splice in a pigtail shall have a 300 m (minimum) test jumper attached to the fiber being tested. The splice loss test values shall be tabulated in computer spreadsheet format and provided to the Engineer for approval.

All splices shall be protected with a metal reinforced thermal shrink sleeve.

The mid-span access method shall be used to access the individual fibers in a cable for splicing to another cable as shown on the plans. Cable manufacturers recommended procedures and approved tools shall be used when performing a mid-span access. Only the fibers to be spliced may be cut. All measures shall be taken to avoid damaging buffer tubes and individual fibers not being used in the mid-span access.

The individual fibers shall be looped one full turn within the splice tray to avoid micro bending. A 45 mm minimum bend radius shall be maintained during installation and after final assembly in the optical fiber splice tray. Each bare fiber shall be individually restrained in a splice tray. The optical fibers in buffer tubes and the placement of the bare optical fibers in the splice tray shall be such that there is no discernable tensile force on the optical fiber.

The Contractor will be allowed to splice a total of 2 fibers to repair any damage done during mid-span access splicing without penalty. The Contractor will be assessed a penalty of \$300.00 for each additional and unplanned splice. Any single fiber may not have more than 3 unplanned splices. If any fiber requires more than 3 unplanned splices, the entire length of F/O cable must be replaced at the Contractor's expense.

10-3.35 SPLICE CLOSURES

The F/O field splices shall be enclosed in splice closures which shall be complete with splice organizer trays, brackets, clips, cable ties, seals and sealant, as needed. The splice closure shall be suitable for a direct burial or pull box application. Manufacturer's installation instructions shall be supplied to the Engineer prior to the installation of any splice closures. Location of the splice closures shall be where a splice is required as shown on the plans, designated by the Engineer, or described in these special provisions.

The splice closure shall conform to the following specifications:

- A. Non-filled thermoplastic case.
- B. Rodent proof, waterproof, re-enterable and moisture proof.
- C. Expandable from 2 cables per end to 8 cables per end by using adapter plates.

- D. Cable entry ports shall accommodate 10 mm to 25 mm diameter cables.
- E. Multiple grounding straps.
- F. Accommodate up to 8 splice trays.
- G. Suitable for "butt" or "through" cable entry configurations.
- H. Place no stress on finished splices within the splice trays.
- I. Splice closures shall be attached by bolted suitable hangers to the side wall of the splice vault.

The splice closure shall be bolted to the sidewall of the splice vault.

The Contractor shall verify the quality of each splice prior to sealing the splice closure. The splice closure shall not be sealed until link testing is performed and is approved by the Engineer.

10-3.36 SPLICE TRAYS

Splice trays must accommodate a minimum of 12 fusion splices and must allow for a minimum bend radius of 45 mm. Individual fibers must be looped one full turn within the splice tray to allow for future splicing. No stress is to be applied on the fiber when it is located in its final position. Buffer tubes must be secured near the entrance of the splice tray to reduce the chance that an inadvertent tug on the pigtail will damage the fiber. The splice tray cover shall be transparent.

Splice trays in the splice closure shall conform to the following:

- A. Accommodate up to 24 fusion splices.
- B. Place no stress on completed within the tray.
- C. Stackable with a snap-on hinge cover.
- D. Buffer tubes securable with channel straps.
- E. Must be able to accommodate a fusion splice with the addition of an alternative splice holder.
- F. Must be labeled after splicing is completed.

Only one single splice tray may be secured by a bolt through the center of the tray in the fiber termination unit. Multiple trays must be securely held in place as per the manufacturer's recommendation.

10-3.37 PASSIVE CABLE ASSEMBLIES AND COMPONENTS

The F/O cable assemblies and components shall be compatible components, designed for the purpose intended, and manufactured by a company regularly engaged in the production of material for the fiber optic industry. All components or assemblies shall be best quality, non-corroding, with a design life of at least 20 years. All components or assemblies of the same type shall be from the same manufacturer.

The cable assemblies and components manufacturer shall be ISO9001 registered.

10-3.38 FIBER OPTIC CABLE TERMINATIONS

Distribution Breakout

The jacketed cable shall be lashed with tie wraps to the rack prior to entering the **FDU or ITU**. The cable shall also be tie-wrapped to the inside of the **FDU or ITU** near the point of entry. The glass fibers shall not be damaged during cutting and removal of the buffer tubes.

The jacketed area and bare fibers shall be cleaned to remove the moisture blocking gel. The transition from the buffer tube to the bundle of jacketed fibers shall be treated by an accepted procedure for sleeve tubing, shrink tube and silicone blocking of the transition to prevent future gel leak. A subsequent transition shall then be made, with flexible tubing, to isolate the fiber bundles of each buffer tube to serve as a transition from the bundle to the separation point and to protect the individual coated fibers. The last transition point (bundle to single fiber) shall consist of inserting the individual fibers into 26 AWG clear teflon tubing, to protect the fiber as it is routed toward the splice tray and to allow clear color identification of fibers for proper distribution. The final transition from bundle to individual fiber tube shall be secured with an adhesive heat shrink sleeve.

All fibers terminating in a cabinet or rack shall be properly terminated inside a FDU or ITU.

Distribution Interconnect Package

General--Distribution involves connecting the fibers to the active electronic components. The distribution equipment consists of FDUs or ITUs with connector panels, couplers, splice trays, fiber optic pigtails and cable assemblies with connectors. The distribution interconnect package shall be assembled and tested by a company who is regularly engaged in the assembly of these packages. Attention is directed to "Fiber Optic Testing" elsewhere in these special provisions. All distribution components shall be products of the same manufacturers, who are regularly engaged in the production of these components, and the respective manufacturers shall have quality assurance programs.

Fiber Optic Cable Assemblies and Pigtails

General.--Cable assemblies (jumpers) and pigtails shall be products of the same manufacturer. The cable used for cable assemblies (jumpers) and pigtails shall be made of fiber meeting the performance requirements of these special provisions for the F/O cable being connected.

Pigtails.--Pigtails shall be of simplex (one fiber) or duplex (two fibers) construction, in 900 μm tight buffer form, surrounded by aramid for strength, with a PVC jacket with manufacturer identification information. Singlemode cable jackets shall be yellow in color. Duplex pigtails shall be of duplex round cable construction, and shall not have zipcord (siamese) construction. The two inner simplex jackets shall be color coded white and slate, respectively, to provide easy visual identification for polarity. All pigtails shall be at least one meter in length.

Jumpers.--Jumpers may be of simplex or duplex design. Duplex jumpers shall be of duplex round cable construction, and shall not have zipcord (siamese) construction. All jumpers shall be at least 2 m in length, sufficient to avoid stress and orderly routing. The outer jacket of duplex jumpers shall be colored yellow. The two inner simplex jackets shall be color coded white and slate, respectively, to provide easy visual identification for polarity.

SC Connectors.-- SC type connectors shall meet the requirements of EIA/TIA-568A except as specified below. SC connector body housings shall be of polymer construction.

All F/O connectors shall have a 2.5 mm diameter, Zirconia Ceramic, SC connector ferrule with a PC (Physical Contact) pre-radius tip.

The SC connector operating temperature range shall be -40°C to $+70^{\circ}\text{C}$. Insertion loss shall not exceed 0.4 dB for singlemode and the return reflection loss on connectors shall be at least 50 dB. Connection durability shall be less than a 0.2 dB change per 500 mating cycles per EIA-455-21A (FOTP-21). All terminations shall provide a minimum 222N pullout strength. Factory test results shall be documented and submitted to the Engineer prior to installing any of the connectors. Singlemode connectors shall have a blue color on the shroud and a white color on the boot in accordance with the Munsell color shades specified elsewhere, that renders them easily identifiable.

Field terminations shall be limited to splicing of adjoining cable ends and/or cables to SC pigtails.

ST Connectors.-- ST type connectors shall meet the requirements of EIA/TIA-568A except as specified below. ST connector body housings shall be of polymer construction.

All F/O connectors shall have a 2.5 mm diameter, Zirconia Ceramic, ST connector ferrule with a PC (Physical Contact) pre-radius tip.

The ST connector operating temperature range shall be -40°C to $+70^{\circ}\text{C}$. Insertion loss shall not exceed 0.5 dB, for either multimode or singlemode, and the return reflection loss on singlemode connectors shall be at least 40 dB. Connection durability shall be less than a 0.2 dB change per 500 mating cycles per EIA-455-21A (FOTP-21). All terminations shall provide a minimum 222 N pullout strength. Factory test results shall be documented and submitted to the Engineer prior to installing any of the connectors. Singlemode connectors shall have a blue color on the shroud and a white color on the boot in accordance with the Munsell color shades specified elsewhere, that renders them easily identifiable.

Field terminations shall be limited to splicing of adjoining cable ends and/or cables to ST pigtails.

SC Couplers. — The SC couplers shall be made of polymer construction that is consistent with the material forming the associated SC connector body. The design mechanism for mounting the couplers to the ITU connector panel may be achievable using metal clips or fasteners but shall coincide with the ITU panel punch-outs.

All coupler sleeves shall be of the cylinder split ceramic or clover leaf design.

The temperature operating range for couplers shall be the same as that specified for the SC connectors.

ST Couplers. — The ST couplers shall be made of polymer construction that is consistent with the material forming the associated ST connector body. The design mechanism for mounting the couplers to the ITU connector panel may be achievable using metal clips or fasteners but shall coincide with the ITU panel punch-outs.

All coupler sleeves shall be of the cylinder split ceramic or clover leaf design.

The temperature operating range for couplers shall be the same as that specified for the ST connectors.

Splice Trays.-- Splice trays must accommodate a minimum of 12 fusion splices. They must allow for a minimum bend radius of 45 mm. No stress can be placed on the fiber when it is located in its final position. Buffer tubes must be secured to the tray near the entrance of the splice tray to reduce the chance that an inadvertent tug on the pigtail will damage the fiber. Reduced length splice trays will only be allowed in wall mounted type fiber termination units. The splice tray cover must be transparent.

Only one single splice tray may be secured by a bolt through the center of the tray in the ITU. Multiple trays must be securely held in place by a different method.

Interconnect and Termination Unit

The Contractor shall furnish and install all related equipment to interface the rack mount interconnect and termination unit (ITU) to the incoming fiber optic communications cable and the patchcord fiber optic cable.

The ITU shall be a modular enclosure that provides interconnect capability of one multi-fiber cable to a minimum of 12 single-fiber cable.

The ITU shall be environmentally sealed and contain grommets at the cable entrances to prevent any ingress of dirt or moisture. Strain relief shall be provided for the fiber optic cable.

The ITU shall contain a splice tray, connector panel and the appropriate number of pigtails which will be fusion spliced to the incoming fiber cable.

Each fiber shall be fusion spliced to a pigtail with a factory installed and polished SC connector. Each pigtail shall be labeled and secured onto cable as described elsewhere in these special provisions. Brackets shall be provided to spool the incoming fiber optic cable to minimum of 3 turns before separating out individual fibers to the connector panel.

Interconnect and termination unit (ITU) shall be packaged in a rack unit with dimensions of 432 mm (W) X 44.45 mm (H) X 280 mm (D) having metal housing slide-out shelf. The ITU shall contain grommets at cable entrances and provide strain relief for the fiber cable. The ITU shall accommodate 12 single mode fibers having SC type connector feed through adapters and 12 interconnection points or 12 splices. The components of the passive interconnect package shall be installed in the ITU.

The ITU shall be a metal enclosure with a hinged door. The door shall have a latch or thumbscrew to hold the door in the closed position. An opening shall be provided on the back side of the incoming fiber optic communications cable. Connector panels (for up to 12 SC connectors) shall be provided inside the enclosure. Strain relief shall be provided for the incoming fiber optic cable. A guard shall be provided to protect the patchcord fiber optic cables plugged into this enclosure.

Fiber Distribution Unit

The Contractor shall furnish and install all components to terminate the incoming fiber optic communication cables.

| FDU Type | Accommodates Termination of |
|----------|-----------------------------|
| C | 48SMFO fibers |
| D | 12SMFO fibers |
| E | 144SMFO Fiber |

The fiber distribution unit (FDU) shall include the following:

1. A patch panel to terminate the appropriate number of singlemode fibers with SC (or ST) type connector feed through couplers.
2. Splice trays.
3. Storage for splice trays.
4. A slide out metal drawer for the storage of spare jumpers.

Strain relief shall be provided for the incoming fiber optic cable. Cable accesses shall have rubber grommets or similar material to prevent the cable from coming in contact with bear metal. All fibers shall be terminated and individually identified in the FDU and on the patch panel.

The patch panel shall be hinged or have coupler plates to provide easy access and maintenance. Brackets shall be provided to spool the incoming fiber a minimum of two turns, each turn shall not be less than 300 mm, before separating out individual fibers to the splice tray.

The FDU shall be 482 mm rack mountable.

The FDU in a field cabinet shall not exceed 100 mm in height and 380 mm in depth.

Fan Out Termination

A fan out termination shall be required as shown on the plans, irrigation cabinets, designated by the Engineer or described in these special provisions.

For fiber counts of less than 6 fibers, a fan out termination may be used to terminate the incoming fiber optic cable. The connector return loss shall be no greater than -40 dB.

The fan out termination shall consist of a splice connector and the appropriate number of fiber optic pigtails which will be fusion spliced to the incoming fibers.

The pigtail shall be contained in a housing that will provide strain relief between the incoming fiber optic cable plant jacket, buffer tubes, fibers and pigtail jacket material.

Each fiber shall be spliced to a pigtail with a factory installed and polished SC connector, as specified elsewhere in these special provisions. The splices shall then be encapsulated in a weather proof housing. Each connector shall have a weatherproof cap to protect it from the elements. The pigtail shall be of simplex (one fiber) construction, in a 900 µm tight buffer form, surrounded by Aramid yarn for strength. The buffer shall have a PVC jacket with manufacturer identification information, and a nominal outer jacket diameter of 3 mm. Singlemode simplex cable jackets shall be yellow in color. All pigtails shall be at least two meter in length.

Each pigtail shall be labeled, as specified elsewhere in these special provisions, and secured onto the cable using clear heat shrink tubing.

10-3.39 FIBER OPTIC TESTING

Testing shall include the tests on elements of the passive fiber optic components: (1) at the factory, (2) after installation but prior to connection to any other portion of the system.

The Contractor shall provide all personnel, equipment, instrumentation and materials necessary to perform all testing. The Engineer shall be notified two working days prior to all field tests. The notification shall include the exact location or portion of the system to be tested.

Documentation of all test results shall be provided to the Engineer within 2 working days after the test involved.

A minimum of 20 working days prior to arrival of the cable at the site, the Contractor shall provide detailed test procedures for all field testing for the Engineer's review and approval. The procedures shall include the tests involved and how the tests are to be conducted. Included in the test procedures shall be the model, manufacturer, configuration, calibration and alignment procedures for all proposed test equipment.

FACTORY TESTING

Documentation of compliance with the fiber specifications as listed in the "Fiber Characteristics Table" shall be supplied by the original equipment manufacturer. Before shipment, but while on the shipping reel, 100 percent of all fibers shall be tested for attenuation. Copies of the results shall be (1) maintained on file by the manufacturer with a file identification number for a minimum of seven years, (2) attached to the cable reel in a waterproof pouch, and (3) submitted to the Contractor and to the Engineer. All test results must be approved by the Engineer prior to installation. The results shall be submitted within two weeks for approval.

After Cable Installation

After the fiber optic cable has been pulled but before breakout and termination, 100 percent of all the fibers shall be tested with an OTDR for attenuation. Test results shall be recorded, dated, compared and filed with the previous copies of these tests.

Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the F/O cable segment will be unacceptable. The unsatisfactory segment of cable shall be replaced with a new segment, without additional splices, at the Contractor's expense.

The new segment of cable shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.02 dB as a minimum. Singlemode fibers (SM) shall be tested at 1310 nm and 1550 nm. Attenuation readings for each direction shall be recorded on the cable data sheet.

The OTDR shall have a printer capable of producing a verifying test trace with fiber identification as shown in Appendix A "Link Loss Budget Work Sheet", numerical loss values, the date and the operator's name. It shall also have a Window based 89 mm (or 3.5 inch) disk recording capability that has associated software to do comparisons and reproductions on 216 mm x 279 mm paper, via a personal computer.

Test traces shall be given to the Engineer within 72 hours of the completion of the test.

Outdoor Splices

At the conclusion of all outdoor splices at one location, and before they are enclosed and sealed, all splices shall be tested with the OTDR, in both directions. Splices in singlemode segments shall be tested at 1310 nm and at 1550 nm. Individual fusion splice losses shall not exceed 0.10 dB.

Measurement results shall be recorded, dated, validated by the OTDR trace printout and filed with the records of the respective cable runs. Copies of traces and test results shall be submitted to the Engineer within seven days after the test.

If the OTDR test results are unsatisfactory, the splice shall be unacceptable. The unsatisfactory splice shall be replaced at the Contractor's expense. The new splice shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.02 dB as a minimum. Single mode fibers (SM) shall be tested at 1310 nm and 1550 nm.

Distribution Interconnect Package Testing and Documentation

All the components of the passive interconnect package (FDUs, ITUs, pigtails, jumpers, couplers and splice trays) shall comprise a unit from a manufacturer who is regularly engaged in the production of the fiber optic components described.

In developing the distribution interconnect package, each SC, ST or SC-ST hybrid termination (pigtail or jumper) shall be tested for insertion attenuation loss with the use of an optical power meter and source.

In addition, all singlemode terminations shall be tested for return reflection loss. These values shall meet the loss requirements specified earlier and shall be recorded on a tag attached to the pigtail or jumper. The quality control sheets from the manufacturer shall be given to the Engineer before the installation of the pigtails and jumpers.

Once assembly is complete, the manufacturer shall visually verify that all tagging, including loss values, is complete. Then as a final quality control measure, the manufacturer shall do an "end to end" optical power meter/light source test from pigtail end to jumper lead end to assure continuity and overall attenuation loss values.

The final test results shall be recorded, along with previous individual component values, on a special form assigned to each FDF. The completed form shall be dated and signed by the Manufacturer's Quality Control supervisor. One copy of this form will be attached in a plastic envelope to the assembled FDF unit. Copies will be provided separately to the Contractor and to the Engineer, and shall be also be maintained on file by the manufacturer or supplier.

10-3.40 ACTIVE COMPONENT TESTING

The transmitters and receivers shall be tested with a power meter and light source, to record the transmitter average power (dBm) and receiver sensitivity (dBm). These values shall be recorded in the Link Loss Budget Worksheet shown in Appendix A.

10-3.41 SYSTEM VERIFICATION AT COMPLETION

OTDR Testing

Once the passive cabling system has been installed and is ready for activation, 100 percent of the fibers shall be tested with the OTDR for attenuation. Test results shall be recorded, dated, compared and filed with previous copies. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory the fiber shall be replaced at the Contractor's expense. The new fiber shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Installed System Cable Verification Worksheet.

The Cable Verification Worksheet shown in Appendix A shall be completed for each fiber in the fiber optic system, using the data gathered throughout the installation process. The completed worksheets shall be submitted to the Engineer for approval

Power Meter and Light Source.--At the conclusion of the final OTDR testing, 100 percent of all fibers shall be tested end to end with a power meter and light source, in accordance with EIA Optical Test Procedure 171 and in the same wavelengths specified for the OTDR tests. These tests shall be conducted in both directions. Test results shall be recorded on the Cable Verification Worksheet, compared and proven to be within the design fiber loss budgets, and filed with the other recordings of the same fibers.

Test Failures

If the link loss measured from the power meter and light source exceeds the calculated link loss, or the actual location of the fiber ends does not agree with the expected location of the fiber ends (as would occur with a broken fiber), the fiber optic link will not be accepted. The unsatisfactory segments of cable, or splices shall be replaced with a new segment of cable or splice at the Contractor's expense. The OTDR testing, power meter and light source testing and Cable Verification Worksheet shall be completed for the repaired link to determine acceptability. Copies of the test results shall be submitted to the Engineer. The removal and replacement of a segment of cable shall be interpreted as the removal and replacement of a single contiguous length of cable connecting two splices and two connectors. The removal of a small section containing the failure and therefore introducing new unplanned splices, will not be allowed.

Test Failures.--If during any of these system verification tests, the results prove to be unsatisfactory, the F/O cable will not be accepted. The unsatisfactory segments of cable shall be replaced with a new segment of cable at the Contractor's expense. The new segment of cable shall undergo the same testing procedure to determine acceptability. Copies of the test results shall be submitted to the Engineer. The removal and replacement of a segment of cable shall be interpreted as the removal and replacement of a single contiguous length of cable connecting two splices, two connectors, or a splice and a connector. The removal of only the small section containing the failure and therefore introducing new unplanned splices, will not be allowed.

APPENDIX A

Cable Verification Worksheet

*End-to-End Attenuation (Power Meter and Light Source) Testing
and OTDR Testing*

Contract No. _____ Contractor: _____

Operator: _____ Date: _____

Link Number: _____ Fiber Number: _____

Test Wavelength (Circle one): 1310 nm 1550 nm

Expected Location of fiber ends: End 1: _____ End 2: _____

Power Meter and Light Source Test Results:

| | | |
|---------------------------|-----------|----|
| Power In: | _____ dBm | 1A |
| Output Power: | _____ dBm | 1B |
| Insertion Loss [1A - 1B]: | _____ dB | 1C |

OTDR Test Results:

| | | |
|-----------------------------|----------|----|
| Forward Loss: | _____ dB | 2A |
| Reverse Loss: | _____ dB | 2B |
| Average Loss [(2A + 2B)/2]: | _____ dB | 2C |

To Be Completed by Caltrans:
Resident Engineer's Signature: _____
Cable Link Accepted: _____

APPENDIX B
Fiber System Performance Margin Calculations Worksheet

A. Calculate the Passive Cable Attenuation

| | | |
|---|---|-------------------------|
| 1. Calculate Fiber Loss at Operating Wavelength: _____ nm | Cable Distance (times) Individual Fiber Loss (equal) @ 1310 nm (0.4 dB/km) @ 1550 nm (0.3 dB/km) | _____ km x ____ dB/km = |
| Total Fiber Loss: | | _____ dB |

B. Calculate the Total Connector/Splice Loss

| | | |
|---|--|------------------------------------|
| 2. Calculate Connectors/couplers Loss: (exclude Tx and Rx connectors) | Individual Connector Loss (times) Number of Connector Pairs (equal) Total Connector Loss: | 0.4 dB x ____ = _____ dB |
| 3. Calculate Splice Loss: | Individual Splice Loss (times) Number of Splices (equal) Total Splice Loss: | 0.1 dB x ____ = _____ dB |
| 4. Calculate Other Components Loss: | Total Components: | _____ dB |
| 5. Calculate Total Losses: | Total Connector Loss (plus) Total Splice Loss (plus) Total Components (equal) | + dB + dB + dB = |
| Total Connector/Splice Loss: | | _____ dB |

C. Calculate Active Component Link Loss Budget

| | |
|--|---|
| System Wavelength: | _____ nm |
| Fiber Type: | singlemode |
| Average Transmitter Output (Launch Power): | _____ dBm |
| Receiver MAX Sensitivity (10 ⁹ BER) (minus) | _____ dBm |
| Receiver MIN Sensitivity (equal) | - _____ dBm = |
| Receiver Dynamic Range: | |
| _____ dB | |
| 6. Calculate Active Component Link Loss Budget: | Average Transmitter Output (Launch Power) (minus) Receiver MAX Sensitivity (equal) |
| | _____ dBm - _____ dBm = |
| Active Component Link Loss Budget: | |
| | _____ dB |

D. Verify Performance

| | | |
|--|---|--------------|
| 7. Calculate System Performance Margin to Verify Adequate Power: | Active Component Link Loss Budget [C] (minus) | _____ dB |
| | Passive Cable Attenuation [A] (minus) | - _____ dB |
| | Total Connector/Splice Lost [B] (equal) | - _____ dB = |
| System Performance Margin: | | _____ dB |

APPENDIX C

Optical Modem Test

Worksheet

Contract No. _____ Contractor: _____

Operator: _____ Date: _____

Location: _____

| | | |
|---|----------|----|
| DS-1 Optical Modem, Modem No.: | | |
| Optical Receiver Power (max) into modem (10 ⁹ BER) | _____ dB | 3A |
| Optical Receiver Level (minimum) into modem | _____ dB | 3B |
| Receiver Dynamic Range (3A-3B): | _____ dB | 3C |

| | | |
|---|----------|----|
| DS-1 Optical Modem, Modem No.: | | |
| Optical Receiver Power (max) into modem (10 ⁹ BER) | _____ dB | 4A |
| Optical Receiver Level (minimum) into modem | _____ dB | 4B |
| Receiver Dynamic Range (4A-4B): | _____ dB | 4C |

| | | |
|---|----------|----|
| DS-1 Optical Modem, Modem No.: | | |
| Optical Receiver Power (max) into modem (10 ⁹ BER) | _____ dB | 5A |
| Optical Receiver Level (minimum) into modem | _____ dB | 5B |
| Receiver Dynamic Range (5A-5B): | _____ dB | 5C |

| | | |
|---|----------|----|
| DS-1 Optical Modem, Modem No.: | | |
| Optical Receiver Power (max) into modem (10 ⁹ BER) | _____ dB | 6A |
| Optical Receiver Level (minimum) into modem | _____ dB | 6B |
| Receiver Dynamic Range (6A-6B): | _____ dB | 6C |

Engineers Signatures

Date

Technician Signatures

Date

General

Communication equipment shall conform to all rules and regulations of the Federal Communications Commission (FCC) and shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

The Contractor shall arrange to have a technician, qualified to work on the communication equipment and employed by the communication equipment manufacturer or his representative, present at the time the equipment is turned on.

Prototype equipment is not acceptable. All equipment shall be current standard production units and shall have been in use for a minimum of 6 months. Rebuilt or reconditioned equipment will not be allowed.

All rack mounted equipment and card cage assemblies shall have metal filler plates to cover any unused channel slots or card slots.

10-3.42 CLOSED CIRCUIT TELEVISION SYSTEM

GENERAL

Closed circuit television (CCTV) system shall conform to all rules and regulations of the Federal Communications Commission, and shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Each CCTV system shall consist of a camera pole, CCTV camera assembly and CCTV cabinet assembly.

The CCTV System shall include the installation and testing of all components (Camera, Environmental Enclosures, Positioning Unit, Camera Control Unit, Power Supplies, and associated cables). All items of the CCTV System shall be Contractor-furnished.

The CCTV System shall be installed as a complete and operational system.

The contractor shall be responsible for providing any mounting adapter and/or attachment required for installation of the CCTV Camera System. All materials furnished, assembled, fabricated or installed under this item shall be new, corrosion resistant and in strict accordance with the details shown on the plans and in the specifications.

The Contractor shall be responsible for all deliveries. Contractor shall provide submittals for equipment specified in these special provisions for approval by the Caltrans Engineer.

All components of the CCTV System, except the cameras, shall have a minimum one-year manufacturer's warranty for parts and labor. The cameras shall have a minimum of a one-year manufacturer's warranty for parts and labor to begin from installation acceptance with additional two years extended warranty. The Resident Engineer and the CCTV Camera System vendor representative shall verify the installation acceptance date.

CAMERA POLE

Sheet steel shall have a minimum yield of 331 MPa. Modifications for hand hole, connector bracket and strain relief shall be made as shown on the plans.

CLOSED CIRCUIT TELEVISION (CCTV) CAMERA ASSEMBLY

Closed circuit television (CCTV) camera assembly shall consist of the following:

- 1 - CCTV camera.
- 1 - Camera lens.
- 1 - Environmental enclosure.
- 1 - Pan and tilt drive unit.

The Contractor shall perform a functional test to verify that the unit works in accordance with the manufacturer's specifications before installing the assembly. The Contractor shall provide details of the camera and operational elements to the Engineer with the material submittals.

CLOSED CIRCUIT TELEVISION (CCTV) CAMERA

Functional Capabilities

The video camera shall be capable of dual mode operation, day (color) and night (monochrome) capabilities with optical zoom lens and a high speed positioning system. The lens shall have a focal length of 3.6 mm to 82.8 mm (23:1) with auto/manual focus. The video camera shall have a digital zoom range of up to 10X and provide an effective overall zoom ratio of 230:1. The effective focal length is 3.6 mm to 828 mm. The image sensor and lens combination shall consist of a 6.35 mm format Progressive Scan CCD resulting in an effective horizontal angle of view of 54° wide angle to 0.25°

maximum telephoto. The camera shall provide Wide Dynamic Range (WDR) by use of dual shutter exposure technique. The pan function shall provide 360° of continuous rotation, with a variable speed from 0.1° per second to 100° per second. The tilt function shall provide 130° of movement (0° to +40° to -90°, with a variable speed from 0.1° per second to 60° per second. Up to 64 presets shall be available for storing and recalling zoom, pan and tilt positions. The Positioner shall be capable of a tour sequence defined using up to 64 preset positions. All camera and pan & tilt functions shall be operable via RS-422 serial communications. Communications protocol command set shall be public domain.

The CCTV camera shall meet the following requirements:

6.35 mm Progressive Scan Color Sensor
Horizontal Resolution of 470 TV Lines
23:1 (3.6 mm to 82.8 mm) optical zoom lens
Continuous digital zoom with selectable range from OFF to 10X
Effective overall focal length of 3.6 mm to 828 mm
2 possible zoom speeds
Auto/Manual Focus
Selectable long-term integration to 1/4 second with frame store video output
Selectable shutter speeds from 1/60 second to 1/30,000 second
Composite video output; NTSC format
Adjustable color balance
Crystal and/or Internal phase adjust line-lock, software adjustable
Programmable on screen character generator
Wide Dynamic Range (WDR) by use of dual shutter exposure technique
RS-422 serial control protocol command set to be public domain
Camera Addressing via serial control
Internal Heater
Camera case (88.9 mm diameter) shall be a sealed enclosure pressurized with dry nitrogen
Camera rotation capability shall be continuous in either direction
Variable pan speed from 0.1°/sec. to >100°/sec. (Preset Mode)
Variable tilt speed from 0.1°/sec. to 60°/sec
64 zoom, focus, pan & tilt preset positions, each with a unique user programmable preset ID
Imager: Interline transfer Progressive Scan CCD with mosaic-type color compensating filter.
Image Area: 6.35 mm Format of 3.6 mm (H) x 2.7 mm (V)
Resolution: 470 horizontal; 350 vertical
Elements: 758 (H) x 504 (V)
Video Output: NTSC, 1 V p-p @ 75 ohms, unbalanced

The camera lens shall meet the following requirements:

Maximum Lens Aperture: f/1.6 (wide) to f/3.6 (telephoto)
Optical Zoom Range: 23X, 3.6 mm to 82.8 mm
Digital Zoom Range: 1X (Off) through 10X, Smooth transition from Optical to Digital Zoom
Effective Digital Focal Length: 82.8 mm to 828 mm
Optical Zoom Speed: Two speeds, from approximately 2.9 seconds to 5.8 seconds full range
Horizontal Angle of View: Optical: 54° to 2.5°; at 10X Digital: 54° to 0.25°
Minimum Focus Distance: 1 m in telephoto, 0.01 m in wide angle
Auto Focus: Selectable Auto/Manual
Minimum Scene Illumination for Reliable Auto Focus, 30% video
Manual Focus Speed: One speed, approximately 2.0 seconds to full range
Zoom & Focus Presets: 64 preset positions, focus is auto, if programmed, shall display the Preset ID
Flash Memory: Update firmware and new features via serial communication
Long Term Integration Range: (Short Shutter) shall provide manual selection of integration duration for enhanced sensitivity. Integration times are: 1/4 second, 1/2 second, 1/8 second, 1/15 second, 1/30 second. Frame Store video output shall provide continuous video output, updated at the integration rate.
Manual shutter speeds of 1/60; 1/120; 1/180; 1/250; 1/500; 1/1,000; 1/2,000; 1/4,000; 1/10,000; 1/30,000 second
Auto Iris - Iris automatically adjusts to compensate for changes in scene illumination to maintain constant video level output within sensitivity specifications

Manual Iris - The effect of open iris/close iris shall be accomplished by changing the video level. To give the effect of open iris, a decrease in the video level value shall change and to give the effect of close iris an increase in the video level shall change

Gamma: 0.45

Automatic Gain Control (AGC): 0 to 28 dB

Color Balance: Auto Tracking Color Balance/Manual with adjustable Red and Blue Levels

Signal to Noise Ratio: Greater than 50 dB

Synchronization: Crystal or Phase-Adjust Line Lock on 60 Hz

Sensitivity: (3200K): Scene Illumination @ F1.6, Wide Angle

3.0 Lux @ 1/60 s, F1.6, Shutter, Color I.R. Cut On

0.2 Lux @ 1/4 s, F1.6, Shutter, Color I.R. Cut On

0.3 Lux @ 1/60 s, F1.6, Shutter, monochrome mode I.R. Cut Off

0.02 Lux @ 1/4 s., F1.6, Shutter, monochrome mode I.R. Cut Off

Environmental Enclosure

The camera enclosure shall be a corrosion resistant and tamperproof sealed and pressurized housing with 34.475 kPa dry nitrogen with Schrader purge fitting and 137.9 kPa relief valve for each camera. The size of the housing shall be 89 mm diameter or smaller.

The camera housing shall include a loss of pressure sensor that will trigger an alarm message that will be inserted in the video output signal when the pressure drops below 3.45 kPa .

The enclosure shall be constructed from 6061-T6 standard aluminum tubing with a wall thickness of 6.35 mm \pm 0.76 mm . Internal components shall be mounted to a rail assembly. A copper plated spring-steel ring shall be used to ensure electrical bonding of the rail assembly and components to the camera housing. The housing exterior shall be finished by pre-treatment with conversion coating and baked enamel paint. The camera enclosure shall be designed to withstand the effects of sand, dust, and hose-directed water.

The internal humidity of the housing shall be less than 10%, when sealed and pressurized. Desiccant packs shall be securely placed inside the housing to absorb any residual moisture and maintain internal humidity at 10% or less.

A sun shield shall be provided to shield the entire housing from direct sunlight.

Mechanical Specifications (DSP camera assembly)

The mechanical specifications shall meet the following requirements:

Weight: 1.9 kg .

Dimensions:

Length (less connectors): 305 mm

Housing Diameter: 89.9 mm

Height (Including mounting base): 130.3 mm

Mounting: Four (4) mounting holes shall be 10 mm to 11 mm in diameter and match the bolt pattern as detailed in sheet ES-16A (Camera Mounting Plate) as found in the Standard Plans.

Pan and Tilt Drive Unit

The following are the requirements for the Pan and Tilt Positioning or the CCTV camera:

Must be capable of continuous rotation in either direction.

Tilt movement shall be 130°, + 40° to – 90° unobstructed.

Pan Speed (Operator Control) shall be variable from 0.1°/s to 40 °/s

Pan Speed (Preset Control) shall be greater than 100°/s

Tilt Speed (Operator Control): Variable from 0.1°/sec. to 20 °/s

Tilt Speed (Preset Control): 40°/s

The 64 Pan & Tilt preset positions shall be repeatable within \pm 0.5°

Tour Specifications

The following are the requirements for tour sequencing:

Eight - tour sequence may be defined.

Programming of the tour sequences shall be accomplished by the selection of a preset position (by number), and then selection a dwell time. The presets can be used in any order, and the same preset may be used more than once as long as the total number of preset positions used does not exceed 32.

The dwell time defines the length of time paused at each preset position. It can be from 1 second to 60 seconds. The dwell time is can be changed individually for all stops on the tour.

If the appropriate preset ID is programmed, it shall be displayed for each preset position used on the tour.

The tour shall stop upon receipt of a pan command.

All programmable functions shall be stored in non-volatile memory.

Power Requirements:

Operating voltage shall be 108 V(ac) to 132 V(ac), 120 V(ac) Nominal 50/60 Hz. (± 3.0 Hz).

Power consumption shall not exceed a total of 95 Watts.

Camera/receiver/P&T driver (pan & tilt in motion) power not to exceed 40 Watts.

Power for the heater (heater on) shall not exceed 6 Watts.

Environmental Specifications:

Ambient operating temperature limits shall be -40°C to $+55^{\circ}\text{C}$

Ambient storage temperature limits shall be -45°C to $+65^{\circ}\text{C}$

Relative humidity shall be up to 100% (per MIL-E-5400T, paragraph 3.2.24.4) IP 66 Rating.

The equipment shall withstand exposure to sand, dust, fungus, and salt atmosphere per MIL-E-5400T, paragraph 3.2.24.7, 3.2.24.8, and 3.2.24.9.

The equipment shall withstand shock up to 5G's, 11ms, in any axis under non-operating conditions per MIL-E-5400T, paragraph 3.2.24.6.

The equipment shall withstand sine vibration from 5 to 60 Hz with 0.021mm total excursion without damage. The equipment shall also withstand random vibration from 60 to 1000 Hz, 5 G's RMS without damage.

Mechanical Specifications

The weight shall not exceed 12.7 kg.

The dimensions shall not exceed 432 mm height and 279.5 mm width.

Main Interface Connector

The main interface connector shall be equivalent to an Amphenol 206036-3 with back shell 206070-1 and mating connector equivalent to an Amphenol 206037-11 with clamp 206070-1.

Backward Compatibility With Mpc-M-100/104/105 Master Controller

The Camera Positioning System shall be compatible with existing MPC Masters, providing the following control:

Address Selection: Same on Camera Positioning System.

Camera Power ON/OFF: Camera turns on/off.

Auto / Manual Iris Select: Same on Camera Positioning System.

Fast / Slow: Provides two speeds for Zoom.

Auto / Manual Color Balance Select: Auto / Manual shutter Select on Camera Positioning System.

BLUE: Increases blue level.

RED: increases red level.

ZOOM: Same on Camera Positioning System.

FOCUS: Focus Control if in Manual focus mode, No effect if in auto focus mode.

IRIS: Iris Control if in Manual iris, No effect if in auto iris.

PAN / TILT: Controls Pan & Tilt direction. Speed of Pan & Tilt is determined by Fast / Slow mode selection and by optical zoom position of lens, so that the narrower the field of view the slower the pan & tilt speed. In the fast mode, the pan speed shall be adjusted to provide approximately 1 1/2 to 2 1/2 fields of view per second. In the slow mode the pan speed shall be adjusted to provide approximately 1/2 to 1 field of view per second. The tilt speed shall be adjusted to remain proportional to the pan speed.

Presets

Allows Presets 1 through 10 to be set or recalled. Selecting presets 1-10 shall control presets 33 through 42 stored in Camera Positioning System.

Privacy Zones

Video blanking for up to 8 Privacy zones shall be provided. The video shall be blanked out for privacy of 1 line; numeric messages can also be displayed. Message shall be displayed in “blinking” or “non-blinking” mode and be enabled or disabled. Privacy Zones shall be programmed via the RS422 serial communications.

Communication And Camera Addressing Protocol

Control and addressing shall be via RS422 optically isolated serial communications. Refer to Camera Positioning System Protocol for detailed description. Camera Positioning System protocol shall be public domain.

Upon receipt of any given command, the Camera Positioning System shall not take longer than 1.0 second to respond.

All programmable functions shall be stored in non-volatile memory and shall not be lost if a power failure occurs. System configurations such as video privacy zones, preset text and sector I.D. shall be able to be stored in a computer file and a camera personality can be cloned or uploaded into a camera in the event that a camera replacement is necessary.

The communications transmission interface shall be terminated with appropriate connector. If required a converter shall be supplied to transform EIA-422 to EIA-232.

10-3.43 CAMERA TRANSCEIVER (TCVR)

The Contractor shall furnish and install camera transceiver (TCVR) at the camera site to interface with the CCTV camera assembly, and with the fiber optic cable.

The TCVR shall operate on one single mode fiber.

The TCVR shall support high quality, simultaneous two-way transmission of camera control data and one-way transmission of camera video over one single mode fiber. The TCVR shall receive RS 232 data for the camera control receiver (CCR) and shall transmit NTSC video from the CCTV camera assembly.

The TCVR video transmission and data receiving format used in the camera junction box shall be compatible with the TCVR video receiving and data transmitting format used in the communications hub structure.

The TCVR may be packaged as one surface mountable module or may be individual components such as a receiver, transmitter and wavelength division multiplexer to combine both data and video onto one single mode fiber.

Supply voltage shall be 120 V(ac) ±10 percent, 60 Hz. Lower voltage units will be acceptable if a UL listed power conversion module is used to adapt from the 120 V(ac) source.

Power required shall be 50 W maximum.

Mounting shall be to a flat wall surface.

Operating temperature range shall be from -20°C to +70°C minimum range.

Video transmitter section shall meet the following requirements:

| | |
|--|---|
| Input level: | 1 V peak – peak (NTSC composite) |
| Signal-to-Noise ratio at minimum receiver input: | 50 dB minimum |
| Differential phase (10-90% APL): | 3° maximum |
| Differential gain (10-90% APL): | 3% maximum |
| Frequency response: | 100 kHz to 5.5 MHz: ±0.30 dB maximum 5.5 MHz to 8 MHz: ±0.6 dB maximum |

RS 232 receiver section shall meet the following requirements:

Data rate: DC to 9.6 kbps minimum.

Bit error rate: 10⁻⁹ maximum.

Optical shall meet the following requirements:

Video transmitter shall meet the following requirements:

Operating wavelength: 1300 nm or 1550 nm.

Launch power: -14 dBm minimum.

Sensitivity (receiver): -28 dBm maximum.

Loss budget: 14 dB minimum.

Fiber compatibility: 8.3/125 µm singlemode.

RS 232 receiver shall meet the following requirements:

Operating wavelength: 1300 nm or 1550 nm.
Loss budget: 20 dB.
Fiber compatibility: 8.3/125 μ m singlemode.

Connectors shall meet the following requirements:

Video input: BNC.
RS 232: DB-9, DB-15 or DB-25.
Optical: Type SC.

The TCVR units shall be tested prior to installation to ensure proper operation with the camera control transmitter.

The Contractor shall confirm the operation of the TCVR, after installation, using test equipment which emulates all the functions of the camera control transmitter, and shall document all results and keep test equipment in operation until witnessed and approved by the Engineer.

The Contractor shall confirm equipment placement with the Engineer before installing any equipment.

After installing all TCVR units and the communication system, the Contractor shall demonstrate operation of the camera control system and assign all system parameters using the camera control system located at the communication hub that the CCTV is assigned to.

The camera control system functions shall be tested on all TCVR units and shall operate all remote control functions, for example pan and tilt, zoom in and out, focus near and far, set up, and recall up to eight preset positions per remote TCVR address. The response of the camera control system shall appear to be instantaneous.

The Contractor shall demonstrate the camera control system to show that it can access all TCVR units.

Testing of the Camera Transceivers

The Contractor shall be responsible for all testing and documentation required for proper installation and operation of the camera transceivers, materials and equipment. The following identifies the specific quality control requirements for both the TCVR and TCVR-CH. The TCVR-CH is described elsewhere.

Prior to installation all transceivers shall be tested. The Contractor shall input a standard level video test signal into the TCVR at the camera site and adjust the optical power output of the TCVR to receive a mid-range optical power level for the TCVR-CH located at the communication hub needed to produce the required video receiver output level. The TCVR-CH's video output shall then be connected to a monitor for viewing with the level adjusted to the mid-range of any output settings. The Contractor shall then qualitatively assess the monitor output. Video shall be of high quality with good color and no image ghosting. The signal-to-noise ratio and signal-to-low frequency noise ratio shall be measured and recorded. No optical attenuation devices shall be used to reduce optical signals to required operating range. All indicators shall be verified to function correctly.

RS-232 to RS-422 Converter

The contractor shall furnish and install RS-232 to RS-485 / RS-232 to RS-422 converter, which can be used to convert any standard RS-232C port into a two-wire half-duplex RS-485 port, or a four-wire full-duplex RS-422 port and vice versa. The converter shall meet the following requirements:

Compatibility: EIA/TIA RS-232C standard and RS-485/RS-422 standard
Current Consumption: Under 10mA
Baud Rates: 300 to 115,200bps (auto-sensing and self-adjusting)
Distance: RS-232 side: 5m; RS-485/RS-422 side: Depending on power from RS-232 port, will transmit up to 1.2km at 19,200bps
Connector: RS-232 side: DB-9 Female; RS-485/RS-422 side: DB-9 Male; Termination Board: DB-9 Female and a 6-Way Terminal Block
Maximum number of drops: 128
End-of-Line Terminator: 1202 (Built-in)
Static Protection (ESD): Up to 15KV
Dimensions (H x W x D): 16 x 32 x 90 mm (with termination board)
Weight: 38 g (with termination board)
Operating Temperature: -10°C to 50°C
Operating Humidity: Up to 90% RH (no condensation)

CCTV ACCEPTANCE TEST PROCEDURE

Upon installation of the CCTV System in the field, the Contractor shall perform the following tests locally in the presence of the Engineer, with a Contractor provided camera controller. The camera controller can be a laptop computer with the latest version of the vendor supplied camera control software and be compatible with the CCTV System DB-9F control cable connector (to PC Com port).

- A. Iris Auto//Manual Operation
 - With IRIS Auto/Manual switch in Manual, open Iris and verify that the video image lightens.
 - Close the Iris and verify that the video image darkens.
 - Open the Iris to lighten the image and then switch IRIS Auto/Manual switch to auto. Verify that the camera iris closes to produce the original video image.
 - Close the Iris to darken the image and then switch IRIS Auto/Manual switch to auto. Verify that the camera iris opens to produce the original video image.
- B. Focus Auto/Manual Operation
 - With Focus Auto/Manual switch in Manual, demonstrate that the camera can focus on objects both near and far in the field of view.
 - Focus near, then switch FOCUS Auto/Manual switch to auto and demonstrate that the camera focus adjusts automatically to bring the image back in focus.
 - Focus far, then switch FOCUS Auto/Manual switch to auto and demonstrate that the camera focus adjusts automatically to bring the image back in focus.
- C. Zoom Telephoto//Wide Operation
 - With the IRIS and FOCUS Auto/Manual switches in Auto the contractor shall demonstrate that the auto IRIS & FOCUS adjustments operate with a focused picture present in the video image and that the picture zooms in and out.
 - With IRIS and FOCUS Auto/Manual switch in Manual and operating the Zoom from wide angle to Telephoto the Contractor shall demonstrate that all IRIS & FOCUS adjustments do not operate as if in Auto and that picture still zooms in and out.
 - Demonstrate that the Digital zoom functions through 10 times the focal length.
- D. Tilt Operation

The Contractor shall demonstrate that with Iris and Focus in Auto & Zoom in wide mode that the camera has free movement with a minimum of +30° to – 80° Elevation range travel.
- E. Pan Right/Left Operation

The Contractor shall demonstrate that with Iris and Focus in Auto, and Zoom in wide mode and with the camera tilted at +30° to -80° the camera shall rotate with free movement, with a minimum of 360° pan travel range.
- F. Camera Preset Operation

Using camera control software the Contractor shall demonstrate that the camera system shall execute a minimum of 6 various preset positions employing various degrees of zoom, pan and tilt. The camera must move freely from on preset position to the next. The camera system shall not take more than 4 seconds to go to a preset position. Once in the preset position the camera shall not move unless directed by another command.

The camera control software shall automatically and continuously test all 6 preset positions in succession for a minimum of one hour.
- G. ID Generation

Using camera ID Generator and vendor supplied camera control software the contractor shall demonstrate the insertion of 20 text characters into the video image.
- H. Performance

Streaming outputs: 640x480@15FPS, 176x144@6FPS, and a 320x240-JPEG image.

A thermal monitor may be enabled to maintain the processor within the published specification.

The video output stream generated from the test archive file shall be continuous/seamless and without error/glitches when played back.

PERIPHERAL WIRING

The Contractor shall install the peripheral wiring at each CCTV system location site as shown on the plans. The peripheral wiring shall include all conduit, conductors, and pull boxes as shown on the plan sheets to make the CCTV system completely functional.

10-3.44 FIBER DISRIBUTION UNIT (FDU)

The fiber distribution unit (FDU) shall be rack mounted. The Contractor shall install all related equipment to interface the rack mount fiber distribution unit to the incoming fiber optic communications cable, the pigtail fiber optic cable, and the fiber optic jumpers.

Attention is directed to Fiber Distribution Unit described elsewhere in these special provisions.

10-3.45 MODIFY COMMUNICATION HUB (HUB H) (210/215 INTERCHANGE)

Modifying communication hub assembly (HUB-H) shall consist of installing the following equipment into existing racks as per plans and these special provisions.

| Qty | Description |
|-----|------------------------------------|
| 2 | IFS CARD CAGE WITH DS-1 MODEMS |
| 1 | T-1 MULTIDROP COMMUNICATION SYSTEM |
| 0 | AFOM |
| 2 | RS232 DISTRIBUTION PANEL |
| 2 | TCVR-CH (Video Receiver) |
| 2 | DS1 OPTICAL MODEM/SWITCH |
| 20 | RS-232 SERIAL CABLES |
| 1 | UNINTERRUPTABLE POWER SUPPLY (UPS) |

The T1/DS1 multiplexer shelf and equipment shall consist of the following equipment:

| Qty | Description | Newbridge Part No. |
|-----|---|--------------------|
| 1 | T-1 shelf | 90-0010-10 |
| 1 | AC power shelf-Dual | 90-0435-02 |
| 1 | AC power shelf upgrade kit | 90-0481-02 |
| 1 | T1 dual card | 90-0564-01 |
| 2 | T1 LIM module | 90-0567-01 |
| 2 | Data Cards: Direct connect cards | |
| 1 | Resource Cards: DSP-3 Cards | |
| 1 | Common Control Cards: System Control Card 3 | |
| 1 | Common Control Cards: General facilities card | |
| 1 | Common Control Cards: Expander card (16+) | |

Also included shall be the associated power supplies and interconnect cables which shall provide T1 multiplexing and switching functions for multi-location interfacing to standard DS1 signals and remote data using RS 232 and voice communication systems as described elsewhere in these special provisions. The T1 multidrop communication system equipment shall transmit and receive RS 232 information via optical fiber and shall provide for the ability to multidrop asynchronous RS 232 information.

Local operator control of all essential features of the T1/DS1 multiplexer equipment shall be accomplished by the use of necessary discrete front panel controls. Dual V.24/RS 232 ports for local operator control and remote Network Management System functions and/or Control/Status reporting shall be provided.

The operation of the T1/DS1 multiplexer shall not produce any electrical noise which will interfere with the operation of any other equipment when proper cables are used.

All printed circuit boards shall be of epoxy glass based material or other high quality material. All common equipment and channel unit boards shall be made to conform coating for added protection against moisture, salt, and other environmental agents.

The T1 multidrop communication system equipment shall be designed with all the circuitry mounted on plug-in cards or modules in a single equipment shelf (that shall have no active components on its backplane). Modular design is required to allow a user to configure the multiplexer equipment for specific needs by plugging in the appropriate modules and to allow field repairs to be accomplished using plug-in module replacements. The multiplexer equipment shall be expandable in increments, channel by channel, until shelf capacity is reached.

The T1 multidrop communication system equipment shall be designed for testing, monitoring, and adjustment without service interruption. Front access shall be provided for all routine adjustments normally required to be performed by field personnel.

Spare positions--the absence of channel cards from the spare shelf positions, if provided, shall not affect equipment operation nor generate alarm conditions.

RS-232 DISTRIBUTION PANEL

The RS-232 distribution panel shall be a Newbridge Networks' Model 90-0350-01 or equal to interface with existing equipment. Interface connector and cable assembly shall be as specified by the manufacturer to interface between the T1/DS1 multiplexer direct connect cards and the distribution panel. All interface connectors and/or cables between RS 232 distribution panel and T1/DS1 multiplexer shall be provided and installed by the Contractor and as recommended by the manufacturer of the T1/DS1 multiplexer.

The connectors shall be female DB25 connectors and the cable length shall be a minimum of 1 m and not more than 15 m.

RS-232 SERIAL CABLE

There shall be one RS-232 serial cable per asynchronous fiber optic modem to provide a link between the modems and the RS-232 Distribution Panel. The RS-232 serial cable shall meet the following requirements:

- A. Length: Minimum of 0.5 meters.
- B. Termination: DB-25p, Bare-wire for screw terminal.
- C. Conductors: Straight through DB-25 to DB-25, No. 22 AWG, THWN.
- D. Cable Jacket: Polyethylene.

ASYNCHRONOUS FIBER OPTIC MODEM

The asynchronous fiber optic modem (AFOM) shall be used as an RS-232C interface between the 170 controller and T1/DS1 multiplexer via optical link. The modem located in the communication hub shall be a rack-mounted version installed in the card cage assembly. Model 170 controller interface modems shall be stand-alone units securely fastened on a rack-mounted shelf. An LED indicator shall be provided for use in determining received optical power.

The AFOM shall be fully compatible and interoperable with the existing International Fiber Systems Inc. models D9230SC (wall mount) and D9230SC-R3 (rack mount).

The modem shall meet the following requirements:

| | |
|--------------------------------------|---|
| Electrical Signaling | Per EIA RS-232 with full handshake control signals |
| Electrical Power | V (dc) version: +9 to +14 V (dc) @ 32 mA, nominal. V (ac) version: 115 V (ac) ±10%, 60 Hz. |
| Bit Error Rate | 1 in 10 ⁹ within optical budget. |
| Operating Mode | Asynchronous, simplex or full duplex. |
| Input/Output Logic Level | I: +3.75 to +12 V. O: -3.75 to -12 V. |
| Input/Output Impedance | Per RS-232D |
| System Bandwidth | DC to 56/64 kbps |
| Optical Wavelength | 1300 nm. |
| Minimum Optical Receiver Sensitivity | -30 dBm |
| Minimum Transmit Output Power | -10 dBm |
| Connectors Optical: | SC |
| Connectors Electrical (Data) | DB25 female |
| Number of fibers | 2 |
| Mechanical Size | 178 mm W x 127 mm D x 25 mm H for stand-alone module. |
| Weight | 170 g for stand-alone module, nominal. |
| Environmental Ambient: | |
| Temperature Range | -20°C to +70°C. |
| Storage Temperature | -40°C to +85°C. |

The asynchronous fiber optic modem shall be tested as follows:

Each optical modem shall be functionally tested by looping back the optical transmit connector to the optical receive connector using a variable optical attenuator with measured optical loss of 20 dB, nominal, at 1300 nm. A test set shall be connected to the modem and set for RS-232 communications testing. A fifteen-minute test after burn-in shall be error free.

After performing the fifteen-minute bit error rate (BER) test, at least two modems shall be tested for receiver dynamic range. To do this the optical attenuation shall be increased to the point at which the data test just begins to register bit errors. The optical receive power into the modem shall be measured and recorded. The optical attenuation shall be then decreased until the data test once again registers errors. At no time shall the optical power into the receiver exceed the manufacturer's specified saturation level. The optical receive level shall once again be measured and recorded. These minimum and maximum receive levels define the modem receiver's dynamic range.

One pair of modems shall be interconnected using optical patch-cords and attenuators with a loss of 20 dB, nominal, in each direction. The RS-232 interface shall be looped back on one modem and a test set connected to the RS-232 interface of the other modem. A bit error rate of less than 1 in 10⁹ shall be demonstrated.

CAMERA TRANSCIEVER IN COMMUNICATION HUB H

Camera transceiver-communication hub (TCVR-CH) shall be located in the communication hub (I) structures shall conform to the requirements of TCVR's specified for CCTV camera assemblies with the following differences:

The TVCR (video receiver) shall be fully compatible and interoperable with the exist international fiber system (IFS) model VT 4730 WDM0-R3

The TCVR-CH shall transmit RS 232 data for the auxiliary control unit (ACU) at each camera site and shall receive NTSC video from the CCTV camera assembly.

The TCVR-CH video receiving and data transmitting format used in the communications hub shall be compatible with the TCVR video transmission and data receiving format used by the TCVR's at each of the camera junction boxes.

The TCVR-CH shall be packaged as one rack unit (1 RU x 482 mm) insert able module or shall be individual rack modules such as a receiver, transmitter and wavelength division multiplexer to combine both data and video onto one optical fiber.

The TCVR-CH shall be mounted in one rack unit (1 RU x 482 mm) insert able, and have the operating temperature range between 0°C to 50°C. (minimum.)

| | | | |
|--------------------|-------|------------------|-----------|
| Asynchronous Modem | F/O | Model Controller | 170 |
| Function | | Pin No. | Function |
| Ground | Pin 7 | N | DC Ground |
| | | H | DCD |
| Data Out | Pin 2 | K | Rx Data |
| Data In | Pin 3 | L | Tx Data |
| | | J | RTS |
| | | M | CTS |
| | | D | +5 V(dc) |

Pin J shall be looped back to pin M

UNINTERRUPTABLE POWER SUPPLY

Four Uninterruptible Power Supply shall be furnished and installed by the Contractor at the bottom of each 19” equipment rack that has 120 VAC powered communication equipment in the communications hub structure. The Uninterruptible Power Supply shall replicate the functions and features of the Liebert GXT2-3000RT120 or equal.

The Uninterruptible Power Supply shall meet the following requirements:

| | |
|---|-----------------------------|
| Power Rating | |
| Rating, VA | 500VA |
| Rating, W | 350W |
| Input AC Specifications | |
| Phase | 1 |
| Power Factor | 0.97 |
| Input Frequency, Hz | 50/60 |
| Frequency Range, Hz | 40 - 70 Hz; Auto Sensing |
| Input Voltage Range, VAC | 60 - 140 |
| Input Voltage | 100/110/115/120/127 |
| Input Connections or Input Cord/Plug Type | (6 ft) NEMA 5-15P |
| General Specifications | |
| UPS Technology | On-Line |
| Battery Specifications | |
| Battery Test Type | Manual & Automatic |
| Runtime, Full Load, Watt | 28 min. |
| Runtime, Half Load, Watt | 66 min. |
| Recharge Time | 5 Hrs to 95% |
| User Replaceable Battery | Yes |
| Battery Technology | VRLA |
| Output Waveform on Battery | Sinewave |
| Output AC Specifications | |
| Nominal Voltage | 100/110/115/120/127V +/- 3% |
| Output Waveform | Sinewave |
| Receptacles (b=Battery, s=Surge) | (4) NEMA 5-15R |
| User Interface | |
| Audible Alarms | Yes |
| Display Type | LED |
| Communications | |
| Communications Options | SNMP/RS232 |
| Software and Cable | N/A |
| Software and Cable | Multilink SW & Serial Cable |
| Audible Alarms | Yes |
| Physical Data | |
| Color | Black |
| Form Factor | Racktower |
| Unit Height, inches (mm) | 17.0 (430) |
| Unit Width, inches (mm) | 3.5 (87) |
| Unit Depth, inches (mm) | 21.5 (547) |
| Unit Weight, lbs. (kg) | 48.9 (22.2) |
| Shipping Height, inches (mm) | 23.0 (584) |
| Shipping Width, inches (mm) | 10.6 (269) |
| Shipping Depth, inches (mm) | 27.2 (691) |
| Shipping Weight, lbs. (kg) | 57.7 (26.2) |
| Environmental | |
| Operating Temperature, Minimum _F (_C) | 32 (0) |
| Operating Temperature, Maximum _F (_C) | 104 (40) |
| Storage Temperature, Minimum _F (_C) | 5 (-15) |
| Storage Temperature, Maximum _F (_C) | 122 (50) |
| Relative Humidity | 0% to 95%, Non Condensing |
| Operating Elevation, ft. (m) | Up to 10,000 (3000) |
| Sound Emission/Audible Noise | < 50dBA, at 1 meter |
| Cooling | Fan Cooled |

| | |
|----------------------------------|---|
| Options | |
| Optional Items | External Battery Cabinets |
| Agency/Certification/Conformance | |
| Agency Approval | UL Listed, FCC Part 15, Subpart B, Class A, UL 1778, UL Listed |
| Warranty | |
| Standard | 2 years UPS replacement |
| | 1 Year and 3 Year Extended Options |
| Extended | Available |

T1 Equipment Shelf

The existing T1 equipment shelf located in communication hub "H" shall accommodate all universal channel slot, common control, resource, and extender cards as described under these special provisions to configure the T1/DS1 multiplexer. The T1 equipment shelf shall be compliant with Federal Communications Commission (FCC) Class A - Type II requirements. Cable entrances shall be located at the top and bottom of the back panel. An equipment interface area shall be provided with connectors to connect to external equipment such as the RS 232 distribution panels, as described elsewhere in these special provisions. A single shelf shall be composed of 12 card slots and divided into the universal channel slot (UCS) card section and the common control card section. Eight slots shall be designated for the UCS card section and 4 slots for the common control card section. The power section shall be configured with dual redundant load sharing 120 V(ac) power supplies that meet the following requirements:

Existing T1/DS1

The existing T1/DS1 shall be configured with a dual internal redundant load sharing -48 V(dc) power supplies. In the event of a commercial AC power failure the T1 multiplexer shall be capable of uninterrupted operation by deriving -48 V(dc) power from a backup battery source. (Battery source not required under this contract.) The T1/DS1 multiplexer shall be convection cooled when powered by -48 V(dc). No forced-air cooling devices shall be permitted.

All power and ground connectors shall be screw-terminal or UL-approved connectors. Wire-wrap post, and solder post terminals are not acceptable.

Required channel card supply voltage and current levels shall be provided by terminal common equipment being distributed on the shelf back plane.

The back plane shall be designed to support a mixture of voice and high speed data.

Ring voltage on voice lines are not permitted to produce crosstalk on adjacent high speed data lines.

Line Interface Module (LIM) T1: The T1/DS1 multiplexer shall fully support an integrated LIM T1 module. The LIM shall be modular to the T1/DS1 dual and single 1.544 Mbps aggregate cards. The LIM shall support the DSX-1 electrical interface and loopbacks towards the T1 line, and shall be software controllable through the T1/DS1 multiplexer. No external buttons, switches and dip switches shall be used or allowed to activate loopbacks. The integrated LIM shall meet the specifications in AT&T Compatibility Bulletin #119 Interconnection Specification for Digital Cross-Connects. The integrated LIM shall be locally powered. Span simplex power can be either looped in channel bank mode or passed through in drop and insert mode.

Connector specifications:

| | |
|-----------------|---|
| Connector Type: | 25-pair Amp Champ Connector on the back plane |
|-----------------|---|

DS0 Map Assignments.- Will be done by Caltrans Freeway Systems, for final testing through the TMC the Contractor shall give the Engineer 48 hours notice for this portion of the test..

10-3.46 MODIFY TRANSPORTATION MANAGEMENT CENTER ASSEMBLY

The modify transportation management center (TMC) assembly shall consist of furnishing and installing the following equipment into existing racks:

| Qty | Description |
|-----|----------------------------------|
| 2 | Video Demultiplexer Demodulators |

Video Demultiplexer

The video demultiplexer and the video multiplexer system components shall be from the same manufacturer and shall be fully compatible and interoperable with each other.

The demultiplexer shall be capable of providing optical reception (demultiplexing) of up to 16 channels of RS-250C baseband video via 8-bit linear pulse code modulation digital-decoding, from the communications hub to the demultiplexer unit located within the Transportation Management Center. All equipment shall have an ambient operating temperature range of 0 to +60 degrees, C, and shall be directly mountable within the existing IFS Model R3 19-Inch Card Cage Unit.

The video demultiplexer unit shall not utilize video compression techniques and shall introduce zero latency to each of the 16 received video channels, and shall not require any user-adjustments to facilitate installation or operation.

Operating Wavelength: 1300 nm., single mode
Optical Detector: PIN Photodiode
Optical Connector Type: Type SC
Operating Power: 115 VAC

LED status indicators shall be provided on the video demultiplexer unit for ascertaining the status of the following parameters:

Video sync presence for each video output channel
Optical Carrier Detect/Link-Lock
Operating Power

The 16-channel video multiplexer and demultiplexer units shall provide the following video transmission performance end-to-end with an optical path loss of 18 dB between the two units:

Video Signal-to-Noise Ratio: 60 dB, at a maximum optical path loss of 18 dB
Video Bandwidth: 5 Hz. to 6.5 Mhz.
Differential Gain: <2%
Differential Phase: <0.7 degrees
Tilt: <1%

Installation

The Video Demultiplexer system units shall be installed at the TMC as shown on plans and specified in these special provisions.

The contractor shall connect the correct optical pigtail or patch cord to the optical connector on the transmitters and receivers, as well as the correct video interface cables to the demodulator inputs and demodulator outputs as specified by the equipment manufacturer.

The contractor shall coordinate the physical space required by the Video demodulator with the space allocated with any other equipment.

The contractor shall connect the Video Demodulator power supply to one of the 120 V (ac), 60 hz power receptacles reserved for communication equipment in the TMC. The fiber optic path for each video link shall be tested and verified in accordance with the contract prior to installing the video Demodulator.

The contractor shall neatly install all drop cables together, route them along the same path and neatly secure them to the support rails in the equipment racks. No cable shall be installed with a bend radius less than the manufacture's minimum recommended bending radius.

Payment

The contract lump sum price paid for modify TMC assembly shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in modify TMC assembly, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-3.47 TRAFFIC SIGNAL COMMUNICATION INTERFACE SYSTEM

The Model 170 controller interface shall consist of an gigabit ethernet fiber switch, ethernet extender, ethernet to serial server/converter, category 5 external (CAT 5E) cable and a fiber distribution unit (ITU), located in the Model 170 controller cabinet. The asynchronous fiber optic modem is described elsewhere in these special provisions.

Gigabit Ethernet Fiber Switch

A self healing redundant Gigabit Ethernet Fiber Switch shall be used at all specified locations. Industrial hardened fiber switches with two separate Gigabit fiber ports using Single Mode one-fiber bi-directional communication, and six 10/100 Base-T Ethernet copper ports shall be provided. Each of the two fiber ports shall include a transceiver. The first fiber port shall transmit at 1550 nm and receive at 1300 nm, while the second fiber port shall transmit at 1300 nm and receive at 1550 nm. The fiber switches shall be stand-alone units installed on 482 mm rack-mounted shelves. Power options shall be 12 V(dc) and 115/230 V(ac). The switches shall allow for daisy-chaining and support distances between switches a minimum of 32 km. The fiber ports shall have SC connectors and copper ports have RJ-45 female connectors. The fiber switches shall allow for an operating temperature of -40°C to 80°C and a storage temperature of -40°C to 90°C. The units shall have a maximum Bit Error Rate of $1 \text{ in } 10^{10}$.

Self healing redundant Gigabit Ethernet Fiber Switch TC3820 by TC Communications, Inc., or approved equal shall be furnished. The fiber switches will be tested by Caltrans District 8 Electrical Operations (Mr. Koon Tse tel. 909-383-6431) to be functional and compatible with CTNET and QuicNet central signal system software. A Web-based configuration user interface shall be provided to view and change network settings such as IP Address, Subnet, Gateway, Speed, Half/Full Duplex, Name, Password and other parameters. It should also monitor the fiber ring status, alarm conditions, and fault locations for local or remote units. The fiber switches shall provide Simple Network Management Protocol (SNMP) and provide a fault recovery within 50 ms.

Ethernet Extender

An Ethernet Extender shall be used at all specified locations. Industrial hardened Ethernet Extender with two separate ports – an RJ-45 10/100 Ethernet port and a 4-wire RJ-11 connector VDSL port shall be furnished.

Ethernet Extender Model EX3101 by Ether WAN with a higher operating temperature of up to 75°C, or approved equal shall be furnished. The Ethernet Extender unit will be tested by Caltrans District 8 Electrical Operations (Mr. Koon Tse tel. 909-383-6431) to be functional and compatible with CTNET and QuicNet central signal system software. The Ethernet Extender shall provide data transfer rates of 1 Mbps at a distance of 1829 m, 10 Mbps at a distance of 1463 m, 20 Mbps at a distance of 914 m, and 30 Mbps at a distance of 457 m. The Ethernet Extender units shall allow for an operating temperature of 0°C to 75°C and a storage temperature of -25°C to 80°C. The units shall be stand-alone units installed on a rack-mounted shelf.

Ethernet to Serial Server/Converter

Industrial hardened Ethernet to Serial Server/Converter shall be used at all specified locations. The unit shall convert RS-232 Serial communications to and from 10Base-T Ethernet communications and provide data rates up to 57.6 Kbps. The unit shall support full RS-232 handshaking (DCD, RTS, CTS, DTR and DSR). LEDs shall be provided on the front panel for all five control signals and Sync, Activity, Power and Link. Power options shall be 12 V(dc) and 115/230 V(ac). Electrical connectors shall be DB-9F and terminal blocks, and 10Base-T connector shall be RJ-45F. A Web-based user interface shall be provided to view or change network settings. The Ethernet to Serial Server/Converter units shall allow for an operating temperature of -20°C to 80°C and a storage temperature of -40°C to 90°C. The units shall be stand-alone units installed on a rack-mounted shelf.

Ethernet to Serial Server/Converter Model TC3400 by TC Communications or approved equal shall be furnished. The Ethernet to Serial Server/Converter unit will be tested by Caltrans District 8 Electrical Operations (Mr. Koon Tse tel. 909-383-6431) to be functional and compatible with CTNET and QuicNet central signal system software.

Category 5 External (CAT 5E) Cable

Industrial hardened Category 5 External cable shall be used at all specified locations. CommScope Ultra II Enhanced Category 5E Outdoor cable or approved equal shall be furnished.

Intermediate Transition Unit (ITU)

The unit (ITU) shall be packaged in a 482 mm rack mount unit with dimensions of 432 mm (W) x 44 mm (H) x 280 mm (D) having metal housing slide-out shelf. The ITU shall contain grommets at cable entrances and provide strain relief for the fiber optic cable. The FDU shall accommodate 12 singlemode fibers having SC type connector feed through adapters and 12 interconnection points or 12 splices. The components of the passive interconnect package shall be installed in the 332 cabinet.

Payment

Full compensation for traffic signal communication interface system shall be considered as included in the contract lump sum price for signal and lighting and no separate payment will be made therefore.

10-3.48 SYSTEM TESTING AND DOCUMENTATION

DESCRIPTION

The system testing and documentation shall cover pre-installation testing, physical inspection, subsystem testing, fiber optic cable testing, data link testing, acceptance testing, functional testing, performance testing, final acceptance and system documentation that is required to validate the operational performance of the vehicle detection system, closed circuit television, communication system and ramp metering system, as shown on the plans and described elsewhere in these special provisions.

PRE-INSTALLATION TESTING

Pre-inspection testing shall include testing of all material, equipment and cable in a laboratory environment prior to delivery to the site. Use of laboratory facilities, including an environmental simulation chamber, shall be arranged by the Contractor. The tests shall either be conducted at the equipment manufacturer's premises or at a laboratory arranged by the Contractor.

All material, except test equipment and special tools, shall be bench tested in accordance with the following sections, which include those items described elsewhere requiring pre-installation testing..

All active equipment shall be connected to normal operating power, energized and subjected to normal operating conditions for a continuous period of time in the laboratory of not less than 48 hours.

Functional testing shall be performed by the manufacturer on all material prior to delivery to the site. The functional tests shall be performed in accordance with an approved test plan. Any material or equipment which fails to meet the requirements of the contract shall be repaired or replaced and the test shall be repeated until satisfactory. All functional test results, including results of failed tests or re-tests, shall be submitted and delivered with all material and equipment delivered to the site.

Full performance test shall be performed by the manufacturer or by the Contractor on not less than 5 percent or at least one unit of material selected at random from the normal production run. The full performance test shall be performed in accordance with a test plan developed by the Contractor and approved by the Engineer.

The tests shall demonstrate that the design and production of material and equipment meets the requirements of the Contract. Full environmental conditions shall be tested as part of the functional tests for field equipment.

PHYSICAL INSPECTION

The Contractor shall provide documentation to prove delivery of all material, equipment, cable and documentation. If any material or documentation is outstanding or have been replaced under pre-acceptance warranty a physical inspection and documentation shall be provided for this material. The physical inspection shall consist of inspecting all installed material to ensure workmanship satisfies the specified requirements.

SYSTEM DOCUMENTATION

Parts List: The manual shall include a list of all replaceable parts with exact parts description and number and a directory of recommended suppliers with correspondence address, telephone and fax numbers.

Test Results: This section shall include a copy of the results for all the tests that has been conducted for the contract.

System schematic drawings shall be provided to identify the type of equipment at each location and the function of all equipment. The drawings shall also show how the system is interconnected. A comprehensive list of cabling and wiring shall be provided to clearly identify the interconnection and labeling of all equipment supplied under this contract, State-furnished or existing both in the field and at the communication hub.

ACCEPTANCE TESTING

The acceptance testing includes the preparation of an acceptance test plan, conducting acceptance tests and subsequent retests, and documentation of the results.

Final acceptance tests shall be conducted after the site test results have been reviewed and accepted by the Engineer. These tests include the complete system in normal operations.

Installation documentation and test results shall be provided for all material, equipment and cable prior to submission of the acceptance test plan and commencement of acceptance tests. This documentation shall be in accordance with the Contract and shall include the following as appropriate:

Model and part number for all material.

Test equipment model number, serial number, settings, and date of last calibration.

All strap and switch settings.
Record of all adjustments and levels.
Alignment measurements.
Identification of interconnections.
All factory, laboratory and site test results.

The Contractor shall submit three copies of the acceptance test plan to the Engineer for approval prior to commencement of acceptance testing. The acceptance test plan shall address the full testing requirements of the specifications. The acceptance test plan shall detail all tests to be performed, the test results which are expected and the test schedule. The acceptance test plan will include the following major test and acceptance categories:

Physical inspection
Functional tests
Performance tests

The Contractor shall test the communication system according to the approved acceptance test plan and shall provide all test equipment, labor and ancillary items required to perform the testing. The test equipment shall be certified to be calibrated to the manufacturers' specifications. The model and part numbers and date of last calibration of all test equipment shall be included with the test results.

Acceptance testing shall not commence until all material required by these special provisions and plans are delivered, installed, aligned, all production test and site test documentation and results have been approved by the Engineer.

All acceptance test results shall be fully documented and such documentation provided as a condition of acceptance.

FUNCTIONAL TESTS

The Contractor shall test all system functions to demonstrate the connectivity of each data channel, that all circuits and all equipment satisfies the functional requirements of these special provisions.

The Contractor shall document all functional test results. In the event that any aspect of the functional tests are determined by the Engineer to have failed, the Contractor shall cease all acceptance testing and determine the cause of the failure and make repairs to the satisfaction of the Engineer. Acceptance testing shall, at the discretion of the Engineer, be repeated from the start of functional tests.

Performance Tests.--The Contractor shall conduct operational performance tests on all data circuits operational from the communication hub to the field equipment.

Data tests shall be performed on all operational and voice/data circuits using appropriate test equipment for the measurement of the following parameters:

End-to-end bit error rate tests shall be run from the communication hub to each remote drop of each data circuit. A data test set shall be used at both the communication hub and the remote modems to insert an asynchronous pseudo-random pattern using 8 data bits, 1 start bit, 1 stop bit and even parity. The data test set at the remote modem must hold RTS high for the duration of the data test. The data rate of the test sets shall be set to rate as employed in the system. A 15 minute test on each drop of each multipoint circuit shall be error free in both directions.

One drop of each circuit, as chosen by the Engineer, shall be tested for 48 hours. The average bit error rate in both directions shall be less than 1 in 10^8 .

Pulse-width distortion shall be defined as the difference between the data pulse width into a data channel port at the communication hub port and the pulse width out of the EIA-232D port of an interconnected drop modem.

Distortion shall be tested between the communication hub and the selected field modem for each data circuit. The signal shall not have a gross span-stop distortion greater than 20 percent at any data interface measured as per EIA-404-A.

If any circuit or element fails to satisfy the specified performance requirements the Contractor shall determine the cause and remedy the failure to the satisfaction of the Engineer. The full performance tests shall be repeated under operating conditions as determined by the Engineer.

FINAL ACCEPTANCE

The system will not be accepted until all of the following conditions have been met as follows:

Physical, functional and full performance acceptance tests have been completed and the results are approved by the Engineer.

All documentation has been completed and submitted to the Engineer.

All connections that were changed to perform acceptance tests are restored and tested.

10-3.49 TRAINING FOR FIBER OPTIC OPERATION AND MAINTENANCE

A training course shall be developed by the Contractor and shall be given to the Engineer and designated personnel. The course shall be an approved GTE, Pac Bell or and AT&T fiber course covering the areas needed on this project to operate and maintain the fiber optic system installed on this contract.

A training area will be provided by the State at the District Office Building, 464 W. 4th St., San Bernardino, California.

The training course shall provide training for technical personnel, and shall follow a training outline prepared by the Contractor. The Contractor shall provide all materials and instructors for the course.

The course shall be not less than 4 eight-hour (excluding lunch and breaks) days in duration. No more than twenty-five State employees with technical backgrounds will attend this course. Each person shall receive a training manual.

The training manual shall be written especially for the freeway CCTV and communications system and shall provide complete procedures for operating, maintaining, and troubleshooting the cable plant, CCTV system assembly, communication hub assembly, TOS cabinet assembly, VDS cabinet assembly and 170 controller interface.

The maintenance section of the training course shall cover preventive, routine and emergency maintenance procedures. The emergency maintenance discussion shall provide recommendations for the provisioning and use of emergency repair kits to assist maintenance crews. Ten copies of the project manual shall be given to the Engineer.

The four day training course shall consist of, a total of, 20 hours of class work and 12 hours of hands-on lab work.

Classroom shall consist of the following:

| | |
|-------------------------------|-----------------------------|
| Introduction of Fiber Optics | Fiber Optics Installations |
| Applications | Optical Testing |
| Fiber Optic Theory | Fiber Optics Maintenance |
| Optical Fiber | Fiber Optics Restoration |
| Connectors | Fiber Optic Safety |
| Patch Panels | Advance Technologies Review |
| Splices/Splicing | Light Sources |
| Detectors | Repeaters |
| Physical Plant Systems Design | Design Examples |

Classroom Lab shall consist of the following (Hands-On):

| | |
|--------------------|-------------------------|
| Acceptance testing | Optical Testing |
| Cable Preparation | Patch Panel Preparation |
| Connectorization | OTDR Testing |
| Splicing | Test Documentation |

The Lab groups or stations shall consist of no more than three people per station.

The course shall also include field training using operational equipment at the communication hub, camera locations, CMS and VDS locations. The field training shall include operational checkout of camera site and shall discuss the location of access to the various system field elements. The field training shall also cover how the different systems were installed, problems with the installation and trouble shooting and maintenance tips for the different systems.

The field training shall be in groups of no larger than five but maybe done in more than one day by choice of the Contractor.

The training course shall be designed to assist Maintenance and other personnel in trouble shooting and understanding not only the system that was installed for this project but also existing and future projects.

A maintenance course shall also be provided following the four day course for no more than twenty-five State employees. The maintenance course shall follow a manual written so that Maintenance personnel shall be able to use the manual in trouble shooting, installing, preventive maintenance and designing future fiber optic systems.

Each student shall be given a manual to keep at the beginning of the class. A draft copy of the manual shall be given to the Engineer 90 days after the job has started and an updated copy 90 days before the class is to be held for approval. Nine copies, of the approved version by the Engineer, shall be provided to the Engineer for project records (four copies for design, three copies for construction, and two copies for operations).

The Contractor shall provide an evaluation sheet to be completed by the attendees of the courses. The evaluation sheets will be turned in to the Engineer and a copy will be provided to the Contractor. The evaluation sheets need not be signed by the attendees.

The Engineer will notify the Contractor of the number of State personnel who will attend, up to twenty-five for the two courses. The courses must be completed prior to the acceptance of the contract.

10-3.50 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

Salvaged electrical materials shall be hauled to 175 W. Cluster Street, San Bernardino, CA 92401 and stockpiled.

Salvaged electrical materials for the city of San Bernardino shall be hauled to 234 S. Mt View Avenue, San Bernardino, 92408 and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum notice of 2 business days shall be given prior to delivery.

10-3.51 DISPOSING OF ELECTRICAL EQUIPMENT

Fluorescent light ballasts which contain polychlorinated biphenyls (PCBs) shall be disposed of in conformance with the California Department of Toxic Substances Control (DTSC) Regulations set forth in Title 22, Division 4.5, Chapter 42, of the California Code of Regulations.

Ballasts and transformers that contain polychlorinated biphenyl (PCB) are designated as extremely hazardous wastes and fluorescent tubing and mercury lamps are designated as hazardous wastes under Title 22, Division 4.5, Chapter 11, Article 4.1 and Article 5, of the California Code of Regulations.

The State assumes generator responsibility for these wastes. The Engineer will prepare the Hazardous Waste Manifest for Shipment. Ballasts shall be packaged and transported to a hazardous waste disposal facility. The Contractor shall package and transport fluorescent lights to an appropriately permitted facility.

PAYMENT

Full compensation for hauling, stockpiling, and disposing of transformers, fluorescent tubing and mercury lamps and non-leaking fluorescent light ballasts shall be considered as included in the contract price paid for the various items of work and no additional compensation will be allowed therefor.

10-3.52 PAYMENT

The contract lump sum price or prices paid for signal and lighting shall include highway lighting at intersections in connection with signals only.

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for lighting and sign illumination.

The contract lump sum price paid for electric service (irrigation) at various location shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in electric service (irrigation) complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per meter for 103C fiber optic conduit shall include full compensation for furnishing all labor, materials and incidents and for doing all work involved in 103C fiber conduit, complete in place, including tracer wire, warning tape as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per meter for 53C fiber optic conduit shall include full compensation for furnishing all labor, materials and incidents and for doing all work involved in 53C fiber conduit, complete in place, including tracer wire, warning tape as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per meter for 41C fiber optic conduit shall include full compensation for furnishing all labor, materials and incidents and for doing all work involved in 41C fiber conduit, complete in place, including tracer wire, warning tape as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract unit price paid for splice vault shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in splice vault, complete in place, including splice trays, splice enclosures as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per meter for singlemode fiber optic cables of various types shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in fiber optic cables, including making fiber optic splices, complete in place as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for system testing and documentation shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in system testing and documentation, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for modify existing communication hub assembly (Hub H) (210/215 interchange) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, conductors, and for doing all the work involved in modifying the hub and maintaining the system complete in place during construction, as shown on the plans as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for modify transportation management center (464 West Fourth Street, San Bernardino CA.) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, conductors, and for doing all the work involved in modifying transportation management center complete in place during construction, as shown on the plans as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for training for fiber optic operation and maintenance shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in training for fiber optic operation and maintenance, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

If any of the fabrication sites for the materials listed are located more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and difficult to determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing these listed materials from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$2000:

1. Extinguishable message signs
2. Service equipment enclosures
3. Closed circuit television cabinets furnished by the Contractor
4. Traffic monitoring station cabinets furnished by the Contractor

SECTION 11. (BLANK)

SECTION 12. (BLANK)

SECTION 13-1. RAILROAD RELATIONS AND INSURANCE - CAJON BOULEVARD OH RAILROAD RELATIONS AND INSURANCE CLAUSES CAJON BOULEVARD CONNECTOR OVERHEADS

1.01 General

1.01.01 The Contractor must cooperate with **BNSF RAILWAY COMPANY**, hereinafter referred to as "Railway" where work is over or under on or adjacent to Railway property and/or right-of-way, hereafter referred to as "Railway Property", during the construction of the Cajon Boulevard Connector Overheads.

1.01.02 The Contractor must execute and deliver to the Railway duplicate copies of the Exhibit "C-1" Agreement, in the form attached hereto, obligating the Contractor to provide and maintain in full force and effect the insurance called for under Section 3 of said Exhibit "C-1". Questions regarding procurement of the Railroad Protective Liability Insurance should be directed to Rosa Martinez at Marsh, USA, 214-303-8519.

1.01.03 The Contractor must plan, schedule and conduct all work activities so as not to interfere with the movement of any trains on Railway Property.

1.01.04 The Contractor's right to enter Railway's Property is subject to the absolute right of Railway to cause the Contractor's work on Railway's Property to cease if, in the opinion of Railway, Contractor's activities create a hazard to Railway's Property, employees, and/or operations. Railway will have the right to stop construction work on the Project if any of the following events take place: (i) Contractor (or any of its subcontractors) performs the Project work in a manner contrary to the plans and specifications approved by Railway; (ii) Contractor (or any of its subcontractors), in Railway's opinion, prosecutes the Project work in a manner which is hazardous to Railway property, facilities or the safe and expeditious movement of railroad traffic; (iii) the insurance described in the attached Exhibit C-1 is canceled during the course of the Project; or (iv) STATE OF CALIFORNIA fails to pay Railway for the Temporary Construction License or the Easement pursuant to Article II, Section 1 of this Agreement. The work stoppage will continue until all necessary actions are taken by Contractor or its subcontractor to rectify the situation to the satisfaction of Railway's Division Engineer or until additional insurance has been delivered to and accepted by Railway. In the event of a breach of (i) this Agreement, (ii) the Temporary Construction License, or (iii) the Easement, Railway may immediately terminate the Temporary Construction License or the Easement. Any such work stoppage under this provision will not give rise to any liability on the part of Railway. Railway's right to stop the work is in addition to any other rights Railway may have including, but not limited to, actions or suits for damages or lost profits. In the event that Railway desires to stop construction work on the Project, Railway agrees to immediately notify the following individual in writing:

SANBAG Director of Freeway Construction
1170 W. 3rd Street, 2nd Floor
San Bernardino, CA 92410
Fax: (909) 388-2002.

1.01.05 The Contractor is responsible for determining and complying with all Federal, State and Local Governmental laws and regulations, including, but not limited to environmental laws and regulations (including but not limited to the Resource Conservation and Recovery Act, as amended; the Clean Water Act, the Oil Pollution Act, the Hazardous Materials Transportation Act, CERCLA), and health and safety laws and regulations. The Contractor hereby indemnifies, defends and holds harmless Railway for, from and against all fines or penalties imposed or assessed by Federal, State and Local Governmental Agencies against the Railway which arise out of Contractor's work under this Agreement.

1.01.06 The Contractor must notify the Director of Freeway Construction, **SAN BERNARDINO ASSOCIATED GOVERNMENTS**, hereinafter referred to as ("**SANBAG**") at 1170 W. 3rd Street, 2nd. Floor, San Bernardino, CA. 92410, Fax No. (909) 388 2002 and Railway's Manager Public Projects, telephone number (909)-386-4472 at least thirty (30) calendar days before commencing any work on Railway Property. Contractor's notification to Railway, must refer to Railroad's file No. 027860A.

1.01.07 For any bridge demolition and/or falsework above any tracks or any excavations located with any part of the excavations located within, whichever is greater, twenty-five (25) feet of the nearest track or intersecting a slope from the plane of the top of rail on a 2 horizontal to 1 vertical slope beginning at eleven (11) feet from centerline of the nearest track, both measured perpendicular to center line of track, the Contractor must furnish the Railway five sets of working drawings showing details of construction affecting Railway Property and tracks. The working drawing must include the proposed method of installation and removal of falsework, shoring or cribbing, not included in the contract plans and two sets of structural calculations of any falsework, shoring or cribbing. For all excavation and shoring submittal plans, the current "BNSF-UPRR Guidelines for Temporary Shoring" must be used for determining the design loading conditions to be used in shoring design, and all calculations and submittals must be in accordance with the current "BNSF-UPRR Guidelines for Temporary Shoring". All submittal drawings and calculations must be stamped by a registered professional engineer licensed to practice in the state the project is located. All calculations must take into consideration railway surcharge loading and must be designed to meet American Railway Engineering and Maintenance-of-Way Association (previously known as American Railway Engineering Association) Coopers E-80 live loading standard. All drawings and calculations must be stamped by a registered professional engineer licensed to practice in the state the project is located. The Contractor must not begin work until notified by the Railway that plans have been approved. The Contractor will be required to use lifting devices such as, cranes and/or winches to place or to remove any falsework over Railway's tracks. In no case will the Contractor be relieved of responsibility for results obtained by the implementation of said approved plans.

1.01.08 Subject to the movement of Railway's trains, Railway will cooperate with the Contractor such that the work may be handled and performed in an efficient manner. The Contractor will have no claim whatsoever for any type of damages or for extra or additional compensation in the event his work is delayed by the Railway.

1.02 Contractor Safety Orientation

1.02.01 No employee of the Contractor, its subcontractors, agents or invitees may enter Railway Property without first having completed Railway's Engineering Contractor Safety Orientation, found on the web site www.contractororientation.com. The Contractor must ensure that each of its employees, subcontractors, agents or invitees completes Railway's Engineering Contractor Safety Orientation through internet sessions before any work is performed on the Project. Additionally, the Contractor must ensure that each and every one of its employees, subcontractors, agents or invitees possesses a card certifying completion of the Railway Contractor Safety Orientation before entering Railway Property. The Contractor is responsible for the cost of the Railway Contractor Safety Orientation. The Contractor must renew the Railway Contractor Safety Orientation annually. Further clarification can be found on the web site or from the Railway's Representative.

1.03 Railway Requirements

1.03.01 The Contractor must take protective measures as are necessary to keep railway facilities, including track ballast, free of sand, debris, and other foreign objects and materials resulting from his operations. Any damage to railway facilities resulting from Contractor's operations will be repaired or replaced by Railway and the cost of such repairs or replacement must be paid for by SANBAG.

1.03.02 Blasting shall not be allowed on or adjacent to Railway property and/or right of way unless approved by the Railway.

1.03.03 The Contractor must abide by the following temporary clearances during construction:

- 15'-0" Horizontally from centerline of nearest track
- 21'-6" Vertically above top of rail
- 27'-0" Vertically above top of rail for electric wires carrying less than 750 volts
- 28'-0" Vertically above top of rail for electric wires carrying 750 volts to 15,000 volts
- 30'-0" Vertically above top of rail for electric wires carrying 15,000 volts to 20,000 volts
- 34'-0" Vertically above top of rail for electric wires carrying more than 20,000 volts

1.03.04 Upon completion of construction, the following clearances shall be maintained:

- 29.4' Horizontally from centerline of nearest track for Cajon Blvd previously constructed.
- 29.5' Horizontally from centerline of nearest track for Connector Bridge Structures.
- 23.9' Vertically above top of rail for Cajon Blvd previously constructed.
- 27.0' Vertically above top of rail for Connector Bridge Structures.

1.03.05 Any infringement within State statutory clearances due to the Contractor's operations must be submitted to the Railway and to SANBAG and must not be undertaken until approved in writing by the Railway, and until SANBAG has obtained any necessary authorization from the State Regulatory Authority for the infringement. No extra compensation will be allowed in the event the Contractor's work is delayed pending Railway approval, and/or the State Regulatory Authority's approval.

1.03.06 In the case of impaired vertical clearance above top of rail, Railway will have the option of installing tell-tales or other protective devices Railway deems necessary for protection of Railway operations. The cost of tell-tales or protective devices will be borne by SANBAG.

1.03.07 The details of construction affecting the Railway's Property and tracks not included in the contract plans must be submitted to the Railway by SANBAG for approval before work is undertaken and this work must not be undertaken until approved by the Railway.

1.03.08 At other than public road crossings, the Contractor must not move any equipment or materials across Railway's tracks until permission has been obtained from the Railway. The Contractor must obtain a "Temporary Construction Crossing Agreement" from the Railway prior to moving his equipment or materials across the Railways tracks. The temporary crossing must be gated and locked at all times when not required for use by the Contractor. The temporary crossing for use of the Contractor will be constructed and at the completion of the project, removed at the expense of the Contractor.

1.03.09 Discharge, release or spill on the Railway Property of any hazardous substances, oil, petroleum, constituents, pollutants, contaminants, or any hazardous waste is prohibited and Contractor must immediately notify the Railway's Resource Operations Center at 1(800) 832-5452, of any discharge, release or spills in excess of a reportable quantity. Contractor must not allow Railway Property to become a treatment, storage or transfer facility as those terms are defined in the Resource Conservation and Recovery Act or any state analogue.

1.03.10 The Contractor upon completion of the work covered by this contract, must promptly remove from the Railway's Property all of Contractor's tools, equipment, implements and other materials, whether brought upon said property by said Contractor or any Subcontractor, employee or agent of Contractor or of any Subcontractor, and must cause Railway's Property to be left in a condition acceptable to the Railway's representative.

1.04 Contractor Roadway Worker on Track Safety Program and Safety Action Plan

1.04.01 Each Contractor that will perform work within 25 feet of the centerline of a track must develop and implement a Roadway Worker Protection/On Track Safety Program and work with Railway Project Representative to develop an on track safety strategy as described in the guidelines listed in the on track safety portion of the Safety Orientation. This Program must provide Roadway Worker protection/on track training for all employees of the Contractor, its subcontractors, agents or invitees. This training is reinforced at the job site through job safety briefings. Additionally, each Contractor must develop and implement the Safety Action Plan, as provided for on the web site www.contractororientation.com, which will be made available to Railway prior to commencement of any work on Railway Property. During the performance of work, the Contractor must audit its work activities. The Contractor must designate an on-site Project Supervisor who will serve as the contact person for the Railway and who will maintain a copy of the Safety Action Plan, safety audits, and Material Safety Datasheets (MSDS), at the job site.

1.04.02 Contractor shall have a background investigation performed on all of its employees, subcontractors and agents who will be performing any services on railroad property under this Agreement.

The background screening shall at a minimum meet the criteria defined by the e-RAILSAFE program outlined at <http://www.e-railsafe.com> in addition to any other applicable regulatory requirements. The e-RAILSAFE program uses rail industry background screening standards.

Contractor shall obtain consent from all employees screened in compliance with the e-RAILSAFE program criteria to release completed background information to BNSF. Contractor shall be subject to periodic audit to ensure compliance.

Contractor shall not permit any of its employees, subcontractors or agents to perform services on property hereunder who are not approved under e-RAILSAFE program standards. Railroad shall have the right to deny entry onto its premises to any of Contractor's employees, subcontractors or agents who do not display the authorized identification badge issued by a background screening service meeting the standards set forth for the e-RAILSAFE program or who pose a threat, in Railroad's reasonable opinion, to the safety or security of Railroad's operations.

Contractors shall ensure its employees, subcontractors and agents are United States citizens or legally working in this country under a work VISA.

1.05 Facilities and Railway Flagger Services:

1.05.01 The Contractor must give Railway's Roadmaster (telephone 909 386 4061) a minimum of thirty (30) calendar days advance notice when flagging services will be required so that the Roadmaster can make appropriate arrangements (i.e., bulletin the flagger's position). If flagging services are scheduled in advance by the Contractor and it is subsequently determined by the parties hereto that such services are no longer necessary, the Contractor must give the Roadmaster five (5) working days advance notice so that appropriate arrangements can be made to abolish the position pursuant to union requirements.

1.05.02 Unless determined otherwise by Railway's Project Representative, Railway flagger will be required and furnished when Contractor's work activities are located over, under and/or within twenty-five (25) feet measured horizontally from centerline of the nearest track and when cranes or similar equipment positioned beyond 25-feet from the track centerline could foul the track in the event of tip over or other catastrophic occurrence, but not limited thereto for the following conditions:

1.05.02a When upon inspection by Railway's Representative, other conditions warrant.

1.05.02b When any excavation is performed below the bottom of tie elevation, if, in the opinion of Railway's representative, track or other Railway facilities may be subject to movement or settlement.

1.05.02c When work in any way interferes with the safe operation of trains at timetable speeds.

1.05.02d When any hazard is presented to Railway track, communications, signal, electrical, or other facilities either due to persons, material, equipment or blasting in the vicinity.

1.05.02e Special permission must be obtained from the Railway before moving heavy or cumbersome objects or equipment which might result in making the track impassable.

1.05.03 Flagging services will be performed by qualified Railway flaggers.

1.05.03a Flagging crew generally consists of one employee. However, additional personnel may be required to protect Railway Property and operations, if deemed necessary by the Railways Representative.

1.05.03b Each time a flagger is called, the minimum period for billing will be the eight (8) hour basic day.

1.05.03c The cost of flagger services provided by the Railway will be borne by SANBAG. The estimated cost for one (1) flagger is approximately between \$800.00 - \$1600.00 for an eight (8) hour basic day with time and one-half or double time for overtime, rest days and holidays. The estimated cost for each flagger includes vacation allowance, paid holidays, Railway and unemployment insurance, public liability and property damage insurance, health and welfare benefits, vehicle transportation, meals, lodging, radio equipment, supervision and other costs incidental to performing flagging services. Negotiations for Railway labor or collective bargaining agreements and rate changes authorized by appropriate Federal authorities may increase actual or estimated flagging rates. The flagging rate in effect at the time of performance by the Contractor hereunder will be used to calculate the actual costs of flagging pursuant to this paragraph.

1.05.03d The average train traffic on this route is 79 freight trains and 2 passenger trains per 24-hour period. Train timetable speeds are:

Westward: 50 MPH Passenger, 35 MPH Freight
Eastward: 60 MPH Passenger, 55 MPH Freight

1.06 Contractor General Safety Requirements

1.06.01 Work in the proximity of railway track(s) is potentially hazardous where movement of trains and equipment can occur at any time and in any direction. All work performed by contractors within 25 feet of any track must be in compliance with FRA Roadway Worker Protection Regulations.

1.06.02 Before beginning any task on Railway Property, a thorough job safety briefing must be conducted with all personnel involved with the task and repeated when the personnel or task changes. If the task is within 25 feet of any track, the job briefing must include the Railway's flagger, as applicable, and include the procedures the Contractor will use to protect its employees, subcontractors, agents or invitees from moving any equipment adjacent to or across any Railway track(s).

1.06.03 Workers must not work within 25 feet of the centerline of any track without an on track safety strategy approved by the Railway's Project Representative. When authority is provided, every contractor employee must know: (1) who the Railway flagger is, and how to contact the flagger, (2) limits of the authority, (3) the method of communication to stop and resume work, and (4) location of the designated places of safety. Persons or equipment entering flag/work limits that were not previously job briefed, must notify the flagger immediately, and be given a job briefing when working within 25 feet of the center line of track.

1.06.04 When Contractor employees are required to work on the Railway Property after normal working hours or on weekends, the Railroad's representative in charge of the project must be notified. A minimum of two employees must be present at all times.

1.06.05 Any employees, agents or invitees of Contractor or its subcontractors under suspicion of being under the influence of drugs or alcohol, or in the possession of same, will be removed from the Railway's Property and subsequently released to the custody of a representative of Contractor management. Future access to the Railway's Property by that employee will be denied.

1.06.06 Any damage to Railway Property, or any hazard noticed on passing trains must be reported immediately to the Railway's representative in charge of the project. Any vehicle or machine which may come in contact with track, signal equipment, or structure (bridge) and could result in a train derailment must be reported immediately to the Railway representative in charge of the project and to the Railway's Resource Operations Center at 1(800) 832-5452. Local emergency numbers are to be obtained from the Railway representative in charge of the project prior to the start of any work and must be posted at the job site.

1.06.07 For safety reasons, all persons are prohibited from having pocket knives, firearms or other deadly weapons in their possession while working on Railway's Property.

1.06.08 All personnel protective equipment (PPE) used on Railway Property must meet applicable OSHA and ANSI specifications. Current Railway personnel protective equipment requirements are listed on the web site, **www.contractororientation.com**, however, a partial list of the requirements include: a) safety glasses with permanently affixed side shields (no yellow lenses); b) hard hats c) safety shoe with: hardened toes, above-the-ankle lace-up and a defined heel; and d) high visibility retro-reflective work wear. The Railroad's representative in charge of the project is to be contacted regarding local specifications for meeting requirements relating to hi-visibility work wear. Hearing protection, fall protection, gloves, and respirators must be worn as required by State and Federal regulations. **(NOTE – Should there be a discrepancy between the information contained on the web site and the information in this paragraph, the web site will govern.)**

1.06.09 THE CONTRACTOR MUST NOT PILE OR STORE ANY MATERIALS, MACHINERY OR EQUIPMENT CLOSER THAN 25'-0" TO THE CENTER LINE OF THE NEAREST RAILWAY TRACK. MATERIALS, MACHINERY OR EQUIPMENT MUST NOT BE STORED OR LEFT WITHIN 250 FEET OF ANY HIGHWAY/RAIL AT-GRADE CROSSINGS OR TEMPORARY CONSTRUCTION CROSSING, WHERE STORAGE OF THE SAME WILL OBSTRUCT THE VIEW OF A TRAIN APPROACHING THE CROSSING. PRIOR TO BEGINNING WORK, THE CONTRACTOR MUST ESTABLISH A STORAGE AREA WITH CONCURRENCE OF THE RAILROAD'S REPRESENTATIVE.

1.06.10 Machines or vehicles must not be left unattended with the engine running. Parked machines or equipment must be in gear with brakes set and if equipped with blade, pan or bucket, they must be lowered to the ground. All machinery and equipment left unattended on Railway's Property must be left inoperable and secured against movement. (See internet Engineering Contractor Safety Orientation program for more detailed specifications)

1.06.11 Workers must not create and leave any conditions at the work site that would interfere with water drainage. Any work performed over water must meet all Federal, State and Local regulations.

1.06.12 All power line wires must be considered dangerous and of high voltage unless informed to the contrary by proper authority. For all power lines the minimum clearance between the lines and any part of the equipment or load must be; 200 KV or below - 15 feet; 200 to 350 KV - 20 feet; 350 to 500 KV - 25 feet; 500 to 750 KV - 35 feet; and 750 to 1000 KV - 45 feet. If capacity of the line is not known, a minimum clearance of 45 feet must be maintained. A person must be designated to observe clearance of the equipment and give a timely warning for all operations where it is difficult for an operator to maintain the desired clearance by visual means.

1.07 Excavation

1.07.01 Before excavating, the Contractor must determine whether any underground pipe lines, electric wires, or cables, including fiber optic cable systems are present and located within the Project work area. The Contractor must determine whether excavation on Railway's Property could cause damage to buried cables resulting in delay to Railway traffic and disruption of service to users. Delays and disruptions to service may cause business interruptions involving loss of revenue and profits. Before commencing excavation, the Contractor must contact **BNSF's Field Engineering Representative (909 386 4079)**. All underground and overhead wires will be considered HIGH VOLTAGE and dangerous until verified with the company having ownership of the line. **It is the Contractor's responsibility to notify any other companies that have underground utilities in the area and arrange for the location of all underground utilities before excavating.**

1.07.02 The Contractor must cease all work and notify the Railway immediately before continuing excavation in the area if obstructions are encountered which do not appear on drawings. If the obstruction is a utility and the owner of the utility can be identified, then the Contractor must also notify the owner immediately. If there is any doubt about the location of underground cables or lines of any kind, no work must be performed until the exact location has been determined. There will be no exceptions to these instructions.

1.07.03 All excavations must be conducted in compliance with applicable OSHA regulations and, regardless of depth, must be shored where there is any danger to tracks, structures or personnel.

1.07.04 Any excavations, holes or trenches on the Railway's Property must be covered, guarded and/or protected when not being worked on. When leaving work site areas at night and over weekends, the areas must be secured and left in a condition that will ensure that Railway employees and other personnel who may be working or passing through the area are protected from all hazards. All excavations must be back filled as soon as possible.

1.08 Hazardous Waste, Substances and Material Reporting

1.08.01 If Contractor discovers any hazardous waste, hazardous substance, petroleum or other deleterious material, including but not limited to any non-containerized commodity or material, on or adjacent to Railway's Property, in or near any surface water, swamp, wetlands or waterways, while performing any work under this Agreement, Contractor must immediately: (a) notify the Railway's Resource Operations Center at 1(800) 832-5452, of such discovery: (b) take safeguards necessary to protect its employees, subcontractors, agents and/or third parties: and (c) exercise due care with respect to the release, including the taking of any appropriate measure to minimize the impact of such release.

1.09 Personal Injury Reporting

1.09.01 The Railway is required to report certain injuries as a part of compliance with Federal Railroad Administration (FRA) reporting requirements. Any personal injury sustained by an employee of the Contractor, subcontractor or Contractor's invitees while on the Railway's Property must be reported immediately (by phone mail if unable to contact in person) to the Railway's representative in charge of the project. The Non-Employee Personal Injury Data Collection Form contained herein is to be completed and sent by Fax to the Railway at 1(817) 352-7595 and to the Railway's Project Representative no later than the close of shift on the date of the injury.

NON-EMPLOYEE PERSONAL INJURY DATA COLLECTION

INFORMATION REQUIRED TO BE COLLECTED PURSUANT TO FEDERAL REGULATION. IT SHOULD BE USED FOR COMPLIANCE WITH FEDERAL REGULATIONS ONLY AND IS NOT INTENDED TO PRESUME ACCEPTANCE OF RESPONSIBILITY OR LIABILITY.

1. Accident City/St _____ 2. Date: _____ Time: _____
County: _____ 3. Temperature: _____ 4. Weather _____
(if non-Railway location)

5. Social Security # _____

6. Name (last, first, mi) _____

7. Address: Street: _____ City: _____ St. _____ Zip: _____

8. Date of Birth: _____ and/or Age _____ Gender: _____
(if available)

9. (a) Injury: _____ (b) Body Part: _____
(i.e. (a) Laceration (b) Hand)

11. Description of Accident (To include location, action, result, etc.):

12. Treatment:
First Aid Only
Required Medical Treatment
Other Medical Treatment

13. Dr. Name _____ 30. Date: _____

14. Dr. Address:
Street: _____ City: _____ St: _____ Zip: _____

15. Hospital Name: _____

16. Hospital Address:
Street: _____ City: _____ St: _____ Zip: _____

17. Diagnosis: _____

**FAX TO
RAILWAY AT (817) 352-7595
AND COPY TO
RAILWAY ROADMASTER FAX 909-386-4843**

**OVERHEAD EXHIBIT "C -1"
Cajon Boulevard Overhead**

**Agreement
Between
BNSF RAILWAY COMPANY
and the
CONTRACTOR**

**BNSF RAILWAY COMPANY
Attention: Manager Public Projects**

**Railway File: 027860A
Agency Project: Cajon Boulevard. Overhead Connectors**

Gentlemen:

The undersigned (hereinafter called, the "Contractor"), has entered into a contract (the "Contract") dated _____, 200__, with **SAN BERNARDINO ASSOCIATED GOVERNMENTS** for the performance of certain work in connection with the following project: construct the Cajon Boulevard Overhead Connectors, in San Bernardino, CA. Performance of such work will necessarily require contractor to enter BNSF RAILWAY COMPANY ("Railway") right of way and property ("Railway Property"). The Contract provides that no work will be commenced within Railway Property until the Contractor employed in connection with said work for **SAN BERNARDINO ASSOCIATED GOVERNMENTS** (i) executes and delivers to Railway an Agreement in the form hereof, and (ii) provides insurance of the coverage and limits specified in such Agreement and Section 3 herein. If this Agreement is executed by a party who is not the Owner, General Partner, President or Vice President of Contractor, Contractor must furnish evidence to Railway certifying that the signatory is empowered to execute this Agreement on behalf of Contractor.

Accordingly, in consideration of Railway granting permission to Contractor to enter upon Railway Property and as an inducement for such entry, Contractor, effective on the date of the Contract, has agreed and does hereby agree with Railway as follows:

Section 1. RELEASE OF LIABILITY AND INDEMNITY

Contractor hereby waives, releases, indemnifies, defends and holds harmless Railway for all judgments, awards, claims, demands, and expenses (including attorneys' fees), for injury or death to all persons, including Railway's and Contractor's officers and employees, and for loss and damage to property belonging to any person, arising in any manner from Contractor's or any of Contractor's subcontractors' acts or omissions or any work performed on or about Railway's property or right-of-way. **THE LIABILITY ASSUMED BY CONTRACTOR WILL NOT BE AFFECTED BY THE FACT, IF IT IS A FACT, THAT THE DESTRUCTION, DAMAGE, DEATH, OR INJURY WAS OCCASIONED BY OR CONTRIBUTED TO BY THE NEGLIGENCE OF RAILWAY, ITS AGENTS, SERVANTS, EMPLOYEES OR OTHERWISE, EXCEPT TO THE EXTENT THAT SUCH CLAIMS ARE PROXIMATELY CAUSED BY THE WILLFUL MISCONDUCT OR SOLE NEGLIGENCE OF RAILWAY.**

THE INDEMNIFICATION OBLIGATION ASSUMED BY CONTRACTOR INCLUDES ANY CLAIMS, SUITS OR JUDGMENTS BROUGHT AGAINST RAILWAY UNDER THE FEDERAL EMPLOYEE'S LIABILITY ACT, INCLUDING CLAIMS FOR STRICT LIABILITY UNDER THE SAFETY APPLIANCE ACT OR THE LOCOMOTIVE INSPECTION ACT, WHENEVER SO CLAIMED.

Contractor further agrees, at its expense, in the name and on behalf of Railway, that it will adjust and settle all claims made against Railway, and will, at Railway's discretion, appear and defend any suits or actions of law or in equity brought against Railway on any claim or cause of action arising or growing out of or in any manner connected with any liability assumed by Contractor under this Agreement for which Railway is liable or is alleged to be liable. Railway will give notice to Contractor, in writing, of the receipt or dependency of such claims and thereupon Contractor must proceed to adjust and handle to a conclusion such claims, and in the event of a suit being brought against Railway, Railway may forward summons and complaint or other process in connection therewith to Contractor, and Contractor, at Railway's discretion, must defend, adjust, or settle such suits and protect, indemnify, and save harmless Railway from and against all damages, judgments, decrees, attorney's fees, costs, and expenses growing out of or resulting from or incident to any such claims or suits.

In addition to any other provision of this Agreement, in the event that all or any portion of this Article shall be deemed to be inapplicable for any reason, including without limitation as a result of a decision of an applicable court, legislative enactment or regulatory order, the parties agree that this Article shall be interpreted as requiring Contractor to indemnify Railroad to the fullest extent permitted by applicable law. **THROUGH THIS AGREEMENT THE PARTIES EXPRESSLY INTEND FOR CONTRACTOR TO INDEMNIFY RAILROAD FOR RAILROAD'S ACTS OF NEGLIGENCE.**

It is mutually understood and agreed that the assumption of liabilities and indemnification provided for in this Agreement survive any termination of this Agreement.

Section 2. TERM

This Agreement is effective from the date of the Contract until (i) the completion of the project set forth herein, and (ii) full and complete payment to Railway of any and all sums or other amounts owing and due hereunder.

Section 3. INSURANCE

Contractor must, at its sole cost and expense, procure and maintain during the life of this Agreement the following insurance coverage:

A. Commercial General Liability insurance. This insurance must contain broad form contractual liability with a combined single limit of a minimum of \$5,000,000 each occurrence and an aggregate limit of at least \$10,000,000. Coverage must be purchased on a post 1998 ISO occurrence form or equivalent and include coverage for, but not limit to the following:

- Bodily Injury and Property Damage
- Personal Injury and Advertising Injury
- Fire legal liability
- Products and completed operations

This policy must also contain the following endorsements, which must be indicated on the certificate of insurance:

It is agreed that any workers' compensation exclusion does not apply to **Railroad** payments related to the Federal Employers Liability Act or a **Railroad** Wage Continuation Program or similar programs and any payments made are deemed not to be either payments made or obligations assumed under any Workers Compensation, disability benefits, or unemployment compensation law or similar law.

The definition of insured contract must be amended to remove any exclusion or other limitation for any work being done within 50 feet of railroad property.

Any exclusions related to the explosion, collapse and underground hazards must be removed.

No other endorsements limiting coverage as respects obligations under this Agreement may be included on the policy.

B. Business Automobile Insurance. This insurance must contain a combined single limit of at least \$1,000,000 per occurrence, and include coverage for, but not limited to the following:

- Bodily injury and property damage
- Any and all vehicles owned, used or hired

C. Workers Compensation and Employers Liability insurance including coverage for, but not limited to:

California's statutory liability under the worker's compensation laws of the state(s) in which the work is to be performed. If optional under State law, the insurance must cover all employees anyway.

Employers' Liability (Part B) with limits of at least \$500,000 each accident, \$500,000 by disease policy limit, \$500,000 by disease each employee.

D. Railroad Protective Liability insurance naming only the **Railroad** as the Insured with coverage of at least \$5,000,000 per occurrence and \$10,000,000 in the aggregate. The policy Must be issued on a standard ISO form CG 00 35 10 93 and include the following:

Endorsed to include the Pollution Exclusion Amendment (ISO form CG 28 31 10 93)

Endorsed to include the Limited Seepage and Pollution Endorsement.

Endorsed to remove any exclusion for punitive damages.

No other endorsements restricting coverage may be added.

The original policy must be provided to the **Railroad** prior to performing any work or services under this Agreement

Other Requirements:

All policies (applying to coverage listed above) must not contain an exclusion for punitive damages and certificates of insurance must reflect that no exclusion exists.

Contractor agrees to waive its right of recovery against **Railroad** for all claims and suits against **Railroad**. In addition, its insurers, through the terms of the policy or policy endorsement, waive their right of subrogation against **Railroad** for all claims and suits. The certificate of insurance must reflect the waiver of subrogation endorsement. Contractor further waives its right of recovery, and its insurers also waive their right of subrogation against **Railroad** for loss of its owned or leased property or property under contractor's care, custody or control.

Contractor's insurance policies through policy endorsement, must include wording which states that the policy is primary and non-contributing with respect to any insurance carried by **Railroad**. The certificate of insurance must reflect that the above wording is included in evidenced policies.

All policy(ies) required above (excluding Workers Compensation and if applicable, Railroad Protective) must include a severability of interest endorsement and **Railroad** must be named as an additional insured with respect to work performed under this agreement. Severability of interest and naming **Railroad** as additional insured must be indicated on the certificate of insurance.

Contractor is not allowed to self-insure without the prior written consent of **Railroad**. If granted by **Railroad**, any deductible, self-insured retention or other financial responsibility for claims must be covered directly by contractor in lieu of insurance. Any and all **Railroad** liabilities that would otherwise, in accordance with the provisions of this **Agreement**, be covered by contractor's insurance will be covered as if contractor elected not to include a deductible, self-insured retention or other financial responsibility for claims.

Prior to commencing the Work, contractor must furnish to **Railroad** an acceptable certificate(s) of insurance including an original signature of the authorized representative evidencing the required coverage, endorsements, and amendments and referencing the contract audit/folder number if available. The policy(ies) must contain a provision that obligates the insurance company(ies) issuing such policy(ies) to notify **Railroad** in writing at least 30 days prior to any cancellation, non-renewal, substitution or material alteration. This cancellation provision must be indicated on the certificate of insurance. Upon request from **Railroad**, a certified duplicate original of any required policy must be furnished. Contractor should send the certificate(s) to the following address:

IDS
PO Box 12010-BN
Hemet, CA 92546-8010
Fax number: 951-766-2299
Email: customerservice@certsonline.com

Any insurance policy must be written by a reputable insurance company acceptable to **Railroad** or with a current Best's Guide Rating of A- and Class VII or better, and authorized to do business in the state(s) in which the service is to be provide.

Contractor represents that this **Agreement** has been thoroughly reviewed by contractor's insurance agent(s)/broker(s), who have been instructed by contractor to procure the insurance coverage required by this **Agreement**. Allocated Loss Expense must be in addition to all policy limits for coverages referenced above.

Not more frequently than once every five years, **Railroad** may reasonably modify the required insurance coverage to reflect then-current risk management practices in the railroad industry and underwriting practices in the insurance industry.

If any portion of the operation is to be subcontracted by contractor, contractor must require that the subcontractor provide and maintain the insurance coverages set forth herein, naming **Railroad** as an additional insured, and requiring that the subcontractor release, defend and indemnify **Railroad** to the same extent and under the same terms and conditions as contractor is required to release, defend and indemnify **Railroad** herein.

Failure to provide evidence as required by this section will entitle, but not require, **Railroad** to terminate this **Agreement** immediately. Acceptance of a certificate that does not comply with this section will not operate as a waiver of contractor's obligations hereunder.

The fact that insurance (including, without limitation, self-insurance) is obtained by contractor will not be deemed to release or diminish the liability of contractor including, without limitation, liability under the indemnity provisions of this **Agreement**. Damages recoverable by **Railroad** will not be limited by the amount of the required insurance coverage.

For purposes of this section, **Railroad** means "Burlington Northern Santa Fe Corporation", "BNSF RAILWAY COMPANY" and the subsidiaries, successors, assigns and affiliates of each.

Section 4. EXHIBIT "C" CONTRACTOR REQUIREMENTS

The Contractor must observe and comply with the provisions, obligations, requirements and limitations contained in the Contract and the Contractor Requirements set forth on Exhibit "C" attached to the Contract and this Agreement, including, but not be limited to, payment of all costs incurred for any damages to Railway roadbed, tracks, and/or appurtenances thereto, resulting from use, occupancy, or presence of its employees, representatives, or agents or subcontractors on or about the construction site.

Section 5. TRAIN DELAY

Contractor is responsible for and hereby indemnifies and holds harmless Railway (including its affiliated railway companies, and its tenants) for, from and against all damages arising from any unscheduled delay to a freight or passenger train which affects Railway's ability to fully utilize its equipment and to meet customer service and contract obligations. Contractor will be billed, as further provided below, for the economic losses arising from loss of use of equipment, contractual loss of incentive pay and bonuses and contractual penalties resulting from train delays, whether caused by Contractor, or subcontractors, or by the Railway performing work under this Agreement. Railway agrees that it will not perform any act to unnecessarily cause train delay.

For loss of use of equipment, Contractor will be billed the current freight train hour rate per train as determined from Railway's records. Any disruption to train traffic may cause delays to multiple trains at the same time for the same period.

Additionally, the parties acknowledge that passenger, U.S. mail trains and certain other grain, intermodal, coal and freight trains operate under incentive/penalty contracts between Railway and its customer(s). Under these arrangements, if Railway does not meet its contract service commitments, Railway may suffer loss of performance or incentive pay and/or be subject to penalty payments. Contractor is responsible for any train performance and incentive penalties or other contractual economic losses actually incurred by Railway which are attributable to a train delay caused by Contractor or its subcontractors.

The contractual relationship between Railway and its customers is proprietary and confidential. In the event of a train delay covered by this Agreement, Railway will share information relevant to any train delay to the extent consistent with Railway confidentiality obligations. Damages for train delay for certain trains may be as high as \$50,000.00 (\$382.20 per hour) per incident. **THE RATE THEN IN EFFECT AT THE TIME OF PERFORMANCE BY THE CONTRACTOR HEREUNDER WILL BE USED TO CALCULATE THE ACTUAL COSTS OF TRAIN DELAY PURSUANT TO THIS AGREEMENT.**

Contractor and its subcontractors must give Railway's representative 909 386 4079 eight (8) weeks advance notice of the times and dates for proposed work windows. Railway and Contractor will establish mutually agreeable work windows for the project. Railway has the right at any time to revise or change the work windows due to train operations or service obligations. Railway will not be responsible for any additional costs or expenses resulting from a change in work windows. Additional costs or expenses resulting from a change in work windows shall be accounted for in Contractor's expenses for the project.

Contractor and subcontractors must plan, schedule, coordinate and conduct all Contractor's work so as to not cause any delays to any trains.

Kindly acknowledge receipt of this letter by signing and returning to the Railway two original copies of this letter, which, upon execution by Railway, will constitute an Agreement between us.

(Contractor)

BNSF Railway Company

By: _____
Printed Name: _____
Title: _____

By: _____
Name: Melvin Thomas
Manager Public Projects

Contact Person: _____

Accepted and effective this _____ day of 20____.

Address _____

City: _____ State: ___ Zip: _____

Fax: _____

Phone: _____

E-mail: _____

Exhibit F
Cajon Boulevard Overhead

BNSF Bridge Requirements

BRIDGE DESIGN, PLANS & SPECIFICATIONS:

Except for the design of temporary falsework and shoring, BNSF review of the Structure plans will be limited to the vertical and horizontal clearances, sight distance for existing train signals, foundation dimensions and drainage characteristics as they relate to existing and future tracks. BNSF will not review structural design calculations for the permanent Structure unless a member or members are influenced by railroad live loads.

Temporary falsework and shoring plans and calculations must be reviewed and approved by BNSF prior to beginning construction. SANBAG shall perform an independent review of the design calculations for temporary falsework and shoring prior to submitting them to BNSF for approval. Temporary construction clearances must be no less than 15 feet measured horizontally from the centerline of the nearest track and 21 feet-6inches measured vertically from the top of rail of the most elevated track to the bottom of lowest temporary falsework member. State regulatory agencies may have more restrictive requirements for temporary railroad clearances.

For the permanent Structure, SANBAG will submit plans showing the least horizontal distance from the centerline of existing and future tracks to the face of the nearest member of the proposed Structure. The location of the least horizontal distance must be accurately described such that BNSF can determine where it will occur in both the horizontal and vertical plane. The general policy of the Burlington Northern and Santa Fe (BNSF) with regard to bridge and related crash wall construction is to follow the current recommendations of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Current AREMA recommended practice in Manual for Railway Engineering Chapter 8 (Art. 2.1.5.1). Crash Walls will not be required for the construction of the Cajon Boulevard Connectors Overpass Project, U.S. D.O.T. No. 027860A, as provided for in Article I of this Agreement.

For the permanent Structure, SANBAG will submit plans showing the least vertical clearance from top of the most elevated rail of existing and future tracks to the lowest point of the proposed Structure. Prior to beginning construction of the permanent Structure, the top of rail elevations should be checked and verified that they have not changed from the assumed elevations utilized for the design of the bridge.

Prior to issuing any invitation to bid on construction of the Structure, SANBAG should conduct a pre-bid meeting where prospective Contractors have the opportunity to communicate with BNSF personnel regarding site specific train speeds, train density, and general safety requirements for men and equipment working near live tracks. Any invitation to bid and specifications for the Structure must be submitted to BNSF for review and approval prior to letting of bids for the Project.

BRIDGE CONSTRUCTION:

After awarding the bid, but prior to the Contractor entering BNSF's railroad corridor or property, SANBAG should conduct a pre-construction meeting with BNSF personnel in attendance to reiterate the safety requirements of construction activity adjacent to live tracks.

During construction, BNSF may require an independent engineering inspector to be present during certain critical activities of the Project, including but not limited to: driving foundation piles, erecting falsework, construction of shoring and retaining walls, placing concrete, placing soil backfill and compaction processes. SANBAG shall reimburse BNSF for all costs of supplemental inspection services.

Within 90 days of the conclusion of the Project and final acceptance by BNSF, SANBAG will provide BNSF with a complete electronic set of the bridge plans. BNSF will also accept a marked up paper copy of the bridge plans labeled "As Built". The marked up paper copy of the plans will reflect any and all deviations from the original plans that occurred during construction. The electronic set of the bridge plans will be submitted in Micro Station *.dgn electronic format (preferred) or AutoCAD *.dwg format. Electronic plans are to be submitted in the original format used for CAD plan preparation and not converted to another format prior to submission. The "As Built" plans shall show actual measured "as constructed" clearances shall be shown as well as depth, size and location of all foundation components. The plans shall show dimensioned locations of existing and relocated utilities. It is understood that BNSF prefers to receive the "As Built" plans in an electronic format.

BRIDGE MAINTENANCE:

STATE will be responsible for maintenance and repair of the Structure including the earth retention components, embankment slopes, erosion control, surface drainage, fencing, deck drains, landscaping, paint, walkways, handrails, lighting, and other improvements associated with the Project.

Fencing and other pedestrian access controls within BNSF's rail corridor and incorporated into the Project shall be designed and maintained by SANBAG through construction. Trespasser control shall be the responsibility of SANBAG through construction. Graffiti removal will be the responsibility of STATE.

BRIDGE INSPECTION:

STATE will conduct annual routine structural inspections. In the event of an earthquake, fire, flood, damage from vehicular impacts or other emergent situations, STATE will provide an immediate inspection by qualified personnel and notify BNSF of damage that may affect safe passage of trains. If necessary STATE will embargo weights or provide lane closures or other such measures to protect the structural integrity of the Structure such that there can be continuous safe passage of trains until repairs are made.

BRIDGE ALTERATIONS:

Except as provided otherwise by this Agreement, there will be no alterations made to the Structure that will alter the railroad vertical or horizontal clearances provided by the original design

It is expressly understood by STATE that the right to install utilities is restricted to the placement of underground utilities beneath BNSF's tracks located a minimum of fifty (50) feet from abutments, piers, piles, or footings. Under no circumstances will utilities be allowed to hang from the Structure, unless approved by BNSF. All utility crossings within the limits of BNSF's Rail Corridor will be covered by separate agreements between BNSF and each of the owners of the utilities.

SECTION 13-2. RAILROAD RELATIONS AND INSURANCE - HIGHLAND AVENUE

RAILROAD RELATIONS AND INSURANCE CLAUSES

HIGHLAND AVENUE

1.01 General

1.01.01 The Contractor must cooperate with **BNSF RAILWAY COMPANY**, hereinafter referred to as "Railway" where work is over or under on or adjacent to Railway property and/or right-of-way, hereafter referred to as "Railway Property", during the demolition and reconstruction of the Highland Avenue Overhead.

1.01.02 The Contractor must execute and deliver to the Railway duplicate copies of the Exhibit "C-1" Agreement, in the form attached hereto, obligating the Contractor to provide and maintain in full force and effect the insurance called for under Section 3 of said Exhibit "C-1". Questions regarding procurement of the Railroad Protective Liability Insurance should be directed to Rosa Martinez at Marsh, USA, 214-303-8519.

1.01.03 The Contractor must plan, schedule and conduct all work activities so as not to interfere with the movement of any trains on Railway Property.

1.01.04 The Contractor's right to enter Railway's Property is subject to the absolute right of Railway to cause the Contractor's work on Railway's Property to cease if, in the opinion of Railway, Contractor's activities create a hazard to Railway's Property, employees, and/or operations. Railway will have the right to stop construction work on the Project if any of the following events take place: (i) Contractor (or any of its subcontractors) performs the Project work in a manner contrary to the plans and specifications approved by Railway; (ii) Contractor (or any of its subcontractors), in Railway's opinion, prosecutes the Project work in a manner which is hazardous to Railway property, facilities or the safe and expeditious movement of railroad traffic; (iii) the insurance described in the attached Exhibit C-1 is canceled during the course of the Project; or (iv) STATE OF CALIFORNIA fails to pay Railway for the Temporary Construction License or the Easement pursuant to Article II, Section 1 of this Agreement. The work stoppage will continue until all necessary actions are taken by Contractor or its subcontractor to rectify the situation to the satisfaction of Railway's Division Engineer or until additional insurance has been delivered to and accepted by Railway. In the event of a breach of (i) this Agreement, (ii) the Temporary Construction License, or (iii) the Easement, Railway may immediately terminate the Temporary Construction License or the Easement. Any such work stoppage under this provision will not give rise to any liability on the part of Railway. Railway's right to stop the work is in addition to any other rights Railway may have including, but not limited to, actions or suits for damages or lost profits. In the event that Railway desires to stop construction work on the Project, Railway agrees to immediately notify the following individual in writing:

SANBAG Director of Freeway Construction
1170 W. 3rd Street, 2nd Floor
San Bernardino, CA 92410
Fax: (909) 388-2002.

1.01.05 The Contractor is responsible for determining and complying with all Federal, State and Local Governmental laws and regulations, including, but not limited to environmental laws and regulations (including but not limited to the Resource Conservation and Recovery Act, as amended; the Clean Water Act, the Oil Pollution Act, the Hazardous Materials Transportation Act, CERCLA), and health and safety laws and regulations. The Contractor hereby indemnifies, defends and holds harmless Railway for, from and against all fines or penalties imposed or assessed by Federal, State and Local Governmental Agencies against the Railway which arise out of Contractor's work under this Agreement.

1.01.06 The Contractor must notify the Director of Freeway Construction, **SAN BERNARDINO ASSOCIATED GOVERNMENTS**, hereinafter referred to as ("**SANBAG**") at 1170 W. 3rd Street, 2nd. Floor, San Bernardino, CA. 92410, Fax No. (909) 388 2002 and Railway's Manager Public Projects, telephone number (909)-386-4472 at least thirty (30) calendar days before commencing any work on Railway Property. Contractor's notification to Railway, must refer to Railroad's file No. 26108J.

1.01.07 For any bridge demolition and/or falsework above any tracks or any excavations located with any part of the excavations located within, whichever is greater, twenty-five (25) feet of the nearest track or intersecting a slope from the plane of the top of rail on a 2 horizontal to 1 vertical slope beginning at eleven (11) feet from centerline of the nearest track, both measured perpendicular to center line of track, the Contractor must furnish the Railway five sets of working drawings showing details of construction affecting Railway Property and tracks. The working drawing must include the proposed method of installation and removal of falsework, shoring or cribbing, not included in the contract plans and two sets of structural calculations of any falsework, shoring or cribbing. For all excavation and shoring submittal plans, the current "BNSF-UPRR Guidelines for Temporary Shoring" must be used for determining the design loading conditions to be used in shoring design, and all calculations and submittals must be in accordance with the current "BNSF-UPRR Guidelines for Temporary Shoring". All submittal drawings and calculations must be stamped by a registered professional engineer licensed to practice in the state the project is located. All calculations must take into consideration railway surcharge loading and must be designed to meet American Railway Engineering and Maintenance-of-Way Association (previously known as American Railway Engineering Association) Coopers E-80 live loading standard. All drawings and calculations must be stamped by a registered professional engineer licensed to practice in the state the project is located. The Contractor must not begin work until notified by the Railway that plans have been approved. The Contractor will be required to use lifting devices such as, cranes and/or winches to place or to remove any falsework over Railway's tracks. In no case will the Contractor be relieved of responsibility for results obtained by the implementation of said approved plans.

1.01.08 Subject to the movement of Railway's trains, Railway will cooperate with the Contractor such that the work may be handled and performed in an efficient manner. The Contractor will have no claim whatsoever for any type of damages or for extra or additional compensation in the event his work is delayed by the Railway.

1.02 Contractor Safety Orientation

1.02.01 No employee of the Contractor, its subcontractors, agents or invitees may enter Railway Property without first having completed Railway's Engineering Contractor Safety Orientation, found on the web site www.contractororientation.com. The Contractor must ensure that each of its employees, subcontractors, agents or invitees completes Railway's Engineering Contractor Safety Orientation through internet sessions before any work is performed on the Project. Additionally, the Contractor must ensure that each and every one of its employees, subcontractors, agents or invitees possesses a card certifying completion of the Railway Contractor Safety Orientation before entering Railway Property. The Contractor is responsible for the cost of the Railway Contractor Safety Orientation. The Contractor must renew the Railway Contractor Safety Orientation annually. Further clarification can be found on the web site or from the Railway's Representative.

1.03 Railway Requirements

1.03.01 The Contractor must take protective measures as are necessary to keep railway facilities, including track ballast, free of sand, debris, and other foreign objects and materials resulting from his operations. Any damage to railway facilities resulting from Contractor's operations will be repaired or replaced by Railway and the cost of such repairs or replacement must be paid for by SANBAG.

1.03.02 Blasting shall not be allowed on or adjacent to Railway property and/or right of way unless approved by the Railway.

1.03.03 The Contractor must abide by the following temporary clearances during construction:

- 10' -0" Horizontally from centerline of nearest track
- 21'-6" Vertically above top of rail
- 27'-0" Vertically above top of rail for electric wires carrying less than 750 volts
- 28'-0" Vertically above top of rail for electric wires carrying 750 volts to 15,000 volts
- 30'-0" Vertically above top of rail for electric wires carrying 15,000 volts to 20,000 volts
- 34'-0" Vertically above top of rail for electric wires carrying more than 20,000 volts

1.03.04 Upon completion of construction, the following clearances shall be maintained:

- 10'-1" Horizontally from centerline of nearest track
- 27'-10" Vertically above top of rail

1.03.05 Any infringement within State statutory clearances due to the Contractor's operations must be submitted to the Railway and to SANBAG and must not be undertaken until approved in writing by the Railway, and until SANBAG has obtained any necessary authorization from the State Regulatory Authority for the infringement. No extra compensation will be allowed in the event the Contractor's work is delayed pending Railway approval, and/or the State Regulatory Authority's approval.

1.03.06 In the case of impaired vertical clearance above top of rail, Railway will have the option of installing tell-tales or other protective devices Railway deems necessary for protection of Railway operations. The cost of tell-tales or protective devices will be borne by SANBAG.

1.03.07 The details of construction affecting the Railway's Property and tracks not included in the contract plans must be submitted to the Railway by SANBAG for approval before work is undertaken and this work must not be undertaken until approved by the Railway.

1.03.08 At other than public road crossings, the Contractor must not move any equipment or materials across Railway's tracks until permission has been obtained from the Railway. The Contractor must obtain a "Temporary Construction Crossing Agreement" from the Railway prior to moving his equipment or materials across the Railways tracks. The temporary crossing must be gated and locked at all times when not required for use by the Contractor. The temporary crossing for use of the Contractor will be constructed and at the completion of the project, removed at the expense of the Contractor.

1.03.09 Discharge, release or spill on the Railway Property of any hazardous substances, oil, petroleum, constituents, pollutants, contaminants, or any hazardous waste is prohibited and Contractor must immediately notify the Railway's Resource Operations Center at 1(800) 832-5452, of any discharge, release or spills in excess of a reportable quantity. Contractor must not allow Railway Property to become a treatment, storage or transfer facility as those terms are defined in the Resource Conservation and Recovery Act or any state analogue.

1.03.10 The Contractor upon completion of the work covered by this contract, must promptly remove from the Railway's Property all of Contractor's tools, equipment, implements and other materials, whether brought upon said property by said Contractor or any Subcontractor, employee or agent of Contractor or of any Subcontractor, and must cause Railway's Property to be left in a condition acceptable to the Railway's representative.

1.04 Contractor Roadway Worker on Track Safety Program and Safety Action Plan

1.04.01 Each Contractor that will perform work within 25 feet of the centerline of a track must develop and implement a Roadway Worker Protection/On Track Safety Program and work with Railway Project Representative to develop an on track safety strategy as described in the guidelines listed in the on track safety portion of the Safety Orientation. This Program must provide Roadway Worker protection/on track training for all employees of the Contractor, its subcontractors, agents or invitees. This training is reinforced at the job site through job safety briefings. Additionally, each Contractor must develop and implement the Safety Action Plan, as provided for on the web site www.contractororientation.com, which will be made available to Railway prior to commencement of any work on Railway Property. During the performance of work, the Contractor must audit its work activities. The Contractor must designate an on-site Project Supervisor who will serve as the contact person for the Railway and who will maintain a copy of the Safety Action Plan, safety audits, and Material Safety Datasheets (MSDS), at the job site.

1.04.02 Contractor shall have a background investigation performed on all of its employees, subcontractors and agents who will be performing any services on railroad property under this Agreement.

The background screening shall at a minimum meet the criteria defined by the e-RAILSAFE program outlined at <http://www.e-railsafe.com> in addition to any other applicable regulatory requirements. The e-RAILSAFE program uses rail industry background screening standards.

Contractor shall obtain consent from all employees screened in compliance with the e-RAILSAFE program criteria to release completed background information to BNSF. Contractor shall be subject to periodic audit to ensure compliance.

Contractor shall not permit any of its employees, subcontractors or agents to perform services on property hereunder who are not approved under e-RAILSAFE program standards. Railroad shall have the right to deny entry onto its premises to any of Contractor's employees, subcontractors or agents who do not display the authorized identification badge issued by a background screening service meeting the standards set forth for the e-RAILSAFE program or who pose a threat, in Railroad's reasonable opinion, to the safety or security of Railroad's operations.

Contractors shall ensure its employees, subcontractors and agents are United States citizens or legally working in this country under a work VISA.

1.05 Facilities and Railway Flagger Services:

1.05.01 The Contractor must give Railway's Roadmaster (telephone 909 386 4061) a minimum of thirty (30) calendar days advance notice when flagging services will be required so that the Roadmaster can make appropriate arrangements (i.e., bulletin the flagger's position). If flagging services are scheduled in advance by the Contractor and it is subsequently determined by the parties hereto that such services are no longer necessary, the Contractor must give the Roadmaster five (5) working days advance notice so that appropriate arrangements can be made to abolish the position pursuant to union requirements.

1.05.02 Unless determined otherwise by Railway's Project Representative, Railway flagger will be required and furnished when Contractor's work activities are located over, under and/or within twenty-five (25) feet measured horizontally from centerline of the nearest track and when cranes or similar equipment positioned beyond 25-feet from the track centerline could foul the track in the event of tip over or other catastrophic occurrence, but not limited thereto for the following conditions:

1.05.02a When upon inspection by Railway's Representative, other conditions warrant.

1.05.02b When any excavation is performed below the bottom of tie elevation, if, in the opinion of Railway's representative, track or other Railway facilities may be subject to movement or settlement.

1.05.02c When work in any way interferes with the safe operation of trains at timetable speeds.

1.05.02d When any hazard is presented to Railway track, communications, signal, electrical, or other facilities either due to persons, material, equipment or blasting in the vicinity.

1.05.02e Special permission must be obtained from the Railway before moving heavy or cumbersome objects or equipment which might result in making the track impassable.

1.05.03 Flagging services will be performed by qualified Railway flaggers.

1.05.03a Flagging crew generally consists of one employee. However, additional personnel may be required to protect Railway Property and operations, if deemed necessary by the Railways Representative.

1.05.03b Each time a flagger is called, the minimum period for billing will be the eight (8) hour basic day.

1.05.03c The cost of flagger services provided by the Railway will be borne by SANBAG. The estimated cost for one (1) flagger is approximately between \$800.00 - \$1600.00 for an eight (8) hour basic day with time and one-half or double time for overtime, rest days and holidays. The estimated cost for each flagger includes vacation allowance, paid holidays, Railway and unemployment insurance, public liability and property damage insurance, health and welfare benefits, vehicle transportation, meals, lodging, radio equipment, supervision and other costs incidental to performing flagging services. Negotiations for Railway labor or collective bargaining agreements and rate changes authorized by appropriate Federal authorities may increase actual or estimated flagging rates. The flagging rate in effect at the time of performance by the Contractor hereunder will be used to calculate the actual costs of flagging pursuant to this paragraph.

1.05.03d The average train traffic on this route is 79 freight trains and 2 passenger trains per 24-hour period. Train timetable speeds are:

Westward: 50 MPH Passenger, 35 MPH Freight
Eastward: 70 MPH Passenger, 55 MPH Freight

1.06 Contractor General Safety Requirements

1.06.01 Work in the proximity of railway track(s) is potentially hazardous where movement of trains and equipment can occur at any time and in any direction. All work performed by contractors within 25 feet of any track must be in compliance with FRA Roadway Worker Protection Regulations.

1.06.02 Before beginning any task on Railway Property, a thorough job safety briefing must be conducted with all personnel involved with the task and repeated when the personnel or task changes. If the task is within 25 feet of any track, the job briefing must include the Railway's flagger, as applicable, and include the procedures the Contractor will use to protect its employees, subcontractors, agents or invitees from moving any equipment adjacent to or across any Railway track(s).

1.06.03 Workers must not work within 25 feet of the centerline of any track without an on track safety strategy approved by the Railway's Project Representative. When authority is provided, every contractor employee must know: (1) who the Railway flagger is, and how to contact the flagger, (2) limits of the authority, (3) the method of communication to stop and resume work, and (4) location of the designated places of safety. Persons or equipment entering flag/work limits that were not previously job briefed, must notify the flagger immediately, and be given a job briefing when working within 25 feet of the center line of track.

1.06.04 When Contractor employees are required to work on the Railway Property after normal working hours or on weekends, the Railroad's representative in charge of the project must be notified. A minimum of two employees must be present at all times.

1.06.05 Any employees, agents or invitees of Contractor or its subcontractors under suspicion of being under the influence of drugs or alcohol, or in the possession of same, will be removed from the Railway's Property and subsequently released to the custody of a representative of Contractor management. Future access to the Railway's Property by that employee will be denied.

1.06.06 Any damage to Railway Property, or any hazard noticed on passing trains must be reported immediately to the Railway's representative in charge of the project. Any vehicle or machine which may come in contact with track, signal equipment, or structure (bridge) and could result in a train derailment must be reported immediately to the Railway representative in charge of the project and to the Railway's Resource Operations Center at 1(800) 832-5452. Local emergency numbers are to be obtained from the Railway representative in charge of the project prior to the start of any work and must be posted at the job site.

1.06.07 For safety reasons, all persons are prohibited from having pocket knives, firearms or other deadly weapons in their possession while working on Railway's Property.

1.06.08 All personnel protective equipment (PPE) used on Railway Property must meet applicable OSHA and ANSI specifications. Current Railway personnel protective equipment requirements are listed on the web site, **www.contractororientation.com**, however, a partial list of the requirements include: a) safety glasses with permanently affixed side shields (no yellow lenses); b) hard hats c) safety shoe with: hardened toes, above-the-ankle lace-up and a defined heel; and d) high visibility retro-reflective work wear. The Railroad's representative in charge of the project is to be contacted regarding local specifications for meeting requirements relating to hi-visibility work wear. Hearing protection, fall protection, gloves, and respirators must be worn as required by State and Federal regulations. **(NOTE – Should there be a discrepancy between the information contained on the web site and the information in this paragraph, the web site will govern.)**

1.06.09 THE CONTRACTOR MUST NOT PILE OR STORE ANY MATERIALS, MACHINERY OR EQUIPMENT CLOSER THAN 25'-0" TO THE CENTER LINE OF THE NEAREST RAILWAY TRACK. MATERIALS, MACHINERY OR EQUIPMENT MUST NOT BE STORED OR LEFT WITHIN 250 FEET OF ANY HIGHWAY/RAIL AT-GRADE CROSSINGS OR TEMPORARY CONSTRUCTION CROSSING, WHERE STORAGE OF THE SAME WILL OBSTRUCT THE VIEW OF A TRAIN APPROACHING THE CROSSING. PRIOR TO BEGINNING WORK, THE CONTRACTOR MUST ESTABLISH A STORAGE AREA WITH CONCURRENCE OF THE RAILROAD'S REPRESENTATIVE.

1.06.10 Machines or vehicles must not be left unattended with the engine running. Parked machines or equipment must be in gear with brakes set and if equipped with blade, pan or bucket, they must be lowered to the ground. All machinery and equipment left unattended on Railway's Property must be left inoperable and secured against movement. (See internet Engineering Contractor Safety Orientation program for more detailed specifications)

1.06.11 Workers must not create and leave any conditions at the work site that would interfere with water drainage. Any work performed over water must meet all Federal, State and Local regulations.

1.06.12 All power line wires must be considered dangerous and of high voltage unless informed to the contrary by proper authority. For all power lines the minimum clearance between the lines and any part of the equipment or load must be; 200 KV or below - 15 feet; 200 to 350 KV - 20 feet; 350 to 500 KV - 25 feet; 500 to 750 KV - 35 feet; and 750 to 1000 KV - 45 feet. If capacity of the line is not known, a minimum clearance of 45 feet must be maintained. A person must be designated to observe clearance of the equipment and give a timely warning for all operations where it is difficult for an operator to maintain the desired clearance by visual means.

1.07 Excavation

1.07.01 Before excavating, the Contractor must determine whether any underground pipe lines, electric wires, or cables, including fiber optic cable systems are present and located within the Project work area. The Contractor must determine whether excavation on Railway's Property could cause damage to buried cables resulting in delay to Railway traffic and disruption of service to users. Delays and disruptions to service may cause business interruptions involving loss of revenue and profits. Before commencing excavation, the Contractor must contact **BNSF's Field Engineering Representative (909 386 4079)**. All underground and overhead wires will be considered HIGH VOLTAGE and dangerous until verified with the company having ownership of the line. **It is the Contractor's responsibility to notify any other companies that have underground utilities in the area and arrange for the location of all underground utilities before excavating.**

1.07.02 The Contractor must cease all work and notify the Railway immediately before continuing excavation in the area if obstructions are encountered which do not appear on drawings. If the obstruction is a utility and the owner of the utility can be identified, then the Contractor must also notify the owner immediately. If there is any doubt about the location of underground cables or lines of any kind, no work must be performed until the exact location has been determined. There will be no exceptions to these instructions.

1.07.03 All excavations must be conducted in compliance with applicable OSHA regulations and, regardless of depth, must be shored where there is any danger to tracks, structures or personnel.

1.07.04 Any excavations, holes or trenches on the Railway's Property must be covered, guarded and/or protected when not being worked on. When leaving work site areas at night and over weekends, the areas must be secured and left in a condition that will ensure that Railway employees and other personnel who may be working or passing through the area are protected from all hazards. All excavations must be back filled as soon as possible.

1.08 Hazardous Waste, Substances and Material Reporting

1.08.01 If Contractor discovers any hazardous waste, hazardous substance, petroleum or other deleterious material, including but not limited to any non-containerized commodity or material, on or adjacent to Railway's Property, in or near any surface water, swamp, wetlands or waterways, while performing any work under this Agreement, Contractor must immediately: (a) notify the Railway's Resource Operations Center at 1(800) 832-5452, of such discovery: (b) take safeguards necessary to protect its employees, subcontractors, agents and/or third parties: and (c) exercise due care with respect to the release, including the taking of any appropriate measure to minimize the impact of such release.

1.09 Personal Injury Reporting

1.09.01 The Railway is required to report certain injuries as a part of compliance with Federal Railroad Administration (FRA) reporting requirements. Any personal injury sustained by an employee of the Contractor, subcontractor or Contractor's invitees while on the Railway's Property must be reported immediately (by phone mail if unable to contact in person) to the Railway's representative in charge of the project. The Non-Employee Personal Injury Data Collection Form contained herein is to be completed and sent by Fax to the Railway at 1(817) 352-7595 and to the Railway's Project Representative no later than the close of shift on the date of the injury.

NON-EMPLOYEE PERSONAL INJURY DATA COLLECTION

INFORMATION REQUIRED TO BE COLLECTED PURSUANT TO FEDERAL REGULATION. IT SHOULD BE USED FOR COMPLIANCE WITH FEDERAL REGULATIONS ONLY AND IS NOT INTENDED TO PRESUME ACCEPTANCE OF RESPONSIBILITY OR LIABILITY.

1. Accident City/St _____ 2. Date: _____ Time: _____
County: _____ 3. Temperature: _____ 4. Weather _____
(if non-Railway location)

5. Social Security # _____

6. Name (last, first, mi) _____

7. Address: Street: _____ City: _____ St. _____ Zip: _____

8. Date of Birth: _____ and/or Age _____ Gender: _____
(if available)

9. (a) Injury: _____ (b) Body Part: _____
(i.e. (a) Laceration (b) Hand)

11. Description of Accident (To include location, action, result, etc.):

12. Treatment:
First Aid Only
Required Medical Treatment
Other Medical Treatment

13. Dr. Name _____ 30. Date: _____

14. Dr. Address:
Street: _____ City: _____ St: _____ Zip: _____

15. Hospital Name: _____

16. Hospital Address:
Street: _____ City: _____ St: _____ Zip: _____

17. Diagnosis: _____

**FAX TO
RAILWAY AT (817) 352-7595
AND COPY TO
RAILWAY ROADMASTER FAX 909-386-4843**

**OVERHEAD EXHIBIT "C -1"
Highland Avenue Overcrossing**

**Agreement
Between
BNSF RAILWAY COMPANY
and the
CONTRACTOR**

**BNSF RAILWAY COMPANY
Attention: Manager Public Projects**

**Railway File: 026108J
Agency Project: Highland Avenue. Overhead**

Gentlemen:

The undersigned (hereinafter called, the "Contractor"), has entered into a contract (the "Contract") dated _____, 200_, with **SAN BERNARDINO ASSOCIATED GOVERNMENTS** for the performance of certain work in connection with the following project: demolish and reconstruct the Highland Avenue Overhead, in San Bernardino, CA. Performance of such work will necessarily require contractor to enter BNSF RAILWAY COMPANY ("Railway") right of way and property ("Railway Property"). The Contract provides that no work will be commenced within Railway Property until the Contractor employed in connection with said work for **SAN BERNARDINO ASSOCIATED GOVERNMENTS** (i) executes and delivers to Railway an Agreement in the form hereof, and (ii) provides insurance of the coverage and limits specified in such Agreement and Section 3 herein. If this Agreement is executed by a party who is not the Owner, General Partner, President or Vice President of Contractor, Contractor must furnish evidence to Railway certifying that the signatory is empowered to execute this Agreement on behalf of Contractor.

Accordingly, in consideration of Railway granting permission to Contractor to enter upon Railway Property and as an inducement for such entry, Contractor, effective on the date of the Contract, has agreed and does hereby agree with Railway as follows:

Section 1. RELEASE OF LIABILITY AND INDEMNITY

Contractor hereby waives, releases, indemnifies, defends and holds harmless Railway for all judgments, awards, claims, demands, and expenses (including attorneys' fees), for injury or death to all persons, including Railway's and Contractor's officers and employees, and for loss and damage to property belonging to any person, arising in any manner from Contractor's or any of Contractor's subcontractors' acts or omissions or any work performed on or about Railway's property or right-of-way. **THE LIABILITY ASSUMED BY CONTRACTOR WILL NOT BE AFFECTED BY THE FACT, IF IT IS A FACT, THAT THE DESTRUCTION, DAMAGE, DEATH, OR INJURY WAS OCCASIONED BY OR CONTRIBUTED TO BY THE NEGLIGENCE OF RAILWAY, ITS AGENTS, SERVANTS, EMPLOYEES OR OTHERWISE, EXCEPT TO THE EXTENT THAT SUCH CLAIMS ARE PROXIMATELY CAUSED BY THE WILLFUL MISCONDUCT OR SOLE NEGLIGENCE OF RAILWAY.**

THE INDEMNIFICATION OBLIGATION ASSUMED BY CONTRACTOR INCLUDES ANY CLAIMS, SUITS OR JUDGMENTS BROUGHT AGAINST RAILWAY UNDER THE FEDERAL EMPLOYEE'S LIABILITY ACT, INCLUDING CLAIMS FOR STRICT LIABILITY UNDER THE SAFETY APPLIANCE ACT OR THE LOCOMOTIVE INSPECTION ACT, WHENEVER SO CLAIMED.

Contractor further agrees, at its expense, in the name and on behalf of Railway, that it will adjust and settle all claims made against Railway, and will, at Railway's discretion, appear and defend any suits or actions of law or in equity brought against Railway on any claim or cause of action arising or growing out of or in any manner connected with any liability assumed by Contractor under this Agreement for which Railway is liable or is alleged to be liable. Railway will give notice to Contractor, in writing, of the receipt or dependency of such claims and thereupon Contractor must proceed to adjust and handle to a conclusion such claims, and in the event of a suit being brought against Railway, Railway may forward summons and complaint or other process in connection therewith to Contractor, and Contractor, at Railway's discretion, must defend, adjust, or settle such suits and protect, indemnify, and save harmless Railway from and against all damages, judgments, decrees, attorney's fees, costs, and expenses growing out of or resulting from or incident to any such claims or suits.

In addition to any other provision of this Agreement, in the event that all or any portion of this Article shall be deemed to be inapplicable for any reason, including without limitation as a result of a decision of an applicable court, legislative enactment or regulatory order, the parties agree that this Article shall be interpreted as requiring Contractor to indemnify Railroad to the fullest extent permitted by applicable law. **THROUGH THIS AGREEMENT THE PARTIES EXPRESSLY INTEND FOR CONTRACTOR TO INDEMNIFY RAILROAD FOR RAILROAD'S ACTS OF NEGLIGENCE.**

It is mutually understood and agreed that the assumption of liabilities and indemnification provided for in this Agreement survive any termination of this Agreement.

Section 2. TERM

This Agreement is effective from the date of the Contract until (i) the completion of the project set forth herein, and (ii) full and complete payment to Railway of any and all sums or other amounts owing and due hereunder.

Section 3. INSURANCE

Contractor must, at its sole cost and expense, procure and maintain during the life of this Agreement the following insurance coverage:

A. Commercial General Liability insurance. This insurance must contain broad form contractual liability with a combined single limit of a minimum of \$5,000,000 each occurrence and an aggregate limit of at least \$10,000,000. Coverage must be purchased on a post 1998 ISO occurrence form or equivalent and include coverage for, but not limit to the following:

- Bodily Injury and Property Damage
- Personal Injury and Advertising Injury
- Fire legal liability
- Products and completed operations

This policy must also contain the following endorsements, which must be indicated on the certificate of insurance:

It is agreed that any workers' compensation exclusion does not apply to **Railroad** payments related to the Federal Employers Liability Act or a **Railroad** Wage Continuation Program or similar programs and any payments made are deemed not to be either payments made or obligations assumed under any Workers Compensation, disability benefits, or unemployment compensation law or similar law.

The definition of insured contract must be amended to remove any exclusion or other limitation for any work being done within 50 feet of railroad property.

Any exclusions related to the explosion, collapse and underground hazards must be removed.

No other endorsements limiting coverage as respects obligations under this Agreement may be included on the policy.

B. Business Automobile Insurance. This insurance must contain a combined single limit of at least \$1,000,000 per occurrence, and include coverage for, but not limited to the following:

- Bodily injury and property damage
- Any and all vehicles owned, used or hired

C. Workers Compensation and Employers Liability insurance including coverage for, but not limited to:

California's statutory liability under the worker's compensation laws of the state(s) in which the work is to be performed. If optional under State law, the insurance must cover all employees anyway.
Employers' Liability (Part B) with limits of at least \$500,000 each accident, \$500,000 by disease policy limit, \$500,000 by disease each employee.

D. Railroad Protective Liability insurance naming only the **Railroad** as the Insured with coverage of at least \$5,000,000 per occurrence and \$10,000,000 in the aggregate. The policy Must be issued on a standard ISO form CG 00 35 10 93 and include the following:

Endorsed to include the Pollution Exclusion Amendment (ISO form CG 28 31 10 93)

Endorsed to include the Limited Seepage and Pollution Endorsement.

Endorsed to remove any exclusion for punitive damages.

No other endorsements restricting coverage may be added.

The original policy must be provided to the **Railroad** prior to performing any work or services under this Agreement

Other Requirements:

All policies (applying to coverage listed above) must not contain an exclusion for punitive damages and certificates of insurance must reflect that no exclusion exists.

Contractor agrees to waive its right of recovery against **Railroad** for all claims and suits against **Railroad**. In addition, its insurers, through the terms of the policy or policy endorsement, waive their right of subrogation against **Railroad** for all claims and suits. The certificate of insurance must reflect the waiver of subrogation endorsement. Contractor further waives its right of recovery, and its insurers also waive their right of subrogation against **Railroad** for loss of its owned or leased property or property under contractor's care, custody or control.

Contractor's insurance policies through policy endorsement, must include wording which states that the policy is primary and non-contributing with respect to any insurance carried by **Railroad**. The certificate of insurance must reflect that the above wording is included in evidenced policies.

All policy(ies) required above (excluding Workers Compensation and if applicable, Railroad Protective) must include a severability of interest endorsement and **Railroad** must be named as an additional insured with respect to work performed under this agreement. Severability of interest and naming **Railroad** as additional insured must be indicated on the certificate of insurance.

Contractor is not allowed to self-insure without the prior written consent of **Railroad**. If granted by **Railroad**, any deductible, self-insured retention or other financial responsibility for claims must be covered directly by contractor in lieu of insurance. Any and all **Railroad** liabilities that would otherwise, in accordance with the provisions of this **Agreement**, be covered by contractor's insurance will be covered as if contractor elected not to include a deductible, self-insured retention or other financial responsibility for claims.

Prior to commencing the Work, contractor must furnish to **Railroad** an acceptable certificate(s) of insurance including an original signature of the authorized representative evidencing the required coverage, endorsements, and amendments and referencing the contract audit/folder number if available. The policy(ies) must contain a provision that obligates the insurance company(ies) issuing such policy(ies) to notify **Railroad** in writing at least 30 days prior to any cancellation, non-renewal, substitution or material alteration. This cancellation provision must be indicated on the certificate of insurance. Upon request from **Railroad**, a certified duplicate original of any required policy must be furnished. Contractor should send the certificate(s) to the following address:

IDS
PO Box 12010-BN
Hemet, CA 92546-8010
Fax number: 951-766-2299
Email: customerservice@certsonline.com

Any insurance policy must be written by a reputable insurance company acceptable to **Railroad** or with a current Best's Guide Rating of A- and Class VII or better, and authorized to do business in the state(s) in which the service is to be provide.

Contractor represents that this **Agreement** has been thoroughly reviewed by contractor's insurance agent(s)/broker(s), who have been instructed by contractor to procure the insurance coverage required by this **Agreement**. Allocated Loss Expense must be in addition to all policy limits for coverages referenced above.

Not more frequently than once every five years, **Railroad** may reasonably modify the required insurance coverage to reflect then-current risk management practices in the railroad industry and underwriting practices in the insurance industry.

If any portion of the operation is to be subcontracted by contractor, contractor must require that the subcontractor provide and maintain the insurance coverages set forth herein, naming **Railroad** as an additional insured, and requiring that the subcontractor release, defend and indemnify **Railroad** to the same extent and under the same terms and conditions as contractor is required to release, defend and indemnify **Railroad** herein.

Failure to provide evidence as required by this section will entitle, but not require, **Railroad** to terminate this **Agreement** immediately. Acceptance of a certificate that does not comply with this section will not operate as a waiver of contractor's obligations hereunder.

The fact that insurance (including, without limitation, self-insurance) is obtained by contractor will not be deemed to release or diminish the liability of contractor including, without limitation, liability under the indemnity provisions of this **Agreement**. Damages recoverable by **Railroad** will not be limited by the amount of the required insurance coverage.

For purposes of this section, **Railroad** means "Burlington Northern Santa Fe Corporation", "BNSF RAILWAY COMPANY" and the subsidiaries, successors, assigns and affiliates of each.

Section 4. EXHIBIT "C" CONTRACTOR REQUIREMENTS

The Contractor must observe and comply with the provisions, obligations, requirements and limitations contained in the Contract and the Contractor Requirements set forth on Exhibit "C" attached to the Contract and this Agreement, including, but not be limited to, payment of all costs incurred for any damages to Railway roadbed, tracks, and/or appurtenances thereto, resulting from use, occupancy, or presence of its employees, representatives, or agents or subcontractors on or about the construction site.

Section 5. TRAIN DELAY

Contractor is responsible for and hereby indemnifies and holds harmless Railway (including its affiliated railway companies, and its tenants) for, from and against all damages arising from any unscheduled delay to a freight or passenger train which affects Railway's ability to fully utilize its equipment and to meet customer service and contract obligations. Contractor will be billed, as further provided below, for the economic losses arising from loss of use of equipment, contractual loss of incentive pay and bonuses and contractual penalties resulting from train delays, whether caused by Contractor, or subcontractors, or by the Railway performing work under this Agreement. Railway agrees that it will not perform any act to unnecessarily cause train delay.

For loss of use of equipment, Contractor will be billed the current freight train hour rate per train as determined from Railway's records. Any disruption to train traffic may cause delays to multiple trains at the same time for the same period.

Additionally, the parties acknowledge that passenger, U.S. mail trains and certain other grain, intermodal, coal and freight trains operate under incentive/penalty contracts between Railway and its customer(s). Under these arrangements, if Railway does not meet its contract service commitments, Railway may suffer loss of performance or incentive pay and/or be subject to penalty payments. Contractor is responsible for any train performance and incentive penalties or other contractual economic losses actually incurred by Railway which are attributable to a train delay caused by Contractor or its subcontractors.

The contractual relationship between Railway and its customers is proprietary and confidential. In the event of a train delay covered by this Agreement, Railway will share information relevant to any train delay to the extent consistent with Railway confidentiality obligations. Damages for train delay for certain trains may be as high as \$50,000.00 (\$382.20 per hour) per incident. **THE RATE THEN IN EFFECT AT THE TIME OF PERFORMANCE BY THE CONTRACTOR HEREUNDER WILL BE USED TO CALCULATE THE ACTUAL COSTS OF TRAIN DELAY PURSUANT TO THIS AGREEMENT.**

Contractor and its subcontractors must give Railway's representative 909 386 4079 eight (8) weeks advance notice of the times and dates for proposed work windows. Railway and Contractor will establish mutually agreeable work windows for the project. Railway has the right at any time to revise or change the work windows due to train operations or service obligations. Railway will not be responsible for any additional costs or expenses resulting from a change in work windows. Additional costs or expenses resulting from a change in work windows shall be accounted for in Contractor's expenses for the project.

Contractor and subcontractors must plan, schedule, coordinate and conduct all Contractor's work so as to not cause any delays to any trains.

Kindly acknowledge receipt of this letter by signing and returning to the Railway two original copies of this letter, which, upon execution by Railway, will constitute an Agreement between us.

(Contractor)

BNSF Railway Company

By: _____
Printed Name: _____
Title: _____

By: _____
Name: Melvin Thomas
Manager Public Projects

Contact Person: _____
Address _____

City: _____ State: ___ Zip: _____
Fax: _____
Phone: _____
E-mail: _____

Accepted and effective this _____ day of 20__.

Exhibit F
Highland Avenue Overcrossing

BNSF Bridge Requirements

BRIDGE DESIGN, PLANS & SPECIFICATIONS:

Except for the design of temporary falsework and shoring, BNSF review of the Structure plans will be limited to the vertical and horizontal clearances, sight distance for existing train signals, foundation dimensions and drainage characteristics as they relate to existing and future tracks. BNSF will not review structural design calculations for the permanent Structure unless a member or members are influenced by railroad live loads.

Temporary falsework and shoring plans and calculations must be reviewed and approved by BNSF prior to beginning construction. SANBAG shall perform an independent review of the design calculations for temporary falsework and shoring prior to submitting them to BNSF for approval. Temporary construction clearances must be no less than 15 feet measured horizontally from the centerline of the nearest track and 21 feet-6inches measured vertically from the top of rail of the most elevated track to the bottom of lowest temporary falsework member. State regulatory agencies may have more restrictive requirements for temporary railroad clearances.

For the permanent Structure, SANBAG will submit plans showing the least horizontal distance from the centerline of existing and future tracks to the face of the nearest member of the proposed Structure. The location of the least horizontal distance must be accurately described such that BNSF can determine where it will occur in both the horizontal and vertical plane. If the permanent member is within 25 feet of the nearest track (or future track), collision walls shall be incorporated into the permanent Structure design according to American Railway Engineering and Maintenance Association Manual of Recommended Practice - Chapter 8 - Article 2.1.5.

For the permanent Structure, SANBAG will submit plans showing the least vertical clearance from top of the most elevated rail of existing and future tracks to the lowest point of the proposed Structure. Prior to beginning construction of the permanent Structure, the top of rail elevations should be checked and verified that they have not changed from the assumed elevations utilized for the design of the bridge.

Prior to issuing any invitation to bid on construction of the Structure, SANBAG should conduct a pre-bid meeting where prospective Contractors have the opportunity to communicate with BNSF personnel regarding site specific train speeds, train density, and general safety requirements for men and equipment working near live tracks. Any invitation to bid and specifications for the Structure must be submitted to BNSF for review and approval prior to letting of bids for the Project.

BRIDGE CONSTRUCTION:

After awarding the bid, but prior to the Contractor entering BNSF's railroad corridor or property, SANBAG should conduct a pre-construction meeting with BNSF personnel in attendance to reiterate the safety requirements of construction activity adjacent to live tracks.

During construction, BNSF may require an independent engineering inspector to be present during certain critical activities of the Project, including but not limited to: driving foundation piles, erecting falsework, construction of shoring and retaining walls, placing concrete, placing soil backfill and compaction processes. SANBAG shall reimburse BNSF for all costs of supplemental inspection services.

Within 90 days of the conclusion of the Project and final acceptance by BNSF, SANBAG will provide BNSF with a complete electronic set of the bridge plans. BNSF will also accept a marked up paper copy of the bridge plans labeled "As Built". The marked up paper copy of the plans will reflect any and all deviations from the original plans that occurred during construction. The electronic set of the bridge plans will be submitted in Micro Station *.dgn electronic format (preferred) or AutoCAD *.dwg format. Electronic plans are to be submitted in the original format used for CAD plan preparation and not converted to another format prior to submission. The "As Built" plans shall show actual measured "as constructed" clearances shall be shown as well as depth, size and location of all foundation components. The plans shall show dimensioned locations of existing and relocated utilities. It is understood that BNSF prefers to receive the "As Built" plans in an electronic format.

BRIDGE MAINTENANCE:

STATE will be responsible for maintenance and repair of the Structure including the earth retention components, embankment slopes, erosion control, surface drainage, fencing, deck drains, landscaping, paint, walkways, handrails, lighting, and other improvements associated with the Project.

Fencing and other pedestrian access controls within BNSF's rail corridor and incorporated into the Project shall be designed and maintained by SANBAG through construction. Trespasser control shall be the responsibility of SANBAG through construction. Graffiti removal will be the responsibility of STATE.

BRIDGE INSPECTION:

STATE will conduct annual routine structural inspections. In the event of an earthquake, fire, flood, damage from vehicular impacts or other emergent situations, STATE will provide an immediate inspection by qualified personnel and notify BNSF of damage that may affect safe passage of trains. If necessary STATE will embargo weights or provide lane closures or other such measures to protect the structural integrity of the Structure such that there can be continuous safe passage of trains until repairs are made.

BRIDGE ALTERATIONS:

Except as provided otherwise by this Agreement, there will be no alterations made to the Structure that will alter the railroad vertical or horizontal clearances provided by the original design

It is expressly understood by STATE that the right to install utilities is restricted to the placement of underground utilities beneath BNSF's tracks located a minimum of fifty (50) feet from abutments, piers, piles, or footings. Under no circumstances will utilities be allowed to hang from the Structure, unless approved by BNSF. All utility crossings within the limits of BNSF's Rail Corridor will be covered by separate agreements between BNSF and each of the owners of the utilities.

SECTION 13-3. RAILROAD RELATIONS AND INSURANCE – MASSACHUSETTS AVENUE

RAILROAD RELATIONS AND INSURANCE CLAUSES

MASSACHUSETTS AVENUE

1.01 General

1.01.01 The Contractor must cooperate with **BNSF RAILWAY COMPANY**, hereinafter referred to as "Railway" where work is over or under on or adjacent to Railway property and/or right-of-way, hereafter referred to as "Railway Property", during the demolition and reconstruction of the Massachusetts Avenue Overhead.

1.01.02 The Contractor must execute and deliver to the Railway duplicate copies of the Exhibit "C-1" Agreement, in the form attached hereto, obligating the Contractor to provide and maintain in full force and effect the insurance called for under Section 3 of said Exhibit "C-1". Questions regarding procurement of the Railroad Protective Liability Insurance should be directed to Rosa Martinez at Marsh, USA, 214-303-8519.

1.01.03 The Contractor must plan, schedule and conduct all work activities so as not to interfere with the movement of any trains on Railway Property.

1.01.04 The Contractor's right to enter Railway's Property is subject to the absolute right of Railway to cause the Contractor's work on Railway's Property to cease if, in the opinion of Railway, Contractor's activities create a hazard to Railway's Property, employees, and/or operations. Railway will have the right to stop construction work on the Project if any of the following events take place: (i) Contractor (or any of its subcontractors) performs the Project work in a manner contrary to the plans and specifications approved by Railway; (ii) Contractor (or any of its subcontractors), in Railway's opinion, prosecutes the Project work in a manner which is hazardous to Railway property, facilities or the safe and expeditious movement of railroad traffic; (iii) the insurance described in the attached Exhibit C-1 is canceled during the course of the Project; or (iv) STATE OF CALIFORNIA fails to pay Railway for the Temporary Construction License or the Easement pursuant to Article II, Section 1 of this Agreement. The work stoppage will continue until all necessary actions are taken by Contractor or its subcontractor to rectify the situation to the satisfaction of Railway's Division Engineer or until additional insurance has been delivered to and accepted by Railway. In the event of a breach of (i) this Agreement, (ii) the Temporary Construction License, or (iii) the Easement, Railway may immediately terminate the Temporary Construction

License or the Easement. Any such work stoppage under this provision will not give rise to any liability on the part of Railway. Railway's right to stop the work is in addition to any other rights Railway may have including, but not limited to, actions or suits for damages or lost profits. In the event that Railway desires to stop construction work on the Project, Railway agrees to immediately notify the following individual in writing:

SANBAG Director of Freeway Construction
1170 W. 3rd Street, 2nd Floor
San Bernardino, CA 92410
Fax: (909) 388-2002.

1.01.05 The Contractor is responsible for determining and complying with all Federal, State and Local Governmental laws and regulations, including, but not limited to environmental laws and regulations (including but not limited to the Resource Conservation and Recovery Act, as amended; the Clean Water Act, the Oil Pollution Act, the Hazardous Materials Transportation Act, CERCLA), and health and safety laws and regulations. The Contractor hereby indemnifies, defends and holds harmless Railway for, from and against all fines or penalties imposed or assessed by Federal, State and Local Governmental Agencies against the Railway which arise out of Contractor's work under this Agreement.

1.01.06 The Contractor must notify the Director of Freeway Construction, **SAN BERNARDINO ASSOCIATED GOVERNMENTS**, hereinafter referred to as ("**SANBAG**") at 1170 W. 3rd Street, 2nd. Floor, San Bernardino, CA. 92410, Fax No. (909) 388 2002 and Railway's Manager Public Projects, telephone number (909)-386-4472 at least thirty (30) calendar days before commencing any work on Railway Property. Contractor's notification to Railway, must refer to Railroad's file No. 026109R.

1.01.07 For any bridge demolition and/or falsework above any tracks or any excavations located with any part of the excavations located within, whichever is greater, twenty-five (25) feet of the nearest track or intersecting a slope from the plane of the top of rail on a 2 horizontal to 1 vertical slope beginning at eleven (11) feet from centerline of the nearest track, both measured perpendicular to center line of track, the Contractor must furnish the Railway five sets of working drawings showing details of construction affecting Railway Property and tracks. The working drawing must include the proposed method of installation and removal of falsework, shoring or cribbing, not included in the contract plans and two sets of structural calculations of any falsework, shoring or cribbing. For all excavation and shoring submittal plans, the current "BNSF-UPRR Guidelines for Temporary Shoring" must be used for determining the design loading conditions to be used in shoring design, and all calculations and submittals must be in accordance with the current "BNSF-UPRR Guidelines for Temporary Shoring". All submittal drawings and calculations must be stamped by a registered professional engineer licensed to practice in the state the project is located. All calculations must take into consideration railway surcharge loading and must be designed to meet American Railway Engineering and Maintenance-of-Way Association (previously known as American Railway Engineering Association) Coopers E-80 live loading standard. All drawings and calculations must be stamped by a registered professional engineer licensed to practice in the state the project is located. The Contractor must not begin work until notified by the Railway that plans have been approved. The Contractor will be required to use lifting devices such as, cranes and/or winches to place or to remove any falsework over Railway's tracks. In no case will the Contractor be relieved of responsibility for results obtained by the implementation of said approved plans.

1.01.08 Subject to the movement of Railway's trains, Railway will cooperate with the Contractor such that the work may be handled and performed in an efficient manner. The Contractor will have no claim whatsoever for any type of damages or for extra or additional compensation in the event his work is delayed by the Railway.

1.02 Contractor Safety Orientation

1.02.01 No employee of the Contractor, its subcontractors, agents or invitees may enter Railway Property without first having completed Railway's Engineering Contractor Safety Orientation, found on the web site www.contractororientation.com. The Contractor must ensure that each of its employees, subcontractors, agents or invitees completes Railway's Engineering Contractor Safety Orientation through internet sessions before any work is performed on the Project. Additionally, the Contractor must ensure that each and every one of its employees, subcontractors, agents or invitees possesses a card certifying completion of the Railway Contractor Safety Orientation before entering Railway Property. The Contractor is responsible for the cost of the Railway Contractor Safety Orientation. The Contractor must renew the Railway Contractor Safety Orientation annually. Further clarification can be found on the web site or from the Railway's Representative.

1.03 Railway Requirements

1.03.01 The Contractor must take protective measures as are necessary to keep railway facilities, including track ballast, free of sand, debris, and other foreign objects and materials resulting from his operations. Any damage to railway facilities resulting from Contractor's operations will be repaired or replaced by Railway and the cost of such repairs or replacement must be paid for by SANBAG.

1.03.02 Blasting shall not be allowed on or adjacent to Railway property and/or right of way unless approved by the Railway.

1.03.03 The Contractor must abide by the following temporary clearances during construction:

- 15'-0" Horizontally from centerline of nearest track
- 21'-6" Vertically above top of rail
- 27'-0" Vertically above top of rail for electric wires carrying less than 750 volts
- 28'-0" Vertically above top of rail for electric wires carrying 750 volts to 15,000 volts
- 30'-0" Vertically above top of rail for electric wires carrying 15,000 volts to 20,000 volts
- 34'-0" Vertically above top of rail for electric wires carrying more than 20,000 volts

1.03.04 Upon completion of construction, the following clearances shall be maintained:

- 16'-4.5" Horizontally from centerline of nearest track
- 26'-0" Vertically above top of rail

1.03.05 Any infringement within State statutory clearances due to the Contractor's operations must be submitted to the Railway and to SANBAG and must not be undertaken until approved in writing by the Railway, and until SANBAG has obtained any necessary authorization from the State Regulatory Authority for the infringement. No extra compensation will be allowed in the event the Contractor's work is delayed pending Railway approval, and/or the State Regulatory Authority's approval.

1.03.06 In the case of impaired vertical clearance above top of rail, Railway will have the option of installing tell-tales or other protective devices Railway deems necessary for protection of Railway operations. The cost of tell-tales or protective devices will be borne by SANBAG.

1.03.07 The details of construction affecting the Railway's Property and tracks not included in the contract plans must be submitted to the Railway by SANBAG for approval before work is undertaken and this work must not be undertaken until approved by the Railway.

1.03.08 At other than public road crossings, the Contractor must not move any equipment or materials across Railway's tracks until permission has been obtained from the Railway. The Contractor must obtain a "Temporary Construction Crossing Agreement" from the Railway prior to moving his equipment or materials across the Railways tracks. The temporary crossing must be gated and locked at all times when not required for use by the Contractor. The temporary crossing for use of the Contractor will be constructed and at the completion of the project, removed at the expense of the Contractor.

1.03.09 Discharge, release or spill on the Railway Property of any hazardous substances, oil, petroleum, constituents, pollutants, contaminants, or any hazardous waste is prohibited and Contractor must immediately notify the Railway's Resource Operations Center at 1(800) 832-5452, of any discharge, release or spills in excess of a reportable quantity. Contractor must not allow Railway Property to become a treatment, storage or transfer facility as those terms are defined in the Resource Conservation and Recovery Act or any state analogue.

1.03.10 The Contractor upon completion of the work covered by this contract, must promptly remove from the Railway's Property all of Contractor's tools, equipment, implements and other materials, whether brought upon said property by said Contractor or any Subcontractor, employee or agent of Contractor or of any Subcontractor, and must cause Railway's Property to be left in a condition acceptable to the Railway's representative.

1.04 Contractor Roadway Worker on Track Safety Program and Safety Action Plan

1.04.01 Each Contractor that will perform work within 25 feet of the centerline of a track must develop and implement a Roadway Worker Protection/On Track Safety Program and work with Railway Project Representative to develop an on track safety strategy as described in the guidelines listed in the on track safety portion of the Safety Orientation. This Program must provide Roadway Worker protection/on track training for all employees of the Contractor, its subcontractors, agents or invitees. This training is reinforced at the job site through job safety briefings. Additionally, each Contractor must develop and implement the Safety Action Plan, as provided for on the web site www.contractororientation.com, which will be made available to Railway prior to commencement of any work on Railway Property. During the performance of work, the Contractor must audit its work activities. The Contractor must designate an on-site Project Supervisor who will serve as the contact person for the Railway and who will maintain a copy of the Safety Action Plan, safety audits, and Material Safety Datasheets (MSDS), at the job site.

1.04.02 Contractor shall have a background investigation performed on all of its employees, subcontractors and agents who will be performing any services on railroad property under this Agreement.

The background screening shall at a minimum meet the criteria defined by the e-RAILSAFE program outlined at <http://www.e-railsafe.com> in addition to any other applicable regulatory requirements. The e-RAILSAFE program uses rail industry background screening standards.

Contractor shall obtain consent from all employees screened in compliance with the e-RAILSAFE program criteria to release completed background information to BNSF. Contractor shall be subject to periodic audit to ensure compliance.

Contractor shall not permit any of its employees, subcontractors or agents to perform services on property hereunder who are not approved under e-RAILSAFE program standards. Railroad shall have the right to deny entry onto its premises to any of Contractor's employees, subcontractors or agents who do not display the authorized identification badge issued by a background screening service meeting the standards set forth for the e-RAILSAFE program or who pose a threat, in Railroad's reasonable opinion, to the safety or security of Railroad's operations.

Contractors shall ensure its employees, subcontractors and agents are United States citizens or legally working in this country under a work VISA.

1.05 Facilities and Railway Flagger Services:

1.05.01 The Contractor must give Railway's Roadmaster (telephone 909 386 4061) a minimum of thirty (30) calendar days advance notice when flagging services will be required so that the Roadmaster can make appropriate arrangements (i.e., bulletin the flagger's position). If flagging services are scheduled in advance by the Contractor and it is subsequently determined by the parties hereto that such services are no longer necessary, the Contractor must give the Roadmaster five (5) working days advance notice so that appropriate arrangements can be made to abolish the position pursuant to union requirements.

1.05.02 Unless determined otherwise by Railway's Project Representative, Railway flagger will be required and furnished when Contractor's work activities are located over, under and/or within twenty-five (25) feet measured horizontally from centerline of the nearest track and when cranes or similar equipment positioned beyond 25-feet from the track centerline could foul the track in the event of tip over or other catastrophic occurrence, but not limited thereto for the following conditions:

1.05.02a When upon inspection by Railway's Representative, other conditions warrant.

1.05.02b When any excavation is performed below the bottom of tie elevation, if, in the opinion of Railway's representative, track or other Railway facilities may be subject to movement or settlement.

1.05.02c When work in any way interferes with the safe operation of trains at timetable speeds.

1.05.02d When any hazard is presented to Railway track, communications, signal, electrical, or other facilities either due to persons, material, equipment or blasting in the vicinity.

1.05.02e Special permission must be obtained from the Railway before moving heavy or cumbersome objects or equipment which might result in making the track impassable.

1.05.03 Flagging services will be performed by qualified Railway flaggers.

1.05.03a Flagging crew generally consists of one employee. However, additional personnel may be required to protect Railway Property and operations, if deemed necessary by the Railways Representative.

1.05.03b Each time a flagger is called, the minimum period for billing will be the eight (8) hour basic day.

1.05.03c The cost of flagger services provided by the Railway will be borne by SANBAG. The estimated cost for one (1) flagger is approximately between \$800.00 - \$1600.00 for an eight (8) hour basic day with time and one-half or double time for overtime, rest days and holidays. The estimated cost for each flagger includes vacation allowance, paid holidays, Railway and unemployment insurance, public liability and property damage insurance, health and welfare benefits, vehicle transportation, meals, lodging, radio equipment, supervision and other costs incidental to performing flagging services. Negotiations for Railway labor or collective bargaining agreements and rate changes authorized by appropriate Federal authorities may increase actual or estimated flagging rates. The flagging rate in effect at the time of performance by the Contractor hereunder will be used to calculate the actual costs of flagging pursuant to this paragraph.

1.05.03d The average train traffic on this route is 79 freight trains and 2 passenger trains per 24-hour period. Train timetable speeds are:

Westward: 50 MPH Passenger, 35 MPH Freight
Eastward: 70 MPH Passenger, 55 MPH Freight

1.06 Contractor General Safety Requirements

1.06.01 Work in the proximity of railway track(s) is potentially hazardous where movement of trains and equipment can occur at any time and in any direction. All work performed by contractors within 25 feet of any track must be in compliance with FRA Roadway Worker Protection Regulations.

1.06.02 Before beginning any task on Railway Property, a thorough job safety briefing must be conducted with all personnel involved with the task and repeated when the personnel or task changes. If the task is within 25 feet of any track, the job briefing must include the Railway's flagger, as applicable, and include the procedures the Contractor will use to protect its employees, subcontractors, agents or invitees from moving any equipment adjacent to or across any Railway track(s).

1.06.03 Workers must not work within 25 feet of the centerline of any track without an on track safety strategy approved by the Railway's Project Representative. When authority is provided, every contractor employee must know: (1) who the Railway flagger is, and how to contact the flagger, (2) limits of the authority, (3) the method of communication to stop and resume work, and (4) location of the designated places of safety. Persons or equipment entering flag/work limits that were not previously job briefed, must notify the flagger immediately, and be given a job briefing when working within 25 feet of the center line of track.

1.06.04 When Contractor employees are required to work on the Railway Property after normal working hours or on weekends, the Railroad's representative in charge of the project must be notified. A minimum of two employees must be present at all times.

1.06.05 Any employees, agents or invitees of Contractor or its subcontractors under suspicion of being under the influence of drugs or alcohol, or in the possession of same, will be removed from the Railway's Property and subsequently released to the custody of a representative of Contractor management. Future access to the Railway's Property by that employee will be denied.

1.06.06 Any damage to Railway Property, or any hazard noticed on passing trains must be reported immediately to the Railway's representative in charge of the project. Any vehicle or machine which may come in contact with track, signal equipment, or structure (bridge) and could result in a train derailment must be reported immediately to the Railway representative in charge of the project and to the Railway's Resource Operations Center at 1(800) 832-5452. Local emergency numbers are to be obtained from the Railway representative in charge of the project prior to the start of any work and must be posted at the job site.

1.06.07 For safety reasons, all persons are prohibited from having pocket knives, firearms or other deadly weapons in their possession while working on Railway's Property.

1.06.08 All personnel protective equipment (PPE) used on Railway Property must meet applicable OSHA and ANSI specifications. Current Railway personnel protective equipment requirements are listed on the web site, **www.contractororientation.com**, however, a partial list of the requirements include: a) safety glasses with permanently affixed side shields (no yellow lenses); b) hard hats c) safety shoe with: hardened toes, above-the-ankle lace-up and a defined heel; and d) high visibility retro-reflective work wear. The Railroad's representative in charge of the project is to be contacted regarding local specifications for meeting requirements relating to hi-visibility work wear. Hearing protection, fall protection, gloves, and respirators must be worn as required by State and Federal regulations. **(NOTE – Should there be a discrepancy between the information contained on the web site and the information in this paragraph, the web site will govern.)**

1.06.09 THE CONTRACTOR MUST NOT PILE OR STORE ANY MATERIALS, MACHINERY OR EQUIPMENT CLOSER THAN 25'-0" TO THE CENTER LINE OF THE NEAREST RAILWAY TRACK. MATERIALS, MACHINERY OR EQUIPMENT MUST NOT BE STORED OR LEFT WITHIN 250 FEET OF ANY HIGHWAY/RAIL AT-GRADE CROSSINGS OR TEMPORARY CONSTRUCTION CROSSING, WHERE STORAGE OF THE SAME WILL OBSTRUCT THE VIEW OF A TRAIN APPROACHING THE CROSSING. PRIOR TO BEGINNING WORK, THE CONTRACTOR MUST ESTABLISH A STORAGE AREA WITH CONCURRENCE OF THE RAILROAD'S REPRESENTATIVE.

1.06.10 Machines or vehicles must not be left unattended with the engine running. Parked machines or equipment must be in gear with brakes set and if equipped with blade, pan or bucket, they must be lowered to the ground. All machinery and equipment left unattended on Railway's Property must be left inoperable and secured against movement. (See internet Engineering Contractor Safety Orientation program for more detailed specifications)

1.06.11 Workers must not create and leave any conditions at the work site that would interfere with water drainage. Any work performed over water must meet all Federal, State and Local regulations.

1.06.12 All power line wires must be considered dangerous and of high voltage unless informed to the contrary by proper authority. For all power lines the minimum clearance between the lines and any part of the equipment or load must be; 200 KV or below - 15 feet; 200 to 350 KV - 20 feet; 350 to 500 KV - 25 feet; 500 to 750 KV - 35 feet; and 750 to 1000 KV - 45 feet. If capacity of the line is not known, a minimum clearance of 45 feet must be maintained. A person must be designated to observe clearance of the equipment and give a timely warning for all operations where it is difficult for an operator to maintain the desired clearance by visual means.

1.07 Excavation

1.07.01 Before excavating, the Contractor must determine whether any underground pipe lines, electric wires, or cables, including fiber optic cable systems are present and located within the Project work area. The Contractor must determine whether excavation on Railway's Property could cause damage to buried cables resulting in delay to Railway traffic and disruption of service to users. Delays and disruptions to service may cause business interruptions involving loss of revenue and profits. Before commencing excavation, the Contractor must contact **BNSF's Field Engineering Representative (909 386 4079)**. All underground and overhead wires will be considered HIGH VOLTAGE and dangerous until verified with the company having ownership of the line. **It is the Contractor's responsibility to notify any other companies that have underground utilities in the area and arrange for the location of all underground utilities before excavating.**

1.07.02 The Contractor must cease all work and notify the Railway immediately before continuing excavation in the area if obstructions are encountered which do not appear on drawings. If the obstruction is a utility and the owner of the utility can be identified, then the Contractor must also notify the owner immediately. If there is any doubt about the location of underground cables or lines of any kind, no work must be performed until the exact location has been determined. There will be no exceptions to these instructions.

1.07.03 All excavations must be conducted in compliance with applicable OSHA regulations and, regardless of depth, must be shored where there is any danger to tracks, structures or personnel.

1.07.04 Any excavations, holes or trenches on the Railway's Property must be covered, guarded and/or protected when not being worked on. When leaving work site areas at night and over weekends, the areas must be secured and left in a condition that will ensure that Railway employees and other personnel who may be working or passing through the area are protected from all hazards. All excavations must be back filled as soon as possible.

1.08 Hazardous Waste, Substances and Material Reporting

1.08.01 If Contractor discovers any hazardous waste, hazardous substance, petroleum or other deleterious material, including but not limited to any non-containerized commodity or material, on or adjacent to Railway's Property, in or near any surface water, swamp, wetlands or waterways, while performing any work under this Agreement, Contractor must immediately: (a) notify the Railway's Resource Operations Center at 1(800) 832-5452, of such discovery; (b) take safeguards necessary to protect its employees, subcontractors, agents and/or third parties; and (c) exercise due care with respect to the release, including the taking of any appropriate measure to minimize the impact of such release.

1.09 Personal Injury Reporting

1.09.01 The Railway is required to report certain injuries as a part of compliance with Federal Railroad Administration (FRA) reporting requirements. Any personal injury sustained by an employee of the Contractor, subcontractor or Contractor's invitees while on the Railway's Property must be reported immediately (by phone mail if unable to contact in person) to the Railway's representative in charge of the project. The Non-Employee Personal Injury Data Collection Form contained herein is to be completed and sent by Fax to the Railway at 1(817) 352-7595 and to the Railway's Project Representative no later than the close of shift on the date of the injury.

NON-EMPLOYEE PERSONAL INJURY DATA COLLECTION

INFORMATION REQUIRED TO BE COLLECTED PURSUANT TO FEDERAL REGULATION. IT SHOULD BE USED FOR COMPLIANCE WITH FEDERAL REGULATIONS ONLY AND IS NOT INTENDED TO PRESUME ACCEPTANCE OF RESPONSIBILITY OR LIABILITY.

1. Accident City/St _____ 2. Date: _____ Time: _____
County: _____ 3. Temperature: _____ 4. Weather _____
(if non-Railway location)

5. Social Security # _____

6. Name (last, first, mi) _____

7. Address: Street: _____ City: _____ St. _____ Zip: _____

8. Date of Birth: _____ and/or Age _____ Gender: _____
(if available)

9. (a) Injury: _____ (b) Body Part: _____
(i.e. (a) Laceration (b) Hand)

11. Description of Accident (To include location, action, result, etc.):

12. Treatment:
First Aid Only
Required Medical Treatment
Other Medical Treatment

13. Dr. Name _____ 30. Date: _____

14. Dr. Address:
Street: _____ City: _____ St: _____ Zip: _____

15. Hospital Name: _____

16. Hospital Address:
Street: _____ City: _____ St: _____ Zip: _____

17. Diagnosis: _____

**FAX TO
RAILWAY AT (817) 352-7595
AND COPY TO
RAILWAY ROADMASTER FAX 909-386-4843**

**OVERHEAD EXHIBIT "C -1"
Massachusetts Avenue Overcrossing**

**Agreement
Between
BNSF RAILWAY COMPANY
and the
CONTRACTOR**

**BNSF RAILWAY COMPANY
Attention: Manager Public Projects**

**Railway File: 026109R
Agency Project: Massachusetts Avenue. Overhead**

Gentlemen:

The undersigned (hereinafter called, the "Contractor"), has entered into a contract (the "Contract") dated _____, 200_, with **SAN BERNARDINO ASSOCIATED GOVERNMENTS** for the performance of certain work in connection with the following project: demolish and reconstruct the Massachusetts Avenue Overhead, in San Bernardino, CA. Performance of such work will necessarily require contractor to enter BNSF RAILWAY COMPANY ("Railway") right of way and property ("Railway Property"). The Contract provides that no work will be commenced within Railway Property until the Contractor employed in connection with said work for **SAN BERNARDINO ASSOCIATED GOVERNMENTS** (i) executes and delivers to Railway an Agreement in the form hereof, and (ii) provides insurance of the coverage and limits specified in such Agreement and Section 3 herein. If this Agreement is executed by a party who is not the Owner, General Partner, President or Vice President of Contractor, Contractor must furnish evidence to Railway certifying that the signatory is empowered to execute this Agreement on behalf of Contractor.

Accordingly, in consideration of Railway granting permission to Contractor to enter upon Railway Property and as an inducement for such entry, Contractor, effective on the date of the Contract, has agreed and does hereby agree with Railway as follows:

Section 1. RELEASE OF LIABILITY AND INDEMNITY

Contractor hereby waives, releases, indemnifies, defends and holds harmless Railway for all judgments, awards, claims, demands, and expenses (including attorneys' fees), for injury or death to all persons, including Railway's and Contractor's officers and employees, and for loss and damage to property belonging to any person, arising in any manner from Contractor's or any of Contractor's subcontractors' acts or omissions or any work performed on or about Railway's property or right-of-way. **THE LIABILITY ASSUMED BY CONTRACTOR WILL NOT BE AFFECTED BY THE FACT, IF IT IS A FACT, THAT THE DESTRUCTION, DAMAGE, DEATH, OR INJURY WAS OCCASIONED BY OR CONTRIBUTED TO BY THE NEGLIGENCE OF RAILWAY, ITS AGENTS, SERVANTS, EMPLOYEES OR OTHERWISE, EXCEPT TO THE EXTENT THAT SUCH CLAIMS ARE PROXIMATELY CAUSED BY THE WILLFUL MISCONDUCT OR SOLE NEGLIGENCE OF RAILWAY.**

THE INDEMNIFICATION OBLIGATION ASSUMED BY CONTRACTOR INCLUDES ANY CLAIMS, SUITS OR JUDGMENTS BROUGHT AGAINST RAILWAY UNDER THE FEDERAL EMPLOYEE'S LIABILITY ACT, INCLUDING CLAIMS FOR STRICT LIABILITY UNDER THE SAFETY APPLIANCE ACT OR THE LOCOMOTIVE INSPECTION ACT, WHENEVER SO CLAIMED.

Contractor further agrees, at its expense, in the name and on behalf of Railway, that it will adjust and settle all claims made against Railway, and will, at Railway's discretion, appear and defend any suits or actions of law or in equity brought against Railway on any claim or cause of action arising or growing out of or in any manner connected with any liability assumed by Contractor under this Agreement for which Railway is liable or is alleged to be liable. Railway will give notice to Contractor, in writing, of the receipt or dependency of such claims and thereupon Contractor must proceed to adjust and handle to a conclusion such claims, and in the event of a suit being brought against Railway, Railway may forward summons and complaint or other process in connection therewith to Contractor, and Contractor, at Railway's discretion, must defend, adjust, or settle such suits and protect, indemnify, and save harmless Railway from and against all damages, judgments, decrees, attorney's fees, costs, and expenses growing out of or resulting from or incident to any such claims or suits.

In addition to any other provision of this Agreement, in the event that all or any portion of this Article shall be deemed to be inapplicable for any reason, including without limitation as a result of a decision of an applicable court, legislative enactment or regulatory order, the parties agree that this Article shall be interpreted as requiring Contractor to indemnify Railroad to the fullest extent permitted by applicable law. **THROUGH THIS AGREEMENT THE PARTIES EXPRESSLY INTEND FOR CONTRACTOR TO INDEMNIFY RAILROAD FOR RAILROAD'S ACTS OF NEGLIGENCE.**

It is mutually understood and agreed that the assumption of liabilities and indemnification provided for in this Agreement survive any termination of this Agreement.

Section 2. TERM

This Agreement is effective from the date of the Contract until (i) the completion of the project set forth herein, and (ii) full and complete payment to Railway of any and all sums or other amounts owing and due hereunder.

Section 3. INSURANCE

Contractor must, at its sole cost and expense, procure and maintain during the life of this Agreement the following insurance coverage:

A. Commercial General Liability insurance. This insurance must contain broad form contractual liability with a combined single limit of a minimum of \$5,000,000 each occurrence and an aggregate limit of at least \$10,000,000. Coverage must be purchased on a post 1998 ISO occurrence form or equivalent and include coverage for, but not limit to the following:

- Bodily Injury and Property Damage
- Personal Injury and Advertising Injury
- Fire legal liability
- Products and completed operations

This policy must also contain the following endorsements, which must be indicated on the certificate of insurance:

It is agreed that any workers' compensation exclusion does not apply to **Railroad** payments related to the Federal Employers Liability Act or a **Railroad** Wage Continuation Program or similar programs and any payments made are deemed not to be either payments made or obligations assumed under any Workers Compensation, disability benefits, or unemployment compensation law or similar law.

The definition of insured contract must be amended to remove any exclusion or other limitation for any work being done within 50 feet of railroad property.

Any exclusions related to the explosion, collapse and underground hazards must be removed.

No other endorsements limiting coverage as respects obligations under this Agreement may be included on the policy.

B. Business Automobile Insurance. This insurance must contain a combined single limit of at least \$1,000,000 per occurrence, and include coverage for, but not limited to the following:

- Bodily injury and property damage
- Any and all vehicles owned, used or hired

C. Workers Compensation and Employers Liability insurance including coverage for, but not limited to:

California's statutory liability under the worker's compensation laws of the state(s) in which the work is to be performed. If optional under State law, the insurance must cover all employees anyway.

Employers' Liability (Part B) with limits of at least \$500,000 each accident, \$500,000 by disease policy limit, \$500,000 by disease each employee.

D. Railroad Protective Liability insurance naming only the **Railroad** as the Insured with coverage of at least \$5,000,000 per occurrence and \$10,000,000 in the aggregate. The policy Must be issued on a standard ISO form CG 00 35 10 93 and include the following:

Endorsed to include the Pollution Exclusion Amendment (ISO form CG 28 31 10 93)

Endorsed to include the Limited Seepage and Pollution Endorsement.

Endorsed to remove any exclusion for punitive damages.

No other endorsements restricting coverage may be added.

The original policy must be provided to the **Railroad** prior to performing any work or services under this Agreement

Other Requirements:

All policies (applying to coverage listed above) must not contain an exclusion for punitive damages and certificates of insurance must reflect that no exclusion exists.

Contractor agrees to waive its right of recovery against **Railroad** for all claims and suits against **Railroad**. In addition, its insurers, through the terms of the policy or policy endorsement, waive their right of subrogation against **Railroad** for all claims and suits. The certificate of insurance must reflect the waiver of subrogation endorsement. Contractor further waives its right of recovery, and its insurers also waive their right of subrogation against **Railroad** for loss of its owned or leased property or property under contractor's care, custody or control.

Contractor's insurance policies through policy endorsement, must include wording which states that the policy is primary and non-contributing with respect to any insurance carried by **Railroad**. The certificate of insurance must reflect that the above wording is included in evidenced policies.

All policy(ies) required above (excluding Workers Compensation and if applicable, Railroad Protective) must include a severability of interest endorsement and **Railroad** must be named as an additional insured with respect to work performed under this agreement. Severability of interest and naming **Railroad** as additional insured must be indicated on the certificate of insurance.

Contractor is not allowed to self-insure without the prior written consent of **Railroad**. If granted by **Railroad**, any deductible, self-insured retention or other financial responsibility for claims must be covered directly by contractor in lieu of insurance. Any and all **Railroad** liabilities that would otherwise, in accordance with the provisions of this **Agreement**, be covered by contractor's insurance will be covered as if contractor elected not to include a deductible, self-insured retention or other financial responsibility for claims.

Prior to commencing the Work, contractor must furnish to **Railroad** an acceptable certificate(s) of insurance including an original signature of the authorized representative evidencing the required coverage, endorsements, and amendments and referencing the contract audit/folder number if available. The policy(ies) must contain a provision that obligates the insurance company(ies) issuing such policy(ies) to notify **Railroad** in writing at least 30 days prior to any cancellation, non-renewal, substitution or material alteration. This cancellation provision must be indicated on the certificate of insurance. Upon request from **Railroad**, a certified duplicate original of any required policy must be furnished. Contractor should send the certificate(s) to the following address:

IDS

PO Box 12010-BN

Hemet, CA 92546-8010

Fax number: 951-766-2299

Email: customerservice@certsonline.com

Any insurance policy must be written by a reputable insurance company acceptable to **Railroad** or with a current Best's Guide Rating of A- and Class VII or better, and authorized to do business in the state(s) in which the service is to be provide.

Contractor represents that this **Agreement** has been thoroughly reviewed by contractor's insurance agent(s)/broker(s), who have been instructed by contractor to procure the insurance coverage required by this **Agreement**. Allocated Loss Expense must be in addition to all policy limits for coverages referenced above.

Not more frequently than once every five years, **Railroad** may reasonably modify the required insurance coverage to reflect then-current risk management practices in the railroad industry and underwriting practices in the insurance industry.

If any portion of the operation is to be subcontracted by contractor, contractor must require that the subcontractor provide and maintain the insurance coverages set forth herein, naming **Railroad** as an additional insured, and requiring that the subcontractor release, defend and indemnify **Railroad** to the same extent and under the same terms and conditions as contractor is required to release, defend and indemnify **Railroad** herein.

Failure to provide evidence as required by this section will entitle, but not require, **Railroad** to terminate this **Agreement** immediately. Acceptance of a certificate that does not comply with this section will not operate as a waiver of contractor's obligations hereunder.

The fact that insurance (including, without limitation, self-insurance) is obtained by contractor will not be deemed to release or diminish the liability of contractor including, without limitation, liability under the indemnity provisions of this **Agreement**. Damages recoverable by **Railroad** will not be limited by the amount of the required insurance coverage.

For purposes of this section, **Railroad** means "Burlington Northern Santa Fe Corporation", "BNSF RAILWAY COMPANY" and the subsidiaries, successors, assigns and affiliates of each.

Section 4. EXHIBIT "C" CONTRACTOR REQUIREMENTS

The Contractor must observe and comply with the provisions, obligations, requirements and limitations contained in the Contract and the Contractor Requirements set forth on Exhibit "C" attached to the Contract and this Agreement, including, but not be limited to, payment of all costs incurred for any damages to Railway roadbed, tracks, and/or appurtenances thereto, resulting from use, occupancy, or presence of its employees, representatives, or agents or subcontractors on or about the construction site.

Section 5. TRAIN DELAY

Contractor is responsible for and hereby indemnifies and holds harmless Railway (including its affiliated railway companies, and its tenants) for, from and against all damages arising from any unscheduled delay to a freight or passenger train which affects Railway's ability to fully utilize its equipment and to meet customer service and contract obligations. Contractor will be billed, as further provided below, for the economic losses arising from loss of use of equipment, contractual loss of incentive pay and bonuses and contractual penalties resulting from train delays, whether caused by Contractor, or subcontractors, or by the Railway performing work under this Agreement. Railway agrees that it will not perform any act to unnecessarily cause train delay.

For loss of use of equipment, Contractor will be billed the current freight train hour rate per train as determined from Railway's records. Any disruption to train traffic may cause delays to multiple trains at the same time for the same period.

Additionally, the parties acknowledge that passenger, U.S. mail trains and certain other grain, intermodal, coal and freight trains operate under incentive/penalty contracts between Railway and its customer(s). Under these arrangements, if Railway does not meet its contract service commitments, Railway may suffer loss of performance or incentive pay and/or be subject to penalty payments. Contractor is responsible for any train performance and incentive penalties or other contractual economic losses actually incurred by Railway which are attributable to a train delay caused by Contractor or its subcontractors.

The contractual relationship between Railway and its customers is proprietary and confidential. In the event of a train delay covered by this Agreement, Railway will share information relevant to any train delay to the extent consistent with Railway confidentiality obligations. Damages for train delay for certain trains may be as high as \$50,000.00 (\$382.20 per hour) per incident. **THE RATE THEN IN EFFECT AT THE TIME OF PERFORMANCE BY THE CONTRACTOR HEREUNDER WILL BE USED TO CALCULATE THE ACTUAL COSTS OF TRAIN DELAY PURSUANT TO THIS AGREEMENT.**

Contractor and its subcontractors must give Railway's representative 909 386 4079 eight (8) weeks advance notice of the times and dates for proposed work windows. Railway and Contractor will establish mutually agreeable work windows for the project. Railway has the right at any time to revise or change the work windows due to train operations or service obligations. Railway will not be responsible for any additional costs or expenses resulting from a change in work windows. Additional costs or expenses resulting from a change in work windows shall be accounted for in Contractor's expenses for the project.

Contractor and subcontractors must plan, schedule, coordinate and conduct all Contractor's work so as to not cause any delays to any trains.

Kindly acknowledge receipt of this letter by signing and returning to the Railway two original copies of this letter, which, upon execution by Railway, will constitute an Agreement between us.

(Contractor)

BNSF Railway Company

By: _____
Printed Name: _____
Title: _____

By: _____
Name: Melvin Thomas
Manager Public Projects

Contact Person: _____
Address _____

City: _____ State: _____ Zip: _____
Fax: _____
Phone: _____
E-mail: _____

Accepted and effective this ____ day of 20__.

Exhibit F
Massachusetts Avenue Overcrossing

BNSF Bridge Requirements

BRIDGE DESIGN, PLANS & SPECIFICATIONS:

Except for the design of temporary falsework and shoring, BNSF review of the Structure plans will be limited to the vertical and horizontal clearances, sight distance for existing train signals, foundation dimensions and drainage characteristics as they relate to existing and future tracks. BNSF will not review structural design calculations for the permanent Structure unless a member or members are influenced by railroad live loads.

Temporary falsework and shoring plans and calculations must be reviewed and approved by BNSF prior to beginning construction. SANBAG shall perform an independent review of the design calculations for temporary falsework and shoring prior to submitting them to BNSF for approval. Temporary construction clearances must be no less than 15 feet measured horizontally from the centerline of the nearest track and 21 feet-6inches measured vertically from the top of rail of the most elevated track to the bottom of lowest temporary falsework member. State regulatory agencies may have more restrictive requirements for temporary railroad clearances.

For the permanent Structure, SANBAG will submit plans showing the least horizontal distance from the centerline of existing and future tracks to the face of the nearest member of the proposed Structure. The location of the least horizontal distance must be accurately described such that BNSF can determine where it will occur in both the horizontal and vertical plane. If the permanent member is within 25 feet of the nearest track (or future track), collision walls shall be incorporated into the permanent Structure design according to American Railway Engineering and Maintenance Association Manual of Recommended Practice - Chapter 8 - Article 2.1.5.

For the permanent Structure, SANBAG will submit plans showing the least vertical clearance from top of the most elevated rail of existing and future tracks to the lowest point of the proposed Structure. Prior to beginning construction of the permanent Structure, the top of rail elevations should be checked and verified that they have not changed from the assumed elevations utilized for the design of the bridge.

Prior to issuing any invitation to bid on construction of the Structure, SANBAG should conduct a pre-bid meeting where prospective Contractors have the opportunity to communicate with BNSF personnel regarding site specific train speeds, train density, and general safety requirements for men and equipment working near live tracks. Any invitation to bid and specifications for the Structure must be submitted to BNSF for review and approval prior to letting of bids for the Project.

BRIDGE CONSTRUCTION:

After awarding the bid, but prior to the Contractor entering BNSF's railroad corridor or property, SANBAG should conduct a pre-construction meeting with BNSF personnel in attendance to reiterate the safety requirements of construction activity adjacent to live tracks.

During construction, BNSF may require an independent engineering inspector to be present during certain critical activities of the Project, including but not limited to: driving foundation piles, erecting falsework, construction of shoring and retaining walls, placing concrete, placing soil backfill and compaction processes. SANBAG shall reimburse BNSF for all costs of supplemental inspection services.

Within 90 days of the conclusion of the Project and final acceptance by BNSF, SANBAG will provide BNSF with a complete electronic set of the bridge plans. BNSF will also accept a marked up paper copy of the bridge plans labeled "As Built". The marked up paper copy of the plans will reflect any and all deviations from the original plans that occurred during construction. The electronic set of the bridge plans will be submitted in Micro Station *.dgn electronic format (preferred) or AutoCAD *.dwg format. Electronic plans are to be submitted in the original format used for CAD plan preparation and not converted to another format prior to submission. The "As Built" plans shall show actual measured "as constructed" clearances shall be shown as well as depth, size and location of all foundation components. The plans shall show dimensioned locations of existing and relocated utilities. It is understood that BNSF prefers to receive the "As Built" plans in an electronic format.

BRIDGE MAINTENANCE:

STATE will be responsible for maintenance and repair of the Structure including the earth retention components, embankment slopes, erosion control, surface drainage, fencing, deck drains, landscaping, paint, walkways, handrails, lighting, and other improvements associated with the Project.

Fencing and other pedestrian access controls within BNSF's rail corridor and incorporated into the Project shall be designed and maintained by SANBAG through construction. Trespasser control shall be the responsibility of SANBAG through construction. Graffiti removal will be the responsibility of STATE.

BRIDGE INSPECTION:

STATE will conduct annual routine structural inspections. In the event of an earthquake, fire, flood, damage from vehicular impacts or other emergent situations, STATE will provide an immediate inspection by qualified personnel and notify BNSF of damage that may affect safe passage of trains. If necessary STATE will embargo weights or provide lane closures or other such measures to protect the structural integrity of the Structure such that there can be continuous safe passage of trains until repairs are made.

BRIDGE ALTERATIONS:

Except as provided otherwise by this Agreement, there will be no alterations made to the Structure that will alter the railroad vertical or horizontal clearances provided by the original design

It is expressly understood by STATE that the right to install utilities is restricted to the placement of underground utilities beneath BNSF's tracks located a minimum of fifty (50) feet from abutments, piers, piles, or footings. Under no circumstances will utilities be allowed to hang from the Structure, unless approved by BNSF. All utility crossings within the limits of BNSF's Rail Corridor will be covered by separate agreements between BNSF and each of the owners of the utilities.

**AMENDMENTS TO THE STANDARD SPECIFICATIONS
DATED JULY 1999**

Bidder's." After award, interpret sentences written in the imperative mood as starting with "The Contractor must" and interpret "you" as "the Contractor" and "your" as "the Contractor's."

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

All items in a list apply unless the items are specified as choices.

Headings are included for the purposes of organization and referencing. Inclusion of a heading with no related content, "Reserved," or "Not Used" does not indicate that no specification exists for that subject; applicable specifications may be covered in a general or referenced specification.

1-2 REFERENCES

1-2.01 REFERENCES

A reference within parentheses to a law or regulation is included in the contract for convenience only and is not a comprehensive listing of related laws and regulations. Lack of a reference does not indicate no related laws or regulations exist.

If the version of a referenced document is not specified, use the current version in effect on the date of Notice to Bidders.

A reference to a subsection includes the section's general specifications of which the subsection is a part.

A code not specified as a Federal code is a California code.

1-3 ABBREVIATIONS AND MEASUREMENT UNITS

1-3.01 ABBREVIATIONS

Abbreviations

| Abbreviation | Meaning |
|--------------|--|
| AAN | American Association of Nurserymen |
| AASHTO | American Association of State Highway and Transportation Officials |
| AISC | American Institute of Steel Construction |
| AISI | American Iron and Steel Institute |
| ANSI | American National Standards Institute |
| APHA | American Public Health Association |
| API | American Petroleum Institute |
| AREMA | American Railway Engineering and Maintenance-of-Way Association |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| AWG | American Wire Gage |
| AWPA | American Wood-Preservers' Association |
| AWS | American Welding Society |
| AWWA | American Water Works Association |
| CIH | Certified Industrial Hygienist |
| DBE | Disadvantaged Business Enterprise |
| DVBE | Disabled Veteran Business Enterprise |
| EIA | Electronic Industries Alliance |
| ETL | Electrical Testing Laboratories |
| FHWA | Federal Highway Administration |
| IEEE | Institute of Electrical and Electronics Engineers |
| NETA | National Electrical Testing Association, Inc. |
| NEMA | National Electrical Manufacturers Association |
| PLAC | permit, license, agreement, certification, or any combination of these |
| SSPC | The Society for Protective Coatings |
| UL | Underwriters' Laboratories Inc. |

1-3.02 MEASUREMENT UNITS

Some of the symbols for units of measurement used in the specifications and in the Bid Item List are defined as follows. The symbols for other units of measurement used in the specifications are as defined in ASTM E 380 or in the various specifications and test referenced in the specifications.

Measurement Units

| Symbols as used in the specifications | Symbols as used in the Bid Item List | Meaning |
|---------------------------------------|--------------------------------------|----------------------------------|
| A | — | amperes |
| — | EA | each |
| g | G | gram |
| kg | KG | kilogram |
| ha | HA | hectare (10 000 m ²) |
| h | H | hour |
| J | — | joule |
| — | LNKM | lane kilometer |
| L | L | liter |
| — | LS | lump sum |
| m | M | meter |
| km | KM | kilometer |
| mm | MM | millimeter |
| µm | — | micrometer |
| nm | — | nanometer |
| m ² | M2 | square meter |
| m ³ | M3 | cubic meter |
| N | — | newton |
| N·m | — | newton meter |
| Ω | — | ohm |
| Pa | — | pascal |
| kPa | — | kilopascal |
| MPa | — | megapascal |
| s | — | second |
| — | STA | station (100 m) |
| — | TAB | tablet |
| tonne | TONN | metric ton (1000 kg) |
| W | — | watt |

1-4 DEFINITIONS

1-4.01 GENERAL

Interpret terms as defined in the contract documents. A construction-industry term not defined in the contract documents has the meaning defined in Means Illustrated Construction Dictionary, Condensed Version, Second Edition.

1-4.02 GLOSSARY

acceptance: Formal written acceptance by the Director of an entire contract that has been completed in all respects in accordance with the plans and specifications and any modifications to them previously approved.

base: Layer of specified material of planned thickness placed immediately below the pavement or surfacing.

basement material: Material in excavation or embankments underlying the lowest layer of subbase, base, pavement, surfacing, or other specified layer to be placed.

bid item: Specific work unit for which the bidder provides a price.

Bid Item List: List of bid items and the associated quantities.

Bid Item List, verified: Bid Item List with verified prices. The Contract Proposal of Low Bidder at the Department's Web site is the verified Bid Item List.

bridge: Structure, with a bridge number, that carries a utility facility, or railroad, highway, pedestrian or other traffic, over a water course or over or under or around any obstruction.

building-construction contract: Contract that has "building construction" on the cover of the Notice to Bidders and Special Provisions.

business day: Day on the calendar except Saturday or holiday.

California Manual on Uniform Traffic Control Devices: The California Manual on Uniform Traffic Control Devices for Streets and Highways (California MUTCD) is issued by the Department of Transportation and is the Federal Highway Administration's MUTCD 2003 Edition, as amended for use in California.

Certified Industrial Hygienist: Industrial hygienist certified in comprehensive practice by the American Board of Industrial Hygiene.

conduit: Pipe or tube in which smaller pipes, tubes, or electrical conductors are inserted or are to be inserted.

contract: Written and executed contract between the Department and the Contractor.

contract bonds: Security for the payment of workers and suppliers furnishing materials, labor, and services and for guaranteeing the Contractor's work performance.

contract item: Bid item.

Contractor: Person or business or its legal representative entering into a contract with the Department for performance of the work.

culvert: Structure, other than a bridge, that provides an opening under a roadway for drainage or other purposes.

day: 24 consecutive hours running from midnight to midnight; calendar day.

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

Department: Department of Transportation as defined in St & Hwy Code § 20 and authorized in St & Hwy Code § 90; its authorized representatives.

detour: Temporary route for traffic around a closed road part. A passageway through a job site is not a detour.

Director: Department's Director.

Disabled Veteran Business Enterprise: Business certified as a DVBE by the Office of Small Business and DVBE Services, Department of General Services.

divided highway: Highway with separated traveled ways for traffic, generally in opposite directions.

Engineer: Department's Chief Engineer acting either directly or through properly authorized agents; the agents acting within the scope of the particular duties delegated to them.

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

fixed costs: Labor, material, or equipment cost directly incurred by the Contractor as a result of performing or supplying a particular bid item that remains constant regardless of the item's quantity.

frontage road: Local street or road auxiliary to and located generally on the side of an arterial highway for service to abutting property and adjacent areas and for control of access.

grading plane: Basement material surface on which the lowest layer of subbase, base, pavement, surfacing, or other specified layer is placed.

highway: Whole right of way or area that is reserved for and secured for use in constructing the roadway and its appurtenances.

holiday:

1. Every Sunday
2. January 1st, New Year's Day
3. 3rd Monday in January, Birthday of Martin Luther King, Jr.
4. February 12th, Lincoln's Birthday
5. 3rd Monday in February, Washington's Birthday
6. March 31st, Cesar Chavez Day
7. Last Monday in May, Memorial Day
8. July 4th, Independence Day
9. 1st Monday in September, Labor Day
10. 2nd Monday in October, Columbus Day
11. November 11th, Veterans Day
12. 4th Thursday in November, Thanksgiving Day
13. Day after Thanksgiving Day
14. December 25th, Christmas Day

If January 1st, February 12th, March 31st, July 4th, November 11th, or December 25th falls on a Sunday, the Monday following is a holiday. If November 11th falls on a Saturday, the preceding Friday is a holiday. Interpret "legal holiday" as "holiday."

informal-bid contract: Contract that has "Informal Bid Authorized by Pub Cont Code §10122" on the cover of the Notice to Bidders and Special Provisions.

Information Handout: Supplemental project information furnished to bidders as a handout.

laboratory: Laboratory authorized by the Department to test materials.

liquidated damages: Amount prescribed in the specifications, pursuant to the authority of Pub Cont Code § 10226, to be paid to the State or to be deducted for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the specifications.

median: Portion of a divided highway separating the traveled ways for traffic in opposite directions including inside shoulders.

Notice to Bidders: Document that provides a general work description, bidder and bid specifications, and the time and location the Department receives bids.

pavement: Uppermost layer of material placed on the traveled way or shoulders. This term is used interchangeably with surfacing.

plans: Official project plans and Standard Plans, profiles, typical cross sections, working drawings and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed. These documents are to be considered as a part of the plans.

In the above definition, the following terms are defined as follows:

Standard Plans: Standard Plans issued by the Department.

project plans: Specific details and dimensions peculiar to the work supplemented by the Standard Plans insofar as the same may apply.

roadbed: Area between the intersection of the upper surface of the roadway and the side slopes or curb lines. The roadbed rises in elevation as each increment or layer of subbase, base, surfacing or pavement is placed. Where the medians are so wide as to include areas of undisturbed land, a divided highway is considered as including 2 separate roadbeds.

roadway: Highway portion included between the outside lines of sidewalks, or curbs, slopes, ditches, channels, waterways, and including all the appertaining structures, and other features necessary to proper drainage and protection.

shoulder: Roadway portion contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

special provisions: Specific clauses setting forth conditions or requirements peculiar to the work and supplementary to these Standard Specifications. The Department's publication titled "Labor Surcharge And Equipment Rental Rates" is part of the special provisions.

specifications: Directions, provisions, and requirements contained in these Standard Specifications, Amendments to the Standard Specifications, and the special provisions. Where the term "these specifications" or "these Standard Specifications" is used in this book, it means the provisions set forth in this book.

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

Structure Design: Offices of Structure Design of the Department.

subbase: Layer of specified material of planned thickness between a base and the basement material.

subgrade: Roadbed portion on which pavement, surfacing, base, subbase, or a layer of any other material is placed.

substructure: Bridge portions below the bridge seats, tops of piers, haunches of rigid frames, or below the spring lines of arches. Backwalls and parapets of abutments and wingwalls of bridges are portions of the substructure.

superstructure: Bridge portion except the bridge substructure.

supplemental project information: Information relevant to the project, specified as supplemental project information, and made available to bidders.

surfacing: Uppermost layer of material placed on the traveled way, or shoulders. This term is used interchangeably with pavement.

traffic lane: Portion of a traveled way for the movement of a single line of vehicles.

traveled way: Portion of the roadway for the movement of vehicles, exclusive of shoulders.

total bid: Sum of the item totals as verified by the Department; original contract price.

withhold: Money temporarily or permanently taken from progress payment. Withholds are not retentions under Pub Cont Code § 7107.

work: All the work specified, indicated, shown or contemplated in the contract to construct the improvement, including all alterations, amendments, or extensions to it made by contract change order or other written orders of the Engineer.

1-5 DISTRICTS

District Composition and Office Addresses

| District | Counties | Location Address | Mailing Address |
|----------|--|--|---|
| 1 | Del Norte (DN), Humboldt (Hum), Lake (Lak), Mendocino (Men) | 1656 UNION ST EUREKA, CA | PO BOX 3700 EUREKA CA 95502 |
| 2 | Lassen (Las), Modoc (Mod), Plumas (Plu), Shasta (Sha), Siskiyou (Sis), Tehama (Teh), Trinity (Tri) | 1657 RIVERSIDE DR REDDING, CA | PO BOX 496073 REDDING CA 96049-6073 |
| 3 | Butte (But), Colusa (Col), El Dorado (ED), Glenn (Gle), Nevada (Nev), Placer (Pla), Sacramento (Sac), Sierra (Sie), Sutter (Sut), Yolo (Yol), Yuba (Yub) | 703 B ST MARYSVILLE, CA | PO BOX 911 MARYSVILLE CA 95901 |
| 4 | Alameda (Ala), Contra Costa (CC), Marin (Mrn), Napa (Nap), San Francisco (SF), San Mateo (SM), Santa Clara (SCI), Solano (Sol), Sonoma (Son) | 111 GRAND AVE OAKLAND, CA | PO BOX 23660 OAKLAND CA 94623-0660 |
| 5 | Monterey (Mon), San Benito (SBt), San Luis Obispo (SLO), Santa Barbara (SB), Santa Cruz (SCr) | 50 HIGUERA ST SAN LUIS OBISPO, CA | 50 HIGUERA ST SAN LUIS OBISPO CA 93401-5415 |
| 6 | Fresno (Fre), Kern (Ker), Kings (Kin), Madera (Mad), Tulare (Tul) | 1352 W. OLIVE AVE FRESNO, CA | PO BOX 12616 FRESNO CA 93728-2616 |
| 7 | Los Angeles (LA), Ventura (Ven) | 100 S. MAIN ST LOS ANGELES | 100 S MAIN ST LOS ANGELES CA 90012 |
| 8 | Riverside (Riv), San Bernardino (SBd) | 464 W 4TH ST SAN BERNARDINO, CA | 464 W 4TH ST SAN BERNARDINO CA 92401-1400 |
| 9 | Inyo (Iny), Mono (Mno) | 500 S MAIN ST BISHOP, CA | 500 S MAIN ST BISHOP CA 93514-3423 |
| 10 | Alpine (Alp), Amador (Ama), Calaveras (Cal), Mariposa (Mpa), Merced (Mer), San Joaquin (SJ), Stanislaus (Sta), Tuolumne (Tuo) | 1976 E CHARTER WAY STOCKTON, CA | PO BOX 2048 STOCKTON CA 95201 |
| 11 | Imperial (Imp), San Diego (SD) | 4050 TAYLOR ST SAN DIEGO, CA | 4050 TAYLOR ST SAN DIEGO CA 92110-2737 |
| 12 | Orange (Ora) | 3347 MICHELSON DR STE 100 IRVINE, CA | 3347 MICHELSON DR STE 100 IRVINE CA 92612-0661 |

A project with work in District 1, 2, or 3 is a North Region project. For Districts 1, 2, and 3, interpret each reference to the district office as the North Region office. The North Region office address is the District 3 address.

1-6 WEB SITES, ADDRESSES, AND TELEPHONE NUMBERS

Web Sites, Addresses, and Telephone Numbers

| Agency, Department Unit, or Reference | Web Site | Address | Telephone No. |
|--|---|---|----------------------------------|
| Bid Document Unit | | MSC 26 BID DOCUMENT UNIT DEPARTMENT OF TRANSPORTATION 1120 N ST RM 200 SACRAMENTO CA 95814-5605 | |
| Department | www.dot.ca.gov | | |
| Department of General Services, Office of Small Business and DVBE Services | www.pd.dgs.ca.gov/smbus/default.htm | OFFICE OF SMALL BUSINESS AND DVBE SERVICES DEPARTMENT OF GENERAL SERVICES 707 3RD ST WEST SACRAMENTO CA 95605-2811 | (800) 559-5529 (916) 375-4940 |
| Department of Industrial Relations | www.dir.ca.gov | | |
| Department of Industrial Relations, Division of Apprenticeship Standards | | 455 GOLDEN GATE AVENUE SAN FRANCISCO, CA 94102 | |
| Office Engineer | | MSC 43 OFFICE ENGINEER DEPARTMENT OF TRANSPORTATION 1727 30TH ST SACRAMENTO CA 95816-7005 | |
| Office Engineer– Verified Bid Results | http://www.dot.ca.gov/hq/esc/oe/awards/bidsum_html/6week_list.html | | |
| Offices of Structure Design, Documents Unit | | MSC 9-4/4I DOCUMENTS UNIT OFFICES OF STRUCTURE DESIGN DEPARTMENT OF TRANSPORTATION 1801 30TH ST SACRAMENTO CA 95816-7006 | (916) 227-8252 |
| Publication Distribution Unit | | PUBLICATION UNIT DEPARTMENT OF TRANSPORTATION 1900 ROYAL OAKS DRIVE SACRAMENTO CA 95815-3800 | |
| Transportation Laboratory | | MATERIALS AND ENGINEERING TESTING SERVICES AND GEOTECHNICAL SERVICES DEPARTMENT OF TRANSPORTATION 5900 FOLSOM BLVD SACRAMENTO CA 95819-4612 | (916) 227-7000 |
| Department's Pre-Qualified Products List | http://www.dot.ca.gov/hq/esc/approved_products_list | | |

As-built drawings may not show existing dimensions and conditions. Where new construction dimensions are dependent on existing bridge dimensions, verify the field dimensions and adjust dimensions of the work to fit existing conditions.

2-1.04 SMALL BUSINESS ENTERPRISE GOAL

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

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

2-1.05 DISADVANTAGED BUSINESS ENTERPRISES

Section 2-1.05, "Disadvantaged Business Enterprises," 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.

In order to ensure the Department achieves its federally mandated statewide overall DBE goal, the Department encourages the participation of DBEs as defined in 49 CFR 26.

2-1.06 DISABLED VETERAN BUSINESS ENTERPRISES

2-1.06A General

Section 2-1.06, "Disabled Veteran Business Enterprises," applies to a non-Federal-aid contract.
Take necessary and reasonable steps to ensure that DVBEs have opportunity to participate in the contract.
Comply with Mil & Vet Code § 999 et seq.

2-1.06B No Goal

Section 2-1.06B, "No Goal," applies if no DVBE goal is shown in the Notice to Bidders.

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

2-1.06C Goal

Section 2-1.06C, "Goal," applies if a DVBE goal is shown in the Notice to Bidders.

Make work available to DVBEs and select work parts consistent with available DVBE subcontractors and suppliers.

Meet the goal shown or demonstrate that you made good faith efforts to meet this goal.

If a DVBE joint venture is used, submit the joint venture agreement with the Certified DVBE Subcontractor Summary form.

The Department determines a bidder has made good faith efforts if it submits evidence within the specified time that it:

1. Contacted the Office of Small Business and DVBE Services, Department of General Services
2. Advertised in trade media and media focusing on DVBEs unless time limits the Department imposes do not allow the advertising
3. Submitted invitations to bid to potential DVBE contractors
4. Considered available DVBEs

2-1.07 SMALL BUSINESS AND NON-SMALL BUSINESS SUBCONTRACTOR PREFERENCES (GOVT CODE § 14835 ET SEQ. AND 2 CA CODE OF REGS § 1896 ET SEQ.)

2-1.07A General

Section 2-1.07, "Small Business and Non-Small Business Subcontractor Preferences (Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq.)," applies to a non-Federal-aid contract.

2-1.07B Small Business Preference

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

1. You completed a Request for Small Business Preference or Non–Small Business Preference form
2. You attached a copy of your Office of Small Business and DVBE Services small business certification to the form
3. The apparent low bidder is not certified as a small business

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

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

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

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

If this reduction results in the small business contractor becoming the low bidder, the contract award is based on the total bid, not the reduced bid.

2-1.07C Non–Small Business Subcontractor Preference

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

1. You completed a Request for Small Business Preference or Non–Small Business Preference form
2. The apparent low bidder is not certified as a small business and has not requested preference

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

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

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

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

If this reduction results in the non–small business contractor becoming the low bidder or a tie with a non-small business apparent low bidder not requesting the preference, the contract award is based on the total bid, not the reduced bid.

A non–small business bidder cannot displace a small business bidder.

2-1.08 DVBE INCENTIVE EVALUATION

Section 2-1.08, "DVBE Incentive Evaluation," applies to a non-Federal-aid contract.

The Department applies the Small Business and Non–Small Business preference during bid verification and proceeds with the following evaluation for DVBE incentive.

The Department grants a DVBE incentive to bidders who achieve a DVBE participation of 1 percent or greater of the value of their bid (Mil & Vet Code and Code of Regs § 1896.98 et seq).

The DVBE incentive is a reduction, for bid comparison only, in the total bid submitted by the lesser of:

1. Percentage of DVBE achievement, rounded to 2 decimal places, of the verified total bid of the low bidder
2. 5 percent of the verified total bid of the low bidder
3. \$100,000

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

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

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

2-1.09 PREFERENCE HIERARCHY

Section 2-1.09, "Preference Hierarchy," applies to a non-Federal-aid contract.

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

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

2-1.10 CALIFORNIA COMPANIES

Section 2-1.10, "California Companies," 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 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, not the reduced bid used for comparison except as specified in Section 2-1.09, "Preference Hierarchy."

2-1.11 JOB SITE AND DOCUMENT EXAMINATION

Examine the job site and bid documents.

Bid submission is your acknowledgment that you have examined the job site and bid documents and are satisfied with:

1. General and local conditions to be encountered
2. Character, quality, and scope of work to be performed
3. Quantities of materials to be furnished
4. Character, quality, and quantity of surface and subsurface materials or obstacles
5. Requirements of the contract

2-1.12 BID DOCUMENT COMPLETION

2-1.12A General

Complete forms in the Bid book. Submit the forms with your bid except:

1. For the following 2 forms for non-federal-aid non-informal-bid contracts:
 - 1.1. Certified DVBE Summary form. You may submit this form with your bid. If you do not and you are the apparent low bidder or the second or third low bidder, submit it so that it is received at the Office Engineer no later than 4:00 p.m. on the 4th business day after bid opening. If you are not the apparent low bidder or the second or third low bidder, you are not required to submit this form unless the Department asks for it.
 - 1.2. Certified Small Business Subcontractor form. If you are applying for the non-small business subcontractor preference, you may submit this information with your bid. If you do not, submit it so that it is received at the Office Engineer no later than 4:00 p.m. on the 2nd business day after bid opening.
2. On the Subcontractor List you may either submit the percentage of each bid item subcontracted with your bid or fax the percentage to (916) 227-6282 within 24 hours after bid opening.

Except for the percentage of each bid item subcontracted, do not fax submittals.

2-1.12B Bid Item List and Bid Comparison

Submit a bid based on the work item quantities the Department shows in the Bid Item List.

For a lump sum based bid, the Department compares bids based on the total price.

For a unit price based bid, the Department compares bids based on the sum of the item totals.

For a cost plus time based bid, the Department compares bids based on the sum of the item totals and the total bid for time.

2-1.12C Subcontractor List

In the Subcontractor List, list each subcontractor to perform work:

1. 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.)
2. That is a 1st tier DVBE subcontractor regardless of percentage of the total bid

The Subcontractor List must show the name, address, and work portions to be performed by each subcontractor listed. Show work portion by bid item number, description, and percentage of each bid item subcontracted.

2-1.13 BIDDER'S SECURITY

Submit your bid with one of the following forms of bidder's security equal to at least 10 percent of the bid:

1. Cash
2. Cashier's check
3. Certified check
4. Bidder's bond signed by a surety insurer who is licensed in California

Make checks and bonds payable to the Department of Transportation.

If paying with a bidder's bond, you may use the form in the Bid book. If you do not use the form in the Bid book, use a form containing the same information.

2-1.14 BID SUBMITTAL

Submit your bid:

1. Under sealed cover
2. Marked as a bid
3. Identifying the contract number and the bid opening date

If an agent other than the authorized corporation officer or a partnership member signs the bid, file a Power of Attorney with the Department either before opening bids or with the bid. Otherwise, the bid may be nonresponsive.

2-1.15 BID WITHDRAWAL

You or an authorized agent may withdraw a bid before the bid opening date and time by submitting a written bid withdrawal request at the location where the bid was submitted. Withdrawing a bid does not prevent you from submitting a new bid.

After the bid opening time, you cannot withdraw a bid.

2-1.16 BID OPENING

The Department publicly opens and reads bids at the time and place described in the Notice to Bidders. The Department invites bidders or their authorized agents to attend.

2-1.17 BID REJECTION

The Department may reject:

1. All bids
2. A nonresponsive bid

3-1.04 CONTRACTOR LICENSE

For a Federal-aid contract, the Contractor must be properly licensed as a contractor (Pub Cont Code § 10164) from contract award through contract acceptance.

For a non-Federal-aid contract:

1. The Contractor must be properly licensed as a contractor from bid opening through contract acceptance (Bus & Prof Code § 7028.15)
2. Joint venture bidders must obtain a joint venture license before contract award (Bus & Prof Code § 7029.1)

3-1.05 INSURANCE POLICIES

The successful bidder must submit:

1. Copy of its commercial general liability policy and its excess policy or binder until such time as a policy is available, including the declarations page, applicable endorsements, riders, and other modifications in effect at the time of contract execution. Standard ISO form No. CG 0001 or similar exclusions are allowed if not inconsistent with Section 7-1.12, "Indemnification and Insurance." Allowance of additional exclusions is at the discretion of the Department.
2. Certificate of insurance showing all other required coverages. Certificates of insurance, as evidence of required insurance for the auto liability and any other required policy, shall set forth deductible amounts applicable to each policy and all exclusions that are added by endorsement to each policy. The evidence of insurance shall provide that no cancellation, lapse, or reduction of coverage will occur without 10 days prior written notice to the Department.
3. A declaration under the penalty of perjury by a CPA certifying the accountant has applied GAAP guidelines confirming the successful bidder has sufficient funds and resources to cover any self-insured retentions if the self-insured retention is \$50,000 or higher.

If the successful bidder uses any form of self-insurance for workers compensation in lieu of an insurance policy, it shall submit a certificate of consent to self-insure under Labor Code § 3700.

3-1.06 SMALL BUSINESS PARTICIPATION REPORT

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

3-1.07 PAYEE DATA RECORD

Complete and sign the Payee Data Record form included in the contract documents.

3-1.08 CALTRANS BIDDER - DBE INFORMATION FORM

Section 3-1.08, "Caltrans Bidder - DBE Information Form," applies to a Federal-aid contract.

Complete and sign the Caltrans Bidder - DBE Information form included in the contract documents even if no DBE participation is reported.

Provide written confirmation from each DBE that the DBE is participating in the contract. A copy of a DBE's quote serves as written confirmation. If a DBE is participating as a joint venture partner, the Department encourages you to submit a copy of the joint venture agreement.

3-1.09 CONTRACT EXECUTION

The successful bidder must sign the contract.

Deliver to the Office Engineer:

1. Signed Contract form
2. Contract bonds
3. Documents identified in Section 3-1.05, "Insurance Policies"
4. Small Business Participation Report
5. Payee data record
6. For a Federal-aid contract, Caltrans Bidder - DBE Information form

For a non-informal-bid contract, the Office Engineer must receive these documents before the 10th business day after the bidder receives the contract.

For an informal-bid contract, the Office Engineer must receive these documents before the 5th business day after the bidder receives the contract.

The bidder's security may be forfeited for failure to execute the contract (Pub Cont Code §§ 10181 and 10182).

The following is a copy of the Contract form:



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CONTRACT NO. _____

This contract is entered into between the State of California's Department of Transportation and the Contractor named below:

CONTRACTOR'S NAME

The parties agree to comply with the terms of the following exhibits that are by this reference made a part of this contract.

- Exhibit A - Bid book dated _____
- Exhibit B - Notice to Bidders and Special Provisions dated _____
- Exhibit C - Project Plans approved _____
- Exhibit D - Standard Specifications dated _____
- Exhibit E - Standard Plans dated _____
- Exhibit F - Addenda

Exhibits A, B, C, and F are those exhibits identified with the same contract number as this contract.

This contract has been executed by the following parties:

CONTRACTOR

CONTRACTOR'S NAME (if other than an individual, state whether a corporation, partnership, etc.)

BY (Authorized Signature)

DATE SIGNED (Do not type)

PRINTED NAME AND TITLE OF PERSON SIGNING

FEDERAL EMPLOYER IDENTIFICATION NUMBER

DEPARTMENT OF TRANSPORTATION

BY (Authorized Signature)

DATE SIGNED (Do not type)

PRINTED NAME AND TITLE OF PERSON SIGNING

ADA Notice For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814.

1. Description of the contract specifications and drawing details for performing the work and the proposed changes.
2. Itemization of contract specifications and drawing details that would be changed.
3. Detailed cost estimate for performing the work under the existing contract and under the proposed change. Determine the estimates under Section 9-1.03, "Force Account Payment."
4. Deadline for the Engineer to decide on the changes.
5. Bid items affected and resulting quantity changes.

The Department is not required to consider a VECP. If a VECP is similar to a change in the plans or specifications being considered by the Department at the time the proposal is submitted or if the proposal is based on or similar to drawings or specifications adopted by the Department before Contract award, the Department does not accept the VECP and may make these changes without VECP payments.

Until the Department approves a change order incorporating the VECP or parts of it, continue to perform the work under the contract. If the Department does not approve a change order before the deadline stated in the VECP or other date you subsequently stated in writing, the VECP is rejected. The Department does not adjust time or payment for a rejected VECP.

The Department decides whether to accept a VECP and the estimated net construction-cost savings from adopting the VECP or parts of it.

The Department may require you to accept a share of the investigation cost as a condition of reviewing a VECP. After written acceptance, the Department considers the VECP and deducts the agreed cost.

If the Department accepts the VECP or parts of it, the Department issues a change order that:

1. Incorporates changes in the contract necessary to implement the VECP or the parts adopted
2. Includes the Department's acceptance conditions
3. States the estimated net construction-cost savings resulting from the VECP
4. Obligates the Department to pay you 50 percent of the estimated net savings

In determining the estimated net construction-cost savings, the Department excludes your VECP preparation cost and the Department's VECP investigation cost, including parts paid by you.

If a VECP providing for a reduction in working days is accepted by the Department, 50 percent of the reduction is deducted from contract time.

If a VECP providing for a reduction in traffic congestion or avoiding traffic congestion is accepted by the Department, the Department pays 60 percent of the estimated net savings in construction costs attributable to the VECP. Submit detailed traffic handling comparisons between the existing contract and the proposed change, including estimates of the traffic volumes and congestion.

The Department may apply an accepted VECP for general use on other contracts.

If an accepted VECP is adopted for general use, the Department pays only the contractor who first submitted the VECP and only to the contracts awarded to that contractor before the submission of the accepted VECP.

If the Department does not adopt a general-use VECP, an identical or similar submitted proposal is eligible for acceptance.

4-1.035C Value Analysis Workshop

Section 4-1.035C, "Value Analysis Workshop," applies to a non-building-work contract with a total bid of over \$5 million.

You may request a value analysis workshop by submitting a request after contract approval.

The Department offers a value analysis workshop to:

1. Identify value enhancing opportunities
2. Consider changes to the contract that will reduce the total cost of construction, construction activity duration, or traffic congestion without impairing the essential functions specified for a VECP in Section 4-1.035B, "Value Engineering Change Proposal."

If the request is authorized, you and the Engineer:

1. Schedule a value analysis workshop
2. Select a facilitator and workshop site
3. Agree to other workshop administrative details

For a project with a total bid greater than \$10 million, professionally facilitated project partnering is required. In implementing project partnering, you and the Engineer manage the contract by:

1. Using early and regular communication with involved parties
2. Establishing and maintaining a relationship of shared trust, equity, and commitment
3. Identifying, quantifying, and supporting attainment of mutual goals
4. Developing strategies for using risk management concepts
5. Implementing timely communication and decision making
6. Resolving potential problems at the lowest possible level to avoid negative impacts
7. Holding periodic partnering meetings and workshops as appropriate to maintain partnering relationships and benefits throughout the life of the project
8. Establishing periodic joint evaluations of the partnering process and attainment of mutual goals

Partnering does not void any contract part.

The Department's "Field Guide to Partnering on Caltrans Construction Projects" current at the time of bid is available to the project team as reference. This guide provides structure, context, and clarity to the partnering process requirements. This guide is available at the Department's Partnering Program website:

<http://www.dot.ca.gov/hq/construc/partnering.html>

In implementing project partnering, the project team must:

1. Create a partnering charter that includes:
 - 1.1. Mutual goals, including core project goals and may also include project-specific goals and mutually supported individual goals.
 - 1.2. Partnering maintenance and close-out plan.
 - 1.3. Dispute resolution plan that includes a dispute resolution ladder and may also include use of facilitated dispute resolution sessions.
 - 1.4. Team commitment statement and signatures.
2. Participate in monthly partnering evaluation surveys to measure progress on mutual goals and may also measure short-term key issues as they arise.
3. Evaluate the partnering facilitator on Forms CEM-5501 and CEM-5502. The Engineer provides the evaluation forms to the project team and collects the results. The Department makes evaluation results available upon request. Facilitator evaluations must be completed:
 - 3.1. At the end of the initial partnering workshop on Form CEM-5501.
 - 3.2. At the end of the project close-out partnering workshop on Form CEM-5502.
4. Conduct a project close-out partnering workshop.
5. Document lessons learned before contract acceptance.

5-1.012B Partnering Facilitator, Workshops, and Monthly Evaluation Surveys

The Engineer sends you a written invitation to enter into a partnering relationship after contract approval. Respond within 15 days to accept the invitation and request the initial and additional partnering workshops. After the Engineer receives the request, you and the Engineer cooperatively:

1. Select a partnering facilitator that offers the service of a monthly partnering evaluation survey with a 5-point rating and agrees to follow the Department's "Partnering Facilitator Standards and Expectations" available at the Department's Partnering Program website
2. Schedule initial partnering workshop
3. Determine initial workshop site and duration
4. Agree to other workshop administrative details

Additional partnering workshops and sessions are encouraged throughout the life of the project as determined necessary by you and the Engineer, recommended quarterly.

5-1.012C Training in Partnering Skills Development

For a project with a total bid of \$25 million or greater, training in partnering skills development is required.

For a project with a total bid between \$10 million and \$25 million, training in partnering skills is optional.

You and the Engineer cooperatively schedule the training session and select a professional trainer, training site, and 1 to 4 topics from the following list to be covered in the training:

1. Active Listening
2. Building Teams
3. Change Management
4. Communication
5. Conflict Resolution
6. Cultural Diversity
7. Dealing with Difficult People
8. Decision Making
9. Effective Escalation Ladders
10. Emotional Intelligence
11. Empathy
12. Ethics
13. Facilitation Skills
14. Leadership
15. Partnering Process and Concepts
16. Project Management
17. Project Organization
18. Problem Solving
19. Running Effective Meetings
20. Time Management
21. Win-Win Negotiation

Before the initial partnering workshop, the trainer conducts a 1-day training session in partnering skills development for the Contractor's and the Engineer's representatives. This training session must be a separate session from the initial partnering workshop and must be conducted locally. The training session must be consistent with the partnering principles under the Department's "Field Guide to Partnering on Caltrans Construction Projects."

Send at least 2 representatives to the training session. One of these must be your assigned representative as specified in Section 5-1.06, "Superintendence," of the Standard Specifications.

5-1.012D Payment

The Department pays you for:

1. 1/2 of partnering workshops and sessions based on facilitator and workshop site cost
2. 1/2 of monthly partnering evaluation survey service cost
3. Partnering skills development trainer and training site cost

The Department determines the costs based on invoice prices minus any available or offered discounts. The Department does not pay markups on these costs.

The Department does not pay for wages, travel expenses, or other costs associated with the partnering workshops and sessions, monthly partnering evaluation surveys, and training in partnering skills development.

Add:

5-1.015 RECORDS

5-1.015A General

Reserved

5-1.015B Record Retention

Retain project records from bid preparation through:

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

For at least 3 years after the later of these, retain cost records, including records of:

1. Bid preparation
2. Overhead
3. Payrolls
4. Payments to suppliers and subcontractors
5. Cost accounting

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

5-1.015C Record Inspection, Copying, and Auditing

Make your records available for inspection, copying, and auditing by State representatives for the same time frame specified under Section 5-1.015B, "Record Retention." The records of subcontractors and suppliers must be made available for inspection, copying, and auditing by State representatives for the same period. Before contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier 5 business days before inspection, copying, or auditing.

If an audit is to start more than 30 days after contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier when the audit is to start.

5-1.015D Cost Accounting Records

Maintain cost accounting records for the project distinguishing between the following work cost categories:

1. Contract item work
2. Work character changes
3. Force account work
4. Extra work
5. Work performed under protests and claim notifications
6. Overhead
7. Subcontractors, suppliers, owner-operators, and professional services

Cost accounting records must include:

1. Final cost code lists and definitions
2. Itemization of the materials used and corresponding vendor's invoice copies
3. Direct cost of labor
4. Equipment rental charges
5. Workers' certified payrolls
6. Equipment:
 - 6.1. Size
 - 6.2. Type
 - 6.3. Identification number
 - 6.4. Hours operated

5-1.015E Extra Work Bills

Maintain separate records for force account costs.

Submit extra work bills using the Department's Internet extra work billing system.

The Contractor submitting and the Engineer approving an extra work bill using the Internet force account work billing system is the same as each party signing the report.

The Department provides billing system:

1. Training within 30 days of your written request
2. Accounts and user identification to your assigned representatives after a representative has received training

Each representative must maintain a unique password.

Replace Section 5-1.02A with:

5-1.02A Excavation Safety Plans

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

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

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

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

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

Replace Section 5-1.04 with:

5-1.04 CONTRACT COMPONENTS

A component in one contract part applies as if appearing in each. The parts are complementary and describe and provide for a complete work.

If a discrepancy exists:

1. The governing ranking of contract parts in descending order is:
 - 1.1. Special provisions
 - 1.2. Project plans
 - 1.3. Revised Standard Plans
 - 1.4. Standard Plans
 - 1.5. Amendments to the Standard Specifications
 - 1.6. Standard Specifications
 - 1.7. Supplemental project information
2. Written numbers and notes on a drawing govern over graphics
3. A detail drawing governs over a general drawing
4. A detail specification governs over a general specification
5. A specification in a section governs over a specification referenced by that section

If a discrepancy is found or confusion arises, request correction or clarification.

Add:

5-1.055 SUBCONTRACTING

5-1.055A General

No subcontract releases you from the contract or relieves you of your responsibility for a subcontractor's work.

If you violate Pub Cont Code § 4100 et seq., the Department may exercise the remedies provided under Pub Cont Code § 4110. The Department may refer the violation to the Contractors State License Board as provided under Pub Cont Code § 4111.

Perform work equaling at least 30 percent of the value of the original total bid with your employees and with equipment owned or rented by you, with or without operators.

Each subcontract must comply with the contract.

Each subcontractor must have an active and valid State contractor's license with a classification appropriate for the work to be performed (Bus & Prof Code, § 7000 et seq.).

Submit copies of subcontracts upon request.

Before subcontracted work starts, submit a Subcontracting Request form.

Do not use a debarred contractor; a current list of debarred contractors is available at the Department of Industrial Relations' Web site.

Upon request, immediately remove and not again use a subcontractor who fails to prosecute the work satisfactorily.

5-1.055B Disadvantaged Business Enterprises

Section 5-1.055B, "Disadvantaged Business Enterprises," applies to a Federal-aid contract.

Use each subcontractor as listed on the Subcontractor List form unless you receive authorization for a substitution.

The Department requests the Contractor to:

1. Notify the Engineer of any changes to its anticipated DBE participation
2. Provide this notification before starting the affected work

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 of each month, submit a Monthly DBE Trucking Verification form.

For a DBE that leases trucks from a non-DBE, count only the fee or commission the DBE receives as a result of the lease arrangement.

If a DBE subcontractor is decertified before completing subcontracted work, the subcontractor must notify you in writing of the decertification date. If a subcontractor becomes a certified DBE before completing subcontracted work, the subcontractor must notify you in writing of the certification date. Submit the notifications. On contract work completion, complete a Disadvantaged Business Enterprises (DBE) Certification Status Change form. Submit the form within 90 days of contract acceptance.

Upon contract work completion, complete a Final Report – Utilization of Disadvantaged Business Enterprises (DBE), First-Tier Subcontractors form. Submit it within 90 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.

5-1.055C Disabled Veteran Business Enterprises

Section 5-1.055C, "Disabled Veteran Business Enterprises," applies to a non-Federal-aid contract.

If a DVBE goal is shown in the Notice to Bidders:

1. Use each DVBE as shown on the Certified DVBE Summary form unless you receive authorization for a substitution
2. The requirement that DVBEs be certified by the bid opening date does not apply to DVBE substitutions after contract award
3. Maintain records of subcontracts made with certified DVBEs. Include in the records:
 - 3.1. Name and business address of each business
 - 3.2. Total amount paid to each business
4. For the purpose of determining compliance with Pub Cont Code § 10115 et seq.:
 - 4.1. Provide the Department relevant information requested
 - 4.2. Upon reasonable notice and during normal business hours, permit access to its premises for the purpose of:

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

If no DVBE goal is shown in the Notice to Bidders and if you obtain DVBE participation, submit the participating DVBE names and value of work or supplies supplied by each DVBE transaction upon contract completion.

5-1.055D Non-Small Businesses

Section 5-1.055D, "Non-Small Businesses," applies to a non-Federal-aid contract.

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

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

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

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

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

1. Provide the Department relevant information requested.
2. Upon reasonable notice and during normal business hours, permit access to its premises for the purpose of:
 - 2.1. Interviewing employees
 - 2.2. Inspecting and copying books, records, accounts and other material that may be relevant to a matter under investigation

Replace Section 5-1.07 with:

5-1.07 LINES AND GRADES

The Engineer places stakes and marks under Chapter 12, "Construction Surveys," of the Department's Surveys Manual. Submit your request for Department-furnished stakes:

1. On a Request for Construction Stakes form. Ensure:
 - 1.1. Requested staking area is ready for stakes
 - 1.2. You use the stakes in a reasonable time
2. A reasonable time before starting an activity using the stakes

Establish priorities for stakes and note priorities on the request.

Preserve stakes and marks placed by the Engineer. If the stakes or marks are destroyed, the Engineer replaces them at the Engineer's earliest convenience and deducts the cost.

Replace Section 5-1.116 with:

5-1.116 DIFFERING SITE CONDITIONS (23 CFR 635.109)

5-1.116A Contractor's Notification

Promptly notify the Engineer if you find either of the following:

1. Physical conditions differing materially from either of the following:
 - 1.1. Contract documents
 - 1.2. Job site examination

2. Physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract

Include details explaining the information you relied on and the material differences you discovered.

If you fail to notify the Engineer promptly, you waive the differing site condition claim for the period between your discovery of the differing site condition and your notification to the Engineer.

If you disturb the site after discovery and before the Engineer's investigation, you waive the differing site condition claim.

5-1.116B Engineer's Investigation and Decision

Upon your notification, the Engineer investigates job site conditions and:

1. Notifies you whether to resume affected work
2. Decides whether the condition differs materially and is cause for an adjustment of time, payment, or both

5-1.116C Protests

You may protest the Engineer's decision by:

1. Submitting an Initial Notice of Potential Claim within 5 business days after receipt of the Engineer's notification
2. Complying with claim procedures

The Initial Notice of Potential Claim must detail the differences in your position from the Engineer's determination and support your position with additional information, including additional geotechnical data. Attach to the Initial Notice of Potential Claim a certification stating that you complied with Section 2-1.11, "Job Site and Document Examination."

Promptly submit supplementary information when obtained.

Replace Section 5-1.14 with:

5-1.14 COST REDUCTION INCENTIVE

Comply with Section 4-1.035B, "Value Engineering Change Proposal."

Add:

5-1.15 DISPUTE RESOLUTION

5-1.15A General

Section 5-1.15, "Dispute Resolution," applies to a contract with 100 or more working days.

In the Dispute Resolution Advisor Agreement and in the Dispute Review Board Agreement, interpret a reference to the special provisions as a reference to the Amendments to the Standard Specifications. In the Dispute Review Board Agreement, replace "Proposal and Contract" with "Bid book." Where the section title does not match the section number for a reference, refer to the referenced title.

5-1.15B Dispute Resolution Advisor

Section 5-1.15B, "Dispute Resolution Advisor," applies to a contract from \$3 million to \$10 million.

A dispute resolution advisor, hereinafter referred to as "DRA", is chosen by the Department and the Contractor to assist in the resolution of disputes. The DRA is a part of the contract administrative claims process as specified in the provisions in Section 9-1.04, "Notice of Potential Claim," and Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The DRA shall not serve as a substitute for filing a protest or a notice of potential claim.

The DRA shall be established by the Department and the Contractor within 30 days of contract approval.

The Department and the Contractor shall each propose 3 potential DRA candidates. Each potential candidate shall provide the Department and the Contractor with their disclosure statement. The disclosure statement shall include a resume of the potential candidate's experience and a declaration statement describing past, present, anticipated, and planned relationships with all parties involved in this contract.

The Department and the Contractor shall select one of the 6 nominees to be the DRA. If the Department and the Contractor cannot agree on one candidate, the Department and the Contractor shall each choose one of the 3 nominated by the other. The final selection of the DRA will be decided by a coin toss between the two candidates.

The Department and the Contractor shall complete and adhere to the Dispute Resolution Advisor Agreement. No DRA meeting shall take place until the Dispute Resolution Advisor Agreement has been signed by all parties, unless all parties agree to sign it at the first meeting.

If DRA needs outside technical services, technical services shall be preapproved by both the Department and the Contractor.

DRA recommendations are nonbinding.

The Contractor shall not use the DRA for disputes between subcontractors or suppliers that have no grounds for a lawsuit against the Department.

DRA replacement is selected in the same manner as the original selection. The appointment of a replacement DRA will begin promptly upon determination of the need for replacement. The Dispute Resolution Advisor Agreement shall be amended to reflect the change of the DRA.

Failure of the Contractor to participate in selecting DRA will result in the withhold of 25 percent of the estimated value of all work performed during each estimate period that the Contractor fails to comply. DRA withholds will be released for payment on the next monthly progress payment following the date that the Contractor has provided assistance in choosing the DRA and no interest will be due the Contractor.

The State and the Contractor shall bear the costs and expenses of the DRA equally.

The DRA shall be compensated at an agreed rate of \$1,500 per day for time spent per meeting either at the start of the project or for a dispute. A member serving on more than one State DRA or Dispute Review Board, regardless the number of meetings per day shall not be paid more than the agreed rate per day. The agreed rate shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel, and incidentals for each day or portion thereof that the DRA is at an authorized DRA meeting.

No additional compensation will be made for time spent by the DRA to review and research activities outside the official DRA meetings unless that time, such as time spent evaluating and preparing recommendations on specific issues presented to the DRA, has been specifically agreed to in advance by the State and Contractor. Time away from the project that has been specifically agreed to in advance by the Department and the Contractor will be compensated at an agreed rate of \$150 per hour. The agreed amount of \$150 per hour shall include all incidentals including expenses for telephone, fax, and computer services.

The State will provide conference facilities for DRA meetings at no cost to the Contractor.

The Contractor shall make direct payments to the DRA for participation in authorized meetings and approved hourly rate charges from invoices submitted.

The State will reimburse the Contractor for the State's share of the costs.

There will be no markups applied to expenses associated with the DRA, either by the DRA or by the Contractor when requesting payment of the State's share of DRA expenses. Regardless of the DRA recommendation, neither party will be entitled to reimbursement of DRA costs from the other party.

The Contractor shall submit extra work bills and include invoices with original supporting documents for reimbursement of the State's share.

The cost of technical services will be borne equally by the State and Contractor. There will be no markups for these costs.

A copy of the "Dispute Resolution Advisor Agreement" to be executed by the Contractor, State and the DRA is as follows:

Form CEM 6206 Rev (04-06-07)

DISPUTE RESOLUTION ADVISOR AGREEMENT

(Contract Identification)

Contract No. _____

THIS DISPUTE RESOLUTION ADVISOR AGREEMENT, hereinafter called "AGREEMENT", made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ hereinafter called the "CONTRACTOR," and _____, the Dispute Resolution Advisor, hereinafter called the "DRA." .

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRA to assist in resolving disputes; and

WHEREAS, the DRA is composed of one person, chosen by the CONTRACTOR and the STATE;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRA hereto agree as follows:

SECTION I DESCRIPTION OF WORK

To assist in the timely resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRA. The DRA is to fairly and impartially consider disputes placed before it and provide recommendations for resolution of these disputes to the parties. The DRA shall provide recommendations based on the facts related to the dispute, the contract and applicable laws and regulations. The DRA shall perform the services necessary to participate in the DRA's actions as designated in Section III, Scope of Work.

SECTION II DRA QUALIFICATIONS

DRA shall be knowledgeable in the type of construction and contract documents anticipated by the contract and shall have completed training through the Dispute Review Board Foundation. In addition, it is desirable for the DRA to have served on several State Dispute Review Boards (DRB).

No DRA shall have prior direct involvement in this contract. No DRA shall have a financial interest in this contract or parties thereto, including but not limited to the CONTRACTOR, subcontractors, suppliers, consultants, and legal and business services, within a period 6 months prior to award and during this contract. Exceptions to above are compensation for services on this or other DRAs and DRBs or retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.

DRA shall fully disclose all direct or indirect professional or personal relationships with all key members of the contract.

SECTION III SCOPE OF WORK

The Scope of Work of the DRA includes, but is not limited to, the following:

A. PROCEDURES

The DRA shall meet with the parties at the start of the project to establish procedures that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. The DRA established procedures shall only be implemented upon approval by the parties. Subsequent meetings shall be held only to hear disputes between the parties.

The DRA shall not meet with, or discuss contract issues with individual parties.

State shall provide the DRA with the contract and all written correspondence regarding the dispute between the parties and, if available, the Contractor's supplemental notice of potential claim, and the Engineer's response to the supplemental notice of potential claim.

The parties shall not call the DRA who served on this contract as a witness in arbitration proceedings, which may arise from this contract.

The DRA shall have no claim against the STATE or the CONTRACTOR, or both, from claimed harm arising out of the parties' evaluations of the DRA's opinions.

B. DISPUTE MEETING

The term "dispute meeting" as used in this subsection shall refer to both the informal and traditional dispute meeting processes, unless otherwise noted.

If the CONTRACTOR requests a dispute meeting with the DRA, the Contractor must simultaneously notify the STATE. Upon being notified of the need for a dispute meeting, the DRA shall review and consider the dispute. The DRA shall determine the time and location of the dispute meeting with due consideration for the needs and preferences of the parties, while recognizing the importance of a speedy resolution to the dispute.

Dispute meetings shall be conducted at any location that would be convenient and provide required facilities and access to necessary documentation.

Only the STATE's Resident Engineer or Area Construction Engineer and the CONTRACTOR's or subcontractor's, if the dispute involves a subcontractor, Superintendent or Project Manager may present information at a dispute meeting. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute. The exception to this is technical services, as described below:

The DRA, with approval of the parties, may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the two parties as specified in an approved contract change order. The CONTRACTOR shall not be entitled to markups for the payments made for these services.

At the dispute meeting the DRA may ask questions, seek clarification, and request further clarification of data presented by either of the parties as may be necessary to assist in making a fully informed recommendation. However, the DRA shall refrain from expressing opinions on the merits of statements on matters under dispute during the parties' presentations. Each party will be given ample time to fully present its position, make rebuttals, provide relevant documents, and respond to DRA questions and requests.

There shall be no testimony under oath or cross-examination, during DRA dispute meetings. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRA in conformance with the rules and regulations established at the first meeting between the DRA and parties. These established rules and regulations need not comply with prescribed legal laws of evidence.

Failure to attend a dispute meeting by either of the parties shall be conclusively considered by the DRA as indication that the non-attending party considers all written documents and correspondence submitted as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals at the meeting until all aspects of the dispute are thoroughly covered.

1. TRADITIONAL DISPUTE MEETING:

The following procedure shall be used for the traditional dispute meeting:

- a. Within 5 days, after receiving the STATE's written response to the CONTRACTOR's supplemental notice of potential claim, the CONTRACTOR shall refer the dispute to the DRA, if the CONTRACTOR wishes to further pursue the dispute. The CONTRACTOR shall make the referral in writing to the DRA, simultaneously copied to the STATE. The written dispute referral shall describe the disputed matter in individual discrete segments, so that it will be clear to both parties and the DRA what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.
- b. The parties shall each be afforded an opportunity to be present and to be heard by the DRA, and to offer evidence. Either party furnishing written evidence or documentation to the DRA must furnish copies of such information to the other party a minimum of 10 days prior to the date the DRA is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRA may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRA. The DRA shall not consider evidence not furnished in conformance with the terms specified herein.
- c. Upon receipt by the DRA of a written referral of a dispute, the DRA shall convene to review and consider the dispute. The dispute meeting shall be held no later than 25 days after receipt of the written referral unless otherwise agreed to by all parties.
- d. The DRA shall furnish a written report to both parties. The DRA may request clarifying information of either party within 5 days after the DRA dispute meeting. Requested information shall be submitted to the DRA within 5 days of the DRA request. The DRA shall complete its report and submit it to the parties within 10 days of the DRA dispute meeting, except that time extensions may be granted at the request of the DRA with the written concurrence of both parties. The report shall summarize the facts considered, the contract language, law or regulation viewed by the DRA as pertinent to the dispute, and the DRA's interpretation and philosophy in arriving at its conclusions and recommendations and, if appropriate, recommends guidelines for determining compensation. The DRA's written opinion shall stand on its own, without attachments or appendices.

- e. Within 10 days after receiving the DRA's report, both parties shall respond to the DRA in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRA's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRA recommendation. Immediately after responses have been received from both parties, the DRA shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRA's report from the DRA prior to responding to the report. The DRA shall consider any clarification request only if submitted within 5 days of receipt of the DRA's report, and if submitted simultaneously in writing to both the DRA and the other party. Each party may submit only one request for clarification for any individual DRA report. The DRA shall respond, in writing, to requests for clarification within 5 days of receipt of such requests.
- f. Either party may seek a reconsideration of the DRA's recommendation. The DRA shall only grant reconsideration based upon submission of new evidence and if the request is submitted within the 10 day time limit specified for response to the DRA's written report. Each party may submit only one request for reconsideration regarding an individual DRA recommendation.
- g. If the parties are able to settle their dispute with the aid of the DRA's report, the STATE and CONTRACTOR shall promptly accept and implement the settlement of the parties. If the parties cannot agree on compensation within 30 days of the acceptance by both parties of the settlement, either party may request the DRA to make a recommendation regarding compensation.

2. INFORMAL DISPUTE MEETING

An informal dispute meeting shall be convened, only if, the parties and the DRA agree that this dispute resolution process is appropriate to settle the dispute.

The following procedure shall be used for the informal dispute meeting:

- a. The parties shall furnish the DRA with one copy of pertinent documents requested by the DRA that are or may become necessary for the DRA to perform its function. The party furnishing documents shall furnish such documents to the other party at the same time the document is provided to the DRA.
- b. After the dispute meeting has concluded; the DRA shall deliberate in private the same day, until a response to the parties is reached or as otherwise agreed to by the parties.
- c. The DRA then verbally delivers its recommendation with findings to the parties.
- d. After the recommendation is presented, the parties may ask for clarifications.
- e. Occasionally the DRA on complex issues may be unable to formulate a recommendation based on the information given at a dispute meeting. However, the DRA may provide the parties with advice on strengths and weaknesses of their prospective positions, in the hope of the parties reaching settlement.
- f. If the parties are able to settle their dispute with the aid of the DRA's opinion, the STATE and CONTRACTOR shall promptly accept and implement the settlement of the parties.
- g. The DRA will not be bound by its oral recommendation in the event that a dispute is later heard by the DRA in a traditional dispute meeting.

Unless the dispute is settled, use of the informal dispute meeting does not relieve the parties of their responsibilities under Section 5-1.12, "Dispute Resolution Advisor," of the Special Provisions or Subsection, "Traditional Dispute Meeting," of this AGREEMENT. There will be no extension of time allowed for the process to permit the use of the informal dispute meeting, unless otherwise agreed to by the parties.

SECTION IV TIME FOR BEGINNING AND COMPLETION

Once established, the DRA shall be in operation until the day the Director accepts the contract. The DRA shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE or as agreed to by the parties.

SECTION V PAYMENT

DRA shall be compensated at an agreed rate of \$1,500 per day for time spent per meeting, either at the start of the project or for a dispute. A member serving on more than one State DRA or DRB, regardless the number of meetings per day, shall not be paid more than the agreed rate per day. The agreed rate shall be considered full compensation for onsite time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof that the DRA is at an authorized DRA meeting. No additional compensation will be made for time spent by DRA to review and research activities outside the official DRA meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRA), has been specifically agreed to in advance by the parties. Time away from the project,

which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$150 per hour. The agreed amount of \$150 per hour shall include all incidentals including expenses for telephone, fax, and computer services. The State will provide administrative services such as conference facilities to the DRA.

A. PAYMENT PROCESSING

CONTRACTOR shall make direct payments to DRA for their participation in authorized meetings and approved hourly rate charges, from invoices submitted by the DRA, and technical services.

DRA may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRA until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

B. INSPECTION OF COSTS RECORDS

DRA and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

SECTION VI ASSIGNMENT OF TASKS OF WORK

DRA shall not assign the work of this AGREEMENT.

SECTION VII TERMINATION OF A DRA MEMBER

DRA may resign after providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. The DRA may be terminated, by either party, for failing to fully comply at all times with all required employment or financial disclosure conditions of DRA membership in conformance with the terms of the contract and this AGREEMENT. Each party shall document the need for replacement and substantiate the replacement request in writing to the other party and the DRA.

SECTION VIII LEGAL RELATIONS

The parties hereto mutually understand and agree that the DRA in the performance of duties is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRA from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRA.

SECTION IX CONFIDENTIALITY

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRA, which documents and records are marked "Confidential - for use by the DRA only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRA findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of this AGREEMENT. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRA. However, the parties understand that such documents may be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION X DISPUTES

Disputes between the parties arising out of the work or other terms of this AGREEMENT that cannot be resolved by negotiation and mutual concurrence between the parties or through the administrative process provided in the contract shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications. Disputes between the DRA and the parties that cannot be resolved by negotiation and mutual concurrence shall be resolved in the appropriate forum.

SECTION XI VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party, including the DRA, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

SECTION XII FEDERAL REVIEW AND REQUIREMENTS

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRA in progress, except for private meetings or deliberations of the DRA.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIII CERTIFICATION OF CONTRACTOR, DRA, AND STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRA

By: _____

Title: _____

CONTRACTOR

CALIFORNIA STATE DEPARTMENT
OF TRANSPORTATION

By: _____

By: _____

Title: _____

Title: _____

5-1.15C Dispute Review Board

- Section 5-1.15C, "Dispute Review Board," applies to a contract over \$10 million.

5-1.15C(1) General

To assist in the resolution of disputes or potential claims arising out of the work of this project, a Dispute Review Board, hereinafter referred to as the "DRB," shall be established by the Engineer and Contractor cooperatively upon approval of the contract. The DRB is intended to assist the contract administrative claims resolution process as specified in the provisions in Section 9-1.04, "Notice of Potential Claim," and Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications and these special provisions. The DRB shall not serve as a substitute for provisions in the specifications in regard to filing potential claims. The requirements and procedures established in this section shall be a prerequisite to filing a claim, filing for arbitration, or filing for litigation prior or subsequent to project completion.

The DRB shall be utilized when dispute or potential claim resolution at the project level is unsuccessful. The DRB shall function as specified herein until the day of acceptance of the contract, at which time the work of the DRB will cease except for completion of unfinished reports. No DRB dispute meetings shall take place later than 30 days prior to acceptance of contract. After acceptance of contract, disputes or potential claims which have followed the dispute resolution processes of the Standard Specifications and these special provisions, but have not been resolved, shall be stated or restated by the Contractor, in response to the Proposed Final Estimate within the time limits provided in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The State will review those claims in conformance with the provisions in Section 9-1.07B of the Standard Specifications. Following the adherence to and completion of the contractual administrative

claims procedure, the Contractor may file for arbitration in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications and these special provisions.

Disputes, as used in this section, shall include differences of opinion, properly noticed as provided hereinafter, between the State and Contractor on matters related to the work and other subjects considered by the State or Contractor, or by both, to be of concern to the DRB on this project, except matters relating to Contractor, subcontractor or supplier potential claims not actionable against the Department as specified in these special provisions or quantification of disputes for overhead type expenses or costs. Disputes for overhead type expenses or costs shall conform to the requirements of Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. Whenever the term "dispute" or "disputes" is used herein, it shall be deemed to include potential claims as well as disputes.

The DRB shall serve as an advisory body to assist in the resolution of disputes between the State and the Contractor, hereinafter referred to as the "parties." The DRB shall consider disputes referred to it, and furnish written reports containing findings and recommendations pertaining to those disputes, to the parties to aid in resolution of the differences between them. DRB findings and recommendations are not binding on the parties.

5-1.15C(2) Selection Process, Disclosure and Appointments

The DRB shall consist of one member selected by the State and approved by the Contractor, one member selected by the Contractor and approved by the State, and a third member selected by the first 2 members and approved by both the State and the Contractor. The third member shall act as the DRB Chairperson.

DRB members shall be especially knowledgeable in the type of construction and contract documents potentially anticipated by the contract. DRB members shall discharge their responsibilities impartially as an independent body, considering the facts and circumstances related to the matters under consideration, pertinent provisions of the contract and applicable laws and regulations.

The State and the Contractor shall nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions, within 45 days of the approval of the contract. Each party shall provide written notification to the other of the name of their selected DRB nominee along with the prospective member's complete written disclosure statement.

Disclosure statements shall include a resume of the prospective member's experience and a declaration statement describing past, present, anticipated, and planned relationships, including indirect relationships through the prospective member's primary or full-time employer, to this project and with the parties involved in this construction contract, including but not limited to, relevant subcontractors or suppliers to the parties, parties' principals, or parties' counsel. DRB members shall also include a full disclosure of close professional or personal relationships with all key members of the contract. Objections to nominees must be based on a specific breach or violation of nominee responsibilities or on nominee qualifications under these provisions unless otherwise specified. The Contractor or the State may, on a one-time basis, object to the other's nominee without specifying a reason and this person will not be selected for the DRB. Another person shall then be nominated within 15 days.

The first duty of the State and Contractor selected members of the DRB shall be to select and recommend a prospective third DRB member to the parties for final selection and approval. The first 2 DRB members shall proceed with the selection of the third DRB member immediately upon receiving written notification from the State of their selection, and shall provide their recommendation simultaneously to the parties within 15 days of the notification.

The first 2 DRB members shall select a third DRB member subject to mutual approval of the parties or may mutually concur on a list of potentially acceptable third DRB members and submit the list to the parties for final selection and approval of the third member. The goal in the selection of the third member is to complement the professional experience of the first 2 members and to provide leadership for the DRB's activities.

The third prospective DRB member shall supply a full disclosure statement to the first 2 DRB members and to the parties prior to appointment.

An impasse shall be considered to have been reached if the parties are unable to approve a third member within 15 days of receipt of the recommendation of the first 2 DRB members, or if the first 2 DRB members are unable to agree upon a recommendation within their 15 day time limit. In the event of an impasse in selection of third DRB member the State and the Contractor shall each propose 3 candidates for the third DRB member position. The parties shall select the candidates proposed under this paragraph from the current list of arbitrators certified by the Public Works Contract Arbitration Committee created by Article 7.2 (commencing with Section 10245) of the State Contract Act. The first 2 DRB members shall then select one of the 6 proposed candidates in a blind draw.

No DRB member shall have prior direct involvement in this contract. No member shall have a financial interest in this contract or the parties thereto, within a period of 6 months prior to award of this contract or during the contract, except as follows:

- A. Compensation for services on this DRB.
- B. Ownership interest in a party or parties, documented by the prospective DRB member, that has been reviewed and determined in writing by the State to be sufficiently insignificant to render the prospective member acceptable to the State.
- C. Service as a member of other Dispute Review Boards on other contracts.
- D. Retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.
- E. The above provisions apply to parties having a financial interest in this contract, including but not limited to contractors, subcontractors, suppliers, consultants, and legal and business services.

The Contractor or the State may reject any of the 3 DRB members who fail to fully comply at all times with all required employment and financial disclosure conditions of DRB membership as described in the Dispute Review Board Agreement and as specified herein. A copy of the Dispute Review Board Agreement is included in this section.

The Contractor, the State, and the 3 members of the DRB shall complete and adhere to the Dispute Review Board Agreement in administration of this DRB within 15 days of the parties' concurrence in the selection of the third member. No DRB meeting shall take place until the Dispute Review Board Agreement has been signed by all parties. The State authorizes the Engineer to execute and administer the terms of the Agreement. The person(s) designated by the Contractor as authorized to execute contract change orders shall be authorized to execute and administer the terms of this agreement, or to delegate the authority in writing. The operation of the DRB shall be in conformance with the terms of the Dispute Review Board Agreement.

5-1.15C(3) Compensation

The State and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRB), has been specifically agreed to in advance by the State and Contractor. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the Department, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The State will provide, at no cost to the Contractor, administrative services such as conference facilities and secretarial services to the DRB. These special provisions and the Dispute Review Board Agreement state the provisions for compensation and expenses of the DRB. DRB members shall be compensated at the same daily and hourly rate. The Contractor shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The State will reimburse the Contractor for the State's share of the costs. There will be no markups applied to expenses connected with the DRB, either by the DRB members or by the Contractor when requesting payment of the State's share of DRB expenses. Regardless of the DRB recommendation, neither party shall be entitled to reimbursement of DRB costs from the other party.

5-1.15C(4) Replacement of DRB Members

Service of a DRB member may be terminated at any time with not less than 15 days notice as follows:

- A. The State may terminate service of the State appointed member.
- B. The Contractor may terminate service of the Contractor appointed member.
- C. Upon the written recommendation of the State and Contractor appointed members for the removal of the third member.
- D. Upon resignation of a member.
- E. The State or Contractor may terminate the service of any member who fails to fully comply with all required employment and financial disclosure conditions of DRB membership.

When a member of the DRB is replaced, the replacement member shall be appointed in the same manner as the replaced member was appointed. The appointment of a replacement DRB member will begin promptly upon determination of the need for replacement and shall be completed within 15 days. Changes in either of the DRB members chosen by the 2 parties will not require re-selection of the third member, unless both parties agree to such re-selection in writing. The Dispute Review Board Agreement shall be amended to reflect the change of a DRB member.

5-1.15C(5) Operation

The following procedure shall be used for dispute resolution:

- A. If the Contractor objects to any decision, act or order of the Engineer, the Contractor shall give written notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and these special provisions, including the provision of applicable cost documentation; or file written protests or notices in conformance with the provisions in the Standard Specifications and these special provisions.
- B. The Engineer will respond, in writing, to the Contractor's written supplemental notice of potential claim within 20 days of receipt of the notice.
- C. Within 15 days after receipt of the Engineer's written response, the Contractor shall, if the Contractor still objects, file a written reply with the Engineer, stating clearly and in detail the basis of the objection.
- D. Following an objection to the Engineer's written response, the Contractor shall refer the dispute to the DRB if the Contractor wishes to further pursue the objection to the Engineer's decision. The Contractor shall make the referral in writing to the DRB, simultaneously copied to the State, within 21 days after receipt of the written response from the Engineer. The written dispute referral shall describe the disputed matter in individual discrete segments so that it will be clear to both parties and the DRB what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.
- E. By failing to submit the written notice of referral to the DRB, within 21 days after receipt of the Engineer's written response to the supplemental notice of potential claim, the Contractor waives future claims and arbitration on the matter in contention.
- F. The Contractor and the State shall each be afforded an opportunity to be present and to be heard by the DRB, and to offer evidence. Either party furnishing written evidence or documentation to the DRB must furnish copies of such information to the other party a minimum of 15 days prior to the date the DRB is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRB may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRB. The DRB shall not consider evidence not furnished in conformance with the terms specified herein.
- G. Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral unless otherwise agreed to by all parties. The DRB shall determine the time and location of the DRB dispute meeting, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of a timely hearing of the dispute.
- H. There shall be no participation of either party's attorneys at DRB dispute meetings.
- I. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute, including but not limited to consultants, except for expert testimony allowed at the discretion of the DRB and with approval prior to the dispute meeting by both parties.
- J. The DRB shall furnish a report, containing findings and recommendations as described in the Dispute Review Board Agreement, in writing to both the State and the Contractor. The DRB may request clarifying information of either party within 10 days after the DRB dispute meeting. Requested information shall be submitted to the DRB within 10 days of the DRB request. The DRB shall complete its report, including minority opinion, if any, and submit it to the parties within 30 days of the DRB dispute meeting, except that time extensions may be granted at the request of the DRB with the written concurrence of both parties. The report shall include the facts and circumstances related to the matters under consideration, pertinent provisions of the contract, applicable laws and regulations, and actual costs and time incurred as shown on the Contractor's cost accounting records. The DRB shall make recommendations on the merit of the dispute and, if appropriate, recommend guidelines for determining compensation.

- K. Within 30 days after receiving the DRB's report, both the State and the Contractor shall respond to the DRB in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRB's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRB recommendation. Immediately after responses have been received from both parties, the DRB shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRB's report from the DRB prior to responding to the report. The DRB shall consider any clarification request only if submitted within 10 days of receipt of the DRB's report, and if submitted simultaneously in writing to both the DRB and the other party. Each party may submit only one request for clarification for any individual DRB report. The DRB shall respond, in writing, to requests for clarification within 10 days of receipt of such requests.
- L. The DRB's recommendations, stated in the DRB's reports, are not binding on either party. Either party may seek a reconsideration of a recommendation of the DRB. The DRB shall only grant a reconsideration based upon submission of new evidence and if the request is submitted within the 30-day time limit specified for response to the DRB's written report. Each party may submit only one request for reconsideration regarding an individual DRB recommendation.
- M. If the State and the Contractor are able to resolve their dispute with the aid of the DRB's report, the State and Contractor shall promptly accept and implement the recommendations of the DRB. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.
- N. The State or the Contractor shall not call DRB members who served on the DRB for this contract as witnesses in arbitration proceedings which may arise from this contract, and all documents created by the DRB shall be inadmissible as evidence in subsequent arbitration proceedings, except the DRB's final written reports on each issue brought before it.
- O. The State and Contractor shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.
- P. The DRB members shall have no claim against the State or the Contractor, or both, from claimed harm arising out of the parties' evaluations of the DRB's report.

5-1.15C(6) Disputes Involving Subcontractor Potential Claims

For purposes of this section, a "subcontractor potential claim" shall include any potential claim by a subcontractor (including also any pass through potential claims by a lower tier subcontractor or supplier) against the Contractor that is actionable by the Contractor against the Department which arises from the work, services, or materials provided or to be provided in connection with the contract. If the Contractor determines to pursue a dispute against the Department that includes a subcontractor potential claim, the dispute shall be processed and resolved in conformance with these special provisions and in conformance with the following:

- A. The Contractor shall identify clearly in submissions pursuant to this section, that portion of the dispute that involves a subcontractor potential claim or potential claims.
- B. The Contractor shall include, as part of its submission pursuant to Step D above, a certification (False Claims Act Certification) by the subcontractor's or supplier's officer, partner, or authorized representative with authority to bind the subcontractor and with direct knowledge of the facts underlying the subcontractor potential claim. The Contractor shall submit a certification that the subcontractor potential claim is acknowledged and forwarded by the Contractor. The form for these certifications is available from the Engineer.
- C. At DRB dispute meetings involving one or more subcontractor potential claims, the Contractor shall require that each subcontractor involved in the dispute have present an authorized representative with actual knowledge of the facts underlying the subcontractor potential claim to assist in presenting the subcontractor potential claim and to answer questions raised by the DRB members or the Department's representatives.
- D. Failure by the Contractor to declare a subcontractor potential claim on behalf of its subcontractor (including lower tier subcontractors' and suppliers' pass through potential claims) at the time of submission of the Contractor's potential claims, as provided hereunder, shall constitute a release of the State by the Contractor of such subcontractor potential claim.

- E. The Contractor shall include in all subcontracts under this contract that subcontractors and suppliers of any tier (a) agree to submit subcontractor potential claims to the Contractor in a proper form and in sufficient time to allow processing by the Contractor in conformance with the Dispute Review Board resolution specifications; (b) agree to be bound by the terms of the Dispute Review Board provisions to the extent applicable to subcontractor potential claims; (c) agree that, to the extent a subcontractor potential claim is involved, completion of all steps required under these Dispute Review Board special provisions shall be a condition precedent to pursuit by the subcontractor of other remedies permitted by law, including without limitation of a lawsuit against the Contractor; and (d) agree that the existence of a dispute resolution process for disputes involving subcontractor potential claims shall not be deemed to create any claim, right, or cause of action by any subcontractor or supplier against the Department.

Notwithstanding the foregoing, this Dispute Review Board special provision shall not apply to, and the DRB shall not have the authority to consider, subcontractor potential claims between the subcontractor(s) or supplier(s) and the Contractor that are not actionable by the Contractor against the Department.

5-1.15C(7) Dispute Review Board Agreement

A copy of the "Dispute Review Board Agreement" to be executed by the Contractor, State and the 3 DRB members after approval of the contract follows:

Form 6202 Rev (09/01/02)

DISPUTE REVIEW BOARD AGREEMENT

(Contract Identification)

Contract No. _____

THIS DISPUTE REVIEW BOARD AGREEMENT, hereinafter called "AGREEMENT", made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ hereinafter called the "CONTRACTOR," and the Dispute Review Board, hereinafter called the "DRB" consisting of the following members:

_____,
(Contractor Appointee) ,

_____,
(State Appointee) ,

and _____
(Third Person)

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRB to assist in resolving disputes; and

WHEREAS, the DRB is composed of three members, one selected by the STATE, one selected by the CONTRACTOR, and the third member selected by the other two members and approved by the parties;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRB members hereto agree as follows:

SECTION I DESCRIPTION OF WORK

To assist in the resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The intent of the DRB is to fairly and impartially consider disputes placed before it and provide written recommendations for resolution of these disputes to both parties. The members of this DRB shall perform the services necessary to participate in the DRB's actions as designated in Section II, Scope of Work.

SECTION II SCOPE OF WORK

The scope of work of the DRB includes, but is not limited to, the following:

A. OBJECTIVE

The principal objective of the DRB is to assist in the timely resolution of disputes between the parties arising from performance of this contract. It is not intended for either party to default on their normal responsibility to amicably and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the mere existence of the DRB will encourage the parties to resolve disputes without resorting to this review procedure. But when a dispute that is serious enough to warrant the DRB's review does develop, the process for prompt and efficient action will be in place.

B. PROCEDURES

The DRB shall render written reports on disputes between the parties arising from the construction contract. Prior to consideration of a dispute, the DRB shall establish rules and regulations that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. DRB recommendations, resulting from its consideration of a dispute, shall be furnished in writing to both parties. The recommendations shall be based on facts and circumstances involved in the dispute, pertinent contract provisions, applicable laws and regulations. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered. The DRB shall make recommendations on the merit of the dispute, and if appropriate, recommend guidelines for determining compensation. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.

The DRB shall refrain from officially giving advice or consulting services to anyone involved in the contract. The individual members shall act in a completely independent manner and while serving as members of the DRB shall have no consulting business connections with either party or its principals or attorneys or other affiliates (subcontractors, suppliers, etc.) who have a beneficial interest in the contract.

During scheduled meetings of the DRB as well as during dispute meetings, DRB members shall refrain from expressing opinions on the merits of statements on matters under dispute or potential dispute. Opinions of DRB members expressed in private sessions shall be kept strictly confidential. Individual DRB members shall not meet with, or discuss contract issues with individual parties, except as directed by the DRB Chairperson. Such discussions or meetings shall be disclosed to both parties. Other discussions regarding the project between the DRB members and the parties shall be in the presence of all three members and both parties. Individual DRB members shall not undertake independent investigations of any kind pertaining to disputes or potential disputes, except with the knowledge of both parties and as expressly directed by the DRB Chairperson.

C. CONSTRUCTION SITE VISITS, PROGRESS MEETINGS AND FIELD INSPECTIONS

The DRB members shall visit the project site and meet with representatives of the parties to keep abreast of construction activities and to develop familiarity with the work in progress. Scheduled progress meetings shall be held at or near the project site. The DRB shall meet at least once at the start of the project, and at least once every 4 months thereafter. The frequency, exact time, and duration of additional site visits and progress meetings shall be as recommended by the DRB and approved by the parties consistent with the construction activities or matters under consideration and dispute. Each meeting shall consist of a round table discussion and a field inspection of the work being performed on the contract, if necessary. Each meeting shall be attended by representatives of both parties. The agenda shall generally be as follows:

1. Meeting opened by the DRB Chairperson.
2. Remarks by the STATE's representative.
3. A description by the CONTRACTOR's representative of work accomplished since the last meeting; the current schedule status of the work; and a forecast for the coming period.
4. An outline by the CONTRACTOR's representative of potential problems and a description of proposed solutions.
5. An outline by the STATE's representative of the status of the work as the STATE views it.
6. A brief description by the CONTRACTOR's or STATE's representative of potential claims or disputes which have surfaced since the last meeting.

7. A summary by the STATE's representative, the CONTRACTOR's representative, or the DRB of the status of past disputes and potential claims.

The STATE's representative will prepare minutes of all progress meetings and circulate them for revision and approval by all concerned within 10 days of the meeting.

The field inspection shall cover all active segments of the work, the DRB being accompanied by both parties' representatives. The field inspection may be waived upon mutual agreement of the parties.

D. DRB CONSIDERATION AND HANDLING OF DISPUTES

Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral, unless otherwise agreed to by all parties. The DRB shall determine the time and location of DRB dispute meetings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. No dispute meetings shall take place later than 30 days prior to acceptance of contract.

Normally, dispute meetings shall be conducted at or near the project site. However, any location that would be more convenient and still provide required facilities and access to necessary documentation shall be satisfactory.

Both parties shall be given the opportunity to present their evidence at these dispute meetings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, applicable laws and regulations, and the facts and conditions surrounding any dispute presented by either party, and that the recommendations concerning any such dispute are advisory and nonbinding on the parties.

The DRB may request that written documentation and arguments from both parties be sent to each DRB member, through the DRB Chairperson, for review before the dispute meeting begins. A party furnishing written documentation to the DRB shall furnish copies of such information to the other party at the same time that such information is supplied to the DRB.

DRB dispute meetings shall be informal. There shall be no testimony under oath or cross-examination. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRB in conformance with acceptance standards established by the DRB. These standards need not comply with prescribed legal laws of evidence.

The third DRB member shall act as Chairperson for dispute meetings and all other DRB activities. The parties shall have a representative at all dispute meetings. Failure to attend a duly noticed dispute meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers written submittals as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals until all aspects of the dispute are thoroughly covered. DRB members shall ask questions, seek clarification, and request further data from either of the parties as may be necessary to assist in making a fully informed recommendation. The DRB may request from either party documents or information that would assist the DRB in making its findings and recommendations including, but not limited to, documents used by the CONTRACTOR in preparing the bid for the project. A refusal by a party to provide information requested by the DRB may be considered by the DRB as an indication that the requested material would tend to disprove that party's position. In large or complex cases, additional dispute meetings may be necessary in order to consider all the evidence presented by both parties. All involved parties shall maintain the confidentiality of all documents and information, as provided in this AGREEMENT.

During dispute meetings, no DRB member shall express an opinion concerning the merit of any facet of the case. DRB deliberations shall be conducted in private, with interim individual views kept strictly confidential.

After dispute meetings are concluded, the DRB shall meet in private and reach a conclusion supported by 2 or more members. Private sessions of the DRB may be held at a location other than the job site or by electronic conferencing as deemed appropriate, in order to expedite the process.

The DRB's findings and recommendations, along with discussion of reasons therefor, shall then be submitted as a written report to both parties. Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and facts and circumstances related to the dispute. The report shall be thorough in discussing the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the issues, and the DRB's interpretation and philosophy in arriving at its conclusions and recommendations. The DRB's report shall stand on its own, without attachments or appendices. The DRB Chairperson shall furnish a copy of the written recommendation report to the DRB Coordinator, Division of Construction, MS 44, P.O. Box 942874, Sacramento, CA 94274.

With prior written approval of both parties, the DRB may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the 2 parties as specified in an approved contract change order. The CONTRACTOR will not be entitled to markups for the payments made for these services.

The DRB shall resist submittal of incremental portions of information by either party, in the interest of making a fully informed decision and recommendation.

The DRB shall make every effort to reach a unanimous decision. If this proves impossible, the dissenting member shall prepare a minority opinion, which shall be included in the DRB's report.

Although both parties should place weight upon the DRB's recommendations, they are not binding. Either party may appeal a recommendation to the DRB for reconsideration. However, reconsideration shall only be allowed when there is new evidence to present, and the DRB shall accept only one appeal from each party pertaining to an individual DRB recommendation. The DRB shall hear appeals in conformance with the terms described in the Section entitled "Dispute Review Board" in the special provisions.

E. DRB MEMBER REPLACEMENT

Should the need arise to appoint a replacement DRB member, the replacement DRB member shall be appointed in the same manner as the original DRB members were appointed. The selection of a replacement DRB member shall begin promptly upon notification of the necessity for a replacement and shall be completed within 15 days. This AGREEMENT shall be amended to indicate change in DRB membership.

SECTION III CONTRACTOR RESPONSIBILITIES

The CONTRACTOR shall furnish to each DRB member one copy of pertinent documents that are or may become necessary for the DRB to perform their function. Pertinent documents are written notices of potential claim, responses to those notices, drawings or sketches, calculations, procedures, schedules, estimates, or other documents which are used in the performance of the work or in justifying or substantiating the CONTRACTOR's position. The CONTRACTOR shall also furnish a copy of such pertinent documents to the STATE, in conformance with the terms outlined in the special provisions.

SECTION IV STATE RESPONSIBILITIES

The STATE will furnish the following services and items:

A. CONTRACT RELATED DOCUMENTS

The STATE will furnish to each DRB member one copy of Notice to Contractors and Special Provisions, Proposal and Contract, Plans, Standard Specifications, and Standard Plans, change orders, written instructions issued by the STATE to the CONTRACTOR, or other documents pertinent to any dispute that has been referred to the DRB and necessary for the DRB to perform its function.

B. COORDINATION AND SERVICES

The STATE, through the Engineer, will, in cooperation with the CONTRACTOR, coordinate the operations of the DRB. The Engineer will arrange or provide conference facilities at or near the project site and provide secretarial and copying services to the DRB without charge to the CONTRACTOR.

SECTION V TIME FOR BEGINNING AND COMPLETION

Once established, the DRB shall be in operation until the day of acceptance of the contract. The DRB members shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE.

SECTION VI PAYMENT

A. ALL INCLUSIVE RATE PAYMENT

The STATE and the CONTRACTOR shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time has been specifically agreed to in advance by the STATE and CONTRACTOR. Time away from the project that has been specifically agreed to in advance by the parties will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the State, regardless of the number of meetings per day, shall not be paid more than the all

inclusive rate per day or rate per hour for an individual project. The STATE will provide, at no cost to the CONTRACTOR, administrative services such as conference facilities and secretarial services to the DRB.

B. PAYMENTS

DRB members shall be compensated at the same rate. The CONTRACTOR shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The STATE will reimburse the CONTRACTOR for its share of the costs of the DRB.

The DRB members may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRB member until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

Invoices shall be accompanied by original supporting documents, which the CONTRACTOR shall include with the extra work billing when submitting for reimbursement of the STATE's share of cost from the STATE. The CONTRACTOR will be reimbursed for one-half of approved costs of the DRB. No markups will be added to the CONTRACTOR's payment.

C. INSPECTION OF COSTS RECORDS

The DRB members and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

SECTION VII ASSIGNMENT OF TASKS OF WORK

The DRB members shall not assign the work of this AGREEMENT.

SECTION VIII TERMINATION OF DRB MEMBERS

DRB members may resign from the DRB by providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power or by either party, for failing to fully comply at all times with all required employment and financial disclosure conditions of DRB membership in conformance with the terms of the contract.

SECTION IX LEGAL RELATIONS

The parties hereto mutually understand and agree that the DRB member in the performance of duties on the DRB, is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

SECTION X CONFIDENTIALITY

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRB, which documents and records are marked "Confidential - for use by the DRB only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRB findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of the DRB. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRB. However, the parties understand that such documents shall be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION XI DISPUTES

Disputes between the parties hereto, including disputes between the DRB members and either party or both parties, arising out of the work or other terms of this AGREEMENT, which cannot be resolved by negotiation and mutual concurrence between the parties, or through the administrative process provided in the contract, shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications.

SECTION XII VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party, including an individual member of the DRB, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

SECTION XIII FEDERAL REVIEW AND REQUIREMENTS

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRB in progress, except for private meetings or deliberations of the DRB.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIV CERTIFICATION OF THE CONTRACTOR, THE DRB MEMBERS, AND THE STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRB MEMBER

DRB MEMBER

By: _____

By: _____

Title: _____

Title : _____

DRB MEMBER

By : _____

Title : _____

CONTRACTOR

CALIFORNIA STATE DEPARTMENT
OF TRANSPORTATION

By: _____

By: _____

Title: _____

Title: _____

Add:

5-1.16-5-17 (BLANK)

Add:

5-1.18 PROPERTY AND FACILITY PRESERVATION

5-1.18A General

Preserve property and facilities, including:

- 1. Adjacent property
- 2. Department's instrumentation
- 3. ESAs

4. Lands administered by other agencies
5. Railroads and railroad equipment
6. Roadside vegetation not to be removed
7. Utilities
8. Waterways

Immediately report damage to the Engineer.

If you cause damage, you are responsible.

Install sheet piling, cribbing, bulkheads, shores, or other supports necessary to support existing facilities or support material carrying the facilities.

Dispose of temporary facilities when they are no longer needed.

If you damage plants not to be removed:

1. Dispose of them outside the right of way unless the Engineer allows you to reduce them to chips and spread the chips within the highway at locations designated by the Engineer
2. Replace them

Replace plants with plants of the same species.

Replace trees with 600 mm-box trees.

Replace shrubs with No. 15 container shrubs.

Replace ground cover plants with plants from flats. Replace *Carpobrotus* ground cover plants with plants from cuttings.

Plant ground cover plants 300 mm on center.

If a plant establishment period is specified, replace plants before the start of the plant establishment period; otherwise, replace plants at least 30 days before Contract acceptance.

Water each plant immediately after planting and saturate the backfill soil around and below the roots or ball of earth around the roots of each plant. Water as necessary to maintain plants in a healthy condition until Contract acceptance.

The Department may make a temporary repair to restore service to a damaged facility.

If working on or adjacent to railroad property, do not interfere with railroad operations.

For an excavation on or affecting railroad property, submit work plans showing the system to be used to protect railroad facilities. Allow 65 days for the Engineer's review of the plans. Do not perform work based on the plans until the Engineer notifies you they are accepted.

5-1.18B Nonhighway Facilities (Including Utilities)

The Department may rearrange a nonhighway facility during the Contract. Rearrangement of a nonhighway facility includes installation, relocation, alteration, or removal of the facility. The Department may authorize facility owners and their agents to enter the highway to perform rearrangement work for their facilities or to make connections or repairs to their property. Coordinate activities to avoid delays.

Notify the Engineer at least 3 business days before you contact the regional notification center under Govt Code § 4216 et seq. Failure to contact the notification center prohibits excavation.

Before starting work that could damage or interfere with underground infrastructure, locate the infrastructure described in the Contract, including laterals and other appurtenances, and determine the presence of other underground infrastructure inferred from visible facilities such as buildings, meters, or junction boxes.

Notify the Engineer if the infrastructure described in the Contract cannot be found. If after giving the notice, you find the infrastructure in a substantially different location than described, finding the infrastructure is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

Underground infrastructure described in the Contract may be in different locations than described, and additional infrastructure may exist.

Upon discovering an underground main or trunk line not described in the Contract, immediately notify the Engineer and the infrastructure owner. The Engineer orders the locating and protecting of the infrastructure. The locating and protecting is paid for as extra work as specified in Section 4-1.03D, "Extra Work." If ordered, repair infrastructure damage. If the damage is not due to your negligence, the repair is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

If necessary underground infrastructure rearrangement is not described in the Contract, the Engineer may order you to perform the work. The rearrangement is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

If you want infrastructure rearrangement different from that described in the Contract:

1. Notify the Engineer
2. Make an arrangement with the infrastructure owner
3. Obtain authorization for the rearrangement

Within 10 days of receipt of the list, submit for authorization a detailed plan for correcting the work. Include a schedule that includes:

1. Start and completion dates
2. List of labor, equipment, materials, and any special services you plan to use
3. Work related to the corrective work, including traffic control and temporary and permanent pavement markings

The Engineer notifies you when the plan is authorized. Start corrective work and related work within 15 days of notice. If the Engineer determines corrective work is urgently required to prevent injury or property damage:

1. The Engineer furnishes you a request to start emergency repair work and a list of parts requiring corrective work
2. Mobilize within 24 hours and start work
3. Submit a corrective work plan within 5 days of starting emergency repair work

If you fail to perform work as specified, the Department may perform the work and bill you.

Add:

6-1.085 BUY AMERICA (23 CFR 635.410)

For a Federal-aid contract, furnish steel and iron materials to be incorporated into the work that are produced in the United States except:

1. Foreign pig iron and processed, pelletized, and reduced iron ore may be used in the domestic production of the steel and iron materials [60 Fed Reg 15478 (03/24/1995)]
2. If the total combined cost of the materials does not exceed the greater of 0.1 percent of the total bid or \$2 500, material produced outside the United States may be used

Production includes:

1. Processing steel and iron materials, including smelting or other processes that alter the physical form or shape (such as rolling, extruding, machining, bending, grinding, and drilling) or chemical composition
2. Coating application, including epoxy coating, galvanizing, and painting, that protects or enhances the value of steel and iron materials

For steel and iron materials to be incorporated into the work, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications that certifies all production processes occurred in the United States except for the above exceptions.

Add:

6-1.087 BUY AMERICA (PUB RES CODE § 42703(d))

Furnish crumb rubber to be incorporated into the work that is produced in the United States and is derived from waste tires taken from vehicles owned and operated in the United States.

For crumb rubber to be incorporated into the work, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications that certifies only crumb rubber manufactured in the United States and derived from waste tires taken from vehicles owned and operated in the United States is used.

In Section 6-2.01 delete the 4th paragraph.

In Section 6-2.01 replace the 7th paragraph with:

Upon the Contractor's written request, the Department tests materials from an untested local source. If satisfactory material from that source is used in the work, the Department does not charge the Contractor for the tests; otherwise, the Department deducts the test cost.

moneys due the subcontractor sufficient to pay those employees the general prevailing rate of per diem wages if requested by the Division of Labor Standards Enforcement. The Contractor must pay any money withheld from and owed to a subcontractor upon receipt of notification by the Division of Labor Standards Enforcement that the wage complaint has been resolved. If notice of the resolution of the wage complaint has not been received by the Contractor within 180 days of the filing of a valid notice of completion or acceptance of the public works project, whichever occurs later, the Contractor must pay all moneys withheld from the subcontractor to the Department. The Department withholds these moneys pending the final decision of an enforcement action.

In Section 7-1.01A(2) replace the 7th paragraph with:

Changes in general prevailing wage determinations apply to the contract when the Director of Industrial Relations has issued them at least 10 days before advertisement (Labor Code § 1773.6 and 8 CA Code of Regs 16204).

In Section 7-1.01A(3) replace the 2nd paragraph with:

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

In Section 7-1.01A(3) replace the 4th paragraph with:

The Department withholds for delinquent or inadequate payroll records (Labor Code § 1771.5). If the Contractor has not submitted an adequate payroll record by the month's 15th day for the period ending on or before the 1st of that month, the Department withholds 10 percent of the monthly progress estimate, exclusive of mobilization. The Department does not withhold more than \$10 000 or less than \$1000.

In Section 7-1.01A(3) delete the 5th paragraph.

Replace Section 7-1.01A(6) with:

7-1.01A(6) (Blank)

Add:

7-1.01K Solid Waste Disposal and Recycling

Submit an annual Solid Waste Disposal and Recycling Report between January 1 and 15 for each year work is performed under the Contract at any time during the previous calendar year. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project from January 1 through December 31 of the previous calendar year.

Submit a final annual Solid Waste Disposal and Recycling Report within 5 business days after Contract acceptance. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project from January 1 to contract acceptance.

For each failure to submit a completed form, the Department withholds \$10,000.

Add:

7-1.01L Asbestos and Hazardous Substances

• Upon discovery, immediately stop working in and notify the Engineer of areas where asbestos or a hazardous substance is present if the:

1. Contractor reasonably believes the substance is asbestos as defined in Labor Code § 6501.7 or a hazardous substance as defined in Health & Safety Code §§ 25316 and 25317
2. Presence is not described in the contract
3. Substance has not been made harmless

Add:

7-1.01M Archaeological Discoveries

If archaeological materials are discovered at the job site, protect and leave them undisturbed in place and comply with:

1. Pub Res Code §§ 5097.5, 5097.98, and 5097.99
2. 14 CA Code of Regs § 4308
4. Penal Code § 622-1/2
5. Health & Safety Code § 7050.5

Archaeological materials are the remains of past human activity including historic-period archaeological materials and prehistoric Native American archaeological materials. Nonhuman fossils are not archaeological materials unless they show direct evidence of human use or alteration or when found in direct physical association with archaeological materials

Historic-period archaeological materials include cultural remains beginning with initial European contact in California but at least 50 years old and include:

1. Trash deposits or clearly defined disposal pits containing tin cans, bottles, ceramic dishes, or other refuse indicating previous occupation or use of the site
2. Structural remains of stone, brick, concrete, wood, or other building material found above or below ground
3. Human skeletal remains from the historic period, with or without coffins or caskets, including any associated grave goods

Prehistoric Native American archaeological materials include:

1. Human skeletal remains or associated burial goods such as beads or ornaments
2. Evidence of tool making or hunting such as arrowheads and associated chipping debris of fine-grained materials such as obsidian, chert, or basalt
3. Evidence of plant processing such as pestles, grinding slabs, or stone bowls
4. Evidence of habitation such as cooking pits, stone hearths, packed or burnt earth floors
5. Remains from food processing such as concentrations of discarded or burnt animal bone, shellfish remains, or burnt rocks used in cooking

Immediately upon discovering archaeological materials, stop all work within an 18.5-meter radius of the archaeological materials and notify the Engineer. Archaeological materials discovered are the property of the State. Do not resume work within the 18.5-meter radius of the discovery until the Engineer gives you written approval. If, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of an archeological discovery or investigation or recovery of archeological materials, you will be compensated for resulting losses and an extension of time will be granted in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Department may use other forces to investigate and recover archaeological materials from the location of the discovery. If ordered by the Engineer furnish labor, material, tools, and equipment to secure the location of the discovery and assist in the investigation or recovery of archaeological materials; the cost of this work will be paid for as extra work as specified in Section 4-1.03D, "Extra Work," of the Standard Specifications.

In Section 7-1.02 in the 2nd paragraph, replace the 4th sentence with:

Trucks used to haul treated base, portland cement concrete, or hot mix asphalt shall enter onto the base to dump at the nearest practical entry point ahead of spreading equipment.

In Section 7-1.02 between the 4th and 5th paragraphs, add:

Loads imposed on existing, new, or partially completed structures shall not exceed the load carrying capacity of the structure or any portion of the structure as determined by AASHTO LRFD with interims and California Amendments, Design Strength Limit State II. The compressive strength of concrete (f_c) to be used in computing the load carrying capacity shall be the smaller of the following:

1. Actual compressive strength at the time of loading
2. Value of f_c shown on the plans for that portion of the structure or 2.5 times the value of f_c (extreme fiber compressive stress in concrete at service loads) shown on the plans for portions of the structure where no f_c is shown

In Section 7-1.06 in the 1st paragraph, add:

The Contractor's Injury and Illness Prevention Program shall be submitted to the Engineer. The program shall address the use of personal and company issued electronic devices during work. The use of entertainment and personal communication devices in the work zone shall not be allowed. Workers may use a communication device for business purposes in the work area, at a location where their safety and the safety of other workers and the traveling public is not compromised.

In Section 7-1.09 replace the 8th paragraph with:

Signs, lights, flags, and other warning and safety devices and their use shall conform to the requirements set forth in Part 6 of the California MUTCD except where a discrepancy exists between the California MUTCD and the specifications; for discrepancies, comply with the specifications. Signs or other protective devices furnished and erected by the Contractor, at the Contractor's expense, as above provided, shall not obscure the visibility of, nor conflict in intent, meaning and function of either existing signs, lights and traffic control devices or any construction area signs and traffic control devices for which furnishing of, or payment for, is provided elsewhere in the specifications. Signs furnished and erected by the Contractor, at the Contractor's expense, shall be approved by the Engineer as to size, wording and location.

In Section 7-1.09 replace the 14th paragraph with:

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

In Section 7-1.09 replace the 16th paragraph with:

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

Add to Section 7-1.09:

The Contractor shall install temporary railing (Type K) between a lane open to public traffic and an excavation, obstacle or storage area when the following conditions exist:

- A. Excavations-The near edge of the excavation is 3.6 m or less from the edge of the lane, except:
 1. Excavations covered with sheet steel or concrete covers of adequate thickness to prevent accidental entry by traffic or the public.
 2. Excavations less than 0.3 m deep.
 3. Trenches less than 0.3 m wide for irrigation pipe or electrical conduit, or excavations less than 0.3 m in diameter.
 4. Excavations parallel to the lane for the purpose of pavement widening or reconstruction.
 5. Excavations in side slopes, where the slope is steeper than 4:1 (horizontal:vertical).
 6. Excavations protected by existing barrier or railing.
- B. Temporarily Unprotected Permanent Obstacles-The work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or the Contractor, for the Contractor's convenience and with permission of the Engineer, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day.

- C. Storage Areas-Material or equipment is stored within 3.6 m of the lane and the storage is not otherwise prohibited by the provisions of the Standard Specifications and these special provisions.

The approach end of temporary railing (Type K), installed in conformance with the provisions in this section "Public Safety" and in Section 7-1.09, "Public Safety," of the Standard Specifications, shall be offset a minimum of 4.6 m from the edge of the traffic lane open to public traffic. The temporary railing shall be installed on a skew toward the edge of the traffic lane of not more than 0.3 m transversely to 3 m longitudinally with respect to the edge of the traffic lane. If the 4.6 m minimum offset cannot be achieved, the temporary railing shall be installed on the 10 to 1 skew to obtain the maximum available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules shall be installed at the approach end of the temporary railing.

Temporary railing (Type K) shall be secured in place before starting work for which the temporary railing is required.

Except for installing, maintaining and removing traffic control devices, whenever work is performed or equipment is operated in the following work areas, the Contractor shall close the adjacent traffic lane unless otherwise provided in the Standard Specifications and these special provisions:

| Approach Speed of Public Traffic (Posted Limit) (Kilometers Per Hour) | Work Areas |
|--|--|
| Over 72 (45 Miles Per Hour) | Within 1.8 m of a traffic lane but not on a traffic lane |
| 56 to 72 (35 to 45 Miles Per Hour) | Within 0.9 m of a traffic lane but not on a traffic lane |

The lane closure provisions of this section shall not apply if the work area is protected by permanent or temporary railing or barrier.

When traffic cones or delineators are used to delineate a temporary edge of a traffic lane, the line of cones or delineators shall be considered to be the edge of the traffic lane, however, the Contractor shall not reduce the width of an existing lane to less than 3 m without written approval from the Engineer.

When work is not in progress on a trench or other excavation that required closure of an adjacent lane, the traffic cones or portable delineators used for the lane closure shall be placed off of and adjacent to the edge of the traveled way. The spacing of the cones or delineators shall be not more than the spacing used for the lane closure.

Suspended loads or equipment shall not be moved nor positioned over public traffic or pedestrians.

Replace Section 7-1.11 with:

7-1.11 PRESERVATION OF PROPERTY

Comply with Section 5-1.18, "Property and Facility Preservation."

Replace Section 7-1.12 with:

7-1.12 INDEMNIFICATION AND INSURANCE

The Contractor's obligations regarding indemnification of the State of California and the requirements for insurance shall conform to the provisions in Section 3-1.05, "Insurance Policies," and Sections 7-1.12A, "Indemnification," and 7-1.12B, "Insurance," of this Section 7-1.12.

7-1.12A Indemnification

The Contractor shall defend, indemnify, and save harmless the State, including its officers, employees, and agents (excluding agents who are design professionals) from any and all claims, demands, causes of action, damages, costs, expenses, actual attorneys' fees, losses or liabilities, in law or in equity (Section 7-1.12A Claims) arising out of or in connection with the Contractor's performance of this contract for:

1. Bodily injury including, but not limited to, bodily injury, sickness or disease, emotional injury or death to persons, including, but not limited to, the public, any employees or agents of the Contractor, the State, or any other contractor; and
2. Damage to property of anyone including loss of use thereof; caused or alleged to be caused in whole or in part by any negligent or otherwise legally actionable act or omission of the Contractor or anyone directly or indirectly employed by the Contractor or anyone for whose acts the Contractor may be liable.

Except as otherwise provided by law, these requirements apply regardless of the existence or degree of fault of the State. The Contractor is not obligated to indemnify the State for Claims arising from conduct delineated in Civil Code Section 2782 and to Claims arising from any defective or substandard condition of the highway that existed at or before the start of work, unless this condition has been changed by the work or the scope of the work requires the Contractor to maintain existing highway facilities and the Claim arises from the Contractor's failure to maintain. The Contractor's defense and indemnity obligation shall extend to Claims arising after the work is completed and accepted if the Claims are directly related to alleged acts or omissions by the Contractor that occurred during the course of the work. State inspection is not a waiver of full compliance with these requirements.

The Contractor's obligation to defend and indemnify shall not be excused because of the Contractor's inability to evaluate liability or because the Contractor evaluates liability and determine that the Contractor is not liable. The Contractor shall respond within 30 days to the tender of any Claim for defense and indemnity by the State, unless this time has been extended by the State. If the Contractor fails to accept or reject a tender of defense and indemnity within 30 days, in addition to any other remedy authorized by law, the Department may withhold such funds the State reasonably considers necessary for its defense and indemnity until disposition has been made of the Claim or until the Contractor accepts or rejects the tender of defense, whichever occurs first.

With respect to third-party claims against the Contractor, the Contractor waives all rights of any type to express or implied indemnity against the State, its officers, employees, or agents (excluding agents who are design professionals).

Nothing in the Contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these indemnification specifications.

7-1.12B Insurance

7-1.12B(1) General

Nothing in the contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these insurance specifications.

7-1.12B(2) Casualty Insurance

The Contractor shall procure and maintain insurance on all of its operations with companies acceptable to the State as follows:

1. The Contractor shall keep all insurance in full force and effect from the beginning of the work through contract acceptance.
2. All insurance shall be with an insurance company with a rating from A.M. Best Financial Strength Rating of A- or better and a Financial Size Category of VII or better.
3. The Contractor shall maintain completed operations coverage with a carrier acceptable to the State through the expiration of the patent deficiency in construction statute of repose set forth in Code of Civil Procedure Section 337.1.

7-1.12B(3) Workers' Compensation and Employer's Liability Insurance

In accordance with Labor Code Section 1860, the Contractor shall secure the payment of worker's compensation in accordance with Labor Code Section 3700.

In accordance with Labor Code Section 1861, the Contractor shall submit to the Department the following certification before performing the work:

I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.

Contract execution constitutes certification submittal.

The Contractor shall provide Employer's Liability Insurance in amounts not less than:

1. \$1 000 000 for each accident for bodily injury by accident
2. \$1 000 000 policy limit for bodily injury by disease
3. \$1 000 000 for each employee for bodily injury by disease

If there is an exposure of injury to the Contractor's employees under the U.S. Longshoremen's and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations, or statutes applicable to maritime employees, coverage shall be included for such injuries or claims.

7-1.12B(4) Liability Insurance

7-1.12B(4)(a) General

The Contractor shall carry General Liability and Umbrella or Excess Liability Insurance covering all operations by or on behalf of the Contractor providing insurance for bodily injury liability and property damage liability for the following limits and including coverage for:

1. Premises, operations, and mobile equipment
2. Products and completed operations
3. Broad form property damage (including completed operations)
4. Explosion, collapse, and underground hazards
5. Personal injury
6. Contractual liability

7-1.12B(4)(b) Liability Limits/Additional Insureds

The limits of liability shall be at least the amounts shown in the following table:

| Total Bid | For Each Occurrence ¹ | Aggregate for Products/Completed Operation | General Aggregate ² | Umbrella or Excess Liability ³ |
|---------------|----------------------------------|--|--------------------------------|---|
| ≤\$1 000 000 | \$1 000 000 | \$2 000 000 | \$2 000 000 | \$5 000 000 |
| >\$1 000 000 | \$1 000 000 | \$2 000 000 | \$2 000 000 | \$10 000 000 |
| ≤\$5 000 000 | | | | |
| >\$5 000 000 | \$2 000 000 | \$2 000 000 | \$4 000 000 | \$15 000 000 |
| ≤\$25 000 000 | | | | |
| >\$25 000 000 | \$2 000 000 | \$2 000 000 | \$4 000 000 | \$25 000 000 |

1. Combined single limit for bodily injury and property damage.
2. This limit shall apply separately to the Contractor's work under this contract.
3. The umbrella or excess policy shall contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted.

The Contractor shall not require certified Small Business subcontractors to carry Liability Insurance that exceeds the limits in the table above. Notwithstanding the limits specified herein, at the option of the Contractor, the liability insurance limits for certified Small Business subcontractors of any tier may be less than those limits specified in the table. For Small Business subcontracts, "Total Bid" shall be interpreted as the amount of subcontracted work to a certified Small Business.

The State, including its officers, directors, agents (excluding agents who are design professionals), and employees, shall be named as additional insureds under the General Liability and Umbrella Liability Policies with respect to liability arising out of or connected with work or operations performed by or on behalf of the Contractor under this contract. Coverage for such additional insureds does not extend to liability:

1. Arising from any defective or substandard condition of the roadway which existed at or before the time the Contractor started work, unless such condition has been changed by the work or the scope of the work requires the Contractor to maintain existing roadway facilities and the claim arises from the Contractor's failure to maintain;
2. For claims occurring after the work is completed and accepted unless these claims are directly related to alleged acts or omissions of the Contractor that occurred during the course of the work; or
3. To the extent prohibited by Insurance Code Section 11580.04

Additional insured coverage shall be provided by a policy provision or by an endorsement providing coverage at least as broad as Additional Insured (Form B) endorsement form CG 2010, as published by the Insurance Services Office (ISO), or other form designated by the Department.

7-1.12B(4)(c) Contractor's Insurance Policy is Primary

The policy shall stipulate that the insurance afforded the additional insureds applies as primary insurance. Any other insurance or self-insurance maintained by the State is excess only and shall not be called upon to contribute with this insurance.

7-1.12B(5) Automobile Liability Insurance

The Contractor shall carry automobile liability insurance, including coverage for all owned, hired, and nonowned automobiles. The primary limits of liability shall be not less than \$1 000 000 combined single limit each accident for bodily injury and property damage. The umbrella or excess liability coverage required under Section 7-1.12B(4)(b) also applies to automobile liability.

7-1.12B(6) Policy Forms, Endorsements, and Certificates

The Contractor shall provide its General Liability Insurance under Commercial General Liability policy form No. CG0001 as published by the Insurance Services Office (ISO) or under a policy form at least as broad as policy form No. CG0001.

7-1.12B(7) Deductibles

The State may expressly allow deductible clauses, which it does not consider excessive, overly broad, or harmful to the interests of the State. Regardless of the allowance of exclusions or deductions by the State, the Contractor is responsible for any deductible amount and shall warrant that the coverage provided to the State is in accordance with Section 7-1.12B, "Insurance."

7-1.12B(8) Enforcement

The Department may assure the Contractor's compliance with its insurance obligations. Ten days before an insurance policy lapses or is canceled during the contract period, the Contractor shall submit to the Department evidence of renewal or replacement of the policy.

If the Contractor fails to maintain any required insurance coverage, the Department may maintain this coverage and withhold or charge the expense to the Contractor or terminate the Contractor's control of the work in accordance with Section 8-1.08, "Termination of Control."

The Contractor is not relieved of its duties and responsibilities to indemnify, defend, and hold harmless the State, its officers, agents, and employees by the Department's acceptance of insurance policies and certificates.

Minimum insurance coverage amounts do not relieve the Contractor for liability in excess of such coverage, nor do they preclude the State from taking other actions available to it, including the withholding of funds under this contract.

7-1.12B(9) Self-Insurance

Self-insurance programs and self-insured retentions in insurance policies are subject to separate annual review and approval by the State.

If the Contractor uses a self-insurance program or self-insured retention, the Contractor shall provide the State with the same protection from liability and defense of suits as would be afforded by first-dollar insurance. Execution of the contract is the Contractor's acknowledgement that the Contractor will be bound by all laws as if the Contractor were an insurer as defined under Insurance Code Section 23 and that the self-insurance program or self-insured retention shall operate as insurance as defined under Insurance Code Section 22.

In Section 7-1.13 delete the 5th and 6th paragraphs.

Add:

7-1.50 FEDERAL LAWS FOR FEDERAL-AID CONTRACTS

7-1.50A General

Section 7-1.50, "Federal Laws for Federal-Aid Contracts," includes specifications required in a Federal-aid construction contract and applies to a Federal-aid contract.

Form FHWA-1273 is included in the contract in Section 7-1.50B, "FHWA-1273." Some contract terms on the form are different than those used in other contract parts as shown in the following table:

FHWA-1273 Terms and Department Equivalencies

| FHWA-1273 Term | Equivalent Term Used in Other Contract Parts |
|-------------------------|--|
| SHA | Department |
| SHA contracting officer | Engineer |
| SHA resident engineer | Engineer |

7-1.50B FHWA-1273

FHWA-1273 Electronic version -- March 10, 1994
with revised Section VI

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Payment of Predetermined Minimum Wage
- V. Statements and Payrolls
- VI. Record of Materials, Supplies, and Labor
- VII. Subletting or Assigning the Contract
- VIII. Safety: Accident Prevention
- IX. False Statements Concerning Highway Projects
- X. Implementation of Clean Air Act and Federal Water Pollution Control Act
- XI. Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
- XII. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

- A. Employment Preference for Appalachian Contracts (included in Appalachian contracts only)

I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.
3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.
4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:
 - Section I, paragraph 2;
 - Section IV, paragraphs 1, 2, 3, 4, and 7;
 - Section V, paragraphs 1 and 2a through 2g.
5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.
6. **Selection of Labor:** During the performance of this contract, the contractor shall not:
 - a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or
 - b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 *et seq.*) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
 - a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.
 - b. The contractor will accept as his operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."
2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
 - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
 - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
 - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.
 - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
 - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.
 - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
 - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)

- c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.
5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
- a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
 - b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
 - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
 - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.
6. **Training and Promotion:**
- a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
 - b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.
 - c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
 - d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.
7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:
- a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
 - b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
 - c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.

- d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these specifications, such contractor shall immediately notify the SHA.
8. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.
 - a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.
 - b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.
 - c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.
 9. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.
 - a. The records kept by the contractor shall document the following:
 1. The number of minority and non-minority group members and women employed in each work classification on the project;
 2. The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;
 3. The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and
 4. The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.
 - b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

- a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.
- b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

- c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of \$10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. General:

- a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b) (2) of the Davis- Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.
- b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.
- c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. Classification:

- a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.
- b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:
 1. the work to be performed by the additional classification requested is not performed by a classification in the wage determination;
 2. the additional classification is utilized in the area by the construction industry;
 3. the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and
 4. with respect to helpers, when such a classification prevails in the area in which the work is performed.
- c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

- d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
- e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. Payment of Fringe Benefits:

- a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.
- b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:

a. Apprentices:

- 1. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.
- 2. The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.
- 3. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.
- 4. In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

1. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.
2. The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.
3. Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.
4. In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. **Apprentices and Trainees (Programs of the U.S. DOT):**

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. **Withholding:**

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. Overtime Requirements:

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. Violation:

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. Withholding for Unpaid Wages and Liquidated Damages:

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. Compliance with Copeland Regulations (29 CFR 3):

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. Payrolls and Payroll Records:

- a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.
- b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

- c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029- 005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.
- d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
 - 1. that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;
 - 2. that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;
 - 3. that each laborer or mechanic has been paid not less than the applicable wage rate and fringe benefits or cash equivalent for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.
- f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.
- g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

(As of May 22, 2007, Form FHWA-47 is no longer required.)

VII. SUBLETTING OR ASSIGNING THE CONTRACT

- 1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).
 - a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.
 - b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.
- 2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by Engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more than \$10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 *et seq.*, as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 *et seq.*, as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.
2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification - Primary Covered Transactions:

(Applicable to all Federal-aid contracts - 49 CFR 29)

- a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
- d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.
- i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

**Certification Regarding Debarment, Suspension, Ineligibility and
Voluntary Exclusion--Primary Covered Transactions**

- 1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
 - a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
 - b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and
 - d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- 2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

2. Instructions for Certification - Lower Tier Covered Transactions:

- (Applicable to all subcontracts, purchase orders and other lower tier transactions of \$25,000 or more - 49 CFR 29)
- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
 - b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
 - c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
 - d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
- h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions:

- 1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- 2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 - 49 CFR 20)

- 1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
 - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
 - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

7-1.50C Female and Minority Goals

To comply with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-Aid Construction Contracts," the Department is including in Section 7-1.50C, "Female and Minority Goals," female and minority utilization goals for Federal-aid construction contracts and subcontracts that exceed \$10,000.

The nationwide goal for female utilization is 6.9 percent.

The goals for minority utilization [45 Fed Reg 65984 (10/3/1980)] are as follows:

Minority Utilization Goals

| Economic Area | | Goal (Percent) |
|---------------|--|---|
| 174 | Redding CA: Non-SMSA Counties: CA Lassen; CA Modoc; CA Plumas; CA Shasta; CA Siskiyou; CA Tehama | 6.8 |
| 175 | Eureka, CA Non-SMSA Counties: CA Del Norte; CA Humboldt; CA Trinity | 6.6 |
| 176 | San Francisco-Oakland-San Jose, CA: SMSA Counties: 7120 Salinas-Seaside-Monterey, CA CA Monterey 7360 San Francisco-Oakland CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo 7400 San Jose, CA CA Santa Clara, CA 7485 Santa Cruz, CA CA Santa Cruz 7500 Santa Rosa CA Sonoma 8720 Vallejo-Fairfield-Napa, CA CA Napa; CA Solano Non-SMSA Counties: CA Lake; CA Mendocino; CA San Benito | 28.9 25.6 19.6 14.9 9.1 17.1 23.2 |
| 177 | Sacramento, CA: SMSA Counties: 6920 Sacramento, CA CA Placer; CA Sacramento; CA Yolo Non-SMSA Counties CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba | 16.1 14.3 |
| 178 | Stockton-Modesto, CA: SMSA Counties: 5170 Modesto, CA CA Stanislaus 8120 Stockton, CA CA San Joaquin Non-SMSA Counties CA Alpine; CA Amador; CA Calaveras; CA Mariposa; CA Merced; CA Toulumne | 12.3 24.3 19.8 |
| 179 | Fresno-Bakersfield, CA SMSA Counties: 0680 Bakersfield, CA CA Kern 2840 Fresno, CA CA Fresno Non-SMSA Counties: CA Kings; CA Madera; CA Tulare | 19.1 26.1 23.6 |
| 180 | Los Angeles, CA: SMSA Counties: 0360 Anaheim-Santa Ana-Garden Grove, CA CA Orange 4480 Los Angeles-Long Beach, CA CA Los Angeles 6000 Oxnard-Simi Valley-Ventura, CA CA Ventura | 11.9 28.3 21.5 |

| | | |
|-----|--|------|
| | 6780 Riverside-San Bernardino-Ontario, CA CA Riverside; CA San Bernardino | 19.0 |
| | 7480 Santa Barbara-Santa Maria-Lompoc, CA CA Santa Barbara | 19.7 |
| | Non-SMSA Counties CA Inyo; CA Mono; CA San Luis Obispo | 24.6 |
| 181 | San Diego, CA: SMSA Counties 7320 San Diego, CA CA San Diego | 16.9 |
| | Non-SMSA Counties CA Imperial | 18.2 |

For each July during which work is performed under the contract, you and each non-material-supplier subcontractor with a subcontract of \$10,000 or more must complete Form FHWA PR-1391 (Appendix C to 23 CFR 230). Submit the forms by August 15.

7-1.50D Training

Section 7-1.50D, "Training," applies if a number of trainees or apprentices is specified in the special provisions.

As part of your equal opportunity affirmative action program, provide on-the-job training to develop full journeymen in the types of trades or job classifications involved.

You have primary responsibility for meeting this training requirement.

If you subcontract a contract part, determine how many trainees or apprentices are to be trained by the subcontractor.

Include these training requirements in your subcontract.

Where feasible, 25 percent of apprentices or trainees in each occupation must be in their 1st year of apprenticeship or training.

Distribute the number of apprentices or trainees among the work classifications on the basis of your needs and the availability of journeymen in the various classifications within a reasonable recruitment area.

Before starting work, submit to the Department:

1. Number of apprentices or trainees to be trained for each classification
2. Training program to be used
3. Training starting date for each classification

Obtain the Department's approval for this submitted information before you start work. The Department credits you for each apprentice or trainee you employ on the work who is currently enrolled or becomes enrolled in an approved program.

The primary objective of Section 7-1.50D, "Training," is to train and upgrade minorities and women toward journeyman status. Make every effort to enroll minority and women apprentices or trainees, such as conducting systematic and direct recruitment through public and private sources likely to yield minority and women apprentices or trainees, to the extent they are available within a reasonable recruitment area. Show that you have made the efforts. In making these efforts, do not discriminate against any applicant for training.

Do not employ as an apprentice or trainee an employee:

1. In any classification in which the employee has successfully completed a training course leading to journeyman status or in which the employee has been employed as a journeyman
2. Who is not registered in a program approved by the US Department of Labor, Bureau of Apprenticeship and Training

Ask the employee if the employee has successfully completed a training course leading to journeyman status or has been employed as a journeyman. Your records must show the employee's answers to the questions.

In your training program, establish the minimum length and training type for each classification. The Department and FHWA approves a program if one of the following is met:

1. It is calculated to:
 - 1.1. Meet the your equal employment opportunity responsibilities

If approval is granted, the Engineer will accept the non-itemized invoices for specialty work performed, provided the invoices are at current market rates. Markup percentages of Section 9-1.03A, "Work Performed by Contractor," will not apply. A markup of 10 percent will be added to the total cost of the extra work. The 10 percent markup shall reimburse the Contractor for additional administrative costs, and no other payment will be made by reason of performance of the extra work by a specialist.

If approval is not granted prior to the start of the proposed specialty work, the Contractor or subcontractor shall itemize labor, material, and equipment rental costs and apply percentage markups as required by Section 9-1.03A, "Work Performed by Contractor."

In Section 9-1.03C delete the 6th paragraph.

Replace Section 9-1.04 with:

9-1.04 NOTICE OF POTENTIAL CLAIM

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

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

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

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

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

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

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

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

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

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

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

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

1. A detailed factual narration of events fully describing the nature and circumstances that caused the dispute, including, but not limited to, necessary dates, locations, and items of work affected by the dispute
2. The specific provisions of the contract that support the potential claim and a statement of the reasons these provisions support and provide a basis for entitlement of the potential claim
3. When additional monetary compensation is requested, the exact amount requested calculated in conformance with Section 9-1.03, "Force Account Payment," or Section 8-1.09, "Right of Way Delays," including an itemized breakdown of individual costs. These costs shall be segregated into the following cost categories:
 - 3.1. Labor – A listing of individuals, classifications, regular hours and overtime hours worked, dates worked, and other pertinent information related to the requested reimbursement of labor costs
 - 3.2. Materials – Invoices, purchase orders, location of materials either stored or incorporated into the work, dates materials were transported to the project or incorporated into the work, and other pertinent information related to the requested reimbursement of material costs
 - 3.3. Equipment – Listing of detailed description (make, model, and serial number), hours of use, dates of use and equipment rates. Equipment rates shall be at the applicable State rental rate as listed in the Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates," in effect when the affected work related to the dispute was performed.
 - 3.4. Other categories as specified by the Contractor or the Engineer
4. When an adjustment of contract time is requested the following information shall be provided:
 - 4.1. The specific dates for which contract time is being requested
 - 4.2. The specific reasons for entitlement to a contract time adjustment
 - 4.3. The specific provisions of the contract that provide the basis for the requested contract time adjustment
 - 4.4. A detailed time impact analysis of the project schedule. The time impact analysis shall show the effect of changes or disruptions on the scheduled completion date to demonstrate entitlement to a contract time adjustment.
5. The identification and copies of the Contractor's documents and the substance of oral communications that support the potential claim

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

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

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

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

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

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

Replace Section 9-1.05 with:

9-1.05 STOP NOTICE WITHHOLDS

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

Add:

9-1.053 PERFORMANCE FAILURE WITHHOLDS

During each estimate period you fail to comply with a contract part, including submittal of a document as specified, the Department withholds a part of the progress payment. The documents include quality control plans, schedules, traffic control plans, and water pollution control submittals.

For 1 performance failure, the Department withholds 25 percent of the progress payment but does not withhold more than 10 percent of the total bid.

For multiple performance failures, the Department withholds 100 percent of the progress payment but does not withhold more than 10 percent of the total bid.

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

Add:

9-1.055 PENALTY WITHHOLDS

Penalties include fines and damages that are proposed, assessed, or levied against you or the Department by a governmental agency or citizen lawsuit. Penalties are also payments made or costs incurred in settling alleged permit violations of Federal, State, or local laws, regulations, or requirements. The cost incurred may include the amount spent for mitigation or correcting a violation.

If you or the Department is assessed a penalty, the Department may withhold the penalty amount until the penalty disposition has been resolved. The Department may withhold penalty funds and notify you within 15 days of the withhold. If the penalty amount is less than the amount being withheld from progress payments for retentions, the Department will not withhold the penalty amount.

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

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

Add:

9-1.057 PROGRESS WITHHOLDS

The Department withholds 10 percent of a partial payment for noncompliant progress. Noncompliant progress occurs when:

1. Total days to date exceed 75 percent of the revised contract working days
2. Percent of working days elapsed exceeds the percent of value of work completed by more than 15 percent

The Engineer determines the percent of working days elapsed by dividing the total days to date by the revised contract working days and converting the quotient to a percentage.

The Engineer determines the percent of value of work completed by summing payments made to date and the amount due on the current progress estimate, dividing this sum by the current total estimated value of the work, and converting the quotient to a percentage. These amounts are shown on the Progress Payment Voucher.

When the percent of working days elapsed minus the percent of value of work completed is less than or equal to 15 percent, the Department returns the withhold in the next progress payment.

In Section 9-1.06 in the 4th paragraph, replace the 1st sentence with:

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

In Section 9-1.065 replace the title and the 1st and 2nd paragraphs with:

9-1.065 RELEASE OF RETAINED FUNDS

The Department releases retained funds if you:

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

In Section 9-1.07A replace the 2nd sentence with:

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

Replace Section 9-1.07B with:

9-1.07B Final Payment and Claims

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

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

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

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

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

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

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

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

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

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

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

(name) _____ of

(title) _____

(company)

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

Dated _____

/s/ _____

Subscribed and sworn before me this _____ day

of _____

(Notary Public)
My Commission
Expires _____

Failure to submit the notarized certificate will be sufficient cause for denying the claim.

Any claim for overhead, in addition to being certified as stated above, shall be supported and accompanied by an audit report of an independent Certified Public Accountant. Omission of a supporting audit report of an independent Certified Public Accountant shall result in denial of the claim and shall operate as a bar to arbitration, as to the claim, in conformance with the requirements in Section 10240.2 of the California Public Contract Code. Any claim for overhead shall be subject to audit by the State at its discretion. The costs of performing an audit examination and submitting the report shall be borne by the Contractor. The Department will deduct an offset amount for field and home office overhead paid on all added work from any claim for overhead as appropriate, as determined by the Department. The value of the added work equals the value of the work completed minus the total bid. The home office overhead offset equals 5 percent of the added work. The field office overhead offset equals 5-1/2 percent of the added work. The Certified Public Accountant's audit examination shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field and home office overhead are:

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

Costs or expenses incurred by the State in reviewing or auditing claims that are not supported by the Contractor's cost accounting or other records shall be deemed to be damages incurred by the State within the meaning of the California False Claims Act.

If the Engineer determines that a claim requires additional analysis, the Engineer will schedule a board of review meeting. The Contractor shall meet with the review board or person and make a presentation in support of the claim. Attendance by the Contractor at the board of review meeting shall be mandatory.

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

Physical/Chemical Requirements

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

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

Prior to application, the Contractor shall provide the Engineer with a copy of the soil amendment producer's Compost Technical Data Sheet and a copy of the compost producers STA certification. The Compost Technical Data Sheet shall include laboratory analytical test results, directions for product use, and a list of product ingredients.

Prior to application, the Contractor shall provide the Engineer with a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

In Section 20-2.10 delete the 8th, 9th, and 10th paragraphs.

Replace Section 20-2.25 with:

20-2.25 BACKFLOW PREVENTERS

Backflow preventers shall be one of the reduced pressure principle devices as specified in these specifications and the special provisions.

Backflow preventers shall be factory assembled and shall include 2 check valves, one pressure differential relief valve, 2 shut-off valves and 4 test cocks. Backflow preventer and valves shall be the same size as the pipeline in which they are installed, unless otherwise shown on the plans.

Backflow preventer shut-off valves shall be manufactured from iron or bronze and shall be either resilient wedged gate valves, resilient seated and fully ported ball valves, or resilient seated butterfly valves. Threaded type shut-off valves shall be provided with a union on one side of each valve. Unions shall be brass or malleable iron.

In Section 20-3.04A delete the last paragraph.

39-1.01 DESCRIPTION

Section 39 includes specifications for producing and placing hot mix asphalt (HMA) by mixing aggregate and asphalt binder at a mixing plant and spreading and compacting the HMA mixture.

The special provisions specify one or more type of HMA, including:

1. Type A
2. Type B
3. Open graded friction course (OGFC). OGFC includes hot mix asphalt (open graded), rubberized hot mix asphalt (open graded) (RHMA-O) and rubberized hot mix asphalt (open graded high binder) (RHMA-O-HB)
4. Rubberized hot mix asphalt (gap graded) (RHMA-G)

The special provisions specify the HMA construction process, including:

1. Standard
2. Method
3. Quality Control / Quality Assurance (QC / QA)

39-1.02 MATERIALS

39-1.02A Geosynthetic Pavement Interlayer

Geosynthetic pavement interlayer must comply with the specifications for pavement reinforcing fabric in Section 88, "Engineering Fabrics."

39-1.02B Tack Coat

Tack coat must comply with the specifications for asphaltic emulsion in Section 94, "Asphaltic Emulsion," or asphalt binder in Section 92, "Asphalts." Choose the type and grade.

Notify the Engineer if you dilute asphaltic emulsion with water. The mass ratio of added water to asphaltic emulsion must not exceed 1 to 1.

Measure added water either by mass or volume in compliance with the specifications for weighing, measuring, and metering devices under Section 9-1.01, "Measurement of Quantities," or you may use water meters from water districts, cities, or counties. If you measure water by volume, apply a conversion factor to determine the correct mass.

With each dilution, submit in writing:

1. The mass ratio of water to bituminous material in the original asphaltic emulsion
2. The mass of asphaltic emulsion before diluting
3. The mass of added water
4. The final dilution mass ratio of water to asphaltic emulsion

39-1.02C Asphalt Binder

Asphalt binder in HMA must comply with Section 92, "Asphalts," or Section 39-1.02D, "Asphalt Rubber Binder." The special provisions specify the grade.

Asphalt binder for geosynthetic pavement interlayer must comply with Section 92, "Asphalts." Choose from Grades PG 64-10, PG 64-16, or PG 70-10.

39-1.02D Asphalt Rubber Binder

General

Use asphalt rubber binder in RHMA-G, RHMA-O, and RHMA-O-HB. Asphalt rubber binder must be a combination of:

1. Asphalt binder
2. Asphalt modifier
3. Crumb rubber modifier (CRM)

The combined asphalt binder and asphalt modifier must be 80.0 ± 2.0 percent by mass of the asphalt rubber binder.

Asphalt Modifier

Asphalt modifier must be a resinous, high flash point, and aromatic hydrocarbon, and comply with:

Asphalt Modifier for Asphalt Rubber Binder

| Quality Characteristic | ASTM | Specification |
|--|--------|--------------------|
| Viscosity, m ² /s (x 10 ⁻⁶) at 100 °C | D 445 | X ± 3 ^a |
| Flash Point, CL.O.C., °C | D 92 | 207 minimum |
| Molecular Analysis | | |
| Asphaltenes, percent by mass | D 2007 | 0.1 maximum |
| Aromatics, percent by mass | D 2007 | 55 minimum |

Note:

^a The symbol "X" is the proposed asphalt modifier viscosity. "X" must be between 19 and 36. A change in "X" requires a new asphalt rubber binder design.

Asphalt modifier must be from 2.0 percent to 6.0 percent by mass of the asphalt binder in the asphalt rubber binder.

Crumb Rubber Modifier

CRM consists of a ground or granulated combination of scrap tire CRM and high natural CRM. CRM must be 75.0 ± 2.0 percent scrap tire CRM and 25.0 ± 2.0 percent high natural CRM by total mass of CRM. Scrap tire CRM must be from any combination of automobile tires, truck tires, or tire buffings.

Sample and test scrap tire CRM and high natural CRM separately. CRM must comply with:

Crumb Rubber Modifier for Asphalt Rubber Binder

| Quality Characteristic | Test Method | Specification |
|---|-------------|---------------|
| Scrap tire CRM gradation (% passing 2.36-mm sieve) | LP-10 | 100 |
| High natural CRM gradation (% passing 2.00-mm sieve) | LP-10 | 100 |
| Wire in CRM (% max.) | LP-10 | 0.01 |
| Fabric in CRM (% max.) | LP-10 | 0.05 |
| CRM particle length (mm max.) ^a | -- | 4.75 |
| CRM specific gravity ^a | CT 208 | 1.1 – 1.2 |
| Natural rubber content in high natural CRM (%) ^a | ASTM D 297 | 40.0 – 48.0 |

Note:

^a Test at mix design and for Certificate of Compliance.

Only use CRM ground and granulated at ambient temperature. If steel and fiber are cryogenically separated, it must occur before grinding and granulating. Only use cryogenically produced CRM particles that can be ground or granulated and not pass through the grinder or granulator.

CRM must be dry, free-flowing particles that do not stick together. CRM must not cause foaming when combined with the asphalt binder and asphalt modifier. You may add calcium carbonate or talc up to 3 percent by mass of CRM.

Asphalt Rubber Binder Design and Profile

Submit in writing an asphalt rubber binder design and profile. In the design, designate the asphalt, asphalt modifier, and CRM and their proportions. The profile is not a specification and only serves to indicate expected trends in asphalt rubber binder properties during binder production. The profile must include the same component sources for the asphalt rubber binder used.

Design the asphalt rubber binder from testing you perform for each quality characteristic and for the reaction temperatures expected during production. The 24-hour (1,440-minute) interaction period determines the design profile. At a minimum, mix asphalt rubber binder components, take samples, and perform and record the following tests:

Asphalt Rubber Binder Reaction Design Profile

| Test | Minutes of Reaction ^a | | | | | | | Limits |
|---|----------------------------------|----|----|-----|-----|-----|------|---------------|
| | 45 | 60 | 90 | 120 | 240 | 360 | 1440 | |
| Cone penetration @ 77 °F, 0.10 mm (ASTM D 217) | X ^b | | | | X | | X | 25 - 70 |
| Resilience @ 77 °F, percent rebound (ASTM D 5329) | X | | | | X | | X | 18 min. |
| Field softening point, °F (ASTM D 36) | X | | | | X | | X | 125 - 165 |
| Viscosity, centipoises (LP-11) | X | X | X | X | X | X | X | 1,500 - 4,000 |

Notes:

^a Six hours (360 minutes) after CRM addition, reduce the oven temperature to 135 °C for a period of 16 hours. After the 16-hour (1320 minutes) cool-down after CRM addition, reheat the binder to the reaction temperature expected during production for sampling and testing at 24 hours (1440 minutes).

^b "X" denotes required testing

Asphalt Rubber Binder

After interacting for a minimum of 45 minutes, asphalt rubber binder must comply with:

Asphalt Rubber Binder

| Quality Characteristic | Test for Quality Control or Acceptance | Test Method | Specification | |
|-------------------------------------|--|-------------|---------------|---------|
| | | | Minimum | Maximum |
| Cone penetration @ 77 °F, 0.10 mm | Acceptance | ASTM D 217 | 25 | 70 |
| Resilience @ 77 °F, percent rebound | Acceptance | ASTM D 5329 | 18 | -- |
| Field softening point, °F | Acceptance | ASTM D 36 | 125 | 165 |
| Viscosity @ 177 °C, centipoises | Quality Control | LP-11 | 1,500 | 4,000 |

39-1.02E Aggregate

Aggregate must be clean and free from deleterious substances. Aggregate:

1. Retained on the 4.75-millimeter sieve is coarse
2. Passing the 4.75-millimeter sieve is fine
3. Added and passing the 0.6-millimeter sieve is supplemental fine, including:
 - 3.1. Hydrated lime
 - 3.2. Portland cement
 - 3.3. Fines from dust collectors

The special provisions specify the aggregate gradation for each HMA type.

The specified aggregate gradation is before the addition of asphalt binder and includes supplemental fines. The Engineer tests for aggregate grading under California Test 202, modified by California Test 105 if there is a difference in specific gravity of 0.2 or more between the coarse and fine parts of different aggregate blends.

Choose a sieve size target value (TV) within each target value limit presented in the aggregate gradation tables.

**Aggregate Gradation
(Percentage Passing)
HMA Types A and B**

19-mm HMA Types A and B

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

12.5-mm HMA Types A and B

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

9.5-mm HMA Types A and B

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

4.75-mm HMA Types A and B

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

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

19-mm RHMA-G

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

12.5-mm RHMA-G

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

Open Graded Friction Course (OGFC)

25-mm OGFC

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

12.5-mm OGFC

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

9.5-mm OGFC

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

Before the addition of asphalt binder and lime treatment, aggregate must comply with:

Aggregate Quality

| Quality Characteristic | Test Method | HMA Type | | | |
|--|-----------------------------|----------|----|--------|------|
| | | A | B | RHMA-G | OGFC |
| Percent of crushed particles Coarse aggregate (% min.) One fractured face | CT 205 | 90 | 25 | -- | 90 |
| Two fractured faces | | 75 | -- | 90 | 75 |
| Fine aggregate (% min.) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face | CT 211 | 70 | 20 | 70 | 90 |
| Los Angeles Rattler (% max.) Loss at 100 Rev. | | 12 | -- | 12 | 12 |
| Loss at 500 Rev. | 45 | 50 | 40 | 40 | |
| Sand equivalent (min.) ^a | CT 217 | 47 | 42 | 47 | -- |
| Fine aggregate angularity (% min.) ^b | AASHTO T 304 Method A | 45 | 45 | 45 | -- |
| Flat and elongated particles (% max. by mass @ 5:1) | ASTM D 4791 | 10 | 10 | 10 | 10 |

Notes:

^a Reported value must be the average of 3 tests from a single sample.

^b The Engineer waives this specification if HMA contains less than 10 percent of nonmanufactured sand by mass of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

39-1.02F Reclaimed Asphalt Pavement

You may produce HMA using reclaimed asphalt pavement (RAP). HMA produced using RAP must comply with the specifications for HMA except aggregate quality specifications do not apply to RAP. You may substitute RAP aggregate for a part of the virgin aggregate in HMA in a quantity not exceeding 15.0 percent of the aggregate blend. Do not use RAP in OGFC and RHMA-G.

Assign the substitution rate of RAP aggregate for virgin aggregate with the job mix formula (JMF) submittal. The JMF must include the percent of RAP used. If you change your assigned RAP aggregate substitution rate by more than 5 percent (within the 15.0 percent limit), submit a new JMF.

Process RAP from asphalt concrete. You may process and stockpile RAP throughout the project's life. Prevent material contamination and segregation. Store RAP in stockpiles on smooth surfaces free of debris and organic material. Processed RAP stockpiles must consist only of homogeneous RAP.

39-1.03 HOT MIX ASPHALT MIX DESIGN REQUIREMENTS

39-1.03A General

A mix design consists of performing California Test 367 and laboratory procedures on combinations of aggregate gradations and asphalt binder contents to determine the optimum binder content (OBC) and HMA mixture qualities. If RAP is used, use Laboratory Procedure LP-9. The result of the mix design becomes the proposed JMF.

Use Form CEM-3512 to document aggregate quality and mix design data. Use Form CEM-3511 to present the JMF.

Laboratories testing aggregate qualities and preparing the mix design and JMF must be qualified under the Department's Independent Assurance Program. Take samples under California Test 125.

The Engineer reviews the aggregate qualities, mix design, and JMF and verifies and accepts the JMF.

You may change the JMF during production. Do not use the changed JMF until the Engineer accepts it. Except when adjusting the JMF in compliance with Section 39-1.03E, "Job Mix Formula Verification," perform a new mix design and submit in writing a new JMF submittal for changing any of the following:

1. Target asphalt binder percentage
2. Asphalt binder supplier
3. Asphalt rubber binder supplier
4. Component materials used in asphalt rubber binder or percentage of any component materials
5. Combined aggregate gradation
6. Aggregate sources
7. Substitution rate for RAP aggregate of more than 5 percent

8. Any material in the JMF

For OGFC, submit in writing a complete JMF submittal except asphalt binder content. The Engineer determines the asphalt binder content under California Test 368 within 20 days of your complete JMF submittal and provides you a Form CEM-3513.

39-1.03B Hot Mix Asphalt Mix Design

Perform a mix design that produces HMA in compliance with:

Hot Mix Asphalt Mix Design Requirements

| Quality Characteristic | Test Method | HMA Type | | |
|--|---------------------|-------------|-------------|--------------------------|
| | | A | B | RHMA-G |
| Air voids content (%) | CT 367 ^a | 4.0 | 4.0 | Special Provisions |
| Voids in mineral aggregate (% min.) | LP-2 | | | |
| 4.75-mm grading | | 17.0 | 17.0 | -- |
| 9.5-mm grading | | 15.0 | 15.0 | -- |
| 12.5-mm grading | | 14.0 | 14.0 | 18.0 – 23.0 ^b |
| 19-mm grading | | 13.0 | 13.0 | 18.0 – 23.0 ^b |
| Voids filled with asphalt (%) | LP-3 | | | |
| 4.75-mm grading | | 76.0 – 80.0 | 76.0 – 80.0 | Note d |
| 9.5-mm grading | | 73.0 – 76.0 | 73.0 – 76.0 | |
| 12.5-mm grading | | 65.0 – 75.0 | 65.0 – 75.0 | |
| 19-mm grading | 65.0 – 75.0 | 65.0 – 75.0 | | |
| Dust proportion | LP-4 | | | |
| 4.75-mm and 9.5-mm gradings | | 0.9 – 2.0 | 0.9 – 2.0 | Note d |
| 12.5-mm and 19-mm gradings | 0.6 – 1.3 | 0.6 – 1.3 | | |
| Stabilometer value (min.) ^c | CT 366 | | | |
| 4.75-mm and 9.5-mm gradings | | 30 | 30 | -- |
| 12.5-mm and 19-mm gradings | | 37 | 35 | 23 |

Notes:

^a Calculate the air voids content of each specimen using California Test 309 and Lab Procedure LP-1. Modify California Test 367, Paragraph C5, to use the exact air voids content specified in the selection of OBC.

^b Voids in mineral aggregate for RHMA-G must be within this range.

^c Modify California Test 304, Part 2.B.2.c: "After compaction in the compactor, cool to 60 ± 3 °C by allowing the briquettes to cool at room temperature for 0.5-hour, then place the briquettes in the oven at 60 °C for a minimum of 2 hours and not more than 3 hours."

^d Report this value in the JMF submittal.

For stability and air voids, prepare 3 briquettes at the OBC and test for compliance. Report the average of 3 tests. Prepare new briquettes and test if the range of stability for the 3 briquettes is more than 8 points. The average air void content may vary from the specified air void content by ±0.5 percent.

You may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If you use the same briquettes and tests using bulk specific gravity fail, you may prepare 3 new briquettes and determine a new bulk specific gravity.

39-1.03C Job Mix Formula Submittal

Each JMF submittal must consist of:

1. Proposed JMF on Form CEM-3511
2. Mix design documentation on Form CEM-3512 dated within 12 months of submittal
3. JMF verification on Form CEM-3513, if applicable
4. Materials Safety Data Sheets (MSDS) for:
 - 4.1. Asphalt binder
 - 4.2. Base asphalt binder used in asphalt rubber binder
 - 4.3. CRM and asphalt modifier used in asphalt rubber binder

- 4.4. Blended asphalt rubber binder mixture
- 4.5. Supplemental fine aggregate except fines from dust collectors
- 4.6. Antistrip additives

If the JMF must be verified or if the Engineer requests, submit samples of the following materials in labeled containers weighing no more than 22.5 kg each (notify the Engineer at least 2 business days before sampling materials):

1. Coarse, fine, and supplemental fine aggregate from stockpiles, cold feed belts, or hot bins. Samples must include at least 55 kg for each coarse aggregate, 35 kg for each fine aggregate, and 4.5 kg for each type of supplemental fines. The Department combines these aggregate samples to comply with the JMF target values submitted on Form CEM-3511.
2. RAP from stockpiles or RAP system. Samples must be at least 30 kg.
3. Asphalt binder from the binder supplier. Samples must be in two 1-liter cylindrical shaped cans with open top and friction lids.
4. Asphalt rubber binder with the components blended in the proportions to be used. Samples must be in four 1-liter cylindrical shaped cans with open top and friction lids.

39-1.03D Job Mix Formula Review

The Engineer reviews each mix design and proposed JMF within 5 business days from the complete JMF submittal. The review consists of reviewing the mix design procedures and comparing the proposed JMF with the specifications.

The Engineer may verify aggregate qualities during this review period.

39-1.03E Job Mix Formula Verification

If you cannot submit a Department-verified JMF on Form CEM-3513 dated within 12 months before HMA production, the Engineer verifies the JMF.

Based on your testing and production experience, you may submit on Form CEM-3511 an adjusted JMF before the Engineer's verification testing. JMF adjustments may include a change in the:

1. Asphalt binder content target value up to ± 0.6 percent from the optimum binder content value submitted on Form CEM-3512 except do not adjust the target value for asphalt rubber binder for RHMA-G below 7.0 percent
2. Aggregate gradation target values within the target value limits specified in the aggregate gradation tables

Test samples from the HMA plant to be used to determine possible JMF adjustments.

For HMA Type A, Type B, and RHMA-G, the Engineer verifies the JMF from samples taken from HMA produced by the plant to be used. The Engineer verifies each proposed JMF within 20 days of receiving verification samples. Verification is testing for compliance with the specifications for:

1. Aggregate quality
2. Aggregate gradation (JMF TV \pm tolerance)
3. Asphalt binder content (JMF TV \pm tolerance)
4. HMA quality specified in the table Hot Mix Asphalt Mix Design Requirements except:
 - 4.1. Air voids content (design value ± 2.0 percent)
 - 4.2. Voids filled with asphalt (report only if an adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC)
 - 4.3. Dust proportion (report only if an adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC)

If you request in writing, the Engineer verifies RHMA-G quality requirements within 3 business days of sampling.

In the Engineer's presence and from the same production run, take samples of:

1. Aggregate
2. Asphalt binder
3. RAP
4. HMA

Sample aggregate from cold feed belts or hot bins. Sample RAP from the RAP system. Sample HMA under California Test 125 except if you request in writing and the Engineer approves, you may sample from any of the following locations:

1. The plant
2. A truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

You may sample from a different project including a non-Department project if you make arrangements for the Engineer to be present during sampling.

For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 split parts to the Engineer and use 1 part for your testing.

The Engineer prepares 3 briquettes from a single split sample. To verify the JMF for stability, the Engineer tests the 3 briquettes and reports the average of 3 tests. The Engineer prepares new briquettes if the range of stability for the 3 briquettes is more than 8 points.

The Engineer may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If the Engineer uses the same briquettes and the tests using bulk specific gravity fail, the Engineer prepares 3 new briquettes and determines a new bulk specific gravity.

If the Engineer verifies the JMF, the Engineer provides you a Form CEM-3513.

If the Engineer's tests on plant-produced samples do not verify the JMF, the Engineer notifies you in writing and you must submit a new JMF submittal or submit an adjusted JMF based on your testing. JMF adjustments may include a change in the:

1. Asphalt binder content target value up to ± 0.6 percent from the optimum binder content value submitted on Form CEM-3512 except do not adjust the target value for asphalt rubber binder for RHMA-G below 7.0 percent
2. Aggregate gradation target values within the target value limits specified in the aggregate gradation tables

You may adjust the JMF only once due to a failed verification test. An adjusted JMF requires a new Form CEM-3511 and verification of a plant-produced sample.

The Engineer reverifies the JMF if HMA production has stopped for longer than 30 days and the verified JMF is older than 12 months.

For each HMA type and aggregate size specified, the Engineer verifies at the State's expense up to 2 proposed JMF including a JMF adjusted after verification failure. The Engineer deducts \$3,000 from payments for each verification exceeding this limit. This deduction does not apply to verifications initiated by the Engineer or if a JMF expires while HMA production is stopped longer than 30 days.

39-1.03F Job Mix Formula Renewal

You may request a JMF renewal by submitting the following:

1. Proposed JMF on Form CEM-3511
2. A previously verified JMF documented on Form CEM-3513 dated within 12 months
3. Mix design documentation on Form CEM-3512 used for the previously verified JMF
4. Samples of aggregates, asphalt binder, and additives
5. Samples of the following materials obtained in the presence of the Engineer and placed in labeled containers weighing no more than 22.5 kg each:
 - 5.1. Coarse, fine, and supplemental fine aggregate from stockpiles, cold feed belts, or hot bins. Samples must include at least 55 kg for each coarse aggregate, 35 kg for each fine aggregate, and 4.5 kg for each type of supplemental fines. The Department combines these aggregate samples to comply with the JMF target values submitted on Form CEM-3511.
 - 5.2. RAP from stockpiles or RAP system. Samples must be at least 30 kg.
 - 5.3. Asphalt binder from the binder supplier. Samples must be in two 1-liter cylindrical shaped cans with open top and friction lids.
 - 5.4. Asphalt rubber binder with the components blended in the proportions to be used. Samples must be in four 1-liter cylindrical shaped cans with open top and friction lids.

Notify the Engineer in writing at least 2 business days before sampling materials. Split samples into at least 2 parts. You must test 1 part and provide the Engineer a part. The Engineer retains samples until you provide test results for your part on Form CEM-3514.

The Engineer reviews each proposed JMF within 5 business days from the complete JMF submittal and test results. The review consists of reviewing the mix design procedures, test results from the split samples and comparing the proposed JMF with the specifications.

The Engineer may verify aggregate qualities during this review period.

The Engineer verifies the JMF under Section 39-1.03E, "Job Mix Formula Verification," except:

1. The Engineer verifies each proposed JMF within 30 days of receiving verification samples.
2. You may not adjust the JMF due to a failed verification.
3. For each HMA type and aggregate gradation specified, the Engineer verifies at the State's expense 1 proposed JMF.
4. If the Engineer verifies the JMF renewal, the Engineer provides you a Form CEM-3513.

39-1.03G Job Mix Formula Acceptance

You may start HMA production if:

1. The Engineer's review of the JMF shows compliance with the specifications.
2. The Department has verified the JMF within 12 months before HMA production.
3. The Engineer accepts the verified JMF.

39-1.04 CONTRACTOR QUALITY CONTROL

39-1.04A General

Establish, maintain, and change a quality control system to ensure materials and work comply with the specifications. Submit quality control test results to the Engineer within 3 days of a request except when QC / QA is specified.

You must identify the HMA sampling location in your Quality Control Plan. During production, take samples under California Test 125 except if you request in writing and the Engineer approves, you may sample HMA from:

1. The plant
2. The truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

39-1.04B Prepaving Conference

Meet with the Engineer at a prepaving conference at a mutually agreed time and place. Discuss methods of performing the production and paving work.

39-1.04C Asphalt Rubber Binder

Take asphalt rubber binder samples from the feed line connecting the asphalt rubber binder tank to the HMA plant. Sample and test asphalt rubber binder under Laboratory Procedure LP-11.

Test asphalt rubber binder for compliance with the viscosity specifications in Section 39-1.02, "Materials." During asphalt rubber binder production and HMA production using asphalt rubber binder, measure viscosity every hour with not less than 1 reading for each asphalt rubber binder batch. Log measurements with corresponding time and asphalt rubber binder temperature. Submit the log daily in writing.

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance." With the Certificate of Compliance, submit test results in writing for CRM and asphalt modifier with each truckload delivered to the HMA plant. A Certificate of Compliance for asphalt modifier must not represent more than 2250 kg. Use an AASHTO-certified laboratory for testing.

Sample and test gradation and wire and fabric content of CRM once per 4500 kg of scrap tire CRM and once per 1500 kg of high natural CRM. Sample and test scrap tire CRM and high natural CRM separately.

Submit certified weight slips in writing for the CRM and asphalt modifier furnished.

39-1.04D Aggregate

Determine the aggregate moisture content and RAP moisture content in continuous mixing plants at least twice a day during production and adjust the plant controller. Determine the RAP moisture content in batch mixing plants at least twice a day during production and adjust the plant controller.

39-1.04E Reclaimed Asphalt Pavement

Perform RAP quality control testing each day.

Sample RAP once daily and determine the RAP aggregate gradation under Laboratory Procedure LP-9 and submit the results to the Engineer in writing with the combined aggregate gradation.

39-1.04F Density Cores

For Standard and QC / QA projects, take 100-millimeter or 150-millimeter diameter cores at least once every 5 business days. Take 1 core for every 250 tonnes of HMA from random locations the Engineer designates. Take cores in the Engineer's presence and backfill and compact holes with material authorized by the Engineer. Before submitting a core to the Engineer, mark it with the core's location and place it in a protective container.

If a core is damaged, replace it with a core taken within 0.3 m longitudinally from the original core. Relocate any core located within 0.3 m of a rumble strip to 0.3 m transversely away from the rumble strip.

39-1.04G Briquettes

Prepare 3 briquettes for each stability and air voids determination. Report the average of 3 tests. Prepare new briquettes and test if the range of stability for the 3 briquettes is more than 12 points.

You may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If you use these briquettes and tests using bulk specific gravity fail, you may prepare 3 new briquettes and determine a new bulk specific gravity.

39-1.05 ENGINEER'S ACCEPTANCE

The Engineer's acceptance of HMA is specified in the sections for each HMA construction process.

The Engineer samples materials for testing under California Test 125 and the applicable test method except samples may be taken from:

1. The plant from:
 - 1.1. A truck
 - 1.2. An automatic sampling device
2. The mat behind the paver

Sampling must be independent of Contractor quality control, statistically-based, and random.

If you request, the Engineer splits samples and provides you with a part.

The Engineer accepts HMA based on:

1. Accepted JMF
2. Accepted QCP for Standard and QC / QA
3. Compliance with the HMA Acceptance tables
4. Acceptance of a lot for QC / QA
5. Visual inspection

The Engineer prepares 3 briquettes for each stability and air voids determination. The Engineer reports the average of 3 tests. The Engineer prepares new briquettes and test if the range of stability for the 3 briquettes is more than 8 points.

The Engineer may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If the Engineer uses the same briquettes and the tests using bulk specific gravity fail, the Engineer prepares 3 new briquettes and determines a new bulk specific gravity.

39-1.06 DISPUTE RESOLUTION

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. Notify the Engineer in writing within 5 days of receiving a test result if you dispute the test result.

If you or the Engineer dispute each other's test results, submit written quality control test results and copies of paperwork including worksheets used to determine the disputed test results to the Engineer. An Independent Third Party (ITP) performs referee testing. Before the ITP participates in a dispute resolution, the ITP must be accredited under the Department's Independent Assurance Program. The ITP must be independent of the project. By mutual agreement, the ITP is chosen from:

1. A Department laboratory
2. A Department laboratory in a district or region not in the district or region the project is located
3. The Transportation Laboratory
4. A laboratory not currently employed by you or your HMA producer

If split quality control or acceptance samples are not available, the ITP uses any available material representing the disputed HMA for evaluation.

39-1.07 PRODUCTION START-UP EVALUATION

The Engineer evaluates HMA production and placement at production start-up.

Within the first 750 tonnes produced on the first day of HMA production, in the Engineer's presence and from the same production run, take samples of:

1. Aggregate
2. Asphalt binder
3. RAP
4. HMA

Sample aggregate from cold feed belts or hot bins. Take RAP samples from the RAP system. Sample HMA under California Test 125 except if you request in writing and the Engineer approves, you may sample HMA from:

1. The plant
2. The truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 split parts to the Engineer and keep 1 part.

For Standard and QC / QA projects, you and the Engineer must test the split samples and report test results in writing within 3 business days of sampling. If you proceed before receipt of the test results, the Engineer may consider the HMA placed to be represented by these test results.

For Standard and QC / QA projects, take 100-millimeter or 150-millimeter diameter first 750 tonnes on the first day of HMA production. For each density core, the Engineer reports the bulk specific gravity determined under California Test 308, Method A in addition to the percent of maximum theoretical density. You may test for in-place density at the density core locations and include them in your production tests for percent of maximum theoretical density.

39-1.08 PRODUCTION

39-1.08A General

Produce HMA in a batch mixing plant or a continuous mixing plant. Proportion aggregate by hot or cold feed control.

HMA plants must be Department-qualified. Before production, the HMA plant must have a current qualification under the Department's Materials Plant Quality Program.

During production, you may adjust:

1. Hot or cold feed proportion controls for virgin aggregate and RAP
2. The set point for asphalt binder content

39-1.08B Mixing

Mix HMA ingredients into a homogeneous mixture of coated aggregates.

Asphalt binder must be between 135 °C and 190 °C when mixed with aggregate.

Asphalt rubber binder must be between 177 °C and 218 °C when mixed with aggregate.

When mixed with asphalt binder, aggregate must not be more than 163 °C except aggregate for OGFC with unmodified asphalt binder must be not more than 135 °C. Aggregate temperature specifications do not apply when you use RAP.

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

39-1.08C Asphalt Rubber Binder

Deliver scrap tire CRM and high natural CRM in separate bags.

Either proportion and mix asphalt binder, asphalt modifier, and CRM simultaneously or premix the asphalt binder and asphalt modifier before adding CRM. If you premix asphalt binder and asphalt modifier, mix them for at least 20 minutes. When you add CRM, the asphalt binder and asphalt modifier must be between 177 °C and 218 °C.

Do not use asphalt rubber binder during the first 45 minutes of the reaction period. During this period, the asphalt rubber binder mixture must be between 177 °C and the lower of 218 °C or 6 °C below the asphalt binder's flash point indicated in the MSDS.

If any asphalt rubber binder is not used within 4 hours after the reaction period, discontinue heating. If the asphalt rubber binder drops below 177 °C, reheat before use. If you add more scrap tire CRM to the reheated asphalt rubber binder, the binder must undergo a 45-minute reaction period. The added scrap tire CRM must not exceed 10 percent of the total asphalt rubber binder mass. Reheated and reacted asphalt rubber binder must comply with the viscosity specifications for asphalt rubber binder in Section 39-1.02, "Materials." Do not reheat asphalt rubber binder more than twice.

39-1.09 SUBGRADE, TACK COAT, AND GEOSYNTHETIC PAVEMENT INTERLAYER

39-1.09A General

Prepare subgrade or apply tack coat to surfaces receiving HMA. If specified, place geosynthetic pavement interlayer over a coat of asphalt binder.

39-1.09B Subgrade

Subgrade to receive HMA must comply with the compaction and elevation tolerance specifications in the sections for the material involved. Subgrade must be free of loose and extraneous material. If HMA is paved on existing base or pavement, remove loose paving particles, dirt, and other extraneous material by any means including flushing and sweeping.

39-1.09C Tack Coat

Apply tack coat:

1. To existing pavement including planed surfaces
2. Between HMA layers
3. To vertical surfaces of:
 - 3.1. Curbs
 - 3.2. Gutters
 - 3.3. Construction joints

Before placing HMA, apply tack coat in 1 application at the minimum residual rate specified for the condition of the underlying surface:

Tack Coat Application Rates for HMA Type A, Type B, and RHMA-G

| HMA over: | Minimum Residual Rates (liters per square meter) | | |
|------------------------------|--|--|---|
| | CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion | CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion | Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion |
| New HMA (between layers) | 0.09 | 0.14 | 0.09 |
| Existing AC and PCC pavement | 0.14 | 0.18 | 0.14 |
| Planed pavement | 0.23 | 0.27 | 0.18 |

Tack Coat Application Rates for OGFC

| OGFC over: | Minimum Residual Rates (liters per square meter) | | |
|------------------------------|--|--|---|
| | CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion | CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion | Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion |
| New HMA | 0.14 | 0.18 | 0.14 |
| Existing AC and PCC pavement | 0.23 | 0.27 | 0.18 |
| Planed pavement | 0.27 | 0.32 | 0.23 |

If you dilute asphaltic emulsion, mix until homogeneous before application.

Apply to vertical surfaces with a residual tack coat rate that will thoroughly coat the vertical face without running off.

If you request in writing and the Engineer authorizes, you may:

1. Change tack coat rates
2. Omit tack coat between layers of new HMA during the same work shift if:
 - 2.1. No dust, dirt, or extraneous material is present
 - 2.2. The surface is at least 60 °C

Immediately in advance of placing HMA, apply additional tack coat to damaged areas or where loose or extraneous material is removed.

Close areas receiving tack coat to traffic. Do not track tack coat onto pavement surfaces beyond the job site.

Asphalt binder tack coat must be between 140 °C and 175 °C when applied.

39-1.09D Geosynthetic Pavement Interlayer

Place geosynthetic pavement interlayer in compliance with the manufacturer's recommendations.

Before placing the geosynthetic pavement interlayer and asphalt binder:

1. Repair cracks 6.5 mm and wider, spalls, and holes in the pavement. The State pays for this repair work under Section 4-1.03D, "Extra Work."
2. Clean the pavement of loose and extraneous material.

Immediately before placing the interlayer, apply 1.13 L ± 0.14 L of asphalt binder per square meter of interlayer or until the fabric is saturated. Apply asphalt binder the width of the geosynthetic pavement interlayer plus 75 mm on each side. At interlayer overlaps, apply asphalt binder on the lower interlayer the same overlap distance as the upper interlayer.

Align and place the interlayer with no overlapping wrinkles, except a wrinkle that overlaps may remain if it is less than 12.5 mm thick. If the overlapping wrinkle is more than 12.5 mm thick, cut the wrinkle out and overlap the interlayer no more than 50 mm.

The minimum HMA thickness over the interlayer must be 35 mm thick including conform tapers. Do not place the interlayer on a wet or frozen surface.

Overlap the interlayer borders between 50 mm and 100 mm. In the direction of paving, overlap the following roll with the preceding roll at any break.

You may use rolling equipment to correct distortions or wrinkles in the interlayer.

If asphalt binder tracked onto the interlayer or brought to the surface by construction equipment causes interlayer displacement, cover it with a small quantity of HMA.

Before placing HMA on the interlayer, do not expose the interlayer to:

1. Traffic except for crossings under traffic control and only after you place a small HMA quantity
2. Sharp turns from construction equipment
3. Damaging elements

Pave HMA on the interlayer during the same work shift.

39-1.10 Spreading And Compacting Equipment

Paving equipment for spreading must be:

1. Self-propelled
2. Mechanical
3. Equipped with a screed or strike-off assembly that can distribute HMA the full width of a traffic lane
4. Equipped with a full-width compacting device
5. Equipped with automatic screed controls and sensing devices that control the thickness, longitudinal grade, and transverse screed slope

Install and maintain grade and slope references.

The screed must produce a uniform HMA surface texture without tearing, shoving, or gouging.

The paver must not leave marks such as ridges and indentations unless you can eliminate them by rolling.

Rollers must be equipped with a system that prevents HMA from sticking to the wheels. You may use a parting agent that does not damage the HMA or impede the bonding of layers.

In areas inaccessible to spreading and compacting equipment:

1. Spread the HMA by any means to obtain the specified lines, grades and cross sections.
2. Use a pneumatic tamper, plate compactor, or equivalent to achieve thorough compaction.

39-1.11 Transporting, Spreading, And Compacting

Do not pave HMA on a wet pavement or frozen surface.

You may deposit HMA in a windrow and load it in the paver if:

1. Paver is equipped with a hopper that automatically feeds the screed
2. Loading equipment can pick up the windrowed material and deposit it in the paver hopper without damaging base material
3. Activities for deposit, pick-up, loading, and paving are continuous
4. HMA temperature in the windrow does not fall below 127 °C

You may pave HMA in 1 or more layers on areas less than 1.5 m wide and outside the traveled way including shoulders. You may use mechanical equipment other than a paver for these areas. The equipment must produce a uniform smoothness and texture.

HMA handled, spread, or windrowed must not stain the finished surface of any improvement including pavement.

Do not use petroleum products such as kerosene or diesel fuel to release HMA from trucks, spreaders, or compactors.

HMA must be free of:

1. Segregation
2. Coarse or fine aggregate pockets
3. Hardened lumps

Longitudinal joints in the top layer must match specified lane edges. Alternate longitudinal joint offsets in lower layers at least 0.15 m from each side of the specified lane edges. You may request in writing other longitudinal joint placement patterns.

Until the adjoining through lane's top layer has been paved, do not pave the top layer of:

1. Shoulders
2. Tapers
3. Transitions
4. Road connections
5. Driveways
6. Curve widenings
7. Chain control lanes
8. Turnouts
9. Turn pockets

If the number of lanes change, pave each through lane's top layer before paving a tapering lane's top layer. Simultaneous to paving a through lane's top layer, you may pave an adjoining area's top layer including shoulders. Do not operate spreading equipment on any area's top layer until completing final compaction.

If HMA (leveling) is specified, fill and level irregularities and ruts with HMA before spreading HMA over base, existing surfaces, or bridge decks. You may use mechanical equipment other than a paver for these areas. The equipment must produce a uniform smoothness and texture. HMA used to change an existing surface's cross slope or profile is not HMA (leveling).

If placing HMA against the edge of existing pavement, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material without damaging the surface remaining in place. If placing HMA against the edge of a longitudinal or transverse construction joint and the joint is damaged or not placed to a neat line, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material without damaging the surface remaining in place. Repair or remove and replace damaged pavement at your expense.

Rolling must leave the completed surface compacted and smooth without tearing, cracking, or shoving. Complete finish rolling activities before the pavement surface temperature is:

1. Below 65 °C for HMA with unmodified binder
2. Below 60 °C for HMA with modified binder
3. Below 93 °C for RHMA-G

If a vibratory roller is used as a finish roller, turn the vibrator off.

Do not use a pneumatic tired roller to compact RHMA-G.

For Standard and QC/QA, if a 19-millimeter aggregate grading is specified, you may use a 12.5-millimeter aggregate grading if the specified paved thickness is from between 38 mm and 60 mm thick.

Spread and compact HMA under Section 39-3.03, "Spreading and Compacting Equipment," and Section 39-3.04, "Transporting, Spreading, and Compacting," for any of the following:

1. Specified paved thickness is less than 45 mm.
2. Specified paved thickness is less than 60 mm and a 19-millimeter aggregate grading is specified and used.
3. You spread and compact at:
 - 3.1. Asphalt concrete surfacing replacement areas
 - 3.2. Leveling courses
 - 3.3. Areas the Engineer determines conventional compaction and compaction measurement methods are impeded

Do not allow traffic on new HMA pavement until its mid-depth temperature is below 71 °C.

If you request in writing and the Engineer authorizes, you may cool HMA Type A and Type B with water when rolling activities are complete. Apply water under Section 17, "Watering."

Spread sand at a rate between 0.5 kg and 1 kg per square meter on new RHMA-G, RHMA-O, and RHMA-O-HB pavement when finish rolling is complete. Sand must be free of clay or organic matter. Sand must comply with Section 90-3.03, "Fine Aggregate Grading." Keep traffic off the pavement until spreading sand is complete.

39-1.12 SMOOTHNESS

39-1.12A General

Determine HMA smoothness with a profilograph and a straightedge.

Smoothness specifications do not apply to OGFC placed on existing pavement not constructed under the same project.

If portland cement concrete is placed on HMA:

1. Cold plane the HMA finished surface to within specified tolerances if it is higher than the grade specified by the Engineer.
2. Remove and replace HMA if the finished surface is lower than 15 mm below the grade specified by the Engineer.

39-1.12B Straightedge

The HMA pavement top layer must not vary from the lower edge of a 3.66-meter long straightedge:

1. More than 3 mm when the straight edge is laid parallel with the centerline
2. More than 6 mm when the straightedge is laid perpendicular to the centerline and extends from edge to edge of a traffic lane
3. More than 6 mm when the straightedge is laid within 7.3 m of a pavement conform

39-1.12C Profilograph

Under California Test 526, determine the zero (null) blanking band Profile Index (PI_0) and must-grinds on the top layer of HMA Type A, Type B, and RHMA-G pavement. Take 2 profiles within each traffic lane, 1 m from and parallel with the edge of each lane.

A must-grind is a deviation of 7.5 mm or more in a length of 7.5 m. You must correct must-grinds.

For OGFC, only determine must-grinds when placed over HMA constructed under the same project. The top layer of the underlying HMA must comply with the smoothness specifications before placing OGFC.

Profile pavement in the Engineer's presence. Choose the time of profiling.

On tangents and horizontal curves with a centerline radius of curvature 600 m or more, the PI_0 must be at most 75 mm per 160-meter section.

On horizontal curves with a centerline radius of curvature between 300 m and 600 m including pavement within the superelevation transitions, the PI_0 must be at most 150 mm per 160-meter section.

Before the Engineer accepts HMA pavement for smoothness, submit written final profilograms.

Submit 1 electronic copy of profile information in Microsoft Excel and 1 electronic copy of longitudinal pavement profiles in ".erd" format or other ProVAL compatible format to the Engineer and to:

Smoothness@dot.ca.gov

The following HMA pavement areas do not require a PI_0 . You must measure these areas with a 3.6-meter straightedge and determine must-grinds with a profilograph:

1. New HMA with a total thickness less than or equal to 75 mm
2. HMA sections of city or county streets and roads, turn lanes and collector lanes that are less than 460 m in length

The following HMA pavement areas do not require a PI_0 . You must measure these areas with a 3.6-meter straightedge:

1. Horizontal curves with a centerline radius of curvature less than 300 m including pavement within the superelevation transitions of those curves
2. Within 3.66 m of a transverse joint separating the pavement from:
 - 2.1. Existing pavement not constructed under the same project
 - 2.2. A bridge deck or approach slab
3. Exit ramp termini, truck weigh stations, and weigh-in-motion areas
4. If steep grades and superelevation rates greater than 6 percent are present on:
 - 4.1. Ramps
 - 4.2. Connectors
5. Turn lanes
6. Areas within 5 m of manholes or drainage transitions
7. Acceleration and deceleration lanes for at-grade intersections
8. Shoulders and miscellaneous areas

9. HMA pavement within 1 m from and parallel to the construction joints formed between curbs, gutters, or existing pavement

39-1.12D Smoothness Correction

If the top layer of HMA Type A, Type B, or RHMA-G pavement does not comply with the smoothness specifications, grind the pavement to within tolerances, remove and replace it, or place a layer of HMA. The Engineer must authorize your choice of correction before the work begins.

Remove and replace the areas of OGFC not in compliance with the must-grind and straightedge specifications, except you may grind OGFC for correcting smoothness:

1. At a transverse joint separating the pavement from pavement not constructed under the same project
2. Within 3.66 m of a transverse joint separating the pavement from a bridge deck or approach slab

Corrected HMA pavement areas must be uniform rectangles with edges:

1. Parallel to the nearest HMA pavement edge or lane line
2. Perpendicular to the pavement centerline

Measure the corrected HMA pavement surface with a profilograph and a 3.66-meter straightedge and correct the pavement to within specified tolerances. If a must-grind area or straightedged pavement cannot be corrected to within specified tolerances, remove and replace the pavement.

On ground areas not overlaid with OGFC, apply fog seal coat under Section 37-1, "Seal Coats."

39-1.13 MISCELLANEOUS AREAS AND DIKES

Miscellaneous areas are outside the traveled way and include:

1. Median areas not including inside shoulders
2. Island areas
3. Sidewalks
4. Gutters
5. Gutter flares
6. Ditches
7. Overside drains
8. Aprons at the ends of drainage structures

Spread miscellaneous areas in 1 layer and compact to the specified lines and grades.

For miscellaneous areas and dikes:

1. Do not submit a JMF.
2. Choose the 9.5-millimeter or 12.5-millimeter HMA Type A and Type B aggregate gradations.
3. Minimum asphalt binder content must be 6.8 percent for 9.5-millimeter aggregate and 6.0 percent for 12.5-millimeter aggregate. If you request in writing and the Engineer authorizes, you may reduce the minimum asphalt binder content.
4. Choose asphalt binder Grade PG 70-10 or the same grade specified for HMA.

39-1.14 RUMBLE STRIP

Construct rumble strips by rolling or grinding indentations in the top layer of new HMA surfacing.

Select the method and equipment for constructing ground-in indentations.

Do not construct rumble strips on structures or approach slabs.

Construct rumble strips within 50 mm of the specified alignment. Roller or grinding equipment must be equipped with a sighting device enabling the operator to maintain the rumble strip alignment.

Rolled-in indentations must not vary from the specified dimensions by more than 10 percent.

Ground-in indentations must comply with the specified dimensions within 1.5 mm in depth or 10 percent in length and width.

The Engineer orders grinding or removal and replacement of noncompliant rumble strips to bring them within specified tolerances. Ground surface areas must be neat and uniform in appearance.

The grinding equipment must be equipped with a vacuum attachment to remove residue.

Dispose of removed material under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way."
On ground areas, apply fog seal coat under Section 37-1, "Seal Coats."

39-2 STANDARD

39-2.01 DESCRIPTION

If HMA is specified as Standard, construct it under Section 39-1, "General," this Section 39-2, "Standard," and Section 39-5, "Measurement and Payment."

39-2.02 CONTRACTOR QUALITY CONTROL

39-2.02A Quality Control Plan

Establish, implement, and maintain a Quality Control Plan (QCP) for HMA. The QCP must describe the organization and procedures you will use to:

1. Control the quality characteristics
2. Determine when corrective actions are needed (action limits)
3. Implement corrective actions

When you submit the proposed JMF, submit the written QCP. You and the Engineer must discuss the QCP during the prepaving conference.

The QCP must address the elements affecting HMA quality including:

1. Aggregate
2. Asphalt binder
3. Additives
4. Production
5. Paving

The Engineer reviews each QCP within 5 business days from the submittal. Hold HMA production until the Engineer accepts the QCP in writing. The Engineer's QCP acceptance does not mean your compliance with the QCP will result in acceptable HMA. Section 39-1.05, "Engineer's Acceptance," specifies HMA acceptance.

39-2.02B Quality Control Testing

Perform sampling and testing at the specified frequency for the following quality characteristics:

Minimum Quality Control – Standard

| Quality Characteristic | Test Method | Minimum Sampling and Testing Frequency | HMA Type | | | |
|---|----------------------|---|------------------------------|------------------------------|------------------------------|------------------------------|
| | | | A | B | RHMA-G | OGFC |
| Aggregate gradation ^a | CT 202 | 1 per 750 tonnes and any remaining part | JMF ± Tolerance ^b |
| Sand equivalent (min.) ^c | CT 217 | | 47 | 42 | 47 | -- |
| Asphalt binder content (%) | CT 379 or 382 | | JMF ± 0.45 | JMF ± 0.45 | JMF ± 0.50 | JMF ± 0.50 |
| HMA moisture content (% max.) | CT 226 or CT 370 | 1 per 2500 tonnes but not less than 1 per paving day | 1.0 | 1.0 | 1.0 | 1.0 |
| Percent of maximum theoretical density (%) ^{d,e} | Quality control plan | 2 per business day (min.) | 91 - 97 | 91 - 97 | 91 - 97 | -- |
| Stabilometer value (min.) ^{e,f} 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings | CT 366 | One per 4000 tonnes or 2 per 5 business days, whichever is more | 30 | 30 | -- | -- |
| | | | 37 | 35 | 23 | -- |
| Air voids content (%) ^{e,g} | CT 367 | | 4 ± 2 | 4 ± 2 | Specification ± 2 | -- |
| Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants ^h | CT 226 or CT 370 | 2 per day during production | -- | -- | -- | -- |
| Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face | CT 205 | As necessary and designated in the QCP. At least once per project | 90 | 25 | -- | 90 |
| | | | 75 | -- | 90 | 75 |
| | | | 70 | 20 | 70 | 90 |
| Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev. | CT 211 | | 12 45 | -- 50 | 12 40 | 12 40 |

| | | | | | | |
|---|------------------------|------------------|--|--|--|------------------------------------|
| Flat and elongated particles (% max. by mass @ 5:1) | ASTM D 4791 | | Report only | Report only | Report only | Report only |
| Fine aggregate angularity (% min.) | AASHTO T 304, Method A | | 45 | 45 | 45 | -- |
| Voids filled with asphalt (%) ⁱ 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading | LP-3 | | 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0 | 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0 | Report only | -- |
| Voids in mineral aggregate (% min.) ⁱ 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading | LP-2 | | 17.0 15.0 14.0 13.0 | 17.0 15.0 14.0 13.0 | -- -- 18.0 – 23.0 ^j 18.0 – 23.0 ^j | -- |
| Dust proportion ¹ 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings | LP-4 | | 0.9 – 2.0 0.6 – 1.3 | 0.9 – 2.0 0.6 – 1.3 | Report only | -- |
| Smoothness | Section 39-1.12 | -- | 3.66-m straightedge, must-grind, and PI ₀ | 3.66-m straightedge, must-grind, and PI ₀ | 3.66-m straightedge, must-grind, and PI ₀ | 3.66-m straightedge and must-grind |
| Asphalt rubber binder viscosity @ 177 °C, centipoises | Section 39-1.02D | Section 39-1.04C | -- | -- | 1500 – 4000 | 1500 – 4000 |
| Asphalt modifier | Section 39-1.02D | Section 39-1.04C | -- | -- | Section 39-1.02D | Section 39-1.02D |
| Crumb rubber modifier | Section 39-1.02D | Section 39-1.04C | -- | -- | Section 39-1.02D | Section 39-1.02D |

Notes:

^a Determine combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

^b The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

^c Report the average of 3 tests from a single split sample.

^d Required for HMA Type A, Type B, and RHMA-G if the specified paved thickness is at least 45 mm.

^e Determine maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

^f Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."

^g Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

^h For adjusting the plant controller at the HMA plant.

ⁱ Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.

^j Voids in mineral aggregate for RHMA-G must be within this range.

For any single quality characteristic except smoothness, if 2 consecutive quality control test results do not comply with the action limits or specifications:

1. Stop production.
2. Notify the Engineer in writing.
3. Take corrective action.

4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

39-2.03 ENGINEER'S ACCEPTANCE

39-2.03A Testing

The Engineer samples for acceptance testing and tests for:

HMA Acceptance - Standard

| Quality Characteristic | | | | Test Method | HMA Type | | | |
|---|----------------|---------|--------|------------------------|--|--|--|------------------------------|
| | | | | | A | B | RHMA-G | OGFC |
| Aggregate gradation ^a | | | | CT 202 | JMF ± Tolerance ^c | JMF ± Tolerance ^c | JMF ± Tolerance ^c | JMF ± Tolerance ^c |
| Sieve | 19-mm | 12.5-mm | 9.5-mm | | | | | |
| 12.5-mm | X ^b | | | | | | | |
| 9.5-mm | | X | | | | | | |
| 2.36-mm | X | X | X | | | | | |
| 0.075-mm | X | X | X | | | | | |
| Sand equivalent (min.) ^d | | | | CT 217 | 47 | 42 | 47 | -- |
| Asphalt binder content (%) | | | | CT 379 or 382 | JMF ± 0.45 | JMF ± 0.45 | JMF ± 0.5 | JMF ± 0.50 |
| HMA moisture content (% max.) | | | | CT 226 or CT 370 | 1.0 | 1.0 | 1.0 | 1.0 |
| Percent of maximum theoretical density (%) ^{e, f} | | | | CT 375 | 91 – 97 | 91 – 97 | 91 – 97 | -- |
| Stabilometer value (min.) ^{d, g} | | | | CT 366 | 30 37 | 30 35 | -- 23 | -- -- |
| 4.75-mm and 9.5-mm gradings | | | | | | | | |
| 12.5-mm and 19-mm gradings | | | | | | | | |
| Air voids content (%) ^{d, h} | | | | CT 367 | 4 ± 2 | 4 ± 2 | Specification ± 2 | -- |
| Percent of crushed particles Coarse aggregate (% min.) | | | | CT 205 | 90 75 | 25 -- | -- 90 | 90 75 |
| One fractured face | | | | | | | | |
| Two fractured faces | | | | | | | | |
| Fine aggregate (% min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) | | | | CT 205 | 90 75 | 25 -- | -- 90 | 90 75 |
| One fractured face | | | | | | | | |
| Percent of crushed particles Coarse aggregate (% min.) | | | | CT 205 | 90 75 | 25 -- | -- 90 | 90 75 |
| One fractured face | | | | | | | | |
| Two fractured faces | | | | | | | | |
| Los Angeles Rattler (% max.) | | | | CT 211 | 12 45 | -- 50 | 12 40 | 12 40 |
| Loss at 100 rev. | | | | | | | | |
| Loss at 500 rev. | | | | | | | | |
| Fine aggregate angularity (% min.) | | | | AASHTO T 304, Method A | 45 | 45 | 45 | -- |
| Flat and elongated particles (% max. by mass @ 5:1) | | | | ASTM D 4791 | Report only | Report only | Report only | Report only |
| Voids filled with asphalt (%) ¹ | | | | LP-3 | 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0 | 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0 | Report only | -- |
| 4.75-mm grading | | | | | | | | |
| 9.5-mm grading | | | | | | | | |
| 12.5-mm grading | | | | | | | | |
| 19-mm grading | | | | | | | | |
| Voids in mineral aggregate (% min.) ⁱ | | | | LP-2 | 17.0 15.0 14.0 13.0 | 17.0 15.0 14.0 13.0 | -- -- 18.0 – 23.0 ^j 18.0 – 23.0 ^j | -- |
| 4.75-mm grading | | | | | | | | |
| 9.5-mm grading | | | | | | | | |
| 12.5-mm grading | | | | | | | | |
| 19-mm grading | | | | | | | | |
| Dust proportion ¹ | | | | LP-4 | | | | -- |
| 4.75-mm and 9.5-mm | | | | | | | | |

| | | | | | |
|---|--------------------|---|---|---|--|
| gradings 12.5-mm and 19-mm gradings | | 0.9 – 2.0 | 0.9 – 2.0 | Report only | |
| | | 0.6 – 1.3 | 0.6 – 1.3 | | |
| Smoothness | Section 39-1.12 | 3.66-m straightedge, must-grind, and PI ₀ | 3.66-m straightedge, must-grind, and PI ₀ | 3.66-m straightedge, must-grind, and PI ₀ | 3.66-m straightedge and must-grind |
| Asphalt binder | Various | Section 92 | Section 92 | Section 92 | Section 92 |
| Asphalt rubber binder | Various | -- | -- | Section 92- 1.02(C) and Section 39- 1.02D | Section 92- 1.02(C) and Section 39- 1.02D |
| Asphalt modifier | Various | -- | -- | Section 39- 1.02D | Section 39- 1.02D |
| Crumb rubber modifier | Various | -- | -- | Section 39- 1.02D | Section 39- 1.02D |

^a The Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

^b "X" denotes the sieves the Engineer considers for the specified aggregate gradation.

^c The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

^d The Engineer reports the average of 3 tests from a single split sample.

^e The Engineer determines percent of maximum theoretical density if the specified paved thickness is at least 45-mm under California Test 375 except the Engineer uses:

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

^f The Engineer determines maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

^g Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."

^h The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

ⁱ Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.

^j Voids in mineral aggregate for RHMA-G must be within this range.

No single test result may represent more than the smaller of 750 tonnes or 1 day's production.

For any single quality characteristic except smoothness, if 2 consecutive acceptance test results do not comply with the specifications:

1. Stop production.
2. Take corrective action.
3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

The Engineer tests the density core you take from each 250 tonnes of HMA production. The Engineer determines the percent of maximum theoretical density for each density core by determining the density core's density and dividing by the maximum theoretical density.

If the specified total paved thickness is at least 45 mm and any layer is less than 45 mm, the Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness.

For percent of maximum theoretical density, the Engineer determines a deduction for each test result outside the specifications in compliance with:

Reduced Payment Factors for Percent of Maximum Theoretical Density

| HMA Type A and B and RHMA-G Percent of Maximum Theoretical Density | Reduced Payment Factor | HMA Type A and B and RHMA-G Percent of Maximum Theoretical Density | Reduced Payment Factor |
|--|------------------------|--|------------------------|
| 91.0 | 0.0000 | 97.0 | 0.0000 |
| 90.9 | 0.0125 | 97.1 | 0.0125 |
| 90.8 | 0.0250 | 97.2 | 0.0250 |
| 90.7 | 0.0375 | 97.3 | 0.0375 |
| 90.6 | 0.0500 | 97.4 | 0.0500 |
| 90.5 | 0.0625 | 97.5 | 0.0625 |
| 90.4 | 0.0750 | 97.6 | 0.0750 |
| 90.3 | 0.0875 | 97.7 | 0.0875 |
| 90.2 | 0.1000 | 97.8 | 0.1000 |
| 90.1 | 0.1125 | 97.9 | 0.1125 |
| 90.0 | 0.1250 | 98.0 | 0.1250 |
| 89.9 | 0.1375 | 98.1 | 0.1375 |
| 89.8 | 0.1500 | 98.2 | 0.1500 |
| 89.7 | 0.1625 | 98.3 | 0.1625 |
| 89.6 | 0.1750 | 98.4 | 0.1750 |
| 89.5 | 0.1875 | 98.5 | 0.1875 |
| 89.4 | 0.2000 | 98.6 | 0.2000 |
| 89.3 | 0.2125 | 98.7 | 0.2125 |
| 89.2 | 0.2250 | 98.8 | 0.2250 |
| 89.1 | 0.2375 | 98.9 | 0.2375 |
| 89.0 | 0.2500 | 99.0 | 0.2500 |
| < 89.0 | Remove and Replace | > 99.0 | Remove and Replace |

39-2.04 TRANSPORTING, SPREADING, AND COMPACTING

Determine the number of rollers needed to obtain the specified density and surface finish.

39-3 METHOD

39-3.01 DESCRIPTION

If HMA is specified as Method, construct it under Section 39-1, "General," this Section 39-3, "Method," and Section 39-5, "Measurement and Payment."

39-3.02 ENGINEER'S ACCEPTANCE

39-3.02A Testing

The Engineer samples for acceptance testing and tests for:

HMA Acceptance - Method

| Quality Characteristic | Test Method | HMA Type | | | |
|---|------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| | | A | B | RHMA-G | OGFC |
| Aggregate gradation ^a | CT 202 | JMF ± Tolerance ^b |
| Sand equivalent (min.) ^c | CT 217 | 47 | 42 | 47 | -- |
| Asphalt binder content (%) | CT 379 or 382 | JMF ± 0.45 | JMF ± 0.45 | JMF ± 0.5 | JMF ± 0.50 |
| HMA moisture content (% max.) | CT 226 or CT 370 | 1.0 | 1.0 | 1.0 | 1.0 |
| Stabilometer value (min.) ^{c, d} | CT 366 | | | | |
| 4.75-mm and 9.5-mm gradings | | 30 | 30 | -- | -- |
| 12.5-mm and 19-mm gradings | | 37 | 35 | 23 | -- |
| Percent of crushed particles | CT 205 | | | | |
| Coarse aggregate (% min.) | | | | | |
| One fractured face | | 90 | 25 | -- | 90 |
| Two fractured faces | | 75 | -- | 90 | 75 |
| Fine aggregate (% min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) | | | | | |
| One fractured face | | 70 | 20 | 70 | 90 |
| Los Angeles Rattler (% max.) | CT 211 | | | | |
| Loss at 100 rev. | | 12 | -- | 12 | 12 |
| Loss at 500 rev. | | 45 | 50 | 40 | 40 |
| Air voids content (%) ^{c, e} | CT 367 | 4 ± 2 | 4 ± 2 | Specification ± 2 | -- |
| Fine aggregate angularity (% min.) | AASHTO T 304, Method A | 45 | 45 | 45 | -- |
| Flat and elongated particles (% max. by mass @ 5:1) | ASTM D 4791 | Report only | Report only | Report only | Report only |
| Voids filled with asphalt (%) ^f | LP-3 | | | Report only | |
| 4.75-mm grading | | 76.0 – 80.0 | 76.0 – 80.0 | | -- |
| 9.5-mm grading | | 73.0 – 76.0 | 73.0 – 76.0 | | |
| 12.5-mm grading | | 65.0 – 75.0 | 65.0 – 75.0 | | |
| 19-mm grading | | 65.0 – 75.0 | 65.0 – 75.0 | | |
| Voids in mineral aggregate (% min.) ^f | LP-2 | | | | |
| 4.75-mm grading | | 17.0 | 17.0 | -- | -- |
| 9.5-mm grading | | 15.0 | 15.0 | -- | -- |
| 12.5-mm grading | | 14.0 | 14.0 | 18.0 – 23.0 ^g | |
| 19-mm grading | | 13.0 | 13.0 | 18.0 – 23.0 ^g | |
| Dust proportion ^f | LP-4 | | | Report only | |
| 4.75-mm and 9.5-mm gradings | | 0.9 – 2.0 | 0.9 – 2.0 | | -- |
| 12.5-mm and 19-mm gradings | | 0.6 – 1.3 | 0.6 – 1.3 | | |
| Smoothness | Section 39-1.12 | 3.66-m straightedge and must-grind |

| | | | | | |
|-----------------------|---------|------------|------------|---|---|
| Asphalt binder | Various | Section 92 | Section 92 | Section 92 | Section 92 |
| Asphalt rubber binder | Various | -- | -- | Section 92-1.02(C) and Section 39-1.02D | Section 92-1.02(C) and Section 39-1.02D |
| Asphalt modifier | Various | -- | -- | Section 39-1.02D | Section 39-1.02D |
| Crumb rubber modifier | Various | -- | -- | Section 39-1.02D | Section 39-1.02D |

^aThe Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

^bThe tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

^cThe Engineer reports the average of 3 tests from a single split sample.

^dModify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."

^eThe Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

^fReport only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.

^g Voids in mineral aggregate for RHMA-G must be within this range.

No single test result may represent more than the smaller of 750 tonnes or 1 day's production.

For any single quality characteristic except smoothness, if 2 consecutive acceptance test results do not comply with the specifications:

1. Stop production.
2. Take corrective action.
3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

39-3.03 SPREADING AND COMPACTING EQUIPMENT

Each paver spreading HMA Type A and Type B must be followed by 3 rollers:

1. One vibratory roller specifically designed to compact HMA. The roller must be capable of at least 2500 vibrations per minute and must be equipped with amplitude and frequency controls. The roller's gross static mass must be at least 6.8 tonnes.
2. One oscillating type pneumatic-tired roller at least 1.2 m wide. Pneumatic tires must be of equal size, diameter, type, and ply. The tires must be inflated to 415 kilopascals minimum and maintained so that the air pressure does not vary more than 35 kilopascals.
3. One steel-tired, 2-axle tandem roller. The roller's gross static mass must be at least 6.8 tonnes.

Each roller must have a separate operator. Rollers must be self-propelled and reversible.

Compact RHMA-G under the specifications for compacting HMA Type A and Type B except do not use pneumatic-tired rollers.

Compact OGFC with steel-tired, 2-axle tandem rollers. If placing over 275 tonnes of OGFC per hour, use at least 3 rollers for each paver. If placing less than 275 tonnes of OGFC per hour, use at least 2 rollers for each paver. Each roller must weigh between 2250 kilograms to 3075 kilograms per linear meter of drum width. Turn the vibrator off.

39-3.04 TRANSPORTING, SPREADING, AND COMPACTING

Pave HMA in maximum 75-millimeter thick compacted layers.

If the surface to be paved is both in sunlight and shade, pavement surface temperatures are taken in the shade.

Spread HMA Type A and Type B only if atmospheric and surface temperatures are:

Minimum Atmospheric and Surface Temperatures

| Compacted Layer Thickness, mm | | | | |
|-------------------------------|---------------------------|--------------------------------------|---------------------------|--------------------------------------|
| | Unmodified Asphalt Binder | Modified Asphalt Binder ^a | Unmodified Asphalt Binder | Modified Asphalt Binder ^a |
| < 45 | 12.8 | 10 | 15.6 | 12.8 |
| 45 – 75 | 7.2 | 7.2 | 10 | 10 |

Note:

^a Except asphalt rubber binder.

If the asphalt binder for HMA Type A and Type B is:

1. Unmodified asphalt binder, complete:

- 1.1. First coverage of breakdown compaction before the surface temperature drops below 120 °C
- 1.2. Breakdown and intermediate compaction before the surface temperature drops below 95 °C
- 1.3. Finish compaction before the surface temperature drops below 65 °C

2. Modified asphalt binder, complete:

- 2.1. First coverage of breakdown compaction before the surface temperature drops below 115 °C
- 2.2. Breakdown and intermediate compaction before the surface temperature drops below 85 °C
- 2.3. Finish compaction before the surface temperature drops below 60 °C

For RHMA-G:

- 1. Only spread and compact if the atmospheric temperature is at least 12.8 °C and the surface temperature is at least 15.6 °C.
- 2. Complete the first coverage of breakdown compaction before the surface temperature drops below 140 °C.
- 3. Complete breakdown and intermediate compaction before the surface temperature drops below 120 °C.
- 4. Complete finish compaction before the surface temperature drops below 95 °C.
- 5. If the atmospheric temperature is below 21 °C, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface.

For OGFC with unmodified asphalt binder:

- 1. Only spread and compact if the atmospheric temperature is at least 12.8 °C and the surface temperature is at least 15.6 °C.
- 2. Complete first coverage using 2 rollers before the surface temperature drops below 115 °C.
- 3. Complete all compaction before the surface temperature drops below 95 °C.
- 4. If the atmospheric temperature is below 21 °C, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface.

For OGFC with modified asphalt binder except asphalt rubber binder:

- 1. Only spread and compact if the atmospheric temperature is at least 10 °C and the surface temperature is at least 10 °C.
- 2. Complete first coverage using 2 rollers before the surface temperature drops below 115 °C.
- 3. Complete all compaction before the surface temperature drops below 85 °C.
- 4. If the atmospheric temperature is below 21 °C, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface.

For RHMA-O and RHMA-O-HB:

- 1. Only spread and compact if the atmospheric temperature is at least 12.8 °C and surface temperature is at least 15.6 °C.
- 2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 140 °C.

3. Complete compaction before the surface temperature drops below 120 °C.
4. If the atmospheric temperature is below 21 °C, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until the mixture is transferred to the paver's hopper or to the pavement surface.

For RHMA-G and OGFC, tarpaulins are not required if the time from discharge to truck until transfer to the paver's hopper or the pavement surface is less than 30 minutes.

HMA compaction coverage is the number of passes needed to cover the paving width. A pass is 1 roller's movement parallel to the paving in either direction. Overlapping passes are part of the coverage being made and are not a subsequent coverage. Do not start a coverage until completing the prior coverage.

Start rolling at the lower edge and progress toward the highest part.

Perform breakdown compaction of each layer of HMA Type A, Type B, and RHMA-G with 3 coverages using a vibratory roller. The speed of the vibratory roller in kilometers per hour must not exceed the vibrations per minute divided by 1600. If the HMA layer thickness is less than 25 mm, turn the vibrator off. The Engineer may order fewer coverages if the HMA layer thickness is less than 45 mm.

Perform intermediate compaction of each layer of HMA Type A and Type B with 3 coverages using a pneumatic-tired roller at a speed not to exceed 8 kilometers per hour.

Perform finish compaction of HMA Type A, Type B, and RHMA-G with 1 coverage using a steel-tired roller.

Compact OGFC with 2 coverages using steel-tired rollers.

39-4 QUALITY CONTROL / QUALITY ASSURANCE

39-4.01 DESCRIPTION

If HMA is specified as Quality Control / Quality Assurance, construct it under Section 39-1, "General," this Section 39-4, "Quality Control / Quality Assurance," and Section 39-5, "Measurement and Payment."

39-4.02 GENERAL

The QC / QA construction process consists of:

1. Establishing, maintaining, and changing if needed a quality control system providing assurance the HMA complies with the specifications
2. Sampling and testing at specified intervals, or sublots, to demonstrate compliance and to control process
3. The Engineer sampling and testing at specified intervals to verify testing process and HMA quality
4. The Engineer using test results, statistical evaluation of verified quality control tests, and inspection to accept HMA for payment

A lot is a quantity of HMA. The Engineer designates a new lot when:

1. 20 sublots are complete
2. The JMF changes
3. Production stops for more than 30 days

Each lot consists of no more than 20 sublots. A subplot is 750 tonnes except HMA paved at day's end greater than 250 tonnes is a subplot. If HMA paved at day's end is less than 250 tonnes, you may either make this quantity a subplot or include it in the previous subplot's test results for statistical evaluation.

39-4.03 CONTRACTOR QUALITY CONTROL

39-4.03A General

Use a composite quality factor, QF_C , and individual quality factors, QF_{QCi} , to control your process and evaluate your quality control program. For quality characteristics without quality factors, use your quality control plan's action limits to control process.

Control HMA quality including:

1. Materials
2. Proportioning
3. Spreading and compacting
4. Finished roadway surface

Develop, implement, and maintain a quality control program that includes:

1. Inspection
2. Sampling
3. Testing

39-4.03B Quality Control Plan

With the JMF submittal, submit a written Quality Control Plan (QCP). The QCP must comply with the Department's Quality Control Manual for Hot Mix Asphalt Production and Placement. Discuss the QCP with the Engineer during the prepaving conference.

The Engineer reviews each QCP within 5 business days from the submittal. Hold HMA production until the Engineer accepts the QCP in writing. The Engineer's QCP acceptance does not mean your compliance with the QCP will result in acceptable HMA. Section 39-1.05, "Engineer's Acceptance," specifies HMA acceptance.

The QCP must include the name and qualifications of a Quality Control Manager. The Quality Control Manager administers the QCP and during paving must be at the job site within 3 hours of receiving notice. The Quality Control Manager must not be any of the following on the project:

1. Foreman
2. Production or paving crewmember
3. Inspector
4. Tester

The QCP must include action limits and details of corrective action you will take if a test result for any quality characteristic falls outside an action limit.

As work progresses, you must submit a written QCP supplement to change quality control procedures, personnel, tester qualification status, or laboratory accreditation status.

39-4.03C Quality Control Inspection, Sampling, And Testing

Sample, test, inspect, and manage HMA quality control.

Provide a roadway inspector while HMA paving activities are in progress. Provide a plant inspector during HMA production.

Inspectors must comply with the Department's Quality Control Manual for Hot Mix Asphalt Production and Placement.

Provide a testing laboratory and personnel for quality control testing. Provide the Engineer unrestricted access to the quality control activities. Before providing services for the project, the Engineer reviews, accredits, and qualifies the testing laboratory and personnel under the Department's Independent Assurance Program.

The minimum random sampling and testing for quality control is:

Minimum Quality Control – QC / QA

| Quality Characteristic | Test Method | Minimum Sampling and Testing Frequency | HMA Type | | | Location of Sampling | Max. Reporting Time Allowance |
|--|------------------|---|------------------------------|------------------------------|------------------------------|-----------------------------------|-------------------------------|
| | | | A | B | RHMA-G | | |
| Aggregate gradation ^a | CT 202 | 1 per 750 tonnes | JMF ± Tolerance ^b | JMF ± Tolerance ^b | JMF ± Tolerance ^b | CT 125 | 24 hours |
| Asphalt binder content (%) | CT 379 or 382 | | JMF ±0.45 | JMF ±0.45 | JMF ±0.5 | Loose Mix Behind Paver See CT 125 | |
| Percent of maximum theoretical density (%) ^{c, d} | QC Plan | | 92 - 96 | 92 - 96 | 91 - 96 | QC Plan | |
| Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants ^e | CT 226 or CT 370 | 2 per day during production | -- | -- | -- | Stock-piles or cold feed belts | -- |
| Sand equivalent (min.) ^f | CT 217 | 1 per 750 tonnes | 47 | 42 | 47 | CT 125 | 24 hours |
| HMA moisture content (% max.) | CT 226 or CT 370 | 1 per 2500 tonnes but not less than 1 per paving day | 1.0 | 1.0 | 1.0 | Loose Mix Behind Paver See CT 125 | 24 hours |
| Stabilometer Value (min.) ^{f, g} 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings | CT 366 | 1 per 4000 tonnes or 2 per 5 business days, whichever is more | 30 | 30 | -- | | 48 hours |
| | | | 37 | 35 | 23 | | |
| Air voids content (%) ^{f, h} | CT 367 | | 4 ± 2 | 4 ± 2 | Specification ± 2 | | |

| | | | | | | | | |
|---|------------------------|--|--|--|--|---|----------|------------------|
| Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces | CT 205 | As necessary and designated in QCP. At least once per project. | 90 | 25 | -- | CT 125 | 48 hours | |
| Fine aggregate (% min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face | | | 75 | -- | 90 | | | |
| Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev. | CT 211 | | 12 45 | -- 50 | 12 40 | | | CT 125 |
| Fine aggregate angularity (% min.) | AASHTO T 304, Method A | | 45 | 45 | 45 | CT 125 | | |
| Flat and elongated particle (% max. by mass @ 5:1) | ASTM D 4791 | | Report only | Report only | Report only | CT 125 | | |
| Voids filled with asphalt (%) ⁱ 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading | LP-3 | | 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0 | 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0 | Report only | LP-3 | | |
| Voids in mineral aggregate (% min.) ⁱ 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading | LP-2 | | 17.0 15.0 14.0 13.0 | 17.0 15.0 14.0 13.0 | -- -- 18.0 – 23.0 ^j 18.0 – 23.0 ^j | LP-2 | | |
| Dust proportion ¹ 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings | LP-4 | | 0.9 – 2.0 0.6 – 1.3 | 0.9 – 2.0 0.6 – 1.3 | Report only | LP-4 | | |
| Smoothness | Section 39-1.12 | | -- | 3.66-m straight-edge, must-grind, and PI ₀ | 3.66-m straight-edge, must-grind, and PI ₀ | 3.66-m straight-edge, must-grind, and PI ₀ | | -- |
| Asphalt rubber binder viscosity @ 177 °C, centipoises | Section 39-1.02D | | -- | -- | -- | 1500 – 4000 | | Section 39-1.02D |
| Crumb rubber modifier | Section 39-1.02D | -- | -- | -- | Section 39-1.02D | Section 39-1.02D | 48 hours | |

Notes:

^a Determine combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

^b The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

^c Required for HMA Type A, Type B, and RHMA-G if the specified paved thickness is at least 45 mm.

^d Determine maximum theoretical density (California Test 309) at the frequency specified for test maximum density under California Test 375, Part 5 D.

^e For adjusting the plant controller at the HMA plant.

^f Report the average of 3 tests from a single split sample.

^g Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to $60\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at $69\text{ }^{\circ}\text{C}$ for a minimum of 2 hours and not more than 3 hours."

^h Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

ⁱ Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC

^j Voids in mineral aggregate for RHMA-G must be within this range.

Within the specified reporting time, submit written test results including:

1. Sampling location, quantity, and time
2. Testing results
3. Supporting data and calculations

If test results for any quality characteristic are beyond the action limits in the QCP, take corrective actions. Document the corrective actions taken in the inspection records under Section 39-4.03E, "Records of Inspection and Testing."

Stop production, notify the Engineer in writing, take corrective action, and demonstrate compliance with the specifications before resuming production and placement on the State highway if:

1. A lot's composite quality factor, Q_{FC} , or an individual quality factor, $Q_{F_{QCi}}$ for $i = 3, 4, \text{ or } 5$, is below 0.90 determined under Section 39-4.03F, "Statistical Evaluation"
2. An individual quality factor, $Q_{F_{QCi}}$ for $i = 1 \text{ or } 2$, is below 0.75
3. Quality characteristics for which a quality factor, $Q_{F_{QCi}}$, is not determined has 2 consecutive acceptance or quality control tests not in compliance with the specifications

39-4.03D Charts And Records

Record sampling and testing results for quality control on forms provided in the "Quality Control Manual for Hot Mix Asphalt," or on forms you submit with the QCP. The QCP must also include form posting locations and submittal times.

Submit quality control test results using the Department's statistical evaluation program, HMAPay, available at

www.dot.ca.gov/hq/construc/hma/index.htm

39-4.03E Records Of Inspection And Testing

During HMA production, submit in writing a daily:

1. HMA Construction Daily Record of Inspection. Also make this record available at the HMA plant and job site each day.
2. HMA Inspection and Testing Summary. Include in the summary:
 - 2.1. Test forms with the testers' signatures and Quality Control Manager's initials.
 - 2.2. Inspection forms with the inspectors' signatures and Quality Control Manager's initials.
 - 2.3. A list and explanation of deviations from the specifications or regular practices.
 - 2.4. A signed statement by the Quality Control Manager that says:

"It is hereby certified that the information contained in this record is accurate, and that information, tests, or calculations documented herein comply with the specifications of the contract and the standards set forth in the testing procedures. Exceptions to this certification are documented as part of this record."

Retain for inspection the records generated as part of quality control including inspection, sampling, and testing for at least 3 years after final acceptance.

39-4.03F Statistical Evaluation

General

Determine a lot's composite quality factor, QF_C , and the individual quality factors, QF_{QC_i} . Perform statistical evaluation calculations to determine these quality factors based on quality control test results for:

1. Aggregate gradation
2. Asphalt binder content
3. Percent of maximum theoretical density

The Engineer grants a waiver and you must use 1.0 as the individual quality factor for percent of maximum theoretical density, QF_{QCS} , for HMA paved in:

1. Areas where the specified paved thickness is less than 45 mm
2. Areas where the specified paved thickness is less than 60 mm and a 19-millimeter grading is specified and used
3. Dig outs
4. Leveling courses
5. Areas where, in the opinion of the Engineer, compaction or compaction measurement by conventional methods is impeded

Statistical Evaluation Calculations

Use the Variability-Unknown / Standard Deviation Method to determine the percentage of a lot not in compliance with the specifications. The number of significant figures used in the calculations must comply with AASHTO R-11, Absolute Method.

Determine the percentage of work not in compliance with the specification limits for each quality characteristic as follows:

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

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

where:

x = individual test values
 n = number of test values

2. Calculate the standard deviation

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

where:

$\sum(x^2)$ = sum of the squares of individual test values
 $(\sum x)^2$ = sum of the individual test values squared
 n = number of test values

3. Calculate the upper quality index (Q_u)

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

where:

USL = target value plus the production tolerance or upper specification limit
 s = standard deviation
 \bar{X} = arithmetic mean

4. Calculate the lower quality index (QL);

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

where:

LSL = target value minus production tolerance or lower specification limit
s = standard deviation
 \bar{X} = arithmetic mean

5. From the table, Upper Quality Index Q_U or Lower Quality Index Q_L , of this Section 39-4.03F, "Statistical Evaluation", determine P_U ;

where:

P_U = the estimated percentage of work outside the USL.
 $P_U = 0$, when USL is not specified.

6. From the table, Upper Quality Index Q_U or Lower Quality Index Q_L , of this Section 39-4.03F, "Statistical Evaluation," determine P_L ;

where:

P_L = the estimated percentage of work outside the LSL.
 $P_L = 0$, when LSL is not specified.

7. Calculate the total estimated percentage of work outside the USL and LSL, percent defective

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

P_U and P_L are determined from:

| P _U or P _L | Upper Quality Index Q _U or Lower Quality Index Q _L | | | | | | | | | | | | |
|--|--|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|------|
| | Sample Size (n) | | | | | | | | | | | | |
| | 5 | 6 | 7 | 8 | 9 | 10-11 | 12-14 | 15-17 | 18-22 | 23-29 | 30-42 | 43-66 | >66 |
| 0 | 1.72 | 1.88 | 1.99 | 2.07 | 2.13 | 2.20 | 2.28 | 2.34 | 2.39 | 2.44 | 2.48 | 2.51 | 2.56 |
| 1 | 1.64 | 1.75 | 1.82 | 1.88 | 1.91 | 1.96 | 2.01 | 2.04 | 2.07 | 2.09 | 2.12 | 2.14 | 2.16 |
| 2 | 1.58 | 1.66 | 1.72 | 1.75 | 1.78 | 1.81 | 1.84 | 1.87 | 1.89 | 1.91 | 1.93 | 1.94 | 1.95 |
| 3 | 1.52 | 1.59 | 1.63 | 1.66 | 1.68 | 1.71 | 1.73 | 1.75 | 1.76 | 1.78 | 1.79 | 1.80 | 1.81 |
| 4 | 1.47 | 1.52 | 1.56 | 1.58 | 1.60 | 1.62 | 1.64 | 1.65 | 1.66 | 1.67 | 1.68 | 1.69 | 1.70 |
| 5 | 1.42 | 1.47 | 1.49 | 1.51 | 1.52 | 1.54 | 1.55 | 1.56 | 1.57 | 1.58 | 1.59 | 1.59 | 1.60 |
| 6 | 1.38 | 1.41 | 1.43 | 1.45 | 1.46 | 1.47 | 1.48 | 1.49 | 1.50 | 1.50 | 1.51 | 1.51 | 1.52 |
| 7 | 1.33 | 1.36 | 1.38 | 1.39 | 1.40 | 1.41 | 1.41 | 1.42 | 1.43 | 1.43 | 1.44 | 1.44 | 1.44 |
| 8 | 1.29 | 1.31 | 1.33 | 1.33 | 1.34 | 1.35 | 1.35 | 1.36 | 1.36 | 1.37 | 1.37 | 1.37 | 1.38 |
| 9 | 1.25 | 1.27 | 1.28 | 1.28 | 1.29 | 1.29 | 1.30 | 1.30 | 1.30 | 1.31 | 1.31 | 1.31 | 1.31 |
| 10 | 1.21 | 1.23 | 1.23 | 1.24 | 1.24 | 1.24 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.26 | 1.26 |
| 11 | 1.18 | 1.18 | 1.19 | 1.19 | 1.19 | 1.19 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 |
| 12 | 1.14 | 1.14 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 |
| 13 | 1.10 | 1.10 | 1.10 | 1.10 | 1.10 | 1.10 | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 |
| 14 | 1.07 | 1.07 | 1.07 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 |
| 15 | 1.03 | 1.03 | 1.03 | 1.03 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 |
| 16 | 1.00 | 0.99 | 0.99 | 0.99 | 0.99 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| 17 | 0.97 | 0.96 | 0.95 | 0.95 | 0.95 | 0.95 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| 18 | 0.93 | 0.92 | 0.92 | 0.92 | 0.91 | 0.91 | 0.91 | 0.91 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| 19 | 0.90 | 0.89 | 0.88 | 0.88 | 0.88 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| 20 | 0.87 | 0.86 | 0.85 | 0.85 | 0.84 | 0.84 | 0.84 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| 21 | 0.84 | 0.82 | 0.82 | 0.81 | 0.81 | 0.81 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.79 |
| 22 | 0.81 | 0.79 | 0.79 | 0.78 | 0.78 | 0.77 | 0.77 | 0.77 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 |
| 23 | 0.77 | 0.76 | 0.75 | 0.75 | 0.74 | 0.74 | 0.74 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 |
| 24 | 0.74 | 0.73 | 0.72 | 0.72 | 0.71 | 0.71 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| 25 | 0.71 | 0.70 | 0.69 | 0.69 | 0.68 | 0.68 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.66 |
| 26 | 0.68 | 0.67 | 0.67 | 0.65 | 0.65 | 0.65 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.63 |
| 27 | 0.65 | 0.64 | 0.63 | 0.62 | 0.62 | 0.62 | 0.61 | 0.61 | 0.61 | 0.61 | 0.61 | 0.61 | 0.60 |
| 28 | 0.62 | 0.61 | 0.60 | 0.59 | 0.59 | 0.59 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.57 |
| 29 | 0.59 | 0.58 | 0.57 | 0.57 | 0.56 | 0.56 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.54 |
| 30 | 0.56 | 0.55 | 0.54 | 0.54 | 0.53 | 0.53 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 |
| 31 | 0.53 | 0.52 | 0.51 | 0.51 | 0.50 | 0.50 | 0.50 | 0.49 | 0.49 | 0.49 | 0.49 | 0.49 | 0.49 |
| 32 | 0.50 | 0.49 | 0.48 | 0.48 | 0.48 | 0.47 | 0.47 | 0.47 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 |
| 33 | 0.47 | 0.48 | 0.45 | 0.45 | 0.45 | 0.44 | 0.44 | 0.44 | 0.44 | 0.43 | 0.43 | 0.43 | 0.43 |
| 34 | 0.45 | 0.43 | 0.43 | 0.42 | 0.42 | 0.42 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.40 |
| 35 | 0.42 | 0.40 | 0.40 | 0.39 | 0.39 | 0.39 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 |
| 36 | 0.39 | 0.38 | 0.37 | 0.37 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 |
| 37 | 0.36 | 0.35 | 0.34 | 0.34 | 0.34 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.32 |
| 38 | 0.33 | 0.32 | 0.32 | 0.31 | 0.31 | 0.31 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 39 | 0.30 | 0.30 | 0.29 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 |
| 40 | 0.28 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| 41 | 0.25 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |
| 42 | 0.23 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| 43 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 |
| 44 | 0.16 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 45 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| 46 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 47 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| 48 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 49 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

1. If the value of Q_U or Q_L does not correspond to a value in the table, use the next lower value.
2. If Q_U or Q_L are negative values, P_U or P_L is equal to 100 minus the table value for P_U or P_L.

Quality Factor Determination

Determine individual quality factors, QF_{QC_i} , using percent defective = $P_U + P_L$ and:

| Quality Factor | Quality Factors | | | | | | | | | | | | |
|----------------|---|----|----|----|----|-------|-------|-------|-------|-------|-------|-------|-----|
| | Maximum Allowable Percent Defective ($P_U + P_L$) | | | | | | | | | | | | |
| | Sample Size (n) | | | | | | | | | | | | |
| | 5 | 6 | 7 | 8 | 9 | 10-11 | 12-14 | 15-17 | 18-22 | 23-29 | 30-42 | 43-66 | >66 |
| 1.05 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.04 | | | 0 | 1 | 3 | 5 | 4 | 4 | 4 | 3 | 3 | 3 | 3 |
| 1.03 | | 0 | 2 | 4 | 6 | 8 | 7 | 7 | 6 | 5 | 5 | 4 | 4 |
| 1.02 | | 1 | 3 | 6 | 9 | 11 | 10 | 9 | 8 | 7 | 7 | 6 | 6 |
| 1.01 | 0 | 2 | 5 | 8 | 11 | 13 | 12 | 11 | 10 | 9 | 8 | 8 | 7 |
| 1.00 | 22 | 20 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
| 0.99 | 24 | 22 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 11 | 10 | 9 |
| 0.98 | 26 | 24 | 22 | 21 | 20 | 19 | 18 | 16 | 15 | 14 | 13 | 12 | 10 |
| 0.97 | 28 | 26 | 24 | 23 | 22 | 21 | 19 | 18 | 17 | 16 | 14 | 13 | 12 |
| 0.96 | 30 | 28 | 26 | 25 | 24 | 22 | 21 | 19 | 18 | 17 | 16 | 14 | 13 |
| 0.95 | 32 | 29 | 28 | 26 | 25 | 24 | 22 | 21 | 20 | 18 | 17 | 16 | 14 |
| 0.94 | 33 | 31 | 29 | 28 | 27 | 25 | 24 | 22 | 21 | 20 | 18 | 17 | 15 |
| 0.93 | 35 | 33 | 31 | 29 | 28 | 27 | 25 | 24 | 22 | 21 | 20 | 18 | 16 |
| 0.92 | 37 | 34 | 32 | 31 | 30 | 28 | 27 | 25 | 24 | 22 | 21 | 19 | 18 |
| 0.91 | 38 | 36 | 34 | 32 | 31 | 30 | 28 | 26 | 25 | 24 | 22 | 21 | 19 |
| 0.90 | 39 | 37 | 35 | 34 | 33 | 31 | 29 | 28 | 26 | 25 | 23 | 22 | 20 |
| 0.89 | 41 | 38 | 37 | 35 | 34 | 32 | 31 | 29 | 28 | 26 | 25 | 23 | 21 |
| 0.88 | 42 | 40 | 38 | 36 | 35 | 34 | 32 | 30 | 29 | 27 | 26 | 24 | 22 |
| 0.87 | 43 | 41 | 39 | 38 | 37 | 35 | 33 | 32 | 30 | 29 | 27 | 25 | 23 |
| 0.86 | 45 | 42 | 41 | 39 | 38 | 36 | 34 | 33 | 31 | 30 | 28 | 26 | 24 |
| 0.85 | 46 | 44 | 42 | 40 | 39 | 38 | 36 | 34 | 33 | 31 | 29 | 28 | 25 |
| 0.84 | 47 | 45 | 43 | 42 | 40 | 39 | 37 | 35 | 34 | 32 | 30 | 29 | 27 |
| 0.83 | 49 | 46 | 44 | 43 | 42 | 40 | 38 | 36 | 35 | 33 | 31 | 30 | 28 |
| 0.82 | 50 | 47 | 46 | 44 | 43 | 41 | 39 | 38 | 36 | 34 | 33 | 31 | 29 |
| 0.81 | 51 | 49 | 47 | 45 | 44 | 42 | 41 | 39 | 37 | 36 | 34 | 32 | 30 |
| 0.80 | 52 | 50 | 48 | 46 | 45 | 44 | 42 | 40 | 38 | 37 | 35 | 33 | 31 |
| 0.79 | 54 | 51 | 49 | 48 | 46 | 45 | 43 | 41 | 39 | 38 | 36 | 34 | 32 |
| 0.78 | 55 | 52 | 50 | 49 | 48 | 46 | 44 | 42 | 41 | 39 | 37 | 35 | 33 |
| 0.77 | 56 | 54 | 52 | 50 | 49 | 47 | 45 | 43 | 42 | 40 | 38 | 36 | 34 |
| 0.76 | 57 | 55 | 53 | 51 | 50 | 48 | 46 | 44 | 43 | 41 | 39 | 37 | 35 |
| 0.75 | 58 | 56 | 54 | 52 | 51 | 49 | 47 | 46 | 44 | 42 | 40 | 38 | 36 |
| Reject | 60 | 57 | 55 | 53 | 52 | 51 | 48 | 47 | 45 | 43 | 41 | 40 | 37 |
| | 61 | 58 | 56 | 55 | 53 | 52 | 50 | 48 | 46 | 44 | 43 | 41 | 38 |
| | 62 | 59 | 57 | 56 | 54 | 53 | 51 | 49 | 47 | 45 | 44 | 42 | 39 |
| | 63 | 61 | 58 | 57 | 55 | 54 | 52 | 50 | 48 | 47 | 45 | 43 | 40 |
| | 64 | 62 | 60 | 58 | 57 | 55 | 53 | 51 | 49 | 48 | 46 | 44 | 41 |

Reject Values Greater Than Those Shown Above

Notes:

- To obtain a quality factor when the estimated percent outside specification limits from table, "Upper Quality Index Q_U or Lower Quality Index Q_L ," does not correspond to a value in the table, use the next larger value.

Compute the composite of single quality factors, QF_C , for a lot using:

$$QF_C = \sum_{i=1}^5 w_i QF_{QC_i}$$

where:

- QF_c = the composite quality factor for the lot rounded to 2 decimal places.
 QF_{QC_i} = the quality factor for the individual quality characteristic.
 w = the weighting factor listed in the table HMA Acceptance – QC / QA.
 i = the quality characteristic index number in the table HMA Acceptance – QC / QA.

39-4.04 ENGINEER'S QUALITY ASSURANCE

39-4.04A General

The Engineer assures quality by:

1. Reviewing mix designs and proposed JMF
2. Inspecting procedures
3. Conducting oversight of quality control inspection and records
4. Verification sampling and testing during production and paving

39-4.04B Verification Sampling And Testing

General

The Engineer samples:

1. Aggregate to verify gradation
2. HMA to verify asphalt binder content

Verification

For aggregate gradation and asphalt binder content, the ratio of verification testing frequency to the minimum quality control testing frequency is 1:5. The Engineer performs at least 3 verification tests per lot.

Using the t-test, the Engineer compares quality control tests results for aggregate gradation and asphalt binder content with corresponding verification test results. The Engineer uses the average and standard deviation of up to 20 sequential sublots for the comparison. The Engineer uses production start-up evaluation tests to represent the first sublot. When there are less than 20 sequential sublots, the Engineer uses the maximum number of sequential sublots available. The 21st sublot becomes the 1st sublot ($n = 1$) in the next lot.

The t-value for a group of test data is computed as follows:

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

where:

- n_c = Number of quality control tests (2 minimum, 20 maximum).
 n_v = Number of verification tests (minimum of 1 required).
 \bar{X}_c = Mean of quality control tests.
 \bar{X}_v = Mean of verification tests.
 S_p = Pooled standard deviation (When $n_v = 1$, $S_p = S_c$).
 S_c = Standard deviation of quality control tests.
 S_v = Standard deviation of verification tests (when $n_v > 1$).

The comparison of quality control test results and the verification test results is at a level of significance of $\alpha = 0.025$. The Engineer computes t and compares it to the critical t-value, t_{crit} , from:

Critical T-Value

| Degrees of freedom (n_c+n_v-2) | t_{crit} (for $\alpha = 0.025$) | Degrees of freedom (n_c+n_v-2) | t_{crit} (for $\alpha = 0.025$) |
|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 1 | 24.452 | 18 | 2.445 |
| 2 | 6.205 | 19 | 2.433 |
| 3 | 4.177 | 20 | 2.423 |
| 4 | 3.495 | 21 | 2.414 |
| 5 | 3.163 | 22 | 2.405 |
| 6 | 2.969 | 23 | 2.398 |
| 7 | 2.841 | 24 | 2.391 |
| 8 | 2.752 | 25 | 2.385 |
| 9 | 2.685 | 26 | 2.379 |
| 10 | 2.634 | 27 | 2.373 |
| 11 | 2.593 | 28 | 2.368 |
| 12 | 2.560 | 29 | 2.364 |
| 13 | 2.533 | 30 | 2.360 |
| 14 | 2.510 | 40 | 2.329 |
| 15 | 2.490 | 60 | 2.299 |
| 16 | 2.473 | 120 | 2.270 |
| 17 | 2.458 | ∞ | 2.241 |

If the t-value computed is less than or equal to t_{crit} , quality control test results are verified.

If the t-value computed is greater than t_{crit} and both \bar{X}_v and \bar{X}_c comply with acceptance specifications, the quality control tests are verified. You may continue to produce and place HMA with the following allowable differences:

1. $|\bar{X}_v - \bar{X}_c| \leq 1.0$ percent for any grading
2. $|\bar{X}_v - \bar{X}_c| \leq 0.1$ percent for asphalt binder content

If the t-value computed is greater than t_{crit} and the $|\bar{X}_v - \bar{X}_c|$ for grading and asphalt binder content are greater than the allowable differences, quality control test results are not verified and:

1. The Engineer notifies you in writing.
2. You and the Engineer must investigate why the difference exist.
3. If the reason for the difference cannot be found and corrected, the Engineer's test results are used for acceptance and pay.

39-4.05 ENGINEER'S ACCEPTANCE

39-4.05A Testing

The Engineer samples for acceptance testing and tests for:

HMA Acceptance – QC / QA

| Index (i) | Quality Characteristic | | | | Weight -ing Factor (w) | Test Method | HMA Type | | |
|-----------|--|----------------|---------|--------|------------------------|------------------------|--|--|--|
| | | | | | | | A | B | RHMA-G |
| | Aggregate gradation ^a | | | | | CT 202 | JMF ± Tolerance ^c | | |
| | Sieve | 19-mm | 12.5-mm | 9.5-mm | | | | | |
| 1 | 12.5-mm | X ^b | -- | -- | 0.05 | | | | |
| 1 | 9.5-mm | -- | X | -- | 0.05 | | | | |
| 1 | 4.75-mm | -- | -- | X | 0.05 | | | | |
| 2 | 2.36-mm | X | X | X | 0.10 | | | | |
| 3 | 0.075-mm | X | X | X | 0.15 | | | | |
| 4 | Asphalt binder content (%) | | | | 0.30 | CT 379 or 382 | JMF ± 0.45 | JMF ± 0.45 | JMF ± 0.5 |
| 5 | Percent of maximum theoretical density (%) ^{d, e} | | | | 0.40 | CT 375 | 92 – 96 | 92 – 96 | 91 – 96 |
| | Sand equivalent (min.) ^f | | | | | CT 217 | 47 | 42 | 47 |
| | Stabilometer value (min.) ^{f, g} 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings | | | | | CT 366 | 30 37 | 30 35 | -- 23 |
| | Air voids content (%) ^{f, h} | | | | | CT 367 | 4 ± 2 | 4 ± 2 | Specification ± 2 |
| | Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min.) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face | | | | | CT 205 | 90 70 | 25 -- | -- 90 |
| | HMA moisture content (% max.) | | | | | CT 226 or CT 370 | 1.0 | 1.0 | 1.0 |
| | Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev. | | | | | CT 211 | 12 45 | -- 50 | 12 45 |
| | Fine aggregate angularity (% min.) | | | | | AASHTO T 304, Method A | 45 | 45 | 45 |
| | Flat and elongated particle (% max. by mass @ 5:1) | | | | | ASTM D 4791 | Report only | Report only | Report only |
| | Voids in mineral aggregate (% min.) ⁱ 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading | | | | | LP-2 | 17.0 15.0 14.0 13.0 | 17.0 15.0 14.0 13.0 | (Note j) -- -- 18.0 - 23.0 18.0 - 23.0 |
| | Voids filled with asphalt (%) ⁱ 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading | | | | | LP-3 | 76.0 - 80.0 73.0 - 76.0 65.0 - 75.0 65.0 - 75.0 | 76.0 - 80.0 73.0 - 76.0 65.0 - 75.0 65.0 - 75.0 | Report only |
| | Dust proportion ⁱ 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings | | | | | LP-4 | 0.9 - 2.0 0.6 - 1.3 | 0.9 - 2.0 0.6 - 1.3 | Report only |

| | | | | | | |
|--|-----------------------|--|-----------------|---|---|---|
| | Smoothness | | Section 39-1.12 | 3.66-m straight-edge, must-grind, and PI ₀ | 3.66-m straight-edge, must-grind, and PI ₀ | 3.66-m straight-edge, must-grind, and PI ₀ |
| | Asphalt binder | | Various | Section 92 | Section 92 | Section 92 |
| | Asphalt rubber binder | | Various | -- | -- | Section 92-1.02(C) and Section 39-1.02D |
| | Asphalt modifier | | Various | -- | -- | Section 39-1.02D |
| | Crumb rubber modifier | | Various | -- | -- | Section 39-1.02D |

Notes:

^a The Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

^b "X" denotes the sieves the Engineer considers for the specified aggregate gradation.

^c The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

^d The Engineer determines percent of maximum theoretical density if the specified paved thickness is at least 45 mm under California Test 375 except the Engineer uses:

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

^e The Engineer determines maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

^f The Engineer reports the average of 3 tests from a single split sample.

^g Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."

^h The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

ⁱ Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.

^j Voids in mineral aggregate for RHMA-G must be within this range.

The Engineer determines the percent of maximum theoretical density from the average density of 3 density cores you take from every 750 tonnes of production or part thereof divided by the maximum theoretical density.

If the specified total paved thickness is at least 45 mm and any layer is less than 45 mm, the Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness.

The Engineer stops production and terminates a lot if:

1. The lot's composite quality factor, Q_{FC} , or an individual quality factor, $Q_{F_{QCi}}$ for $i = 3, 4, \text{ or } 5$, is below 0.90 determined under Section 39-4.03F, "Statistical Evaluation"
2. An individual quality factor, $Q_{F_{QCi}}$ for $i = 1 \text{ or } 2$, is below 0.75
3. Quality characteristics for which a quality factor, $Q_{F_{QCi}}$, is not determined has 2 consecutive acceptance or quality control tests not in compliance with the specifications

For any single quality characteristic for which a quality factor, $Q_{F_{QCi}}$, is not determined, except smoothness, if 2 consecutive acceptance test results do not comply with specifications:

1. Stop production.
2. Take corrective action.
3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

39-4.05B Statistical Evaluation, Determination Of Quality Factors And Acceptance

Statistical Evaluation and Determination of Quality Factors

To determine the individual quality factor, QF_{QC_i} , for any quality factor $i = 1$ through 5 or a lot's composite quality factor, QF_C , for acceptance and payment adjustment, the Engineer uses the evaluation specifications under Section 39-4.03F, "Statistical Evaluation," and:

1. Verified quality control test results for aggregate gradation
2. Verified quality control test results for asphalt binder content
3. The Engineer's test results for percent of maximum theoretical density

Lot Acceptance Based on Quality Factors

The Engineer accepts a lot based on the quality factors determined for aggregate gradation and asphalt binder content, QF_{QC_i} for $i = 1$ through 4, using the total number of verified quality control test result values and the total percent defective ($P_U + P_L$).

The Engineer accepts a lot based on the quality factor determined for maximum theoretical density, QF_{QC_5} , using the total number of test result values from density cores and the total percent defective ($P_U + P_L$).

The Engineer calculates the quality factor for the lot, QF_C , which is a composite of weighted individual quality factors, QF_{QC_i} , determined for each quality characteristic in the HMA Acceptance – QC / QA table in Section 39-4.05A, "Testing."

The Engineer accepts a lot based on quality factors if:

1. The current composite quality factor, QF_C , is 0.90 or greater
2. Each individual quality factor, QF_{QC_i} for $i = 3, 4,$ and 5 , is 0.90 or greater
3. Each individual quality factor, QF_{QC_i} for $i = 1$ and 2 , is 0.75 or greater

No single quality characteristic test may represent more than the smaller of 750 tonnes or 1 day's production.

Payment Adjustment

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

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

where:

| | |
|---------------|---|
| $PA =$ | Payment adjustment rounded to 2 decimal places. |
| $HMA CP =$ | HMA contract price. |
| $HMATT =$ | HMA total tonnes represented in the lot. |
| $WHMATT_i =$ | Total tonnes of waived quality characteristic HMA. |
| $QF_{QC_i} =$ | Running quality factor for the individual quality characteristic. QF_{QC_i} for $i = 1$ through 4 must be from verified Contractor's QC results. QF_{QC_5} must be determined from the Engineer's results on density cores taken for percent of maximum theoretical density determination. |
| $w =$ | Weighting factor listed in the HMA acceptance table. |
| $i =$ | Quality characteristic index number in the HMA acceptance table. |

If the payment adjustment is a negative value, the Engineer deducts this amount from payment. If the payment adjustment is a positive value, the Engineer adds this amount to payment.

The 21st subplot becomes the 1st subplot ($n = 1$) in the next lot. When the 21st sequential subplot becomes the 1st subplot, the previous 20 sequential sublots become a lot for which the Engineer determines a quality factor. The Engineer uses this quality factor to pay for the HMA in the lot. If the next lot consists of less than 8 sublots, these sublots must be added to the previous lot for quality factor determination using 21 to 27 sublots.

39-4.05C Dispute Resolution

For a lot, if you or the Engineer dispute any quality factor, QF_{QC_i} , or verification test result, every subplot in that lot must be retested.

Referee tests must be performed under the specifications for acceptance testing.

Any quality factor, QF_{QC_i} , must be determined using the referee tests.

For any quality factor, QF_{QC_i} , for $i = 1$ through 5, dispute resolution:

1. If the difference between the quality factors for QF_{QC_i} using the referee test result and the disputed test result is less than or equal to 0.01, the original test result is correct.
2. If the difference between the quality factor for QF_{QC_i} using the referee test result and the disputed test result is more than 0.01, the quality factor determined from the referee tests supersedes the previously determined quality factor.

39-5 MEASUREMENT AND PAYMENT

39-5.01 MEASUREMENT

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

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

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

1. Total aggregate and supplemental fine aggregate mass per batch is printed. If supplemental fine aggregate is weighed cumulatively with the aggregate, the total aggregate batch mass must include the supplemental fine aggregate mass.
2. Total asphalt binder mass per batch is printed.
3. Each truckload's zero tolerance mass is printed before weighing the first batch and after weighing the last batch.
4. Time, date, mix number, load number and truck identification is correlated with a load slip.
5. A copy of the recorded batch mass is certified by a licensed weighmaster and submitted to the Engineer.

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

The contract item for shoulder rumble strips is measured by the station along each shoulder on which the rumble strips are constructed without deductions for gaps between indentations.

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

39-5.02 PAYMENT

The contract prices paid per tonne for hot mix asphalt as designated in the Engineer's Estimate include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in constructing hot mix asphalt, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

If HMA is specified to comply with Section 39-4, "Quality Control / Quality Assurance," the Engineer adjusts payment under that section.

Full compensation for the Quality Control Plan and prepaving conference is included in the contract prices paid per tonne for hot mix asphalt as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for performing and submitting mix designs and for Contractor sampling, testing, inspection, testing facilities, and preparation and submittal of results is included in the contract prices paid per tonne for HMA as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

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

The contract price paid per tonne for hot mix asphalt (leveling) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in hot mix asphalt (leveling), complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The contract prices paid per station for rumble strips as designated in the Engineer's Estimate include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in constructing rumble strips, including fog seal coat, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The State will pay for HMA dike at the contract price per linear meter for place HMA dike and by the tonne for HMA. The contract prices paid per linear meter for place hot mix asphalt dike as designated in the Engineer's Estimate include full compensation for furnishing all labor, tools, equipment, and incidentals, and for doing all the work involved in placing HMA dike, complete in place, including excavation, backfill, and preparation of the area to receive the dike, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The State pays for HMA specified to be a miscellaneous area at the contract price per square meter for place hot mix asphalt (miscellaneous area) and per tonne for hot mix asphalt. The contract price paid per square meter for place hot mix asphalt (miscellaneous area) includes full compensation for furnishing all labor, tools, equipment, and incidentals, and for doing all the work involved in placing HMA (miscellaneous area) complete in place, including excavation, backfill, and preparation of the area to receive HMA (miscellaneous area), as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

If the Quality Control / Quality Assurance construction process is specified, HMA placed in dikes and miscellaneous areas is paid for at the contract price per tonne for hot mix asphalt under Section 39-4, "Quality Control / Quality Assurance." Section 39-4.05B, "Statistical Evaluation, Determination of Quality Factors and Acceptance," does not apply to HMA placed in dikes and miscellaneous areas.

If there are no contract items for place hot mix asphalt dike and place hot mix asphalt (miscellaneous area) and the work is specified, full compensation for constructing HMA dikes and HMA (miscellaneous areas) including excavation, backfill, and preparation of the area to receive HMA dike or HMA (miscellaneous area) is included in the contract price paid per tonne for the hot mix asphalt designated in the Engineer's Estimate and no separate payment will be made therefor.

The contract price paid per square meter for geosynthetic pavement interlayer includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing geosynthetic pavement interlayer, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The contract price paid per tonne for paving asphalt (binder, geosynthetic pavement interlayer) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying paving asphalt (binder, geosynthetic pavement interlayer), complete in place, including spreading sand to cover exposed binder material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

Full compensation for small quantities of HMA placed on geosynthetic pavement interlayer to prevent displacement during construction is included in the contract price paid per tonne for the HMA being paved over the interlayer and no separate payment will be made therefor.

The contract price paid per tonne for tack coat includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying tack coat, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The Engineer does not adjust payment for increases or decreases in the quantities for tack coat, regardless of the reason for the increase or decrease. Section 4-1.03B, "Increased or Decreased Quantities," does not apply to the items for tack coat.

Full compensation for performing smoothness testing, submitting written and electronic copies of tests, and performing corrective work including applying fog seal coat is included in the contract price paid per tonne for the HMA designated in the Engineer's Estimate and no separate payment will be made therefor.

Full compensation for spreading sand on RHMA-G, RHMA-O, and RHMA-O-HB surfaces and for sweeping and removing excess sand is included in the contract price paid per tonne for rubberized hot mix asphalt as designated in the Engineer's Estimate and no separate payment will be made therefor.

If the Engineer fails to comply with a specification within a specified time, and if, in the opinion of the Engineer, work completion is delayed because of the failure, the Engineer adjusts payment and contract time under Section 8-1.09, "Right of Way Delays."

If the dispute resolution ITP determines the Engineer's test results are correct, the Engineer deducts the ITP's testing costs from payments. If the ITP determines your test results are correct, the State pays the ITP's testing costs. If, in the Engineer's opinion, work completion is delayed because of incorrect Engineer test results, the Engineer adjusts payment and contract time under Section 8-1.09, "Right of Way Delays."

In Section 49-1.05 replace the 1st paragraph with:

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

In Section 49-1.05 replace the 7th paragraph with:

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

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

In Section 49-1.07 replace the 2nd paragraph with:

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

Replace Section 49-1.08 with:

49-1.08 PILE DRIVING ACCEPTANCE CRITERIA

Except for piles to be load tested, driven piles shall be driven to a value of not less than the nominal resistance shown on the plans unless otherwise specified in the special provisions or permitted in writing by the Engineer. In addition, when a pile tip elevation is specified, driven piles shall penetrate at least to the specified tip elevation, unless otherwise permitted in writing by the Engineer. Piles to be load tested shall be driven to the specified tip elevation.

When the pile nominal resistance is omitted from the plans or the special provisions, timber piles shall be driven to a nominal resistance of 800 kN, and steel and concrete piles shall be driven to a nominal resistance of 1250 kN.

The nominal resistance for driven piles shall be determined from the following formula in which " R_u " is the nominal resistance in kilonewtons, " E_r " is the manufacturer's rating for joules of energy developed by the hammer at the observed field drop height, and " N " is the number of hammer blows in the last 300 millimeters. (maximum value to be used for N is 100):

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

In Section 49-2.03 replace the 1st paragraph with:

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

In Section 49-2.04 replace the 1st paragraph with:

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

In Section 49-3.01 the 5th paragraph is deleted

In Section 49-3.01 replace the 6th and 7th paragraphs with:

Except for precast prestressed concrete piles in a corrosive environment, lifting anchors used in precast prestressed concrete piles shall be removed, and the holes filled in conformance with the provisions in Section 51-1.18A, "Ordinary Surface Finish."

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

In Section 49-4.01 replace the 1st and 2nd paragraphs with:

Cast-in-place concrete piles shall consist of one of the following:

- A. Steel shells driven permanently to the required nominal resistance and penetration and filled with concrete.
- B. Steel casings installed permanently to the required penetration and filled with concrete.
- C. Drilled holes filled with concrete.
- D. Rock sockets filled with concrete.

The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 25 MPa. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading. Concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," and Section 51, "Concrete Structures." Reinforcement shall conform to the provisions in Section 52, "Reinforcement."

In Section 49-4.03 replace the 4th paragraph with:

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

In Section 49-4.04 replace the 1st and 2nd paragraphs with:

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

In Section 49-4.05 replace the 1st paragraph with:

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

In Section 49-4.05 replace the 3rd paragraph with:

Steel pipe piles shall conform to the following requirements:

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

In Section 49-6.01 replace the 1st paragraph with:

The length of timber, steel, and precast prestressed concrete piles, and of cast-in-place concrete piles consisting of driven shells filled with concrete, shall be measured along the longest side, from the tip elevation shown on the plans to the plane of pile cut-off.

In Section 49-6.02 replace the 3rd paragraph with:

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

In Section 49-6.02 replace the 7th paragraph with:

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

In Section 49-6.02 replace the 9th paragraph with:

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

In Section 49-6.02, add:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

In Section 50-1.07 replace the 2nd paragraph with:

Ducts shall be fabricated with either welded or interlocked seams. Galvanizing of the welded seam will not be required. Ducts shall have sufficient strength to maintain their correct alignment during placing of concrete. Joints between sections of duct shall be positive metallic connections which do not result in angle changes at the joints. Waterproof tape shall be used at the connections. Ducts shall be bent without crimping or flattening. Transition couplings connecting the ducts to anchoring devices shall be either ferrous metal or polyolefin. Ferrous metal transition couplings need not be galvanized.

In Section 50-1.07 replace the 7th paragraph with:

All ducts with a total length of 120 m or more shall be vented. Vents shall be placed at intervals of not more than 120 m and shall be located within 2 m of every high point in the duct profile. Vents shall be 12 mm minimum diameter standard pipe or suitable plastic pipe. Connections to ducts shall be made with metallic or plastic structural fasteners. Plastic components, if selected, shall not react with the concrete or enhance corrosion of the prestressing steel and shall be free of water soluble chlorides. The vents shall be mortar tight, taped as necessary, and shall provide means for injection of grout through the vents and for sealing the vents. Ends of vents shall be removed 25 mm below the roadway surface after grouting has been completed.

In Section 50-1.08 replace the 6th paragraph with:

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

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

Where:

T_o = steel stress at jacking end

T_x = steel stress at any point x

e = base of Napierian logarithms

μ = friction curvature coefficient

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

K = friction wobble coefficient (=0.00066/m)

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

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

* With the use of lubrication

In Section 50-1.08 in the 11th paragraph, replace item 2 with:

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

panels may be placed with the long dimension parallel to the footing. Form panels on each side of the panel joint shall be precisely aligned, by means of supports or fasteners common to both panels, to result in a continuous unbroken concrete plane surface. When prefabricated soffit panels are used, form filler panels joining prefabricated panels shall have a uniform minimum width of 0.3-m and shall produce a smooth uniform surface with consistent longitudinal joint lines between the prefabricated panels.

In Section 51-1.06A replace the 1st paragraph with:

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

In Section 51-1.06A replace the 2nd paragraph with:

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

In Section 51-1.06A replace the 7th paragraph with:

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

In Section 51-1.06A, add:

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

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

In Section 51-1.06A(1) replace the 1st paragraph with:

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

In Section 51-1.06A(1) replace the 8th paragraph with:

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

In Section 51-1.06B replace the 3rd paragraph with:

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

In Section 51-1.06B, add:

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

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

In Section 51-1.06C, add:

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

In Section 51-1.09 replace the 6th paragraph with:

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

In Section 51-1.11 replace the 6th paragraph with:

Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations."

In Section 51-1.12D replace the 4th paragraph with:

Expanded polystyrene shall be a commercially available polystyrene board. Expanded polystyrene shall have a minimum flexural strength of 240 kPa determined in conformance with the requirements in ASTM Designation: C 203 and a compressive yield strength of between 110 and 275 kPa at 5 percent compression. Surfaces of expanded polystyrene against which concrete is placed shall be faced with hardboard. Hardboard shall be 3 mm minimum thickness, conforming to ANSI A135.4, any class. Other facing materials may be used provided they furnish equivalent protection. Boards shall be held in place by nails, waterproof adhesive, or other means approved by the Engineer.

In Section 51-1.12F, add:

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

In Section 51-1.12F replace the 1st and 2nd paragraphs with:

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

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

In Section 51-1.12F replace the 4th and 5th paragraphs with:

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

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

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

In Section 51-1.12F(3)(a) replace the 1st and 2nd paragraphs with:

The sealant must consist of a 2-component silicone sealant that will withstand up to ±50 percent movement. Silicone sealants must be tested under California Test 435 and must comply with the following:

| Specification | Requirement |
|---|---|
| Modulus at 150 percent elongation | 35–520 kPa |
| Recovery | 17 mm max. |
| Notch Test | Notched or loss of bond 6 mm, max. |
| Water Resistance | Notched or loss of bond 6 mm, max. |
| Ultraviolet Exposure ASTM Designation: G 154, Table X2.1, Cycle 2. | No more than slight checking or cracking. |
| Cone Penetration | 4.5-12.0 mm |

In Section 51-1.12F(3)(a) delete the 3rd and 8th paragraphs.

In Section 51-1.12F(3)(a) replace the 10th paragraph with:

A Certificate of Compliance accompanied by a certified test report must be furnished for each batch of silicone sealant in conformance with the provisions in Section 6-1.07, "Certificates of Compliance."

In Section 51-1.12F(3)(b) replace the 2nd paragraph with:

The preformed elastomeric joint seal must conform to the requirements in ASTM D 2628 and the following:

1. The seal must consist of a multichannel, nonporous, homogeneous material furnished in a finished extruded form.
2. The minimum depth of the seal measured at the contact surface must be at least 95 percent of the minimum uncompressed width of the seal as designated by the manufacturer.
3. When tested in conformance with the requirements in California Test 673 for Type B seals, joint seals must provide a movement rating (MR) of not less than that shown on the plans.
4. The top and bottom edges of the joint seal must maintain continuous contact with the sides of the groove over the entire range of joint movement.
5. The seal must be furnished full length for each joint with no more than 1 shop splice in any 18 m length of seal.
6. The Contractor must demonstrate the adequacy of the procedures to be used in the work before installing seals in the joints.
7. One field splice per joint may be made at locations and by methods approved by the Engineer. The seals are to be manufactured full length for the intended joint, then cut at the approved splice section and rematched before splicing. The Contractor must submit splicing details prepared by the joint seal manufacturer for approval before beginning splicing work.
8. Shop splices and field splices must have no visible offset of exterior surfaces and must show no evidence of bond failure.
9. At all open ends of the seal that would admit water or debris, each cell must be filled to a depth of 80 mm with commercial quality open cell polyurethane foam or closed by other means subject to approval by the Engineer.

In Section 51-1.12F(3)(b) replace the 7th paragraph with:

The joint seal must be installed full length for each joint with equipment that does not twist or distort the seal, elongate the seal longitudinally, or otherwise cause damage to the seal or to the concrete forming the groove.

Replace Section 51-1.12F(3)(c), with:

(c) Joint Seal Assemblies and Seismic Joints

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

In Section 51-1.12H(1) replace the 8th paragraph with:

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

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

In Section 51-1.12H(1) in the 9th paragraph replace the table, with:

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

In Section 51-1.12H(2) replace the 1st paragraph with:

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

- A. The bearings shall consist of alternating steel laminates and internal elastomer laminates with top and bottom elastomer covers. Steel laminates shall have a nominal thickness of 1.9 mm (14 gage). Internal elastomer laminates shall have a thickness of 12 mm, and top and bottom elastomer covers shall each have a thickness of 6 mm. The combined thickness of internal elastomer laminates and top and bottom elastomer covers shall be equal to the bearing pad thickness shown on the plans. The elastomer cover to the steel laminates at the sides of the bearing shall be 3 mm. If guide pins or other devices are used to control the side cover over the steel laminates, any exposed portions of the steel laminates shall be sealed by vulcanized patching. The length, width, or diameter of the bearings shall be as shown on the plans.
- B. The total thickness of the bearings shall be equal to the thickness of elastomer laminates and covers plus the thickness of the steel laminates.
- C. Elastomer for steel reinforced elastomeric bearings shall conform to the provisions for elastomer in Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads."
- D. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer certifying that the bearings to be furnished conform to all of the above provisions. The Certificate of Compliance shall be supported by a certified copy of the results of tests performed by the manufacturer on the bearings.

- E. One sample bearing shall be furnished to the Engineer from each lot of bearings to be furnished for the contract. Samples shall be available at least 3 weeks in advance of intended use. The sample bearing shall be one of the following:

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

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

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

In Section 51-1.135 replace the 1st paragraph with:

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

In Section 51-1.135 replace the 3rd paragraph with:

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

In Section 51-1.14 replace the 4th paragraph with:

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

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

In Section 51-1.17 in 4th paragraph, replace the 1st sentence with:

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

In Section 51-1.17 delete the 7th paragraph

In Section 51-1.17 delete the 13th paragraph

In Section 51-1.17 delete the 14th paragraph

Add Section:

51-1.17A DECK CRACK TREATMENT

The Contractor shall use all means necessary to minimize the development of shrinkage cracks.

The Contractor shall remove all equipment and materials from the deck and clean the surface as necessary for the Engineer to measure the surface crack intensity. Surface crack intensity will be determined by the Engineer after completion of concrete cure, before prestressing, and before the release of falsework. In any 50 square meter portion of deck within the limits of the new concrete deck, should the intensity of cracking be such that there are more than 5 m of cracks whose width at any location exceeds 0.5 mm, the deck shall be treated with methacrylate resin. The area of deck to be treated shall have a width that extends for the entire width of new deck inside the concrete barriers and a length that extends at least 1.5 m beyond the furthest single continuous crack outside the 50 square meter portion, measured from where that crack exceeds 0.5 mm in width, as determined by the Engineer.

Deck crack treatment shall include furnishing, testing, and application of methacrylate resin and sand. If grinding is required, deck treatment shall take place before grinding.

51-1.17A(1) Submittals

Before starting deck treatment, the Contractor shall submit plans in conformance with Section 5-1.02, "Plans and Working Drawings," for the following:

1. Public safety plan for the use of methacrylate resin
2. Placement plan for the construction operation

The plans shall identify materials, equipment, and methods to be used.

The public safety plan for the use of methacrylate resin shall include details for the following:

1. Shipping
2. Storage
3. Handling
4. Disposal of residual methacrylate resin and the containers

The placement plan for construction shall include the following:

1. Schedule of deck treatment for each bridge. The schedule shall be consistent with "Maintaining Traffic," of the special provisions and shall include time for the Engineer to perform California Test 342.
2. Methods and materials to be used, including the following:
 - 2.1. Description of equipment for applying the resin
 - 2.2. Description of equipment for applying the sand
 - 2.3. Gel time range and final cure time for the resin

If the measures proposed in the safety plan are inadequate to provide for public safety associated with the use of methacrylate resin, the Engineer will reject the plan and direct the Contractor to revise the plan. Directions for revisions will be in writing and include detailed comments. The Engineer will notify the Contractor of the approval or rejection of a submitted or revised plan within 15 days of receipt of that plan.

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

51-1.17A(2) Materials

Before using methacrylate resin, a Material Safety Data Sheet shall be submitted for each shipment of resin.

Methacrylate resin shall be low odor and have a high molecular weight. Before adding initiator, the resin shall have a maximum volatile content of 30 percent when tested in conformance with the requirements in ASTM Designation: D 2369, and shall conform to the following:

| PROPERTY | REQUIREMENT | TEST METHOD |
|--|---|---|
| * Viscosity | 0.025 Pa·s, maximum, (Brookfield RVT with UL adaptor, 50 RPM at 25°C) | ASTM D 2196 |
| * Specific Gravity | 0.90 minimum, at 25°C | ASTM D 1475 |
| * Flash Point | 82°C, minimum | ASTM D 3278 |
| * Vapor Pressure | 1.0 mm Hg, maximum, at 25°C | ASTM D 323 |
| Tack-free Time | 400 minutes, maximum, at 25°C | Specimen prepared per California Test 551 |
| PCC Saturated Surface-Dry Bond Strength | 3.5 MPa, minimum at 24 hours and 21±1°C | California Test 551 |
| * Test shall be performed before adding initiator. | | |

51-1.17A(3) Testing

The Contractor shall allow 20 days for sampling and testing by the Engineer of the methacrylate resin before proposed use. If bulk resin is to be used, the Contractor shall notify the Engineer in writing at least 15 days before the delivery of the bulk resin to the job site. Bulk resin is any resin stored in containers in excess of 209 liters.

Before starting production treatment, the Contractor shall treat a test area of approximately 50 square meters that is within the project limits and at a location approved by the Engineer. When available the test area shall be outside of the traveled way. Weather and pavement conditions during the test treatment shall be similar to those expected on the deck. Equipment used for testing shall be similar to those used for deck treating operations.

During test and production deck treatment, test tiles shall be used to evaluate the resin cure time. The Contractor shall coat at least one 102 mm x 102 mm commercial quality smooth glazed tile for each batch of methacrylate resin. The coated tile shall be placed adjacent to the corresponding treated area. Sand shall not be applied to the test tiles.

The acceptance criteria for a treated area is as follows:

1. The test tiles are dry to the touch.
2. The treated deck surface is tack free (non-oily).
3. The sand cover adheres and resists brushing by hand.
4. Excess sand has been removed by vacuuming or sweeping.
5. The coefficient of friction is at least 0.35 when tested in conformance with California Test 342.

If a test or production area fails to meet the acceptance criteria, as determined by the Engineer, the treatment will be rejected, and the treatment shall be removed and replaced until the area complies with the acceptance criteria.

51-1.17A(4) Construction

Equipment shall be fitted with suitable traps, filters, drip pans, or other devices as necessary to prevent oil or other deleterious material from being deposited on the deck.

Before deck treatment with methacrylate resin, the bridge deck surface shall be cleaned by abrasive blasting, and all loose material shall be blown from visible cracks using high-pressure air. Concrete curing seals shall be cleaned from the deck surface to be treated, and the deck shall be dry when blast cleaning is performed. If the deck surface becomes contaminated at any time before placing the resin, the deck surface shall be cleaned by abrasive blasting.

Where abrasive blasting is being performed within 3 m of a lane occupied by public traffic, the residue including dust shall be removed immediately after contact between the abrasive and the surface being treated. The removal shall be by a vacuum attachment operating concurrently with the abrasive blasting operation.

A compatible promoter/initiator system shall be capable of providing the resin gel time range shown on the placement plan. Gel time shall be adjusted to compensate for the changes in temperature throughout treatment application.

Resin shall be applied by machine and by using a two-part resin system with a promoted resin for one part and an initiated resin for the other part. This two-part resin system shall be combined at equal volumes to the spray bars through separate positive displacement pumps. Combining of the 2 components shall be by either static in-line mixers or by external intersecting spray fans. The pump pressure at the spray bars shall not be great enough to cause appreciable atomization of the resin. Compressed air shall not be used to produce the spray. A shroud shall be used to enclose the spray bar apparatus.

At the Contractor's option, manual application may be used. For manual application, (1) the quantity of resin mixed with promoter and initiator shall be limited to 20 L at a time, and (2) the resin shall be distributed by squeegees and brooms within 10 minutes after application.

The Contractor shall apply methacrylate resin only to the specified area. Barriers, railing, joints, and drainage facilities shall be adequately protected to prevent contamination by the treatment material. Contaminated items shall be repaired at the Contractor's expense.

The relative humidity shall be less than 90 percent at the time of treatment. The prepared area shall be dry and the surface temperature shall be at least 10°C , and not more than 38°C when the resin is applied. The rate of application of promoted/initiated resin shall be 2.2 square meter per liter; the exact rate shall be determined by the Engineer.

The deck surfaces to be treated shall be completely covered with resin so the resin penetrates and fills all cracks. The resin shall be applied within 5 minutes after complete mixing. A significant increase in viscosity shall be cause for rejection. Excess material shall be redistributed by squeegees or brooms within 10 minutes after application. For textured deck surfaces, including grooved surfaces, excess material shall be removed from the texture indentations.

After the resin has been applied, at least 20 minutes shall elapse before applying sand. The sand shall be commercial quality dry blast sand. At least 95 percent of the sand shall pass the 2.36-mm sieve and at least 95 percent shall be retained on the 850-µm sieve. The sand shall be applied at a rate of approximately one kilogram per square meter or until refusal as determined by the Engineer.

Traffic will not be allowed on treated areas until the acceptance criteria has been met as determined by the Engineer.

In Section 51-1.18C replace the 2nd paragraph with:

When Class 2 surface finish (gun finish) is specified, ordinary surface finish shall first be completed. The concrete surfaces shall then be abrasive blasted to a rough texture and thoroughly washed down with water. While the washed surfaces are damp, but not wet, a finish coating of machine applied mortar, approximately 6 mm thick, shall be applied in not less than 2 passes. The coating shall be pneumatically applied and shall consist of either (1) sand, cementitious material, and water mechanically mixed prior to its introduction to the nozzle or (2) premixed sand and cementitious material to which water is added prior to its expulsion from the nozzle. The use of admixtures shall be subject to the approval of the Engineer as provided in Section 90, "Portland Cement Concrete." Unless otherwise specified, supplementary cementitious materials will not be required. The proportion of cementitious material to sand shall be not less than one to 4, unless otherwise directed by the Engineer. Sand shall be of a grading suitable for the purpose intended. The machines shall be operated and the coating shall be applied in conformance with standard practice. The coating shall be firmly bonded to the concrete surfaces on which it is applied.

In Section 51-1.18C replace the 5th paragraph with:

When surfaces to be finished are in pedestrian undercrossings, the sand shall be silica sand and the cementitious material shall be standard white portland cement.

be applied to the bar reinforcing steel assemblage, or to a combined assemblage of reinforcing steel and forms, shall be the sum of the products of the wind impact area and the applicable wind pressure value for each height zone. The wind impact area is the total projected area of the cage normal to the direction of the applied wind. Wind pressure values shall be determined from the following table:

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

Replace Section 52-1.08 with:

52-1.08 SPLICING

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

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

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

52-1.08A Lap Splicing Requirements

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

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

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

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

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

Splices in bundled bars shall conform to the following:

- A. In bundles of 2 bars, the length of the lap splice shall be the same as the length of a single bar lap splice.
- B. In bundles of 3 bars, the length of the lap splice shall be 1.2 times the length of a single bar lap splice.

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

- A. 150 mm,
- B. The spacing of the cross wires plus 50 mm, or
- C. The numerical value of the longitudinal wire size (MW-Size Number) times 370 divided by the spacing of the longitudinal wires in millimeters.

52-1.08B Service Splicing and Ultimate Butt Splicing Requirements

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

52-1.08B(1) Mechanical Splices

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

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

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

Slip requirements shall not apply to mechanical lap splices, splices that are welded, or splices that are used on hoops.

Splicing procedures shall be in conformance with the manufacturer's recommendations, except as modified in this section. Splices shall be made using the manufacturer's standard equipment, jigs, clamps, and other required accessories.

Splice devices shall have a clear coverage of not less than 40 mm measured from the surface of the concrete to the outside of the splice device. Stirrups, ties, and other reinforcement shall be adjusted or relocated, and additional reinforcement shall be placed, if necessary, to provide the specified clear coverage to reinforcement.

The Contractor shall furnish the following information for each shipment of splice material in conformance with the provisions in Section 6-1.07, "Certificates of Compliance:"

- A. The type or series identification of the splice material including tracking information for traceability.
- B. The bar grade and size number to be spliced.
- C. A copy of the manufacturer's product literature giving complete data on the splice material and installation procedures.
- D. A statement that the splicing systems and materials used in conformance with the manufacturer's installation procedures will develop the required tensile strengths, based on the nominal bar area, and will conform to the total slip requirements and the other requirements in these specifications.
- E. A statement that the splice material conforms to the type of mechanical splice in the Department's current prequalified list.

52-1.08B(2) Butt Welded Splices

Except for resistance butt welds, butt welded splices of reinforcing bars shall be complete joint penetration butt welds conforming to the requirements in AWS D 1.4, and these specifications.

Welders and welding procedures shall be qualified in conformance with the requirements in AWS D 1.4.

Only the joint details and dimensions as shown in Figure 3.2, "Direct Butt Joints," of AWS D 1.4, shall be used for making complete joint penetration butt welds of bar reinforcement. Split pipe backing shall not be used.

Butt welds shall be made with multiple weld passes using a stringer bead without an appreciable weaving motion. The maximum stringer bead width shall be 2.5 times the diameter of the electrode and slagging shall be performed between each weld pass. Weld reinforcement shall not exceed 4 mm in convexity.

Electrodes used for welding shall meet the minimum Charpy V-notch impact requirement of 27°J at -20°C.

For welding of bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 280 or Grade 420, the requirements of Table 5.2, "Minimum Preheat and Interpass Temperatures," of AWS D 1.4 are superseded by the following:

The minimum preheat and interpass temperatures shall be 200°C for Grade 280 bars and 300°C for Grade 420 bars. Immediately after completing the welding, at least 150 mm of the bar on each side of the splice shall be covered by an insulated wrapping to control the rate of cooling. The insulated wrapping shall remain in place until the bar has cooled below 90°C.

When welding different grades of reinforcing bars, the electrode shall conform to Grade 280 bar requirements and the preheat shall conform to the Grade 420 bar requirements.

In the event that any of the specified preheat, interpass, and post weld cooling temperatures are not met, all weld and heat affected zone metal shall be removed and the splice rewelded.

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

Reinforcing bars shall not be direct butt spliced by thermite welding.

Procedures to be used in making welded splices in reinforcing bars, and welders employed to make splices in reinforcing bars, shall be qualified by tests performed by the Contractor on sample splices of the type to be used, before making splices to be used in the work.

52-1.08B(3) Resistance Butt Welds

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

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

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

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

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

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

Testing on prequalification and production sample splices shall be performed at the Contractor's expense, at an independent qualified testing laboratory. The laboratory shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project, and shall have the following:

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

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

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

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

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

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

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

52-1.08C(1) Splice Prequalification Report

Before using any service splices or ultimate butt splices in the work, the Contractor shall submit a Splice Prequalification Report. The report shall include splice material information, names of the operators who will be performing the splicing, and descriptions of the positions, locations, equipment, and procedures that will be used in the work.

The Splice Prequalification Report shall also include certifications from the fabricator for prequalifications of operators and procedures based on sample tests performed no more than 2 years before submitting the report. Each operator shall be certified by performing 2 sample splices for each bar size of each splice type that the operator will be performing in the work. For deformation-dependent types of splice devices, each operator shall be certified by performing 2 additional samples for each bar size and deformation pattern that will be used in the work.

Prequalification sample splices shall be tested by an independent qualified testing laboratory and shall conform to the appropriate production test criteria and slip requirements specified herein. When epoxy-coated reinforcement is required, resistance butt welded sample splices shall have the weld flash removed by the same procedure as will be used in the work, before coating and testing. The Splice Prequalification Report shall include the certified test results for all prequalification sample splices.

The QCM shall review and approve the Splice Prequalification Report before submitting it to the Engineer for approval. The Contractor shall allow 2 weeks for the review and approval of a complete report before performing any service splicing or ultimate butt splicing in the work. In the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

52-1.08C(2) Service Splice Test Criteria

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

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

Production tests shall be performed by the Contractor's independent laboratory for all service splices used in the work. A production test shall consist of testing 4 sample splices prepared for each lot of completed splices. The samples shall be prepared by the Contractor using the same splice material, position, operators, location, and equipment, and following the same procedure as used in the work.

At least one week before testing, the Contractor shall notify the Engineer in writing of the date when and the location where the testing of the samples will be performed.

The 4 samples from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 samples of splices shall not be tested.

Before performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the requirements for total slip. Should this sample not meet the total slip requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. Should any of the 3 remaining samples not conform to the total slip requirements, all splices in the lot represented by this production test will be rejected.

If 3 or more sample splices from a production test conform to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable.

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

If only one sample splice from a production test conforms to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," all splices in the lot represented by this production test will be rejected.

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

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

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

These 4 additional quality assurance sample splices shall be shipped to the Transportation Laboratory for quality assurance testing. The 4 sample splices shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 samples of splices will not be tested. Sample splices not accompanied by the supporting documentation required in Section 52-1.08B(1), for mechanical splices, or in Section 52-1.08B(3), for resistance butt welds, will not be tested.

Quality assurance testing will be performed in conformance with the requirements for service production sample splices in Section 52-1.08C(2)(a), "Production Test Requirements for Service Splices."

52-1.08C(3) Ultimate Butt Splice Test Criteria

Ultimate production and quality assurance sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370 and California Test 670.

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

Each sample splice and its associated control bar shall be identified and marked as a set. Each set shall be identified as representing a prequalification, production, or quality assurance sample splice.

The portion of hoop reinforcing bar, removed to obtain a sample splice and control bar, shall be replaced using a prequalified ultimate mechanical butt splice, or the hoop shall be replaced in kind.

Reinforcing bars, other than hoops, from which sample splices are removed, shall be repaired using ultimate mechanical butt splices conforming to the provisions in Section 52-1.08C(1), "Splice Prequalification Report," or the bars shall be replaced in kind. These bars shall be repaired or replaced such that no splices are located in any "No Splice Zone" shown on the plans.

Ultimate production and quality assurance sample splices shall rupture in the reinforcing bar either: 1) outside of the affected zone or 2) within the affected zone, provided that the sample splice has achieved at least 95 percent of the ultimate tensile strength of the control bar associated with the sample splice. In addition, necking of the bar, as defined in California Test 670, shall occur at rupture regardless of whether the bar breaks inside or outside the affected zone.

The affected zone is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered by fabrication or installation of the splice.

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

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

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

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

After notification has been received, the Engineer will randomly select the 4 sample splices to be removed from the lot and place tamper-proof markings or seals on them. The Contractor shall select the adjacent control bar for each sample splice bar, and the Engineer will place tamper-proof markings or seals on them. These ultimate production sample splices and control bars shall be removed by the Contractor, and tested by an independent qualified testing laboratory.

At least one week before testing, the Contractor shall notify the Engineer in writing of the date when and the location where the testing of the samples will be performed.

A sample splice or control bar from any set will be rejected if a tamper-proof marking or seal is disturbed before testing.

The 4 sets from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 sets of splices shall not be tested.

Before performing any tensile tests on production test sample splices, one of the 4 sample splices shall be tested for, and shall conform to, the requirements for total slip. Should this sample splice not meet these requirements, one retest, in which the 3 remaining sample splices are tested for total slip, will be allowed. Should any of the 3 remaining sample splices not conform to these requirements, all splices in the lot represented by this production test will be rejected.

If 3 or more sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable.

Should only 2 sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," one additional production test shall be performed on the same lot of splices. Should any of the 4 sample splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.

If only one sample splice from a production test conforms to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be rejected.

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

Production tests will not be required on repaired splices from a lot, regardless of the type of prequalified ultimate mechanical butt splice used to make the repair. However, should an additional production test be required, the Engineer may select any repaired splice for the additional production test.

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

For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 subsequent production tests, or portion thereof, the Contractor shall concurrently prepare 4 additional ultimate quality assurance sample splices along with associated control bars.

Each time 4 additional ultimate quality assurance sample splices are prepared, 2 of these quality assurance sample splice and associated control bar sets and 2 of the production sample splice and associated control bar sets, together, shall conform to the requirements for ultimate production sample splices in Section 52-1.08C(3)(a), "Production Test Requirements for Ultimate Butt Splices."

The 2 remaining quality assurance sample splice and associated control bar sets, along with the 2 remaining production sample splice and associated control bar sets shall be shipped to the Transportation Laboratory for quality assurance testing. The 4 sets shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 sets will not be tested.

Quality assurance testing will be performed in conformance with the requirements for ultimate production sample splices in Section 52-1.08C(3)(a), "Production Test Requirements for Ultimate Butt Splices."

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

When the specifications allow for welded sample splices to be taken from other than the completed lot of splices, the Contractor shall meet the following additional requirements.

Except for resistance butt welded splices, radiographic examinations shall be performed on 25 percent of all complete joint penetration butt welded splices from a production lot. The size of a production lot will be a maximum of 150 splices. The Engineer will select the splices which will compose the production lot and also the splices within each production lot to be radiographically examined.

All required radiographic examinations of complete joint penetration butt welded splices shall be performed by the Contractor in conformance with the requirements in AWS D 1.4 and these specifications.

Before radiographic examination, welds shall conform to the requirements in Section 4.4, "Quality of Welds," of AWS D 1.4.

Should more than 12 percent of the splices which have been radiographically examined in any production lot be defective, an additional 25 percent of the splices, selected by the Engineer from the same production lot, shall be radiographically examined. Should more than 12 percent of the cumulative total of splices tested from the same production lot be defective, all remaining splices in the lot shall be radiographically examined.

Additional radiographic examinations performed due to the identification of defective splices shall be at the Contractor's expense.

All defects shall be repaired in conformance with the requirements in AWS D 1.4.

The Contractor shall notify the Engineer in writing 48 hours before performing any radiographic examinations.

The radiographic procedure used shall conform to the requirements in AWS D1.1, AWS D1.4, and the following:

- A. Two exposures shall be made for each complete joint penetration butt welded splice. For each of the 2 exposures, the radiation source shall be centered on each bar to be radiographed. The first exposure shall be made with the radiation source placed at zero degrees from the top of the weld and perpendicular to the weld root and identified with a station mark of "0." The second exposure shall be at 90 degrees to the "0" station mark and shall be identified with a station mark of "90." When obstructions prevent a 90 degree placement of the radiation source for the second exposure, and when approved in writing by the Engineer, the source may be rotated, around the centerline of the reinforcing bar, a maximum of 25 degrees.
- B. For field produced complete joint penetration butt welds, no more than one weld shall be radiographed during one exposure. For shop produced complete joint penetration butt welds, if more than one weld is to be radiographed during one exposure, the angle between the root line of each weld and the direction to the radiation source shall be not less than 65 degrees.
- C. Radiographs shall be made by either X-ray or gamma ray. Radiographs made by X-ray or gamma rays shall have densities of not less than 2.3 nor more than 3.5 in the area of interest. A tolerance of 0.05 in density is allowed for densitometer variations. Gamma rays shall be from the iridium 192 isotope and the emitting specimen shall not exceed 4.45 mm in the greatest diagonal dimension.
- D. The radiographic film shall be placed perpendicular to the radiation source at all times; parallel to the root line of the weld unless source placement determines that the film must be turned; and as close to the root of the weld as possible.
- E. The minimum source to film distance shall be maintained so as to ensure that all radiographs maintain a maximum geometric unsharpness of 0.020 at all times, regardless of the size of the reinforcing bars.
- F. Penetrators shall be placed on the source side of the bar and perpendicular to the radiation source at all times. One penetrator shall be placed in the center of each bar to be radiographed, perpendicular to the weld root, and adjacent to the weld. Penetrator images shall not appear in the weld area.
- G. When radiography of more than one weld is being performed per exposure, each exposure shall have a minimum of one penetrator per bar, or 3 penetrators per exposure. When 3 penetrators per exposure are used, one penetrator shall be placed on each of the 2 outermost bars of the exposure, and the remaining penetrator shall be placed on a centrally located bar.
- H. An allowable weld buildup of 4 mm may be added to the total material thickness when determining the proper penetrator selection. No image quality indicator equivalency will be accepted. Wire penetrators or penetrator blocks shall not be used.
- I. Penetrators shall be sufficiently shimmed using a radiographically identical material. Penetrator image densities shall be a minimum of 2.0 and a maximum of 3.6.
- J. Radiographic film shall be Class 1, regardless of the size of reinforcing bars.
- K. Radiographs shall be free of film artifacts and processing defects, including, but not limited to, streaks, scratches, pressure marks or marks made for the purpose of identifying film or welding indications.

- L. Each splice shall be clearly identified on each radiograph and the radiograph identification and marking system shall be established between the Contractor and the Engineer before radiographic inspection begins. Film shall be identified by lead numbers only; etching, flashing or writing in identifications of any type will not be permitted. Each piece of film identification information shall be legible and shall include, as a minimum, the following information: Contractor's name, date, name of nondestructive testing firm, initials of radiographer, contract number, part number and weld number. The letter "R" and repair number shall be placed directly after the weld number to designate a radiograph of a repaired weld.
- M. Radiographic film shall be developed within a time range of one minute less to one minute more than the film manufacturer's recommended maximum development time. Sight development will not be allowed.
- N. Processing chemistry shall be done with a consistent mixture and quality, and processing rinses and tanks shall be clean to ensure proper results. Records of all developing processes and any chemical changes to the developing processes shall be kept and furnished to the Engineer upon request. The Engineer may request, at any time, that a sheet of unexposed film be processed in the presence of the Engineer to verify processing chemical and rinse quality.
- O. The results of all radiographic interpretations shall be recorded on a signed certification and a copy kept with the film packet.
- P. Technique sheets prepared in conformance with the requirements in ASME Boiler and Pressure Vessels Code, Section V, Article 2 Section T-291 shall also contain the developer temperature, developing time, fixing duration and all rinse times.

52-1.08D Reporting Test Results

A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory performing the testing and submitted to the QCM for review and approval. The report shall be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include, as a minimum, the following information for each test: contract number, bridge number, lot number and location, bar size, type of splice, length of mechanical splice, length of test specimen, physical condition of test sample splice and any associated control bar, any notable defects, total measured slip, ultimate tensile strength of each splice, and for ultimate butt splices, limits of affected zone, location of visible necking area, ultimate tensile strength and 95 percent of this ultimate tensile strength for each control bar, and a comparison between 95 percent of the ultimate tensile strength of each control bar and the ultimate tensile strength of its associated splice.

The QCM must review, approve, and forward each Production Test Report to the Engineer for review before the splices represented by the report are encased in concrete. The Engineer will have 3 working days to review each Production Test Report and respond in writing after a complete report has been received. Should the Contractor elect to encase any splices before receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review and provide notification within the time allowed, and if, in the opinion of the Engineer, the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

Quality assurance test results for each bundle of 4 sets or 4 samples of splices will be reported in writing to the Contractor within 3 working days after receipt of the bundle by the Transportation Laboratory. In the event that more than one bundle is received on the same day, 2 additional working days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received. Should the Contractor elect to encase splices before receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

In Section 52-1.11 after the 7th paragraph, add:

If a portion or all of the reinforcing steel is epoxy-coated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the

SECTION 55 STEEL STRUCTURES

(Issued 05-02-08)

In Section 55-1.01 replace the 3rd paragraph with:

Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations."

In Section 55-1.01 replace the 4th paragraph with:

Details of connections for highway bridges selected for use by the Contractor shall conform to the AASHTO LRFD Bridge Design Specifications with Caltrans Amendments.

Details of design selected by the Contractor, fabrication and workmanship, for steel railway bridges shall conform to the requirements of the Specifications for Steel Railway Bridges, for Fixed Spans Not Exceeding 400 Feet in Length of the AREMA, as set forth in the special provisions.

In Section 55-1.05 replace the 3rd paragraph with:

Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations."

In Section 55-2.01 replace the 4th and 5th paragraphs with:

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

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

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

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

Structural Steel Materials

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

| | |
|---|---|
| Washers | ASTM: F 844 |
| Components of high-strength steel fastener assemblies for use in structural steel joints: | |
| Bolts | ASTM: A 325, Type 1 |
| Tension control bolts | ASTM: F 1852, Type 1 |
| Nuts | ASTM: A 563, including Appendix X1b |
| Hardened washers | ASTM : F 436, Type 1, Circular, including S1 supplementary requirements |
| Direct tension indicators | ASTM: F 959, Type 325, zinc-coated |
| Carbon steel for forgings, pins and rollers | ASTM: A 668/A 668M, Class D |
| Alloy steel for forgings | ASTM: A 668/A 668M, Class G |
| Pin nuts | ASTM: A 36/A 36M |
| Carbon-steel castings | ASTM: A 27/A 27M, Grade 65-35, Class 1 |
| Malleable iron castings | ASTM: A 47, Grade 32510 or A 47M, Grade 22010 |
| Gray iron castings | ASTM: A 48, Class 30B |
| Carbon steel structural tubing | ASTM: A 500, Grade B or A 501 |
| Steel pipe (Hydrostatic testing will not apply) | ASTM: A 53, Type E or S, Grade B; A 106, Grade B; or A 139, Grade B |
| Stud connectors | ASTM: A 108 and AASHTO/AWS D1.5 |

- a Grades that may be substituted for the equivalent ASTM Designation: A 709 steel, at the Contractor's option, subject to the modifications and additions specified and to the requirements of A 709.
- b Zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

In Section 55-2.02 in the 1st paragraph, replace the 1st sentence with:

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

In Section 55-3.05 replace the 1st paragraph with:

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

In Section 55-3.14, after the 9th paragraph add:

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

In Section 55-3.17 replace the 2nd paragraph with:

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

Replace Section 56-1.02B with:

56-1.02B Sheets

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

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

Replace Section 56-1.02F with:

56-1.02F Steel Walkway Gratings

Steel walkway gratings shall be furnished and installed in conformance with the details shown on the plans and the following provisions:

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

In Section 56-1.03 replace the 5th through the 13th paragraphs with:

Clips, eyes, or removable brackets shall be affixed to all signs and all posts and shall be used to secure the sign during shipping and for lifting and moving during erection as necessary to prevent damage to the finished galvanized or painted surfaces. Brackets on tubular sign structures shall be removed after erection. Details of the devices shall be shown on the working drawings.

High-strength bolted connections, where shown on the plans, shall conform to the provisions in Section 55-3.14, "Bolted Connections," except that only fastener assemblies consisting of a high-strength bolt, nut, hardened washer, and direct tension indicator shall be used.

High-strength fastener assemblies, and any other bolts, nuts, and washers attached to sign structures shall be zinc-coated by the mechanical deposition process.

Nuts for high-strength bolts designated as snug-tight shall not be lubricated.

An alternating snugging and tensioning pattern for anchor bolts and high-strength bolted splices shall be used. Once tensioned, high-strength fastener components and direct tension indicators shall not be reused.

For bolt diameters less than 10 mm, the diameter of the bolt hole shall be not more than 0.80-mm larger than the nominal bolt diameter. For bolt diameters greater than or equal to 10 mm, the diameter of the bolt hole shall be not more than 1.6 mm larger than the nominal bolt diameter.

Sign structures shall be fabricated into the largest practical sections prior to galvanizing.

Ribbed sheet metal panels for box beam closed truss sign structures shall be fastened to the truss members by cap screws or bolts as shown on the plans, or by 4.76 mm stainless steel blind rivets conforming to Industrial Fasteners Institute, Standard IFI-114, Grade 51. The outside diameter of the large flange rivet head shall be not less than 15.88 mm in diameter. Web splices in ribbed sheet metal panels may be made with similar type blind rivets of a size suitable for the thickness of material being connected.

Spalling or chipping of concrete structures shall be repaired by the Contractor at the Contractor's expense.

In Section 56-1.03 after the 13th paragraph add:

Overhead sign supports shall have an aluminum identification plate permanently attached near the base, adjacent to the traffic side on one of the vertical posts, using either stainless steel rivets or stainless steel screws. As a minimum, the information on the plate shall include the name of the manufacturer, the date of manufacture and the contract number.

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

In Section 59-1.05 replace the 2nd paragraph with:

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

In Section 59-2.01, between the 1st and 2nd paragraph add:

Unless otherwise specified, no painting Contractors or subcontractors will be permitted to commence work without having the following current "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council) certifications in good standing:

- A. For cleaning and painting structural steel in the field, certification in conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors (Field Application to Complex Industrial Structures)" (SSPC-QP 1).
- B. For removing paint from structural steel, certification in conformance with the requirements in Qualification Procedure No. 2, "Standard Procedure For Evaluating Painting Contractors (Field Removal of Hazardous Coatings from Complex Structures)" (SSPC-QP 2).
- C. For cleaning and painting structural steel in a permanent painting facility, certification in conformance with the requirements in Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Applicators" (SSPC-QP 3). The AISC's Sophisticated Paint Endorsement (SPE) quality program will be considered equivalent to SSPC-QP 3.

In Section 59-2.03 replace the 3rd paragraph with:

Exposed steel or other metal surfaces to be blast cleaned shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 6, "Commercial Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave all surfaces with a dense, uniform, angular anchor pattern of not less than 35 µm as measured in conformance with the requirements in ASTM Designation: D 4417.

In Section 59-2.06 replace the 1st paragraph with:

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

In Section 59-2.12 replace the 3rd and 4th paragraphs with:

Contact surfaces of stiffeners, railings, built up members or open seam exceeding 6 mils in width that would retain moisture, shall be caulked with polysulfide or polyurethane sealing compound conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O, or other approved material.

The dry film thickness of the paint will be measured in place with a calibrated Type 2 magnetic film thickness gage in conformance with the requirements in SSPC-PA 2, "Measurement of Dry Coating Thickness with Magnetic Gages," of the "SSPC: The Society for Protective Coatings," except that there shall be no limit to the number or location of spot measurements to verify compliance with specified thickness requirements.

In Section 75-1.02 in the 10th paragraph, replace the table with:

| Material | Specification |
|---|--|
| Steel bars, plates and shapes | ASTM Designation: A 36/A 36M or A 575, A 576 (AISI or M Grades 1016 through 1030) |
| Steel fastener components for general applications: | |
| Bolts and studs | ASTM Designation: A 307 |
| Headed anchor bolts | ASTM Designation: A 307, Grade B, including S1 supplementary requirements |
| Nonheaded anchor bolts | ASTM Designation: A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO Designation: M 314 supplementary requirements or AASHTO Designation: M 314, Grade 36 or 55, including S1 supplementary requirements |
| High-strength bolts and studs, threaded rods, and nonheaded anchor bolts | ASTM Designation: A 449, Type 1 |
| Nuts | ASTM Designation: A 563, including Appendix X1* |
| Washers | ASTM Designation: F 844 |
| Components of high-strength steel fastener assemblies for use in structural steel joints: | |
| Bolts | ASTM Designation: A 325, Type 1 |
| Tension control bolts | ASTM Designation: F 1852, Type 1 |
| Nuts | ASTM Designation: A 563, including Appendix X1* |
| Hardened washers | ASTM Designation: F 436, Type 1, Circular, including S1 supplementary requirements |
| Direct tension indicators | ASTM Designation: F 959, Type 325, zinc-coated |
| Stainless steel fasteners (Alloys 304 & 316) for general applications: | |
| Bolts, screws, studs, threaded rods, and nonheaded anchor bolts | ASTM Designation: F 593 or F 738M |
| Nuts | ASTM Designation: F 594 or F 836M |
| Washers | ASTM Designation: A 240/A 240M and ANSI B 18.22M |
| Carbon-steel castings | ASTM Designation: A 27/A 27M, Grade 65-35 [450-240], Class 1 |
| Malleable iron castings | ASTM Designation: A 47, Grade 32510 or A 47M, Grade 22010 |
| Gray iron castings | ASTM Designation: A 48, Class 30B |
| Ductile iron castings | ASTM Designation: A 536, Grade 65-45-12 |
| Cast iron pipe | Commercial quality |
| Steel pipe | Commercial quality, welded or extruded |
| Other parts for general Applications | Commercial quality |

* Zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dyed dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

In Section 75-1.03 replace the 2nd paragraph with:

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

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

In Section 75-1.03 replace the 7th paragraph with:

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

In Section 75-1.03 replace the 13th paragraph with:

Concrete anchorage devices shall be mechanical expansion or resin capsule types installed in drilled holes or cast-in-place insert types. The anchorage devices shall be selected from the Department's Pre-Qualified Products List at:

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

The anchorage devices shall be a complete system, including threaded studs, hex nuts, and cut washers. Thread dimensions for externally threaded concrete anchorage devices prior to zinc coating, shall conform to the requirements in ANSI Standard: B1.1 having Class 2A tolerances or ANSI Standard: B1.13M having Grade 6g tolerances. Thread dimensions for internally threaded concrete anchorage devices shall conform to the requirements in ASTM A 563.

In Section 75-1.03 replace the 18th paragraph with:

Mechanical expansion anchors shall, when installed in accordance with the manufacturer's instructions and these specifications and tested in conformance with the requirements in California Test 681, withstand the application of a sustained tension test load of at least the following values for at least 48 hours with a movement not greater than 0.90 mm:

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

* Maximum stud diameter permitted for mechanical expansion anchors.

Resin capsule anchors shall, when installed in accordance with the manufacturer's instructions and these specifications and tested in conformance with the requirements in California Test 681, withstand the application of a sustained tension test load of at least the following values for at least 48 hours with a movement not greater than 0.25 mm:

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

At least 25 days before use, the Contractor shall submit one sample of each resin capsule anchor per lot to the Transportation Laboratory for testing. A lot of resin capsule anchors is 100 units, or fraction thereof, of the same brand and product name.

In Section 75-1.03 in the 19th paragraph, replace the table with:

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

In Section 75-1.03, replace the 20th paragraph with:

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

In Section 75-1.03 in the 22nd paragraph, replace the table with:

Installation Torque Values, (newton meters)

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

In Section 75-1.03, replace the 24th paragraph with:

Sealing compound, for caulking and adhesive sealing, shall be a polysulfide or polyurethane material conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O.

In Section 83-1.02B replace the 1st paragraph with:

The rail elements, backup plates, terminal sections, end and return caps, bolts, nuts and other fittings shall conform to the requirements in AASHTO Designation: M 180, except as modified in this Section 83-1.02B and as specified in Section 83-1.02. The rail elements, backup plates, terminal sections, end and return caps shall conform to Class A, Type 1 W-Beam guard railing as shown in AASHTO Designation: M 180. The edges and center of the rail element shall contact each post block. Rail element joints shall be lapped not less than 316 mm and bolted. The rail metal, in addition to conforming to the requirements in AASHTO Designation: M 180, shall withstand a cold bend, without cracking, of 180 degrees around a mandrel of a diameter equal to 2.5 times the thickness of the plate.

In Section 83-1.02B replace the 9th paragraph with:

The grades and species of wood posts and blocks shall be No. 1 timbers (also known as No. 1 structural) Douglas fir or No. 1 timbers Southern yellow pine. Wood posts and blocks shall be graded in conformance with the provisions in Section 57-2, "Structural Timber," of the Standard Specifications, except allowances for shrinkage after mill cutting shall in no case exceed 5 percent of the American Lumber Standards minimum sizes, at the time of installation.

In Section 83-1.02B replace the 11th paragraph with:

After fabrication, wood posts and blocks shall be pressure treated in conformance with Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA Use Category System: UC4A, Commodity Specification A.

In Section 83-1.02B replace the 12th paragraph with:

If copper naphthenate, ammoniacal copper arsenate, chromated copper arsenate, ammoniacal copper zinc arsenate, ammoniacal copper quat or copper azole is used to treat the wood posts and blocks, the bolt holes shall be treated as follows:

- A. Before the bolts are inserted, bolt holes shall be filled with a grease, recommended by the manufacturer for corrosion protection, which will not melt or run at a temperature of 65°C.

In Section 83-1.02B replace the 24th paragraph with:

End anchor assemblies and rail tensioning assemblies for metal beam guard railing shall be constructed as shown on the plans and shall conform to the following provisions:

1. An end anchor assembly (Type SFT) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a wood post, a steel foundation tube, a steel soil plate and hardware.
2. An end anchor assembly (Type CA) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a single anchor rod or double anchor rods, hardware and one concrete anchor.
3. A rail tensioning assembly for metal beam guard railing shall consist of an anchor cable, an anchor plate, and hardware.
4. The anchor plate, metal plates, steel foundation tubes and steel soil plate shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M.
5. The anchor rods shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M, A 441 or A 572, or ASTM Designation: A 576, Grades 1018, 1019, 1021 or 1026. The eyes shall be hot forged or formed with full penetration welds. After fabrication, anchor rods with eyes that have been formed with any part of the eye below 870°C during the forming operation or with eyes that have been closed by welding shall be thermally stress relieved prior to galvanizing. The completed anchor rod, after galvanizing, shall develop a strength of 220 kN.
6. In lieu of built-up fabrication of anchor plates as shown on the plans, anchor plates may be press-formed from steel plate, with or without welded seams.
7. All bolts and nuts shall conform to the requirements in ASTM Designation: A 307, unless otherwise specified in the special provisions or shown on the plans.
8. Anchor cable shall be 19 mm preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized in conformance with the requirements in Federal Specification RR-W-410, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 200 kN. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer. The overall length of each cable anchor assembly shall be as shown on the plans, but shall be a minimum of 2 m.
9. Where shown on the plans, cable clips and a cable thimble shall be used to attach cable to the anchor rod. Thimbles shall be commercial quality, galvanized steel. Cable clips shall be commercial quality drop forged galvanized steel.

10. The swaged fitting shall be machined from hot-rolled bars of steel conforming to AISI Designation: C 1035, and shall be annealed suitable for cold swaging. The swaged fitting shall be galvanized before swaging. A lock pin hole to accommodate a 6 mm, plated, spring steel pin shall be drilled through the head of the swage fitting to retain the stud in proper position. The manufacturer's identifying mark shall be stamped on the body of the swage fitting.
11. The 25 mm nominal diameter stud shall conform to the requirements in ASTM Designation: A 449 after galvanizing. Prior to galvanizing, a 10 mm slot for the locking pin shall be milled in the stud end.
12. The swaged fittings, stud and nut assembly shall develop the specified breaking strength of the cable.
13. The cable assemblies shall be shipped as a complete unit including stud and nut.
14. Clevises shall be drop forged galvanized steel and shall develop the specified breaking strength of the cable.
15. One sample of cable properly fitted with swaged fitting and right hand thread stud at both ends as specified above, including a clevis when shown on the plans, one meter in total length, shall be furnished the Engineer for testing.
16. The portion of the anchor rod to be buried in earth shall be coated with a minimum 0.5 mm thickness of coal tar enamel conforming to AWWA Standard: C203 or a coal tar epoxy conforming to the requirements in Steel Structures Painting Council Paint Specification No. 16, Coal-Tar Epoxy-Polyimide Black Paint or Corps of Engineers Specification, Formula C-200a, Coal-Tar Epoxy Paint.
17. Metal components of the anchor assembly shall be fabricated in conformance with good shop practice and shall be hot-dip galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."
18. Anchor cables shall be tightened after the concrete anchor has cured for at least 5 days.
19. Concrete used to construct anchors for end anchor assemblies shall be Class 3 or minor concrete conforming to the provisions in Section 90, "Portland Cement Concrete."
20. Concrete shall be placed against undisturbed material of the excavated holes for end anchors. The top 300 mm of holes shall be formed, if required by the Engineer.
21. Reinforcing steel in concrete anchors for end anchor assemblies shall conform to the provisions in Section 52, "Reinforcement."

In Section 83-1.02D replace the 2nd paragraph with:

Structural shapes, tubing, plates, bars, bolts, nuts, and washers shall be structural steel conforming to the provisions in Section 55-2, "Materials." Other fittings shall be commercial quality.

In Section 83-1.02E replace the 2nd paragraph with:

Pipe for posts and braces shall be standard steel pipe or pipe that conforms to the provisions in Section 80-4.01A, "Posts and Braces."

In Section 83-1.02E, delete the 3rd paragraph

In Section 83-1.02E in the 7th paragraph, replace the 2nd sentence with:

Cable shall be galvanized in conformance with the requirements in Federal Specification RR-W-410.

In Section 83-1.02I replace the 5th paragraph with:

Where shown on the plans, cables used in the frame shall be 8 mm in diameter, wire rope, with a minimum breaking strength of 22 kN and shall be galvanized in conformance with the requirements in Federal Specification RR-W-410.

In Section 83-1.02I replace the 14th paragraph with:

Chain link fabric shall be either 11-gage Type I zinc-coated fabric conforming to the requirements in AASHTO M 181 or 11-gage Type IV polyvinyl chloride (PVC) coated fabric conforming to the requirements in Federal Specification RR-F-191/1.

In Section 83-1.03 replace the 2nd paragraph with:

Except for metal beam guard railing within the pay limits of a terminal system end treatment or transition railing (Type WB), metal beam guard railing will be measured by the meter along the face of the rail element from end post to end post of the completed railing at each installation. The point of measurement at each end post will be the center of the bolt attaching the rail element to the end post.

In Section 83-1.03 replace the 7th and 8th paragraphs with:

The quantities of end anchor assemblies (Type SFT or Type CA) and rail tensioning assemblies will be measured as units determined from actual count. An end anchor assembly (Type CA) with 2 cables attached to one concrete anchor will be counted as one terminal anchor assembly (Type CA) for measurement and payment.

The quantities of return and end caps and the various types of terminal sections for metal beam guard railing will be determined as units from actual count.

In Section 83-1.04 replace the 3rd and 4th paragraphs with:

The contract unit prices paid for end anchor assembly (Type SFT), end anchor assembly (Type CA), and rail tensioning assembly shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing the end anchor assemblies, complete in place, including drilling anchor plate bolt holes in rail elements, driving steel foundation tubes, excavating for concrete anchor holes and disposing of surplus material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The contract unit prices paid for return caps, end caps, and the various types of terminal sections for metal beam guard railing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing terminal sections, return and end caps, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

In Section 83-2.02B replace the 2nd paragraph with:

Rail elements, backup plates, terminal connectors, terminal sections, and return caps shall conform to Class A, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180.

In Section 83-2.02B replace the 14th paragraph with:

All metal work shall be fabricated in the shop, and no punching, cutting or welding will be permitted in the field. Rail elements shall be lapped so that the exposed ends will not face approaching traffic. Terminal sections and return caps shall be installed in conformance with the manufacturer's recommendation.

In Section 83-2.02D(2) replace the 1st paragraph with:

Type 50 and 60 series concrete barriers shall be constructed of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," except as follows:

- a. The maximum size of aggregate used for extruded or slip-formed concrete barriers shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5-mm or smaller than 9.5-mm.
- b. If the 9.5 mm maximum size aggregate grading is used to construct extruded or slip-formed concrete barriers, the cementitious material content of the minor concrete shall be not less than 400 kilograms per cubic meter.

In Section 83-2.02D(2) replace the 3rd paragraph with:

The concrete paving between the tops of the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) and the optional concrete slab at the base between the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) shall be constructed of minor concrete conforming to the provisions of Section 90-10, "Minor Concrete," except that the minor concrete shall contain not less than 300 kilograms of cementitious material per cubic meter.

In Section 83-2.03 replace the 1st and 2nd paragraphs with:

Except for single thrie beam barrier within the pay limits of transition railing (Type STB), single thrie beam barrier will be measured by the meter from end post to end post along the face of the rail element of the installed barrier. Single thrie beam barriers constructed on each side of piers under structures or other obstructions will be measured for payment along each line of the installed barrier.

Except for double thrie beam barrier within the pay limits of transition railing (Type DTB), double thrie beam barrier will be measured by the meter from end post to end post along the center line of the installed barrier.

In Section 85-1.04A replace the 5th paragraph with:

Testing

Tests shall be performed in conformance with the requirements in California Test 669.

| Test | Test Description | Requirement |
|------|---|---------------|
| a | Bond strength | 4.8 MPa, min. |
| b | Glaze thickness | 180 µm, min. |
| c | Hardness | 6 Moh, min. |
| d | Luminance factor, Type A, white markers only, glazed surface | 75, min. |
| e | Yellowness index, Type A, white markers only, glazed surface | 7, max. |
| f | Color-yellow, Type AY, yellow markers only. The chromaticity coordinates shall be within a color box defined in CTM 669 | Pass |
| g | Compressive strength | 6700 N, min. |
| h | Water absorption | 2.0 %, max. |
| i | Artificial weathering, 500 hours exposure, yellowness index | 20, max. |

Replace Section 85-1.04B with:

85-1.04B Non-Reflective Pavement Markers (Plastic)

Plastic non-reflective pavement markers Types A and AY shall be, at the option of the Contractor, either polypropylene or acrylonitrile-butadiene-styrene (ABS) plastic type.

Plastic markers shall conform to the testing requirements specified in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," except that Tests a, b, c, and h shall not apply. The plastic markers shall not be coated with substances that interfere with the ability of the adhesive bonding to the marker.

In Section 85-1.05 replace the 6th and 7th paragraphs with:

Testing

Tests shall be performed in conformance with the requirements in California Test 669.

In Section 86-1.02 delete the 2nd paragraph.

In Section 86-1.06 replace the 10th paragraph with:

These provisions will not relieve the Contractor in any manner of the Contractor's responsibilities as provided in Section 7-1.12, "Indemnification and Insurance," and Section 7-1.16, "Contractor's Responsibility for the Work and Materials."

In Section 86-2.02 in the 1st paragraph, replace the 1st sentence with:

Improvements such as sidewalks, curbs, gutters, portland cement concrete and hot mix asphalt pavement, underlying material, lawns and plants and any other improvements removed, broken or damaged by the Contractor's operations, shall be replaced or reconstructed with the same kind of material as found on the work or with materials of equal quality.

In Section 86-2.03 replace the 1st paragraph with:

Except for concrete for cast-in-drilled-hole concrete pile foundations, portland cement concrete shall conform to Section 90-10, "Minor Concrete."

In Section 86-2.03 replace the 3rd, 4th, and 5th paragraph with:

Except when located on structures, foundations for posts, standards, and pedestals shall be placed "in the solid" and monolithic.

After each post, standard, and pedestal is in proper position, mortar shall be placed under the base plate as shown on the plans. The exposed portions shall be finished to present a neat appearance. Mortar shall conform to Section 51-1.135, "Mortar," except the mortar shall consist of one part by volume of cementitious material and 3 parts of clean sand.

Reinforced cast-in-drilled-hole concrete pile foundations shall conform to the provisions in Section 49, "Piling," with the following exceptions:

- A. Material resulting from drilling holes shall be disposed of in conformance with the provisions in Section 86-2.01, "Excavating and Backfilling,"
- B. Concrete for cast-in-drilled-hole concrete piles will not be considered as designated by compressive strength.

In Section 86-2.03 replace the 7th paragraph with:

Forms shall be true to line and grade. Tops of foundations for posts and standards, except special foundations, shall be finished to curb or sidewalk grade or as directed by the Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position and to proper height, and anchor bolts shall be held in place by means of rigid top and bottom templates. The bottom template shall be made of steel. The bottom template shall provide proper spacing and alignment of the anchor bolts near their bottom embedded end. The bottom template shall be installed before placing footing concrete. Anchor bolts shall not be installed more than 1:40 from vertical.

In Section 86-2.03, delete the 8th paragraph.

In Section 86-2.03 replace the 12th paragraph with:

Plumbing of the standards shall be accomplished by adjusting the leveling nuts before placing the mortar or before the foundation is finished to final grade. Shims or other similar devices shall not be used for plumbing or raking of posts, standards, or pedestals. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made, firm contact shall exist between all bearing surfaces of the anchor bolt nuts, washers, and the base plates.

In Section 86-2.04 replace the 1st and 2nd paragraphs with:

Bolts, nuts and washers, and anchor bolts for use in signal and lighting support structures shall conform to the provisions in Section 55-2, "Materials." Except when bearing-type connections or slipbases are specified, high-strength bolted connections shall conform to the provisions in Section 55-3.14, "Bolted Connections." Welding, nondestructive testing (NDT) of welds, and acceptance and repair criteria for NDT of steel members shall conform to the requirements of AWS D1.1 and the special provisions.

On each lighting standard except Type 1, one rectangular corrosion resistant metal identification tag shall be permanently attached above the hand hole, near the base of the standard, using stainless steel rivets. On each signal pole support, two corrosion resistant metal identification tags shall be attached, one above the hand hole near the base of the vertical standard and one on the underside of the signal mast arm near the arm plate. As a minimum, the information on each identification tag shall include the name of the manufacturer, the date of manufacture, the identification number as shown on the plans, the contract number, and a unique identification code assigned by the fabricator. This number shall be traceable to a particular contract and the welds on that component, and shall be readable after the support structure is coated and installed. The lettering shall be a minimum of 7 mm high. The information may be either depressed or raised, and shall be legible.

In Section 86-2.04 replace the 4th paragraph with:

Ferrous metal parts of standards, with shaft length of 4.6 m and longer, shall conform to the details shown on the plans, the provisions in Section 55-2, "Materials," except as otherwise noted, and the following requirements:

- A. Except as otherwise specified, standards shall be fabricated from sheet steel of weldable grade having a minimum yield strength, after fabrication, of 276 MPa.
- B. Certified test reports which verify conformance to the minimum yield strength requirements shall be submitted to the Engineer. The test reports may be the mill test reports for the as-received steel or, when the as-received steel has a lower yield strength than required, the Contractor shall provide supportive test data which provides assurance that the Contractor's method of cold forming will consistently increase the tensile properties of the steel to meet the specified minimum yield strength. The supportive test data shall include tensile properties of the steel after cold forming for specific heats and thicknesses.
- C. When a single-ply 8-mm thick pole is specified, a 2-ply pole with equivalent section modulus may be substituted.
- D. Standards may be fabricated of full-length sheets or shorter sections. Each section shall be fabricated from not more than 2 pieces of sheet steel. Where 2 pieces are used, the longitudinal welded seams shall be directly opposite one another. When the sections are butt-welded together, the longitudinal welded seams on adjacent sections shall be placed to form continuous straight seams from base to top of standard.
- E. Butt-welded circumferential joints of tubular sections requiring CJP groove welds shall be made using a metal sleeve backing ring inside each joint. The sleeve shall be 3-mm nominal thickness, or thicker, and manufactured from steel having the same chemical composition as the steel in the tubular sections to be joined. When the sections to be joined have different specified minimum yield strengths, the steel in the sleeve shall have the same chemical composition as the tubular section having the higher minimum yield strength. The width of the metal sleeve shall be consistent with the type of NDT chosen and shall be a minimum width of 25 mm. The sleeve shall be centered at the joint and be in contact with the tubular section at the point of the weld at time of fit-up.
- F. Welds shall be continuous.
- G. The weld metal at the transverse joint shall extend to the sleeve, making the sleeve an integral part of the joint.
- H. During fabrication, longitudinal seams on vertical tubular members of cantilevered support structures shall be centered on and along the side of the pole that the pole plate is located. Longitudinal seams on horizontal tubular members, including signal and luminaire arms, shall be within +/-45 degrees of the bottom of the arm.
- I. The longitudinal seam welds in steel tubular sections may be made by the electric resistance welding process.
- J. Longitudinal seam welds shall have 60 percent minimum penetration, except that within 150 mm of circumferential welds, longitudinal seam welds shall be CJP groove welds. In addition, longitudinal seam welds on lighting support structures having telescopic pole segment splices shall be CJP groove welds on the female end for a length on each end equal to the designated slip fit splice length plus 150 mm.
- K. Exposed circumferential welds, except fillet and fatigue-resistant welds, shall be ground flush (-0, +2 mm) with the base metal prior to galvanizing or painting.
- L. Circumferential welds and base plate-to-pole welds may be repaired only one time without written permission from the Engineer.
- M. Exposed edges of the plates that make up the base assembly shall be finished smooth and exposed corners of the plates shall be broken unless otherwise shown on the plans. Shafts shall be provided with slip-fitter shaft caps.
- N. Flatness of surfaces of 1) base plates that are to come in contact with concrete, grout, or washers and leveling nuts; 2) plates in high-strength bolted connections; 3) plates in joints where cap screws are used to secure luminaire and signal arms; and 4) plates used for breakaway slip base assemblies shall conform to the requirements in ASTM A6.
- O. Standards shall be straight, with a permissive variation not to exceed 25 mm measured at the midpoint of a 9-m or 11-m standard and not to exceed 20 mm measured at the midpoint of a 5-m through 6-m standard. Variation shall not exceed 25 mm at a point 4.5 m above the base plate for Type 35 and Type 36 standards.

- P. Zinc-coated nuts used on fastener assemblies having a specified preload (obtained by specifying a prescribed tension, torque value, or degree of turn) shall be provided with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the zinc coating on the nut so that the presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.
- Q. No holes shall be made in structural members unless the holes are shown on the plans or are approved in writing by the Engineer.
- R. Standards with an outside diameter of 300 mm or less shall be round. Standards with an outside diameter greater than 300 mm shall be round or multisided. Multisided standards shall have a minimum of 12 sides which shall be convex and shall have a minimum bend radius of 100 mm.
- S. Mast arms for standards shall be fabricated from material as specified for standards, and shall conform to the dimensions shown on the plans.
- T. The cast steel option for slip bases shall be fabricated from material conforming to the requirements in ASTM Designation: A 27/A 27M, Grade 70-40. Other comparable material may be used if written permission is given by the Engineer. The casting tolerances shall be in conformance with the Steel Founder's Society of America recommendations (green sand molding).
- U. One casting from each lot of 50 castings or less shall be subject to radiographic inspection, in conformance with the requirements in ASTM Designation: E 94. The castings shall comply with the acceptance criteria severity level 3 or better for the types and categories of discontinuities in conformance with the requirements in ASTM Designations: E 186 and E 446. If the one casting fails to pass the inspection, 2 additional castings shall be radiographed. Both of these castings shall pass the inspection, or the entire lot of 50 will be rejected.
- V. Material certifications, consisting of physical and chemical properties, and radiographic films of the castings shall be filed at the manufacturer's office. These certifications and films shall be available for inspection upon request.
- W. High-strength bolts, nuts, and flat washers used to connect slip base plates shall conform to the requirements in ASTM Designation: A 325 or A 325M and shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."
- X. Plate washers shall be fabricated by saw cutting and drilling steel plate conforming to the requirements in AISI Designation: 1018, and be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." Prior to galvanizing, burrs and sharp edges shall be removed and holes shall be chamfered sufficiently on each side to allow the bolt head to make full contact with the washer without tension on the bolt.
- Y. High-strength cap screws shown on the plans for attaching arms to standards shall conform to the requirements in ASTM Designation: A 325, A 325M, or A 449, and shall comply with the mechanical requirements in ASTM Designation: A 325 or A 325M after galvanizing. The cap screws shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." The threads of the cap screws shall be coated with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the color of the zinc coating on the cap screw so that presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.
- Z. Unless otherwise specified, bolted connections attaching signal or luminaire arms to poles shall be considered slip critical. Galvanized faying surfaces on plates on luminaire and signal arms and matching plate surfaces on poles shall be roughened by hand using a wire brush prior to assembly and shall conform to the requirements for Class C surface conditions for slip-critical connections in "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," a specification approved by the Research Council on Structural Connections (RCSC) of the Engineering Foundation. For faying surfaces required to be painted, the paint shall be an approved type, brand, and thickness that has been tested and approved according to the RCSC Specification as a Class B coating.
- AA. Samples of fastener components will be randomly taken from each production lot by the Engineer and submitted, along with test reports required by appropriate ASTM fastener specifications, for QA testing and evaluation. Sample sizes for each fastener component shall be as determined by the Engineer.

In Section 86-2.04 replace the 7th paragraph with:

To avoid interference of arm plate-to-tube welds with cap screw heads, and to ensure cap screw heads can be turned using conventional installation tools, fabricators shall make necessary adjustments to details prior to fabrication and properly locate the position of arm tubes on arm plates during fabrication.

In Section 86-2.05C in the 18th paragraph, replace the 4th and 5th subparagraphs with:

The conduit shall be placed in the bottom of the trench, and the trench shall be backfilled with minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 350 kilograms

of cementitious material per cubic meter. Concrete backfill shall be placed to the pavement surface except, when the trench is in hot mix asphalt pavement and additional pavement is not being placed, the top 30 mm of the trench shall be backfilled with hot mix asphalt produced from commercial quality paving asphalt and aggregates.

Prior to spreading hot mix asphalt, tack coat shall be applied in conformance with the provisions in Section 39, "Hot Mix Asphalt." Spreading and compacting of hot mix asphalt shall be performed by any method which will produce a hot mix asphalt surfacing of uniform smoothness, texture and density.

In Section 86-2.05C in the 23rd paragraph, replace the 3rd subparagraph with:

Precast concrete conduit cradles shall conform to the dimensions shown on the plans and shall be constructed of minor concrete and commercial quality welded wire fabric. Minor concrete shall conform to the provisions in Section 90-10, "Minor Concrete," and shall contain not less than 350 kilograms of cementitious material per cubic meter. The cradles shall be moist cured for not less than 3 days.

In Section 86-2.05C in the 23rd paragraph, replace the 7th subparagraph with:

The space around conduits through bridge abutment walls shall be filled with mortar conforming to the provisions in Section 51-1.135, "Mortar," except that the proportion of cementitious material to sand shall be 1:3.

In Section 86-2.07 replace the 5th paragraph with:

Concrete placed around and under traffic pull boxes as shown on the plans shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete."

In Section 86-2.08A in the 1st paragraph in the table, after the heading replace the 4th row with:

| | | | | | |
|--------------------|------------------------------|-----|------|-------|---|
| Traffic Signal | Ungrounded Circuit Conductor | Blk | None | CON-1 | 6 |
| Controller Cabinet | Grounded Circuit Conductor | Wht | None | CON-2 | 6 |

In Section 86-2.08B replace the 2nd paragraph with:

At any point, the minimum insulation thickness of any Type USE, RHH, or RHW insulation shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive; and 1.3 mm for No. 8 to No. 2, inclusive.

At any point, the minimum insulation thickness of any Type THW or TW wires shall be 0.7 mm for conductor sizes No. 14 to No. 10, inclusive; 1.0 mm for No. 8; and 1.4 mm for No. 6 to No. 2, inclusive.

In Section 86-2.12 replace the 6 and 7th paragraphs with:

After fabrication, wood poles shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA Use Category System: UC4B, Commodity Specification D.

Wood poles, when specified in the special provisions to be painted, shall be treated with waterborne wood preservatives.

In Section 86-2.15 replace the 1st paragraph with:

Galvanizing shall be in conformance with the provisions in Section 75-1.05, "Galvanizing," except that cabinets may be constructed of material galvanized prior to fabrication in conformance with the requirements in ASTM Designation: A 653/653M, Coating Designation G 90, in which case all cut or damaged edges shall be painted with at least 2 applications of approved unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint." Aerosol cans shall not be used. Other types of protective coating must be approved by the Engineer prior to installation.

In Section 86-2.16, in the 13th paragraph, replace item B with:

- B. Salt Spray Resistance - The undercutting of the film of the coating system shall not exceed 3 mm average, from lines scored diagonally and deep enough to expose the base metal, after 336 hours exposure in a salt spray cabinet in conformance with the requirements in ASTM Designation: B 117.

In Section 86-4.01 replace the 1st paragraph with:

Each vehicle signal face shall be of the adjustable type conforming to the requirements in Institute of Transportation Engineers (ITE) Publication: ST-017B, "Vehicle Traffic Control Signal Heads."

In Section 86-4.01A in the 1st paragraph, replace the 1st and 3rd subparagraphs with:

Lenses, reflectors, reflector assemblies, lamp receptacles, lamps, wiring and light distribution shall conform to the requirements in ITE Publication: ST-017B.

All reflectors shall conform to the requirements in ITE Publication: ST-017B except that reflectors shall be made of silvered glass or of specular aluminum with an anodic coating. Reflector ring holder shall be made of cast aluminum.

In Section 86-4.01B replace the 1st paragraph with:

Each signal section housing shall be either die-cast or permanent mold-cast aluminum conforming to ITE Publication: ST-017B or, when specified in the special provisions, shall be structural plastic.

In Section 86-4.01C replace the 1st paragraph with:

Lamp receptacles and wiring shall conform to ITE Publication: ST-017B. The metal portion of the medium base lamp socket shall be brass, copper or phosphor bronze.

In Section 86-4.01D replace the 1st paragraph with:

Each signal section shall be provided with a removable visor conforming to the requirements in ITE Publication: ST-017B. Visors are classified, on the basis of lens enclosure, as full circle, tunnel (bottom open), or cap (bottom and lower sides open). Unless otherwise specified, visors shall be the tunnel type.

In Section 86-4.02A replace the 1st paragraph with:

Light emitting diode signal modules shall be designed as retrofit replacements for optical units of standard traffic signal sections and shall not require special tools for installation. Light emitting diode signal modules shall fit into existing traffic signal section housings built in conformance with the requirements in the Institute of Transportation Engineers (ITE) publication ST-017B, "Vehicle Traffic Control Signal Heads (VTCSH)" without modification to the housing.

In Section 86-4.02A replace the 7th paragraph with:

Light emitting diode signal modules shall be protected against dust and moisture intrusion in conformance with the requirements in NEMA Standard 250 for Type 4 enclosures to protect the internal components.

In Section 86-4.02B replace the 1st paragraph with:

The minimum initial luminous intensity values for light emitting diode signal modules shall conform to the requirements in Section 11.04 of the Institute of Transportation Engineers (ITE) publication ST-017B, "Vehicle Traffic Control Signal Heads (VTCSH)" at 25°C.

In Section 86-4.02C replace the 3rd paragraph with:

The light emitting diode signal module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients as specified in Section 2.1.6 of NEMA Standard TS2.

In Section 86-4.02D(1), in the 4th paragraph, replace the 7th subparagraph with:

Moisture resistance testing shall be performed on light emitting diode signal modules in conformance with the requirements in NEMA Standard 250 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

In Section 86-4.05 replace the 2nd paragraph with:

Each programmed visibility signal section shall provide a nominal 300-mm diameter circular or arrow indication. Color and arrow configuration shall conform to the requirements in ITE Publication: ST-017B.

In Section 86-4.06 replace the 1st paragraph with:

Message symbols for pedestrian signal faces shall be white WALKING PERSON and Portland orange UPRAISED HAND conforming to the requirements in the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications" and "California MUTCD." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

In Section 86-4.06(A) in the 1st paragraph, replace the 3rd subparagraph with:

Each reflector assembly shall consist of a double reflector or 2 single reflectors. Each reflector shall be made of either aluminum or plastic. Reflectors shall conform to the requirements in Institute of Transportation Engineers Publication: ST-017B, "Vehicle Traffic Control Signal Heads." Plastic reflectors shall consist of molded or vacuum-formed plastic with a vacuum-deposited aluminum reflecting surface. The plastic material shall not distort when the reflector is used with the lamp of the wattage normally furnished with the signal. In addition, the UL nonmechanical loading temperature of the material shall exceed, by at least 10°C, the maximum temperature in the signal section with the lamp "ON" and measured in an ambient air temperature of 25°C in conformance with the requirements in UL Publication UL 746B. Each completed reflector shall, when operated with the appropriate lamp and lens, provide the message brightness specified.

In Section 86-4.07 replace the 10th paragraph with:

The luminance of the "UPRAISED HAND" symbol shall be 3750 cd/m² minimum. The color of "UPRAISED HAND" shall be Portland orange conforming to the requirements of the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications" and "California MUTCD." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

In Section 86-4.07C replace the 2nd paragraph with:

On-board circuitry of the light emitting diode pedestrian signal modules shall include voltage surge protection to withstand high-repetition noise transients as stated in Section 2.1.6 of NEMA Standard TS2.

In Section 86-4.07D(1) replace the 2nd paragraph with:

A quantity of 2 units for each design shall be submitted for Design Qualification Testing. Test units shall be submitted to the Transportation Laboratory, after manufacturer's testing is complete.

In Section 86-4.07D(1) in the 4th paragraph, replace the 5th and 7th subparagraphs with:

Mechanical vibration testing shall be in conformance with the requirements in Military Specification MIL-STD-883, Test Method 2007, using three 4-minute cycles along each x, y and z axis, at a force of 2.5 Gs, with a frequency sweep from 2 Hz to 120 Hz. The loosening of the lens or of internal components, or other physical damage shall be cause for rejection.

Moisture resistance testing shall be performed on modules mounted in a standard pedestrian signal housing in conformance to the requirements in NEMA Standard 250 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

In Section 86-5.07A(5) in Section "Elastomeric Sealant" in the 1st paragraph, replace the 2nd sentence with:

Sealant shall be suitable for use in both hot mix asphalt and portland cement concrete.

In Section 86-5.07A(5) in Section "Asphatic Emulsion Sealant" in the 1st paragraph, replace the 1st sentence with:

Asphatic emulsion sealant shall conform to the requirements in State Specification 8040-41A-15 and shall be used only for filling slots in hot mix asphalt pavement.

In Section 86-5.07A(5) in Section "Hot-Melt Rubberized Asphalt Sealant" in the 1st paragraph, replace the 3rd sentence with:

Sealant shall be suitable for use in both hot mix asphalt and portland cement concrete.

In Section 86-5.07A(5) in Section "Hot-Melt Rubberized Asphalt Sealant" in the 2nd paragraph in the table, after the heading replace rows 1 through 3 with:

| | | |
|------------------------------------|-----------------|--------------|
| Cone Penetration, 25°C, 150 g, 5 s | D 5329, Sec. 6 | 3.5 mm, max. |
| Flow, 60°C | D 5329, Sec. 8 | 5 mm, max. |
| Resilience, 25°C | D 5329, Sec. 12 | 25%, min. |

In Section 86-5.07A(5) in Section "Hot-Melt Rubberized Asphalt Sealant", replace the 10th paragraph with:

If hot mix asphalt surfacing is to be placed, the loop conductors shall be installed prior to placing the uppermost layer of hot mix asphalt. The conductors shall be installed, as shown on the plans, in the compacted layer of hot mix asphalt immediately below the uppermost layer. Installation details shall be as shown on the plans, except the sealant shall fill the slot flush to the surface.

In Section 86-5.01D replace the 1st paragraph with:

When a foundation for a pressure-sensitive vehicle detector is to be removed, the hole left by removing the detector frame and foundation shall be filled with minor concrete, except the roadway surface shall be reconstructed with material to match existing surfacing. Minor concrete shall conform to the provisions in Section 90-10, "Minor Concrete," except that the concrete shall contain not less than 250 kilograms of cementitious material per cubic meter for hot mix asphalt surfaced roadways and not less than 350 kilograms of cementitious material per cubic meter for portland cement concrete surfaced roadways.

In Section 86-6.065 in Section "Mounting Assemblies", replace the 3rd paragraph with:

At least 4.9 m of clearance shall be provided between the bottom of the fixture and the roadway.

In Section 86-8.01 replace the 1st paragraph with:

The contract lump sum price or prices paid for signal, ramp metering, flashing beacon, lighting, sign illumination, traffic monitoring station, highway advisory radio systems, closed circuit television systems, or combinations thereof; for modifying or removing those systems; for temporary systems; or the lump sum or unit prices paid for various units of those systems; or the lump sum or per meter price paid for conduit of the various sizes, types and installation methods listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing and installing, modifying, or removing the systems, combinations or units thereof, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer, including any necessary pull boxes (except when the type required is shown as a separate contract item); excavation and backfill; concrete foundations (except when shown as a separate contract item); pedestrian barricades; furnishing and installing illuminated street name signs; installing sign panels on pedestrian barricades, on flashing beacon standards, and on traffic signal mast arms; restoring sidewalk, pavement and appurtenances damaged or destroyed during construction; salvaging existing materials; and making all required tests.

Minor concrete shall contain not less than 325 kg of cementitious material per cubic meter unless otherwise specified in these specifications or the special provisions.

Unless otherwise designated on the plans or specified in these specifications or the special provisions, the amount of cementitious material used per cubic meter of concrete in structures or portions of structures shall conform to the following:

| Use | Cementitious Material Content (kg/m ³) |
|--|---|
| Concrete designated by compressive strength: | |
| Deck slabs and slab spans of bridges | 400 min., 475 max. |
| Roof sections of exposed top box culverts | 400 min., 475 max. |
| Other portions of structures | 350 min., 475 max. |
| Concrete not designated by compressive strength: | |
| Deck slabs and slab spans of bridges | 400 min. |
| Roof sections of exposed top box culverts | 400 min. |
| Prestressed members | 400 min. |
| Seal courses | 400 min. |
| Other portions of structures | 350 min. |
| Concrete for precast members | 350 min., 550 max. |

Whenever the 28-day compressive strength shown on the plans is greater than 25 MPa, the concrete shall be designated by compressive strength. If the plans show a 28-day compressive strength that is 28 MPa or greater, an additional 14 days will be allowed to obtain the specified strength. The 28-day compressive strengths shown on the plans that are 25 MPa or less are shown for design information only and are not a requirement for acceptance of the concrete.

Concrete designated by compressive strength shall be proportioned such that the concrete will attain the strength shown on the plans or specified in the special provisions.

Before using concrete for which the mix proportions have been determined by the Contractor, or in advance of revising those mix proportions, the Contractor shall submit in writing to the Engineer a copy of the mix design.

Compliance with cementitious material content requirements will be verified in conformance with procedures described in California Test 518 for cement content. For testing purposes, supplementary cementitious material shall be considered to be cement. Batch proportions shall be adjusted as necessary to produce concrete having the specified cementitious material content.

If any concrete has a cementitious material, portland cement, or supplementary cementitious material content that is less than the minimum required, the concrete shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State \$0.55 for each kilogram of cementitious material, portland cement, or supplementary cementitious material that is less than the minimum required. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract. The deductions will not be made unless the difference between the contents required and those actually provided exceeds the batching tolerances permitted by Section 90-5, "Proportioning." No deductions will be made based on the results of California Test 518.

The requirements of the preceding paragraph shall not apply to minor concrete or commercial quality concrete.

90-2 MATERIALS

90-2.01 CEMENTITIOUS MATERIALS

Unless otherwise specified, cementitious material shall be either a combination of Type II or Type V portland cement and a supplementary cementitious material, or a blended cement.

Cementitious materials used in cast-in-place concrete for exposed surfaces of like elements of a structure shall be from the same sources and of the same proportions.

Cementitious materials shall be protected from moisture until used. Sacked cementitious materials shall be piled to permit access for tallying, inspecting, and identifying each shipment.

Facilities shall be provided to ensure that cementitious materials meeting this Section 90-2.01 are kept separate from other cementitious materials. Sampling cementitious materials shall be in conformance with California Test 125.

The Contractor shall furnish a Certificate of Compliance for cementitious materials in conformance with the provisions in Section 6-1.07, "Certificates of Compliance." The Certificate of Compliance shall indicate the source by name and location (including country, state, and city). If cementitious material is delivered directly to the job site, the Certificate of Compliance shall be signed by the cementitious material supplier. If the cementitious material is used in ready-mixed concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.

90-2.01A CEMENT

Portland cement shall conform to the requirements in ASTM Designation: C 150 except, using a 10-sample moving average, limestone shall not exceed 2.5 percent. The C₃S content of Type II cement shall not exceed 65 percent.

Blended cement shall conform to the requirements for Portland Blast-Furnace Slag, Cement Type IS (MS) or Portland-Pozzolan Cement, Type IP (MS) in AASHTO Designation: M 240 and shall be comprised of an intimate and uniform blend of Type II or Type V cement and supplementary cementitious material in an amount conforming to the requirements in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials."

In addition, blended cement, Type II portland cement, and Type V portland cement shall conform to the following requirements:

- A. The cement shall not contain more than 0.60-percent by mass of alkalis, calculated as the percentage of Na₂O plus 0.658 times the percentage of K₂O, when determined by methods as required in AASHTO Designation: T 105;
- B. The autoclave expansion shall not exceed 0.50-percent; and
- C. Mortar, containing the cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not expand in water more than 0.010-percent and shall not contract in air more than 0.048-percent, except that when cement is to be used for precast prestressed concrete piling, precast prestressed concrete members, or steam cured concrete products, the mortar shall not contract in air more than 0.053-percent.

Type III portland cement shall be used only as specified in the special provisions or with the approval of the Engineer. Type III portland cement shall conform to the additional requirements listed above for Type II portland cement, except when tested in conformance with California Test 527, mortar containing Type III portland cement shall not contract in air more than 0.075-percent.

90-2.01B SUPPLEMENTARY CEMENTITIOUS MATERIALS (SCM)

Fly ash shall conform to the requirements in AASHTO Designation: M 295, Class F, and the following:

- A. Calcium oxide content shall not exceed 10 percent.
- B. The available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 311 or the total alkali, as sodium oxide equivalent, shall not exceed 5.0 percent when determined in conformance with the requirements in AASHTO Designation: T 105.
- C. Commingling of fly ash from different sources at uncontrolled ratios is permissible only if the following criteria are satisfied:
 1. Sources of fly ash to be commingled shall be on the approved list of materials for use in concrete.
 2. Testing of the commingled product is the responsibility of the fly ash supplier.
 3. Each fly ash's running average of density shall not differ from any other by more than 0.25g/cm³ at the time of commingling.
 4. Each fly ash's running average of loss on ignition shall not differ from any other by more than one percent at the time of commingling.
 5. The final product of commingled fly ash shall conform to the requirement in AASHTO Designation: M 295.

Raw or calcined natural pozzolans shall conform to the requirements in AASHTO Designation: M 295, Class N and the following requirements:

- A. Calcium oxide content shall not exceed 10 percent.
- B. The available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 311 or the total alkali, as sodium oxide equivalent, shall not exceed 5.0 percent when determined in conformance with the requirements in AASHTO Designation: T 105.

Ground Granulated Blast Furnace Slag (GGBFS) shall conform to the requirements in AASHTO Designation: M 302, Grade 100 or Grade 120.

Silica Fume shall conform to the requirements of AASHTO Designation: M 307 with reduction in mortar expansion of 80 percent, minimum, using the cement from the proposed mix design.

90-2.01C REQUIRED USE OF SUPPLEMENTARY CEMENTITIOUS MATERIALS

The amount of portland cement and SCM used in portland cement concrete shall conform to the minimum cementitious material content provisions in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," and the following:

- A. If a blended cement conforming to the provisions in Section 90-2.01A, "Cement," is used, the minimum amount of SCM incorporated into the cement shall conform to the provisions in this Section 90-2.01C.
- B. Fly ash or natural pozzolan, silica fume, or GGBFS shall not be used with Type IP or Type IS cements.

Use of SCMs shall conform to the following:

- A. If fly ash or natural pozzolan is used:
 - 1. The minimum amount of portland cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
 - 2. The minimum amount of fly ash or natural pozzolan shall be:
 - a. Fifteen percent by mass of the total amount of cementitious material if the calcium oxide content of fly ash or natural pozzolan is equal to or less than 2 percent by mass;
 - b. Twenty-five percent by mass of the total amount of cementitious material if the calcium oxide content of fly ash or natural pozzolan is greater than 2 percent by mass.
- B. The total amount of fly ash or natural pozzolan shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. If Section 90-1.01, "Description," specifies a maximum cementitious material content in kilograms per cubic meter, the total mass of portland cement and fly ash or natural pozzolan per cubic meter shall not exceed the specified maximum cementitious material content.
- C. If silica fume is used:
 - 1. The amount of silica fume shall not be less than 10 percent by mass of the total amount of cementitious material.
 - 2. The amount of portland cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
 - 3. If Section 90-1.01, "Description," specifies a maximum cementitious material content in kilograms per cubic meter, the total mass of portland cement and silica fume per cubic meter shall not exceed the specified maximum cementitious material content.
- D. If GGBFS is used:
 - 1. The minimum amount of GGBFS shall be either:
 - a. Forty percent of the total cementitious material to be used, if the aggregates used in the concrete are on the Department's list of "Approved Aggregates For Use in Concrete with Reduced Fly Ash."
 - b. No less than 50 percent.
 - 2. The amount of GGBFS shall not exceed 60 percent by mass of the total amount of cementitious materials to be used.

90-2.02 AGGREGATES

Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.

The Contractor shall provide safe and suitable facilities, including necessary splitting devices for obtaining samples of aggregates, in conformance with California Test 125.

Aggregates shall be of such character that it will be possible to produce workable concrete within the limits of water content provided in Section 90-6.06, "Amount of Water and Penetration."

Aggregates shall have not more than 10 percent loss when tested for soundness in conformance with the requirements in California Test 214. The soundness requirement for fine aggregate will be waived, provided that the durability index, D_f , of the fine aggregate is 60 or greater when tested for durability in conformance with California Test 229.

If the results of any one or more of the Cleanness Value, Sand Equivalent, or aggregate grading tests do not meet the requirements specified for "Operating Range" but all meet the "Contract Compliance" requirements, the placement of concrete shall be suspended at the completion of the current pour until tests or other information indicate that the next material to be used in the work will comply with the requirements specified for "Operating Range."

If the results of either or both the Cleanness Value and coarse aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.

If the results of either or both the Sand Equivalent and fine aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.

The 2 preceding paragraphs apply individually to the "Contract Compliance" requirements for coarse aggregate and fine aggregate. When both coarse aggregate and fine aggregate do not conform to the "Contract Compliance" requirements, both paragraphs shall apply. The payments specified in those paragraphs are in addition to any payments made in conformance with the provisions in Section 90-1.01, "Description."

No single Cleanness Value, Sand Equivalent, or aggregate grading test shall represent more than 250 m³ of concrete or one day's pour, whichever is smaller.

When the source of an aggregate is changed, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using the aggregates.

90-2.02A COARSE AGGREGATE

Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, reclaimed aggregate, crushed air-cooled iron blast furnace slag or combinations thereof. Crushed air-cooled blast furnace slag shall not be used in reinforced or prestressed concrete.

Reclaimed aggregate is aggregate that has been recovered from plastic concrete by washing away the cementitious material. Reclaimed aggregate shall conform to all aggregate requirements.

Coarse aggregate shall conform to the following quality requirements:

| Tests | California Test | Requirements |
|---|-----------------|--------------|
| Loss in Los Angeles Rattler (after 500 revolutions) | 211 | 45% max. |
| Cleanness Value | | |
| Operating Range | 227 | 75 min. |
| Contract Compliance | 227 | 71 min. |

In lieu of the above Cleanness Value requirements, a Cleanness Value "Operating Range" limit of 71, minimum, and a Cleanness Value "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the coarse aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

- A. Coarse aggregate sampled at the completion of processing at the aggregate production plant had a Cleanness Value of not less than 82 when tested in conformance with the requirements in California Test 227; and
- B. Prequalification tests performed in conformance with the requirements in California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.02B FINE AGGREGATE

Fine aggregate shall consist of natural sand, manufactured sand produced from larger aggregate or a combination thereof. Manufactured sand shall be well graded.

Fine aggregate shall conform to the following quality requirements:

| Test | California Test | Requirements |
|--|-----------------|---------------------------|
| Organic Impurities | 213 | Satisfactory ^a |
| Mortar Strengths Relative to Ottawa Sand | 515 | 95%, min. |
| Sand Equivalent: | | |
| Operating Range | 217 | 75, min. |
| Contract Compliance | 217 | 71, min. |

- a Fine aggregate developing a color darker than the reference standard color solution may be accepted if it is determined by the Engineer, from mortar strength tests, that a darker color is acceptable.

In lieu of the above Sand Equivalent requirements, a Sand Equivalent "Operating Range" limit of 71, minimum, and a Sand Equivalent "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the fine aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

- A. Fine aggregate sampled at the completion of processing at the aggregate production plant had a Sand Equivalent value of not less than 82 when tested by California Test 217; and
- B. Prequalification tests performed in conformance with California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.03 WATER

In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO₄, when tested in conformance with California Test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO₄, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM Designation: C 109, when compared to the results obtained with distilled water or deionized water, tested in conformance with the requirements in ASTM Designation: C 109.

In nonreinforced concrete work, the water for curing, for washing aggregates and for mixing shall be free from oil and shall not contain more than 2000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, or more than 1500 parts per million of sulfates as SO₄, when tested in conformance with California Test 417.

In addition to the above provisions, water for curing concrete shall not contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis (Na₂O + 0.658 K₂O) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

90-2.04 ADMIXTURE MATERIALS

Admixture materials shall conform to the requirements in the following ASTM Designations:

- A. Chemical Admixtures—ASTM Designation: C 494.
- B. Air-entraining Admixtures—ASTM Designation: C 260.

90-3 AGGREGATE GRADINGS

90-3.01 GENERAL

Before beginning concrete work, the Contractor shall submit in writing to the Engineer the gradation of the primary aggregate nominal sizes that the Contractor proposes to furnish. If a primary coarse aggregate or the fine aggregate is separated into 2 or more sizes, the proposed gradation shall consist of the gradation for each individual size, and the proposed proportions of each individual size, combined mathematically to indicate one proposed gradation. The proposed gradation shall meet the grading requirements shown in the table in this section, and shall show the percentage passing each of the sieve sizes used in determining the end result.

The Engineer may waive, in writing, the gradation requirements in this Section 90-3.01 and in Sections 90-3.02, "Coarse Aggregate Grading," 90-3.03, "Fine Aggregate Grading," and 90-3.04, "Combined Aggregate Gradings," if, in the Engineer's opinion, furnishing the gradation is not necessary for the type or amount of concrete work to be constructed.

Gradations proposed by the Contractor shall be within the following percentage passing limits:

| Primary Aggregate Nominal Size | Sieve Size | Limits of Proposed Gradation |
|--------------------------------|--------------|------------------------------|
| 37.5-mm x 19-mm | 25-mm | 19 - 41 |
| 25-mm x 4.75-mm | 19-mm | 52 - 85 |
| 25-mm x 4.75-mm | 9.5-mm | 15 - 38 |
| 12.5-mm x 4.75-mm | 9.5-mm | 40 - 78 |
| 9.5-mm x 2.36-mm | 9.5-mm | 50 - 85 |
| Fine Aggregate | 1.18-mm | 55 - 75 |
| Fine Aggregate | 600- μ m | 34 - 46 |
| Fine Aggregate | 300- μ m | 16 - 29 |

Should the Contractor change the source of supply, the Contractor shall submit in writing to the Engineer the new gradations before their intended use.

90-3.02 COARSE AGGREGATE GRADING

The grading requirements for coarse aggregates are shown in the following table for each size of coarse aggregate:

| Sieve Sizes | Percentage Passing Primary Aggregate Nominal Sizes | | | | | | | |
|-------------|--|---------------------|-----------------|---------------------|-------------------|---------------------|------------------|---------------------|
| | 37.5-mm x 19-mm | | 25-mm x 4.75-mm | | 12.5-mm x 4.75-mm | | 9.5-mm x 2.36-mm | |
| | Operating Range | Contract Compliance | Operating Range | Contract Compliance | Operating Range | Contract Compliance | Operating Range | Contract Compliance |
| 50-mm | 100 | 100 | — | — | — | — | — | — |
| 37.5-mm | 88 - 100 | 85 - 100 | 100 | 100 | — | — | — | — |
| 25-mm | X \pm 18 | X \pm 25 | 88 - 100 | 86 - 100 | — | — | — | — |
| 19-mm | 0 - 17 | 0 - 20 | X \pm 15 | X \pm 22 | 100 | 100 | — | — |
| 12.5-mm | — | — | — | — | 82 - 100 | 80 - 100 | 100 | 100 |
| 9.5-mm | 0 - 7 | 0 - 9 | X \pm 15 | X \pm 22 | X \pm 15 | X \pm 22 | X \pm 15 | X \pm 20 |
| 4.75-mm | — | — | 0 - 16 | 0 - 18 | 0 - 15 | 0 - 18 | 0 - 25 | 0 - 28 |
| 2.36-mm | — | — | 0 - 6 | 0 - 7 | 0 - 6 | 0 - 7 | 0 - 6 | 0 - 7 |

In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

Coarse aggregate for the 37.5-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," shall be furnished in 2 or more primary aggregate nominal sizes. Each primary aggregate nominal size may be separated into 2 sizes and stored separately, provided that the combined material conforms to the grading requirements for that particular primary aggregate nominal size.

When the 25-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," is to be used, the coarse aggregate may be separated into 2 sizes and stored separately, provided that the combined material shall conform to the grading requirements for the 25-mm x 4.75-mm primary aggregate nominal size.

90-3.03 FINE AGGREGATE GRADING

Fine aggregate shall be graded within the following limits:

| Sieve Sizes | Percentage Passing | |
|-------------|--------------------|---------------------|
| | Operating Range | Contract Compliance |
| 9.5-mm | 100 | 100 |
| 4.75-mm | 95 - 100 | 93 - 100 |
| 2.36-mm | 65 - 95 | 61 - 99 |
| 1.18-mm | X ±10 | X ±13 |
| 600-µm | X ±9 | X ±12 |
| 300-µm | X ±6 | X ±9 |
| 150-µm | 2 - 12 | 1 - 15 |
| 75-µm | 0 - 8 | 0 - 10 |

In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

In addition to the above required grading analysis, the distribution of the fine aggregate sizes shall be such that the difference between the total percentage passing the 1.18-mm sieve and the total percentage passing the 600-µm sieve shall be between 10 and 40, and the difference between the percentage passing the 600-µm and 300-µm sieves shall be between 10 and 40.

Fine aggregate may be separated into 2 or more sizes and stored separately, provided that the combined material conforms to the grading requirements specified in this Section 90-3.03.

90-3.04 COMBINED AGGREGATE GRADINGS

Combined aggregate grading limits shall be used only for the design of concrete mixes. Concrete mixes shall be designed so that aggregates are combined in proportions that shall produce a mixture within the grading limits for combined aggregates as specified herein.

The combined aggregate grading, except when otherwise specified in these specifications or the special provisions, shall be either the 37.5-mm, maximum grading, or the 25-mm, maximum grading, at the option of the Contractor.

Grading Limits of Combined Aggregates

| Sieve Sizes | Percentage Passing | | | |
|-------------|--------------------|------------|--------------|-------------|
| | 37.5-mm Max. | 25-mm Max. | 12.5-mm Max. | 9.5-mm Max. |
| 50-mm | 100 | — | — | — |
| 37.5-mm | 90 - 100 | 100 | — | — |
| 25-mm | 50 - 86 | 90 - 100 | — | — |
| 19-mm | 45 - 75 | 55 - 100 | 100 | — |
| 12.5-mm | — | — | 90-100 | 100 |
| 9.5-mm | 38 - 55 | 45 - 75 | 55 - 86 | 50 - 100 |
| 4.75-mm | 30 - 45 | 35 - 60 | 45 - 63 | 45 - 63 |
| 2.36-mm | 23 - 38 | 27 - 45 | 35 - 49 | 35 - 49 |
| 1.18-mm | 17 - 33 | 20 - 35 | 25 - 37 | 25 - 37 |
| 600-µm | 10 - 22 | 12 - 25 | 15 - 25 | 15 - 25 |
| 300-µm | 4 - 10 | 5 - 15 | 5 - 15 | 5 - 15 |
| 150-µm | 1 - 6 | 1 - 8 | 1 - 8 | 1 - 8 |
| 75-µm | 0 - 3 | 0 - 4 | 0 - 4 | 0 - 4 |

Changes from one grading to another shall not be made during the progress of the work unless permitted by the Engineer.

90-4 ADMIXTURES

90-4.01 GENERAL

Admixtures used in portland cement concrete shall conform to and be used in conformance with the provisions in this Section 90-4 and the special provisions. Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option as provided herein.

Chemical admixtures and air-entraining admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined by California Test 415, shall not be used.

Admixtures shall be uniform in properties throughout their use in the work. Should it be found that an admixture as furnished is not uniform in properties, its use shall be discontinued.

If more than one admixture is used, the admixtures shall be compatible with each other so that the desirable effects of all admixtures used will be realized.

Chemical admixtures shall be used in conformance with the manufacturer's written recommendations.

90-4.02 MATERIALS

Admixture materials shall conform to the provisions in Section 90-2.04, "Admixture Materials."

90-4.03 ADMIXTURE APPROVAL

No admixture brand shall be used in the work unless it is on the Department's current list of approved brands for the type of admixture involved.

Admixture brands will be considered for addition to the approved list if the manufacturer of the admixture submits to the Transportation Laboratory a sample of the admixture accompanied by certified test results demonstrating that the admixture complies with the requirements in the appropriate ASTM Designation and these specifications. The sample shall be sufficient to permit performance of all required tests. Approval of admixture brands will be dependent upon a determination as to compliance with the requirements, based on the certified test results submitted, together with tests the Department may elect to perform.

If the Contractor proposes to use an admixture of a brand and type on the current list of approved admixture brands, the Contractor shall furnish a Certificate of Compliance from the manufacturer, as provided in Section 6-1.07, "Certificates of Compliance," certifying that the admixture furnished is the same as that previously approved. If a previously approved admixture is not accompanied by a Certificate of Compliance, the admixture shall not be used in the work until the Engineer has had sufficient time to make the appropriate tests and has approved the admixture for use. The Engineer may take samples for testing at any time, whether or not the admixture has been accompanied by a Certificate of Compliance.

90-4.04 REQUIRED USE OF CHEMICAL ADMIXTURES

If the use of a chemical admixture is specified, the admixture shall be used at the dosage specified, except that if no dosage is specified, the admixture shall be used at the dosage normally recommended by the manufacturer of the admixture.

90-4.05 OPTIONAL USE OF CHEMICAL ADMIXTURES

The Contractor may use Type A or F, water-reducing; Type B, retarding; or Type D or G, water-reducing and retarding admixtures as described in ASTM Designation: C 494 to conserve cementitious material or to facilitate any concrete construction application subject to the following conditions:

- A. If a water-reducing admixture or a water-reducing and retarding admixture is used, the cementitious material content specified or ordered may be reduced by a maximum of 5 percent by mass, except that the resultant cementitious material content shall be not less than 300 kilograms per cubic meter; and
- B. When a reduction in cementitious material content is made, the dosage of admixture used shall be the dosage used in determining approval of the admixture.

Unless otherwise specified, a Type C accelerating chemical admixture conforming to the requirements in ASTM Designation: C 494, may be used in portland cement concrete. Inclusion in the mix design submitted for approval will not be required provided that the admixture is added to counteract changing conditions that contribute to delayed setting of the portland cement concrete, and the use or change in dosage of the admixture is approved in writing by the Engineer.

90-4.06 REQUIRED USE OF AIR-ENTRAINING ADMIXTURES

When air-entrainment is specified or ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce a concrete having the specified air content as determined by California Test 504.

90-4.07 OPTIONAL USE OF AIR-ENTRAINING ADMIXTURES

When air-entrainment has not been specified or ordered by the Engineer, the Contractor will be permitted to use an air-entraining admixture to facilitate the use of any construction procedure or equipment provided that the average air content, as determined by California Test 504, of 3 successive tests does not exceed 4 percent, and no single test value exceeds 5.5 percent. If the Contractor elects to use an air-entraining admixture in concrete for pavement, the Contractor shall so indicate at the time the Contractor designates the source of aggregate.

90-4.08 BLANK

90-4.09 BLANK

90-4.10 PROPORTIONING AND DISPENSING LIQUID ADMIXTURES

Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers for liquid admixtures shall have sufficient capacity to measure at one time the prescribed quantity required for each batch of concrete. Each dispenser shall include a graduated measuring unit into which liquid admixtures are measured to within ± 5 percent of the prescribed quantity for each batch. Dispensers shall be located and maintained so that the graduations can be accurately read from the point at which proportioning operations are controlled to permit a visual check of batching accuracy prior to discharge. Each measuring unit shall be clearly marked for the type and quantity of admixture.

Each liquid admixture dispensing system shall be equipped with a sampling device consisting of a valve located in a safe and readily accessible position such that a sample of the admixture may be withdrawn slowly by the Engineer.

If more than one liquid admixture is used in the concrete mix, each liquid admixture shall have a separate measuring unit and shall be dispensed by injecting equipment located in such a manner that the admixtures are not mixed at high concentrations and do not interfere with the effectiveness of each other. When air-entraining admixtures are used in conjunction with other liquid admixtures, the air-entraining admixture shall be the first to be incorporated into the mix, unless it is demonstrated that a different sequence improves performance.

When automatic proportioning devices are required for concrete pavement, dispensers for liquid admixtures shall operate automatically with the batching control equipment. The dispensers shall be equipped with an automatic warning system in good operating condition that will provide a visible or audible signal at the point at which proportioning operations are controlled when the quantity of admixture measured for each batch of concrete varies from the preselected dosage by more than 5 percent, or when the entire contents of the measuring unit are not emptied from the dispenser into each batch of concrete.

Unless liquid admixtures are added to premeasured water for the batch, their discharge into the batch shall be arranged to flow into the stream of water so that the admixtures are well dispersed throughout the batch, except that air-entraining admixtures may be dispensed directly into moist sand in the batching bins provided that adequate control of the air content of the concrete can be maintained.

Liquid admixtures requiring dosages greater than 2.5 L/m^3 shall be considered to be water when determining the total amount of free water as specified in Section 90-6.06, "Amount of Water and Penetration."

90-4.11 BLANK

90-5 PROPORTIONING

90-5.01 STORAGE OF AGGREGATES

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size shall be avoided and the various sizes shall not become intermixed before proportioning.

Aggregates shall be stored or stockpiled and handled in a manner that prevent contamination by foreign materials. In addition, storage of aggregates at batching or mixing facilities that are erected subsequent to the award of the contract and that furnish concrete to the project shall conform to the following:

- A. Intermingling of the different sizes of aggregates shall be positively prevented. The Contractor shall take the necessary measures to prevent intermingling. The preventive measures may include, but are not necessarily limited to, physical separation of stockpiles or construction of bulkheads of adequate length and height; and
- B. Contamination of aggregates by contact with the ground shall be positively prevented. The Contractor shall take the necessary measures to prevent contamination. The preventive measures shall include, but are not necessarily limited to, placing aggregates on wooden platforms or on hardened surfaces consisting of portland cement concrete, asphalt concrete, or cement treated material.

In placing aggregates in storage or in moving the aggregates from storage to the weigh hopper of the batching plant, any method that may cause segregation, degradation, or the combining of materials of different gradings that will result in any size of aggregate at the weigh hopper failing to meet the grading requirements shall be discontinued. Any method of handling aggregates that results in excessive breakage of particles shall be discontinued. The use of suitable devices to reduce impact of falling aggregates may be required by the Engineer.

90-5.02 PROPORTIONING DEVICES

Weighing, measuring, or metering devices used for proportioning materials shall conform to the requirements in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems shall comply with the requirements for automatic proportioning devices in Section 90-5.03A, "Proportioning for Pavement." Automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, and supplementary cementitious material for one batch of concrete is a single operation of a switch or starter.

Proportioning devices shall be tested as frequently as the Engineer may deem necessary to ensure their accuracy.

Weighing equipment shall be insulated against vibration or movement of other operating equipment in the plant. When the plant is in operation, the mass of each batch of material shall not vary from the mass designated by the Engineer by more than the tolerances specified herein.

Equipment for cumulative weighing of aggregate shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the aggregate. For systems with individual weigh hoppers for the various sizes of aggregate, the zero tolerance shall be ± 0.5 percent of the individual batch mass designated for each size of aggregate. Equipment for cumulative weighing of cement and supplementary cementitious material shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the cement and supplementary cementitious material. Equipment for weighing cement or supplementary cementitious material separately shall have a zero tolerance of ± 0.5 percent of their designated individual batch masses. Equipment for measuring water shall have a zero tolerance of ± 0.5 percent of its designated mass or volume.

The mass indicated for any batch of material shall not vary from the preselected scale setting by more than the following:

- A. Aggregate weighed cumulatively shall be within 1.0 percent of the designated total batch mass of the aggregate. Aggregates weighed individually shall be within 1.5 percent of their respective designated batch masses; and
- B. Cement shall be 99 to 102 percent of its designated batch mass. When weighed individually, supplementary cementitious material shall be 99 to 102 percent of its designated batch mass. When supplementary cementitious material and cement are permitted to be weighed cumulatively, cement shall be weighed first to 99 to 102 percent of its designated batch mass, and the total for cement and supplementary cementitious material shall be 99 to 102 percent of the sum of their designated batch masses; and
- C. Water shall be within 1.5 percent of its designated mass or volume.

Each scale graduation shall be approximately 0.001 of the total capacity of the scale. The capacity of scales for weighing cement, supplementary cementitious material, or cement plus supplementary cementitious material and aggregates shall not exceed that of commercially available scales having single graduations indicating a mass not exceeding the maximum permissible mass variation above, except that no scale shall be required having a capacity of less than 500 kg, with 0.5-kg graduations.

90-5.03 PROPORTIONING

Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cementitious material and water as provided in these specifications. Aggregates shall be proportioned by mass.

At the time of batching, aggregates shall have been dried or drained sufficiently to result in a stable moisture content such that no visible separation of water from aggregate will take place during transportation from the proportioning plant to the point of mixing. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

Should separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another.

Bulk Type IP (MS) cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer.

Bulk cement and supplementary cementitious material may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer. If the cement and supplementary cementitious material are weighed cumulatively, the cement shall be weighed first.

If cement and supplementary cementitious material are weighed in separate weigh hoppers, the weigh systems for the proportioning of the aggregate, the cement, and the supplementary cementitious material shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and independent material weighing device. The cement and the supplementary cementitious material shall be discharged into the mixer simultaneously with the aggregate.

The scales and weigh hoppers for bulk weighing cement, supplementary cementitious material, or cement plus supplementary cementitious material shall be separate and distinct from the aggregate weighing equipment.

For batches of one cubic meter or more, the batching equipment shall conform to one of the following combinations:

- A. Separate boxes and separate scale and indicator for weighing each size of aggregate.
- B. Single box and scale indicator for all aggregates.
- C. Single box or separate boxes and automatic weighing mechanism for all aggregates.

In order to check the accuracy of batch masses, the gross mass and tare mass of batch trucks, truck mixers, truck agitators, and non-agitating hauling equipment shall be determined when ordered by the Engineer. The equipment shall be weighed on scales designated by the Engineer.

90-5.03A PROPORTIONING FOR PAVEMENT

Aggregates and bulk supplementary cementitious material for use in pavement shall be proportioned by mass by means of automatic proportioning devices of approved type conforming to these specifications.

The Contractor shall install and maintain in operating condition an electronically actuated moisture meter that will indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched within a sensitivity of 0.5 percent by mass of the fine aggregate.

The batching of cement, supplementary cementitious material, or cement plus supplementary cementitious material and aggregate shall be interlocked so that a new batch cannot be started until all weigh hoppers are empty, the proportioning devices are within zero tolerance, and the discharge gates are closed. The interlock shall permit no part of the batch to be discharged until all aggregate hoppers and the cement and supplementary cementitious material hoppers or the cement plus supplementary cementitious material hopper are charged with masses that are within the tolerances specified in Section 90-5.02, "Proportioning Devices."

If interlocks are required for cement and supplementary cementitious material charging mechanisms and cement and supplementary cementitious material are weighed cumulatively, their charging mechanisms shall be interlocked to prevent the introduction of mineral admixture until the mass of cement in the cement weigh hopper is within the tolerances specified in Section 90-5.02, "Proportioning Devices."

If concrete is completely mixed in stationary paving mixers, the supplementary cementitious materials shall be weighed in a separate weigh hopper and the supplementary cementitious material and cement shall be introduced simultaneously into the mixer proportionately with the aggregate. If the Contractor provides certification that the stationary mixer is capable of mixing the cement, supplementary cementitious material, aggregates, and water uniformly before discharge, weighing the supplementary cementitious material cumulatively with the cement is permitted. Certification shall contain the following:

- A. Test results for 2 compressive strength test cylinders of concrete taken within the first one-third and 2 compressive strength test cylinders of concrete taken within the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength";
- B. Calculations demonstrating that the difference in the averages of 2 compressive strengths taken in the first one-third is no greater than 7.5 percent different than the averages of 2 compressive strengths taken in the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength;" and
- C. The mixer rotation speed and time of mixing before discharge that are required to produce a mix that meets the requirements above.

The discharge gate on the cement and supplementary cementitious material hoppers or the cement plus supplementary cementitious material hopper shall be designed to permit regulating the flow of cement, supplementary cementitious material, or cement plus supplementary cementitious material into the aggregate as directed by the Engineer.

If separate weigh boxes are used for each size of aggregate, the discharge gates shall permit regulating the flow of each size of aggregate as directed by the Engineer.

Material discharged from the several bins shall be controlled by gates or by mechanical conveyors. The means of withdrawal from the several bins, and of discharge from the weigh box, shall be interlocked so that not more than one bin can discharge at a time, and so that the weigh box cannot be tripped until the required quantity from each of the several bins has been deposited therein. Should a separate weigh box be used for each size of aggregate, all may be operated and discharged simultaneously.

If the discharge from the several bins is controlled by gates, each gate shall be actuated automatically so that the required mass is discharged into the weigh box, after which the gate shall automatically close and lock.

The automatic weighing system shall be designed so that all proportions required may be set on the weighing controller at the same time.

90-6 MIXING AND TRANSPORTING

90-6.01 GENERAL

Concrete shall be mixed in mechanically operated mixers, except that when permitted by the Engineer, batches not exceeding 0.25-m³ may be mixed by hand methods in conformance with the provisions in Section 90-6.05, "Hand-Mixing."

Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.

Concrete shall be homogeneous and thoroughly mixed, and there shall be no lumps or evidence of undispersed cementitious material.

Uniformity of concrete mixtures will be determined by differences in penetration as determined by California Test 533, or slump as determined by ASTM Designation: C 143, and by variations in the proportion of coarse aggregate as determined by California Test 529.

When the mix design specifies a penetration value, the difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 10 mm. When the mix design specifies a slump value, the difference in slump, determined by comparing slump tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed the values given in the table below. Variation in the proportion of coarse aggregate will be determined by comparing the results of tests of 2 samples of mixed concrete from the same batch or truck mixer load and the difference between the 2 results shall not exceed 100 kg per cubic meter of concrete.

| Average Slump | Maximum Permissible Difference |
|-------------------------------|--------------------------------|
| Less than 100-mm | 25-mm |
| 100-mm to 150-mm | 38-mm |
| Greater than 150-mm to 225-mm | 50-mm |

The Contractor shall furnish samples of the freshly mixed concrete and provide satisfactory facilities for obtaining the samples.

90-6.02 MACHINE MIXING

Concrete mixers may be of the revolving drum or the revolving blade type, and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers and agitators that have an accumulation of hard concrete or mortar shall not be used.

The temperature of mixed concrete, immediately before placing, shall be not less than 10°C or more than 32°C. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.

The batch shall be so charged into the mixer that some water will enter in advance of cementitious materials and aggregates. All water shall be in the drum by the end of the first one-fourth of the specified mixing time.

Cementitious materials shall be batched and charged into the mixer by means that will not result either in loss of cementitious materials due to the effect of wind, in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions that reduce or vary the required quantity of cementitious material in the concrete mixture.

Paving and stationary mixers shall be operated with an automatic timing device. The timing device and discharge mechanism shall be interlocked so that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed.

The total elapsed time between the intermingling of damp aggregates and all cementitious materials and the start of mixing shall not exceed 30 minutes.

The size of batch shall not exceed the manufacturer's guaranteed capacity.

When producing concrete for pavement or base, suitable batch counters shall be installed and maintained in good operating condition at job site batching plants and stationary mixers. The batch counters shall indicate the exact number of batches proportioned and mixed.

Concrete shall be mixed and delivered to the job site by means of one of the following combinations of operations:

- A. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in nonagitating hauling equipment (central-mixed concrete).
- B. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).

- C. Mixed completely in a truck mixer (transit-mixed concrete).
- D. Mixed completely in a paving mixer.

Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades.

Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified.

When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed will be allowed for partial mixing in a central plant.

90-6.03 TRANSPORTING MIXED CONCRETE

Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or in nonagitating hauling equipment, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place, and provided the mixed concrete after hauling to the delivery point conforms to the provisions in Section 90-6.01, "General."

Truck agitators shall be loaded not to exceed the manufacturer's guaranteed capacity and shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

Bodies of nonagitating hauling equipment shall be constructed so that leakage of the concrete mix, or any part thereof, will not occur at any time.

Concrete hauled in open-top vehicles shall be protected during hauling against rain or against exposure to the sun for more than 20 minutes when the ambient temperature exceeds 24°C.

No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.

The rate of discharge of mixed concrete from truck mixer-agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.

If a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours or before 250 revolutions of the drum or blades, whichever occurs first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or if the temperature of the concrete is 30°C or above, the time allowed may be less than 1.5 hours. If an admixture is used to retard the set time, the temperature of the concrete shall not exceed 30°C, the time limit shall be 2 hours, and the revolution limitation shall be 300.

If nonagitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Each load of concrete delivered at the job site shall be accompanied by a weighmaster certificate showing the mix identification number, nonrepeating load number, date and time at which the materials were batched, the total amount of water added to the load, and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged with cement. This weighmaster certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.

Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on a 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be "line feed, carriage return" (LF CR) and "one line, separate record" with allowances for sufficient fields to satisfy the amount of data required by these specifications.

The Contractor may furnish a weighmaster certificate accompanied by a separate certificate that lists the actual batch masses or measurements for a load of concrete provided that both certificates are imprinted with the same nonrepeating load number that is unique to the contract and delivered to the job site with the load.

Weighmaster certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities."

90-6.04 TIME OR AMOUNT OF MIXING

Mixing of concrete in paving or stationary mixers shall continue for the required mixing time after all ingredients, except water and admixture, if added with the water, are in the mixing compartment of the mixer before any part of the batch is released. Transfer time in multiple drum mixers shall not be counted as part of the required mixing time.

The required mixing time, in paving or stationary mixers, of concrete used for concrete structures, except minor structures, shall be not less than 90 seconds or more than 5 minutes, except that when directed by the Engineer in writing, the requirements of the following paragraph shall apply.

The required mixing time, in paving or stationary mixers, except as provided in the preceding paragraph, shall be not less than 50 seconds or more than 5 minutes.

The minimum required revolutions at the mixing speed for transit-mixed concrete shall not be less than that recommended by the mixer manufacturer, but in no case shall the number of revolutions be less than that required to consistently produce concrete conforming to the provisions for uniformity in Section 90-6.01, "General."

When a high range water-reducing admixture is added to the concrete at the job site, the total number of revolutions shall not exceed 300.

90-6.05 HAND-MIXING

Hand-mixed concrete shall be made in batches of not more than 0.25-m³ and shall be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and spread on the platform and the fine aggregate shall be spread on this layer, the 2 layers being not more than 0.3-meters in total depth. On this mixture shall be spread the dry cementitious materials and the whole mass turned no fewer than 2 times dry; then sufficient clean water shall be added, evenly distributed, and the whole mass again turned no fewer than 3 times, not including placing in the carriers or forms.

90-6.06 AMOUNT OF WATER AND PENETRATION

The amount of water used in concrete mixes shall be regulated so that the penetration of the concrete as determined by California Test 533 or the slump of the concrete as determined by ASTM Designation: C 143 is within the nominal values shown in the following table. When the penetration or slump of the concrete is found to exceed the nominal values listed, the mixture of subsequent batches shall be adjusted to reduce the penetration or slump to a value within the nominal range shown. Batches of concrete with a penetration or slump exceeding the maximum values listed shall not be used in the work. If Type F or Type G chemical admixtures are added to the mix, the penetration requirements shall not apply and the slump shall not exceed 225 mm after the chemical admixtures are added.

| Type of Work | Nominal | | Maximum | |
|------------------------------------|------------------|------------|------------------|------------|
| | Penetration (mm) | Slump (mm) | Penetration (mm) | Slump (mm) |
| Concrete Pavement | 0 - 25 | — | 40 | — |
| Non-reinforced concrete facilities | 0 - 35 | — | 50 | — |
| Reinforced concrete structures | | | | |
| Sections over 300-mm thick | 0 - 35 | — | 65 | — |
| Sections 300-mm thick or less | 0 - 50 | — | 75 | — |
| Concrete placed under water | — | 150 - 200 | — | 225 |
| Cast-in-place concrete piles | 65 - 90 | 130 - 180 | 100 | 200 |

The amount of free water used in concrete shall not exceed 183 kg/m³, plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m³.

The term free water is defined as the total water in the mixture minus the water absorbed by the aggregates in reaching a saturated surface-dry condition.

If there are adverse or difficult conditions that affect the placing of concrete, the above specified penetration and free water content limitations may be exceeded providing the Contractor is granted permission by the Engineer in writing to increase the cementitious material content per cubic meter of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 kg of water per added 100 kg of cementitious material per cubic meter. Full compensation for additional cementitious material and water added under these conditions shall be considered as included in the contract price paid for the concrete work involved and no additional compensation will be allowed therefor.

The equipment for supplying water to the mixer shall be constructed and arranged so that the amount of water added can be measured accurately. Any method of discharging water into the mixer for a batch shall be accurate within 1.5 percent of the quantity of water required to be added to the mix for any position of the mixer. Tanks used to measure water shall be designed so that water cannot enter while water is being discharged into the mixer and discharge into the mixer shall be made rapidly in one operation without dribbling. All equipment shall be arranged so as to permit checking the amount of water delivered by discharging into measured containers.

90-7 CURING CONCRETE

90-7.01 METHODS OF CURING

Newly placed concrete shall be cured by the methods specified in this Section 90-7.01 and the special provisions.

90-7.01A WATER METHOD

The concrete shall be kept continuously wet by the application of water for a minimum curing period of 7 days after the concrete has been placed.

Cotton mats, rugs, carpets, or earth or sand blankets may be used as a curing medium to retain the moisture during the curing period.

If a curing medium consisting of cotton mats, rugs, carpets, polyethylene sheeting, polyethylene sheeting on burlap, or earth or sand blankets is to be used to retain the moisture, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. The moisture from the nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow or wash the surface. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing media.

At the option of the Contractor, a curing medium consisting of white opaque polyethylene sheeting extruded onto burlap may be used to cure concrete structures. The polyethylene sheeting shall have a minimum thickness of 100 µm, and shall be extruded onto 283.5-gram burlap.

At the option of the Contractor, a curing medium consisting of polyethylene sheeting may be used to cure concrete columns. The polyethylene sheeting shall have a minimum thickness of 250 µm achieved in a single layer of material.

If the Contractor chooses to use polyethylene sheeting or polyethylene sheeting on burlap as a curing medium, these media and any joints therein shall be secured as necessary to provide moisture retention and shall be within 75 mm of the concrete at all points along the surface being cured. When these media are used, the temperature of the concrete shall be monitored during curing. If the temperature of the concrete cannot be maintained below 60°C, use of these curing media shall be disallowed.

When concrete bridge decks and flat slabs are to be cured without the use of a curing medium, the entire surface of the bridge deck or slab shall be kept damp by the application of water with an atomizing nozzle as specified above, until the concrete has set, after which the entire surface of the concrete shall be sprinkled continuously with water for a period of not less than 7 days.

90-7.01B CURING COMPOUND METHOD

Surfaces of the concrete that are exposed to the air shall be sprayed uniformly with a curing compound.

Curing compounds to be used shall be as follows:

1. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B, except the resin type shall be poly-alpha-methylstyrene.
2. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B.
3. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A.
4. Nonpigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class B.
5. Nonpigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class A.
6. Nonpigmented curing compound with fugitive dye conforming to the requirements in ASTM Designation: C 309, Type 1-D, Class A.

The infrared scan for the dried vehicle from curing compound (1) shall match the infrared scan on file at the Transportation Laboratory.

The loss of water for each type of curing compound, when tested in conformance with the requirements in California Test 534, shall not be more than 0.15-kg/m² in 24 hours.

The curing compound to be used will be specified elsewhere in these specifications or in the special provisions.

If the use of curing compound is required or permitted elsewhere in these specifications or in the special provisions and no specific kind is specified, any of the curing compounds listed above may be used.

Curing compound shall be applied at a nominal rate of 3.7 m²/L, unless otherwise specified.

At any point, the application rate shall be within ±1.2 m²/L of the nominal rate specified, and the average application rate shall be within ±0.5 m²/L of the nominal rate specified when tested in conformance with the requirements in California Test 535. Runs, sags, thin areas, skips, or holidays in the applied curing compound shall be evidence that the application is not satisfactory.

Curing compounds shall be applied using power operated spray equipment. The power operated spraying equipment shall be equipped with an operational pressure gage and a means of controlling the pressure. Hand spraying of small and irregular areas that are not reasonably accessible to mechanical spraying equipment, in the opinion of the Engineer, may be permitted.

The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.

At the time of use, compounds containing pigments shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. A paddle shall be used to loosen all settled pigment from the bottom of the container, and a power driven agitator shall be used to disperse the pigment uniformly throughout the vehicle.

Agitation shall not introduce air or other foreign substance into the curing compound.

The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, de-emulsification, or other requisite qualities of a satisfactory working material. Pigmented curing compounds shall be manufactured so that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Settlement of pigment shall be a thoroughly wetted, soft, mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency.

Curing compounds shall remain sprayable at temperatures above 4°C and shall not be diluted or altered after manufacture.

The curing compound shall be packaged in clean 1040-L totes, 210-L barrels, or 19-L pails, or shall be supplied from a suitable storage tank located at the job site. The containers shall comply with "Title 49, Code of Federal Regulations, Hazardous Materials Regulations." The 1040-L totes and the 210-L barrels shall have removable lids and airtight fasteners. The 19-L pails shall be round and have standard full open head and bail. Lids with bungholes will not be permitted. Settling or separation of solids in containers, except tanks, must be completely redispersed with low speed mixing prior to use, in conformance with these specifications and the manufacturer's recommendations. Mixing shall be accomplished either manually by use of a paddle or by use of a mixing blade driven by a drill motor, at low speed. Mixing blades shall be the type used for mixing paint. On-site storage tanks shall be kept clean and free of contaminants. Each tank shall have a permanent system designed to completely redisperse settled material without introducing air or other foreign substances.

Steel containers and lids shall be lined with a coating that will prevent destructive action by the compound or chemical agents in the air space above the compound. The coating shall not come off the container or lid as skins. Containers shall be filled in a manner that will prevent skinning. Plastic containers shall not react with the compound.

Each container shall be labeled with the manufacturer's name, kind of curing compound, batch number, volume, date of manufacture, and volatile organic compound (VOC) content. The label shall also warn that the curing compound containing pigment shall be well stirred before use. Precautions concerning the handling and the application of curing compound shall be shown on the label of the curing compound containers in conformance with the Construction Safety Orders and General Industry Safety Orders of the State.

Containers of curing compound shall be labeled to indicate that the contents fully comply with the rules and regulations concerning air pollution control in the State.

When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall accompany each load. The invoice shall contain the same information as that required herein for container labels.

Curing compound will be sampled by the Engineer at the source of supply, at the job site, or at both locations.

Curing compound shall be formulated so as to maintain the specified properties for a minimum of one year. The Engineer may require additional testing before use to determine compliance with these specifications if the compound has not been used within one year or whenever the Engineer has reason to believe the compound is no longer satisfactory.

Tests will be conducted in conformance with the latest ASTM test methods and methods in use by the Transportation Laboratory.

90-7.01C WATERPROOF MEMBRANE METHOD

The exposed finished surfaces of concrete shall be sprayed with water, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the concrete has set, after which the curing membrane, shall be placed. The curing membrane shall remain in place for a period of not less than 72 hours.

Sheeting material for curing concrete shall conform to the requirements in AASHTO Designation: M 171 for white reflective materials.

The sheeting material shall be fabricated into sheets of such width as to provide a complete cover for the entire concrete surface. Joints in the sheets shall be securely cemented together in such a manner as to provide a waterproof joint. The joint seams shall have a minimum lap of 100 mm.

The sheets shall be securely weighted down by placing a bank of earth on the edges of the sheets or by other means satisfactory to the Engineer.

Should any portion of the sheets be broken or damaged before the expiration of 72 hours after being placed, the broken or damaged portions shall be immediately repaired with new sheets properly cemented into place.

Sections of membrane that have lost their waterproof qualities or have been damaged to such an extent as to render them unfit for curing the concrete shall not be used.

90-7.01D FORMS-IN-PLACE METHOD

Formed surfaces of concrete may be cured by retaining the forms in place. The forms shall remain in place for a minimum period of 7 days after the concrete has been placed, except that for members over 0.5-m in least dimension the forms shall remain in place for a minimum period of 5 days.

Joints in the forms and the joints between the end of forms and concrete shall be kept moisture tight during the curing period. Cracks in the forms and cracks between the forms and the concrete shall be resealed by methods subject to the approval of the Engineer.

90-7.02 CURING PAVEMENT

The entire exposed area of the pavement, including edges, shall be cured by the waterproof membrane method, or curing compound method using curing compound (1) or (2) as the Contractor may elect. Should the side forms be removed before the expiration of 72 hours following the start of curing, the exposed pavement edges shall also be cured. If the pavement is cured by means of the curing compound method, the sawcut and all portions of the curing compound that have been disturbed by sawing operations shall be restored by spraying with additional curing compound.

Curing shall commence as soon as the finishing process provided in Section 40-1.10, "Final Finishing," has been completed. The method selected shall conform to the provisions in Section 90-7.01, "Methods of Curing."

When the curing compound method is used, the compound shall be applied to the entire pavement surface by mechanical sprayers. Spraying equipment shall be of the fully atomizing type equipped with a tank agitator that provides for continual agitation of the curing compound during the time of application. The spray shall be adequately protected against wind, and the nozzles shall be so oriented or moved mechanically transversely as to result in the minimum specified rate of coverage being applied uniformly on exposed faces. Hand spraying of small and irregular areas, and areas inaccessible to mechanical spraying equipment, in the opinion of the Engineer, will be permitted. When the ambient air temperature is above 15°C, the Contractor shall fog the surface of the concrete with a fine spray of water as specified in Section 90-7.01A, "Water Method." The surface of the pavement shall be kept moist between the hours of 10:00 a.m. and 4:30 p.m. on the day the concrete is placed. However, the fogging done after the curing compound has been applied shall not begin until the compound has set sufficiently to prevent displacement. Fogging shall be discontinued if ordered in writing by the Engineer.

90-7.03 CURING STRUCTURES

Newly placed concrete for cast-in-place structures, other than highway bridge decks, shall be cured by the water method, the forms-in-place method, or, as permitted herein, by the curing compound method, in conformance with the provisions in Section 90-7.01, "Methods of Curing."

The curing compound method using a pigmented curing compound may be used on concrete surfaces of construction joints, surfaces that are to be buried underground, and surfaces where only ordinary surface finish is to be applied and on which a uniform color is not required and that will not be visible from a public traveled way. If the Contractor elects to use the curing compound method on the bottom slab of box girder spans, the curing compound shall be curing compound (1).

The top surface of highway bridge decks shall be cured by both the curing compound method and the water method. The curing compound shall be curing compound (1).

Concrete surfaces of minor structures, as defined in Section 51-1.02, "Minor Structures," shall be cured by the water method, the forms-in-place method or the curing compound method.

When deemed necessary by the Engineer during periods of hot weather, water shall be applied to concrete surfaces being cured by the curing compound method or by the forms-in-place method, until the Engineer determines that a cooling effect is no longer required. Application of water for this purpose will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

90-7.04 CURING PRECAST CONCRETE MEMBERS

Precast concrete members shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing." Curing shall be provided for the minimum time specified for each method or until the concrete reaches its design strength, whichever is less. Steam curing may also be used for precast members and shall conform to the following provisions:

- A. After placement of the concrete, members shall be held for a minimum 4-hour presteaming period. If the ambient air temperature is below 10°C, steam shall be applied during the presteaming period to hold the air surrounding the member at a temperature between 10°C and 32°C.
- B. To prevent moisture loss on exposed surfaces during the presteaming period, members shall be covered as soon as possible after casting or the exposed surfaces shall be kept wet by fog spray or wet blankets.
- C. Enclosures for steam curing shall allow free circulation of steam about the member and shall be constructed to contain the live steam with a minimum moisture loss. The use of tarpaulins or similar flexible covers will be permitted, provided they are kept in good repair and secured in such a manner as to prevent the loss of steam and moisture.
- D. Steam at the jets shall be at low pressure and in a saturated condition. Steam jets shall not impinge directly on the concrete, test cylinders, or forms. During application of the steam, the temperature rise within the enclosure shall not exceed 22°C per hour. The curing temperature throughout the enclosure shall not exceed 65°C and shall be maintained at a constant level for a sufficient time necessary to develop the required transfer strength. Control cylinders shall be covered to prevent moisture loss and shall be placed in a location where temperature is representative of the average temperature of the enclosure.
- E. Temperature recording devices that will provide an accurate, continuous, permanent record of the curing temperature shall be provided. A minimum of one temperature recording device per 60 m of continuous bed length will be required for checking temperature.
- F. Members in pretension beds shall be detensioned immediately after the termination of steam curing while the concrete and forms are still warm, or the temperature under the enclosure shall be maintained above 15°C until the stress is transferred to the concrete.
- G. Curing of precast concrete will be considered completed after termination of the steam curing cycle.

90-7.05 CURING PRECAST PRESTRESSED CONCRETE PILES

Newly placed concrete for precast prestressed concrete piles shall be cured in conformance with the provisions in Section 90-7.04, "Curing Precast Concrete Members," except that piles in a corrosive environment shall be cured as follows:

- A. Piles shall be either steam cured or water cured. If water curing is used, the piles shall be kept continuously wet by the application of water in conformance with the provisions in Section 90-7.01A, "Water Method."
- B. If steam curing is used, the steam curing provisions in Section 90-7.04, "Curing Precast Concrete Members," shall apply except that the piles shall be kept continuously wet for their entire length for a period of not less than 3 days, including the holding and steam curing periods.

90-7.06 CURING SLOPE PROTECTION

Concrete slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

Concreted-rock slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing," with a blanket of earth kept wet for 72 hours, or by sprinkling with a fine spray of water every 2 hours during the daytime for a period of 3 days.

90-7.07 CURING MISCELLANEOUS CONCRETE WORK

Exposed surfaces of curbs shall be cured by pigmented curing compounds as specified in Section 90-7.01B, "Curing Compound Method."

Concrete sidewalks, gutter depressions, island paving, curb ramps, driveways, and other miscellaneous concrete areas shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

Shotcrete shall be cured for at least 72 hours by spraying with water, by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

Mortar and grout shall be cured by keeping the surface damp for 3 days.

After placing, the exposed surfaces of sign structure foundations, including pedestal portions, if constructed, shall be cured for at least 72 hours by spraying with water, by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

90-8 PROTECTING CONCRETE

90-8.01 GENERAL

In addition to the provisions in Section 7-1.16, "Contractor's Responsibility for the Work and Materials," the Contractor shall protect concrete as provided in this Section 90-8. If required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

The Contractor shall protect concrete from damage from any cause, which shall include, but not be limited to: rain, heat, cold, wind, Contractor's actions, and actions of others.

Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.

Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.

Concrete that has been frozen or damaged by other causes, as determined by the Engineer, shall be removed and replaced by the Contractor at the Contractor's expense.

90-8.02 PROTECTING CONCRETE STRUCTURES

Structure concrete and shotcrete used as structure concrete shall be maintained at a temperature of not less than 7°C for 72 hours after placing and at not less than 4°C for an additional 4 days.

90-8.03 PROTECTING CONCRETE PAVEMENT

Pavement concrete shall be maintained at a temperature of not less than 4°C for 72 hours.

Except as provided in Section 7-1.08, "Public Convenience," the Contractor shall protect concrete pavement against construction and other activities that abrade, scar, discolor, reduce texture depth, lower coefficient of friction, or otherwise damage the surface. Stockpiling, drifting, or excessive spillage of soil, gravel, petroleum products, and concrete or asphalt mixes on the surface of concrete pavement is prohibited unless otherwise specified in these specifications, the special provisions or permitted by the Engineer.

If ordered by the Engineer or shown on the plans or specified in the special provisions, pavement crossings shall be constructed for the convenience of public traffic. The material and work necessary for the construction of the crossings, and their subsequent removal and disposal, will be paid for at the contract unit prices for the items of work involved and if there are no contract items for the work involved, payment for pavement crossings will be made by extra work as provided in Section 4-1.03D, "Extra Work.". Where public traffic will be required to cross over the new pavement, Type III portland cement may be used in concrete, if permitted in writing by the Engineer. The pavement may be opened to traffic as soon as the concrete has developed a modulus of rupture of 3.8 MPa. The modulus of rupture will be determined by California Test 523.

No traffic or Contractor's equipment, except as hereinafter provided, will be permitted on the pavement before a period of 10 days has elapsed after the concrete has been placed, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa. Concrete that fails to attain a modulus of rupture of 3.8 MPa within 10 days shall not be opened to traffic until directed by the Engineer.

Equipment for sawing weakened plane joints will be permitted on the pavement as specified in Section 40-1.08B, "Weakened Plane Joints."

When requested in writing by the Contractor, the tracks on one side of paving equipment will be permitted on the pavement after a modulus of rupture of 2.4 MPa has been attained, provided that:

- A. Unit pressure exerted on the pavement by the paver shall not exceed 135 kPa;
- B. Tracks with cleats, grousers, or similar protuberances shall be modified or shall travel on planks or equivalent protective material, so that the pavement is not damaged; and
- C. No part of the track shall be closer than 0.3-m from the edge of pavement.

In case of visible cracking of, or other damage to the pavement, operation of the paving equipment on the pavement shall be immediately discontinued.

Damage to the pavement resulting from early use of pavement by the Contractor's equipment as provided above shall be repaired by the Contractor.

The State will furnish the molds and machines for testing the concrete for modulus of rupture, and the Contractor, at the Contractor's expense, shall furnish the material and whatever labor the Engineer may require.

90-9 COMPRESSIVE STRENGTH

90-9.01 GENERAL

Concrete compressive strength requirements consist of a minimum strength that shall be attained before various loads or stresses are applied to the concrete and, for concrete designated by strength, a minimum strength at the age of 28 days or at the age otherwise allowed in Section 90-1.01, "Description." The various strengths required are specified in these specifications or the special provisions or are shown on the plans.

The compressive strength of concrete will be determined from test cylinders that have been fabricated from concrete sampled in conformance with the requirements of California Test 539. Test cylinders will be molded and initially field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with the requirements of California Test 521. A strength test shall consist of the average strength of 2 cylinders fabricated from material taken from a single load of concrete, except that, if any cylinder should show evidence of improper sampling, molding, or testing, that cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.

When concrete compressive strength is specified as a prerequisite to applying loads or stresses to a concrete structure or member, test cylinders for other than steam cured concrete will be cured in conformance with Method 1 of California Test 540. The compressive strength of concrete determined for these purposes will be evaluated on the basis of individual tests.

When concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete strength to be used as a basis for acceptance of other than steam cured concrete will be determined from cylinders cured in conformance with Method 1 of California Test 540. If the result of a single compressive strength test at the maximum age specified or allowed is below the specified strength but is 95 percent or more of the specified strength, the Contractor shall make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures, before placing additional concrete, and shall pay to the State \$14 for each in-place cubic meter of concrete represented by the deficient test. If the result of a single compressive strength test at the maximum age specified or allowed is below 95 percent of the specified strength, but is 85 percent or more of the specified strength, the Contractor shall make the corrective changes specified above, and shall pay to the State \$20 for each in place cubic meter of concrete represented by the deficient test. In addition, such corrective changes shall be made when the compressive strength of concrete tested at 7 days indicates, in the judgment of the Engineer, that the concrete will not attain the required compressive strength at the maximum age specified or allowed. Concrete represented by a single test that indicates a compressive strength of less than 85 percent of the specified 28-day compressive strength will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials."

If the test result indicates that the compressive strength at the maximum curing age specified or allowed is below the specified strength, but is 85 percent or more of the specified strength, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. If the test result indicates a compressive strength at the maximum curing age specified or allowed below 85 percent, the concrete represented by that test will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength and quality of the concrete placed in the work are acceptable. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in conformance with the requirements in ASTM Designation: C 42.

No single compressive strength test shall represent more than 250 m³.

If a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders that have been handled and stored in conformance with Method 3 of California Test 540. The compressive strength of steam cured concrete will be evaluated on the basis of individual tests representing specific portions of production. If the concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete shall be considered to be acceptable whenever its compressive strength reaches the specified 28-day compressive strength provided that strength is reached in not more than the maximum number of days specified or allowed after the member is cast.

When concrete is specified by compressive strength, prequalification of materials, mix proportions, mixing equipment, and procedures proposed for use will be required prior to placement of the concrete. Prequalification shall be accomplished by the submission of acceptable certified test data or trial batch reports by the Contractor. Prequalification data shall be based on the use of materials, mix proportions, mixing equipment, procedures, and size of batch proposed for use in the work.

Certified test data, in order to be acceptable, shall indicate that not less than 90 percent of at least 20 consecutive tests exceed the specified strength at the maximum number of cure days specified or allowed, and none of those tests are less than 95 percent of specified strength. Strength tests included in the data shall be the most recent tests made on concrete of the proposed mix design and all shall have been made within one year of the proposed use of the concrete.

Trial batch test reports, in order to be acceptable, shall indicate that the average compressive strength of 5 consecutive concrete cylinders, taken from a single batch, at not more than 28 days (or the maximum age allowed) after molding shall be at least 4 MPa greater than the specified 28-day compressive strength, and no individual cylinder shall have a strength less than the specified strength at the maximum age specified or allowed. Data contained in the report shall be from trial batches that were produced within one year of the proposed use of specified strength concrete in the project. Whenever air-entrainment is required, the air content of trial batches shall be equal to or greater than the air content specified for the concrete without reduction due to tolerances.

Tests shall be performed in conformance with either the appropriate California Test methods or the comparable ASTM test methods. Equipment employed in testing shall be in good condition and shall be properly calibrated. If the tests are performed during the life of the contract, the Engineer shall be notified sufficiently in advance of performing the tests in order to witness the test procedures.

The certified test data and trial batch test reports shall include the following information:

- A. Date of mixing.
- B. Mixing equipment and procedures used.
- C. The size of batch in cubic meters and the mass, type, and source of all ingredients used.
- D. Penetration or slump (if the concrete will be placed under water or placed in cast-in-place concrete piles) of the concrete.
- E. The air content of the concrete if an air-entraining admixture is used.
- F. The age at time of testing and strength of all concrete cylinders tested.

Certified test data and trial batch test reports shall be signed by an official of the firm that performed the tests.

When approved by the Engineer, concrete from trial batches may be used in the work at locations where concrete of a lower quality is required and the concrete will be paid for as the type or class of concrete required at that location.

After materials, mix proportions, mixing equipment, and procedures for concrete have been prequalified for use, additional prequalification by testing of trial batches will be required prior to making changes that, in the judgment of the Engineer, could result in a strength of concrete below that specified.

The Contractor's attention is directed to the time required to test trial batches and the Contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress of the work is not delayed.

When precast concrete members are manufactured at the plant of an established manufacturer of precast concrete members, the mix proportions of the concrete shall be determined by the Contractor, and a trial batch and prequalification of the materials, mix proportions, mixing equipment, and procedures will not be required.

90-10 MINOR CONCRETE

90-10.01 GENERAL

Concrete for minor structures, slope paving, curbs, sidewalks and other concrete work, when designated as minor concrete on the plans, in the specifications, or in the contract item, shall conform to the provisions specified herein.

The Engineer, at the Engineer's discretion, will inspect and test the facilities, materials and methods for producing the concrete to ensure that minor concrete of the quality suitable for use in the work is obtained.

90-10.02 MATERIALS

Minor concrete shall conform to the following requirements:

90-10.02A CEMENTITIOUS MATERIAL

Cementitious material shall conform to the provisions in Section 90-1.01, "Description."

90-10.02B AGGREGATE

Aggregate shall be clean and free from deleterious coatings, clay balls, roots, and other extraneous materials.

Use of crushed concrete or reclaimed aggregate is acceptable only if the aggregate satisfies all aggregate requirements.

The Contractor shall submit to the Engineer for approval, a grading of the combined aggregate proposed for use in the minor concrete. After acceptance of the grading, aggregate furnished for minor concrete shall conform to that grading, unless a change is authorized in writing by the Engineer.

The Engineer may require the Contractor to furnish periodic test reports of the aggregate grading furnished. The maximum size of aggregate used shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5 mm or smaller than 19 mm.

The Engineer may waive, in writing, the gradation requirements in this Section 90-10.02B, if, in the Engineer's opinion, the furnishing of the gradation is not necessary for the type or amount of concrete work to be constructed.

90-10.02C WATER

Water used for washing, mixing, and curing shall be free from oil, salts, and other impurities that would discolor or etch the surface or have an adverse affect on the quality of the concrete.

90-10.02D ADMIXTURES

The use of admixtures shall conform to the provisions in Section 90-4, "Admixtures."

90-10.03 PRODUCTION

Cementitious material, water, aggregate, and admixtures shall be stored, proportioned, mixed, transported, and discharged in conformance with recognized standards of good practice that will result in concrete that is thoroughly and uniformly mixed, that is suitable for the use intended, and that conforms to requirements specified herein. Recognized standards of good practice are outlined in various industry publications such as are issued by American Concrete Institute, AASHTO, or the Department.

The cementitious material content of minor concrete shall conform to the provisions in Section 90-1.01, "Description."

The amount of water used shall result in a consistency of concrete conforming to the provisions in Section 90-6.06, "Amount of Water and Penetration." Additional mixing water shall not be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer.

Discharge of ready-mixed concrete from the transporting vehicle shall be made while the concrete is still plastic and before stiffening occurs. An elapsed time of 1.5 hours (one hour in nonagitating hauling equipment), or more than 250 revolutions of the drum or blades, after the introduction of the cementitious material to the aggregates, or a temperature of concrete of more than 32°C will be considered conditions contributing to the quick stiffening of concrete. The Contractor shall take whatever action is necessary to eliminate quick stiffening, except that the addition of water will not be permitted.

The required mixing time in stationary mixers shall be not less than 50 seconds or more than 5 minutes.

The minimum required revolutions at mixing speed for transit-mixed concrete shall be not less than that recommended by the mixer manufacturer, and shall be increased, if necessary, to produce thoroughly and uniformly mixed concrete.

When a high range water-reducing admixture is added to the concrete at the job site, the total number of revolutions shall not exceed 300.

Each load of ready-mixed concrete shall be accompanied by a weighmaster certificate that shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weighmaster certificate shall be clearly marked with the date and time of day when the load left the batching plant and, if hauled in truck mixers or agitators, the time the mixing cycle started.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer, prior to placing minor concrete from a source not previously used on the contract, stating that minor concrete to be furnished meets contract requirements, including minimum cementitious material content specified.

90-10.04 CURING MINOR CONCRETE

Curing minor concrete shall conform to the provisions in Section 90-7, "Curing Concrete."

90-10.05 PROTECTING MINOR CONCRETE

Protecting minor concrete shall conform to the provisions in Section 90-8, "Protecting Concrete," except the concrete shall be maintained at a temperature of not less than 4°C for 72 hours after placing.

90-10.06 MEASUREMENT AND PAYMENT

Minor concrete will be measured and paid for in conformance with the provisions specified in the various sections of these specifications covering concrete construction when minor concrete is specified in the specifications, shown on the plans, or indicated by contract item in the Engineer's Estimate.

Performance Graded Asphalt Binder

| Property | AASHTO Test Method | Specification | | | | |
|---|--------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | | Grade | | | | |
| | | PG 58-22 ^a | PG 64-10 | PG 64-16 | PG 64-28 | PG 70-10 |
| Original Binder | | | | | | |
| Flash Point, Minimum °C | T 48 | 230 | 230 | 230 | 230 | 230 |
| Solubility, Minimum % ^b | T 44 | 99 | 99 | 99 | 99 | 99 |
| Viscosity at 135°C, ^c Maximum, Pa·s | T 316 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa | T 315 | 58 1.00 | 64 1.00 | 64 1.00 | 64 1.00 | 70 1.00 |
| RTFO Test, ^e Mass Loss, Maximum, % | T 240 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| RTFO Test Aged Binder | | | | | | |
| Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa | T 315 | 58 2.20 | 64 2.20 | 64 2.20 | 64 2.20 | 70 2.20 |
| Ductility at 25°C Minimum, cm | T 51 | 75 | 75 | 75 | 75 | 75 |
| PAV ^f Aging, Temperature, °C | R 28 | 100 | 100 | 100 | 100 | 110 |
| RTFO Test and PAV Aged Binder | | | | | | |
| Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G*/sin(delta), kPa | T 315 | 22 ^d 5000 | 31 ^d 5000 | 28 ^d 5000 | 22 ^d 5000 | 34 ^d 5000 |
| Creep Stiffness, Test Temperature, °C Maximum S-value, Mpa Minimum M-value | T 313 | -12 300 0.300 | 0 300 0.300 | -6 300 0.300 | -18 300 0.300 | 0 300 0.300 |

Notes:

- a. Use as asphalt rubber base stock for high mountain and high desert area.
- b. The Engineer waives this specification if the supplier is a Quality Supplier as defined by the Department's "Certification Program for Suppliers of Asphalt."
- c. The Engineer waives this specification if the supplier certifies the asphalt binder can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- d. Test the sample at 3°C higher if it fails at the specified test temperature. G*/sin(delta) remains 5000 kPa maximum.
- e. "RTFO Test" means the asphaltic residue obtained using the Rolling Thin Film Oven Test, AASHTO Test Method T 240 or ASTM Designation: D 2872. The residue from mass change determination may be used for other tests.
- f. "PAV" means Pressurized Aging Vessel.

Performance graded polymer modified asphalt binder (PG Polymer Modified) is:

Performance Graded Polymer Modified Asphalt Binder ^a

| Property | AASHTO Test Method | Specification Grade | | |
|---|--------------------|---------------------|---------------------|---------------------|
| | | PG 58-34 PM | PG 64-28 PM | PG 76-22 PM |
| Original Binder | | | | |
| Flash Point, Minimum °C | T 48 | 230 | 230 | 230 |
| Solubility, Minimum % ^b | T 44 ^c | 98.5 | 98.5 | 98.5 |
| Viscosity at 135°C, ^d Maximum, Pa·s | T 316 | 3.0 | 3.0 | 3.0 |
| Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa | T 315 | 58 1.00 | 64 1.00 | 76 1.00 |
| RTFO Test , Mass Loss, Maximum, % | T 240 | 1.00 | 1.00 | 1.00 |
| RTFO Test Aged Binder | | | | |
| Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa | T 315 | 58 2.20 | 64 2.20 | 76 2.20 |
| Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum (delta), % | T 315 | Note e 80 | Note e 80 | Note e 80 |
| Elastic Recovery ^f , Test Temp., °C Minimum recovery, % | T 301 | 25 75 | 25 75 | 25 65 |
| PAV ^g Aging, Temperature, °C | R 28 | 100 | 100 | 110 |
| RTFO Test and PAV Aged Binder | | | | |
| Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G*/sin(delta), kPa | T 315 | 16 5000 | 22 5000 | 31 5000 |
| Creep Stiffness, Test Temperature, °C Maximum S-value, MPa Minimum M-value | T 313 | -24 300 0.300 | -18 300 0.300 | -12 300 0.300 |

Notes:

- a. Do not modify PG Polymer Modified using acid modification.
- b. The Engineer waives this specification if the supplier is a Quality Supplier as defined by the Department's "Certification Program for Suppliers of Asphalt."
- c. The Department allows ASTM D 5546 instead of AASHTO T 44
- d. The Engineer waives this specification if the supplier certifies the asphalt binder can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- e. Test temperature is the temperature at which G*/sin(delta) is 2.2 kPa. A graph of log G*/sin(delta) plotted against temperature may be used to determine the test temperature when G*/sin(delta) is 2.2 kPa. A graph of (delta) versus temperature may be used to determine delta at the temperature when G*/sin(delta) is 2.2 kPa. The Engineer also accepts direct measurement of (delta) at the temperature when G*/sin(delta) is 2.2 kPa.
- f. Tests without a force ductility clamp may be performed.
- g. "PAV" means Pressurized Aging Vessel.

SAMPLING

Provide a sampling device in the asphalt feed line connecting the plant storage tanks to the asphalt weighing system or spray bar. Make the sampling device accessible between 600 and 750 mm above the platform. Provide a receptacle for flushing the sampling device.

Include with the sampling device a valve:

SECTION 95 EPOXY

(Issued 03-16-07)

Replace Section 95 with:

SECTION 95 EPOXY

95-1 GENERAL

95-1.01 DESCRIPTION

These specifications are intended to specify epoxy that will meet service requirements for highway construction. Epoxy shall be furnished as 2 components, which shall be mixed together at the site of the work.

95-1.02 SAMPLING AND TESTING

Epoxy shall not be used prior to sampling and testing unless its use is permitted prior to sampling and testing in conformance with the provisions in Section 6-1.07, "Certificates of Compliance."

Tests will be conducted in conformance with the latest test methods of the American Society for Testing and Materials, and California Test Methods in use by the Transportation Laboratory.

Epoxy components shall be formulated to maintain the specified properties for a minimum of one year. The Engineer may require additional testing of any epoxy component that has not been used within one year of manufacture.

95-1.03 PACKAGING, LABELING AND STORING

Each component shall be packaged in containers of size proportional to the amount of that component in the mix so that one container of each component is used in mixing one batch of epoxy. The containers shall be of such design that all of the contents may be readily removed and shall be well sealed to prevent leakage. The containers and labeling shall meet U.S. Department of Transportation Hazardous Material Shipping Regulations, and the containers shall be of a material, or lined with a material, of such character as to resist any action by the components. Each container shall be clearly labeled with the ASTM Designation: C881 Class and Type; designation (Component A or B); manufacturer's name; date of manufacture; batch number (a batch shall consist of a single charge of all components in a mixing chamber); all directions for use (as specified elsewhere) and such warning or precautions concerning the contents as may be required by State or Federal Laws and Regulations. The manufacturer of the finished epoxy components shall furnish a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," and a copy of the label for each material. The certificate shall include a list, by Title and Section, of the State and Federal packaging and labeling laws and regulations that the manufacturer has complied with.

Attention is directed to the characteristic of some epoxy components to crystallize or thicken excessively prior to use when stored at temperatures below 2°C. Any material which shows evidence of crystallization or a permanent increase in viscosity or settling of pigments which cannot be readily redispersed with a paddle shall not be used.

95-1.04 DIRECTIONS FOR USE

At the time of mixing, components A and B shall be at a temperature between 15°C and 30°C, unless otherwise specified. Any heating of the adhesive components shall be done by application of indirect heat. Immediately prior to mixing, each component shall be thoroughly mixed with a paddle. Separate paddles shall be used to stir each component. Immediately prior to use, the 2 components shall be thoroughly mixed together in the specified ratios. No solvent shall be added to any epoxy.

After mixing, epoxies shall be placed in the work and any overlaying or inserted material which is to be bonded to the work by the epoxy shall also be placed before thickening of the epoxy has begun. Surfaces upon which epoxy is to be placed shall be free of rust, paint, grease, asphalt, and loose and deleterious material. When epoxy is used as a binder to make epoxy concrete or mortar, the 2 components of epoxy shall be thoroughly mixed together before the aggregate is added and, unless otherwise specified, the mix proportions shall consist of one part of binder to approximately 4 parts of aggregate, by volume. Aggregate for use in epoxy concrete and mortar shall be clean and shall have a moisture content of not more than 0.50-percent when tested by California Test 226. Surfaces against which epoxy concrete and mortar are to be placed shall be primed with a coat of the epoxy used just prior to placing the concrete or mortar.

95-2 TYPES OF EPOXIES

95-2.01 BINDER (ADHESIVE), EPOXY RESIN BASE

Classification:

This specification covers a low viscosity epoxy formulated primarily for use in making high-strength epoxy concrete and epoxy mortar and in pressure grouting of cracks in concrete. For load bearing applications, use ASTM Designation: C 881, Type IV, Grade 1, Class B or C. Class B or C shall be used depending on the substrate and ambient temperatures. Use Grade B for atmospheric and surface temperatures as low as 4°C. Use Class C when temperatures are 15°C or higher. For non-load bearing applications use ASTM Designation: C881, Type I, Grade 1, Class B or C. Apply no thicker than recommended by the manufacturer. Thick sections of this epoxy are not suitable for use in freeze thaw environments. In a freeze-thaw environment, increase the aggregate loading to improve the properties of the epoxy concrete.

Directions for Use:

Mix in conformance with the manufacturer's written recommendations. No more material shall be mixed than can be used within the pot-life from the time mixing operations are started.

95-2.02 (BLANK)

95-2.03 EPOXY RESIN ADHESIVE FOR BONDING NEW CONCRETE TO OLD CONCRETE

Classification:

This specification covers a low viscosity paste epoxy formulated primarily for use in bonding new portland cement concrete to hardened portland cement concrete. The epoxy shall meet the specification requirements of ASTM Designation: C 881, Type V, Grade 2. This epoxy is available in 2 Classes: Class C for general use at temperature greater than 15°C and Class B for use when cure temperatures are below 15°C and above 4°C, or when a faster cure is required.

Directions for Use:

The mixing ratio and use shall be in conformance with the manufacturer's written recommendations. When measuring as individual Components A and B, stir and tap the measuring containers to remove possible air voids. The ingredients in Components A and B shall be thoroughly dispersed such that each component forms a uniform paste. Do not mix more material than can be spread within the pot life from the time mixing operations are started. The spreading rate shall be sufficient to thoroughly coat the surface. Spread the mixed adhesive by brush or roller over blast-cleaned concrete at a rate recommended by the manufacturer. The new concrete shall be placed against the adhesive coating on the old concrete before the adhesive has set. If the adhesive has set and is not tacky prior to placing the new concrete, a new coating of adhesive shall be applied.

95-2.04 RAPID SET EPOXY ADHESIVE FOR PAVEMENT MARKERS

Classification:

This specification covers a high viscosity paste, rapid set epoxy formulated primarily for use in bonding pavement markers to portland cement concrete and asphalt concrete. The adhesive shall meet ASTM Designation: C 881, Type IV, Grade 3, Class B and C except that the gel time may be shorter than 30 minutes. The adhesive shall conform to these requirements and the following.

Characteristics of Combined Components:

All tests shall be performed in conformance with the requirements in California Test 434.

| Property | Requirement |
|--|-------------|
| Gel time, minutes, maximum, at 25°C | 30 |
| Bond Strength to Concrete, Time, minutes (maximum) to reach not less than 1.4 MPa | |
| at 25°C ±1°C | 35 |
| at 10°C ±1°C | 45 |
| Slant Shear Strength | |
| 2 days at 25°C ±1°C, MPa | 7 |
| 14 days at 25°C ±1°C, plus water soak, MPa | 10.5 |
| Tensile Adhesion and Cohesion | |
| Ceramic marker bottom, MPa | 4.8 min. |
| Ceramic marker bottom, including post cure, MPa | 4.8 min. |
| Retroreflective pavement marker bottom, MPa | 3.4 min. |
| Color of mixed epoxy | gray |
| Glass transition temperature, Tg, samples conditioned at 25°C for 24 hours, ASTM Designation: D 4065 | 30°C min. |

Directions for Use:

Components A and B shall be mixed in conformance with the manufacturer's written recommendations. When an automatic proportioning and mixing machine is used, the temperature of the components shall be maintained by indirect heating or cooling, so that the adhesive will meter, mix and extrude properly. The maximum temperature shall be such that after proper mixing no excess adhesive shall flow from under the marker other than that specified in Section 85-1.06, "Placement."

95-2.05 STANDARD SET EPOXY ADHESIVE FOR PAVEMENT MARKERS

Classification:

This specification covers a high viscosity paste standard set epoxy formulated primarily for use in bonding pavement markers to portland cement concrete and asphalt concrete. The epoxy shall meet ASTM Designation: C 881, Type IV, Viscosity Grade 3, Classes B or C, except that the gel time may be shorter than 30 minutes.

Characteristics of Combined Components:

All tests shall be performed in conformance with the requirements in California Test 434.

| Property | Requirement |
|--|-------------|
| Gel time, minutes, maximum, at 25°C | 30 |
| Bond Strength to Concrete, Time (maximum) to reach not less than 1.4 MPa | |
| at 25°C ±1°C | 3.5 hours |
| at 13°C ±1°C | 24 hours |
| Slant Shear Strength | |
| 2 days at 25°C ±1°C, MPa | 7 min. |
| 14 days at 25°C ±1°C, plus water soak, MPa | 10.5 min. |
| Tensile Adhesion and Cohesion | |
| Ceramic marker bottom, MPa | 4.8 min. |
| Ceramic marker bottom, including post cure, MPa | 4.8 min. |
| Reflective pavement marker bottom, MPa | 3.4 min. |
| Color of Mixed Components | gray |
| Glass transition temperature, Tg, samples conditioned at 25°C for 24 hours, ASTM Designation: D 4065 | 30°C min. |

Directions for Use:

Components A and B shall be mixed in conformance with the manufacturer's written recommendations. When an automatic proportioning and mixing machine is used, the temperature of the components shall be maintained by indirect heating or cooling, so that the adhesive will meter, mix and extrude properly. The maximum temperature shall be such that after proper mixing no excess adhesive shall flow from under the marker other than that specified in Section 85-1.06, "Placement."

95-2.06 (BLANK)

95-2.07 (BLANK)

95-2.08 (BLANK)

95-2.09 EPOXY SEALANT FOR INDUCTIVE LOOPS

Classification:

This specification covers a high viscosity liquid epoxy formulated primarily for use in sealing inductive wire loops and leads imbedded in asphalt concrete and portland cement concrete for traffic signal controls and vehicle counters. This epoxy is to be used for repair work on existing spalls, cracks and other deformations in and around saw cuts housing inductor loops and leads. The rapid cure allows minimum traffic delay. This sealant is suitable for use in freeze-thaw areas. The epoxy shall meet ASTM Designation: C 881, Type I, Grade 2 and the following requirements.

Characteristics of Combined Components:

All tests shall be performed in conformance with the requirements in California Test 434.

| Property | Requirement |
|---|-------------|
| Gel time, minutes, maximum | 30 |
| On 3-mm cast sheet, cured 18 hours at 25°C, + 5 hours at 70°C | |
| Tensile Strength, MPa | 2.7 min. |
| Elongation, percent | 90 min. |
| Shore D Hardness | 45 min. |

Directions for Use:

Saw cuts shall be cleaned with compressed air to remove all excess moisture and debris. For repairing damaged saw cuts, all loose spalled material shall be cleaned away from the saw cut, chipping back to sound asphalt concrete or portland cement concrete and all loose material cleaned from loop wires.

The mixing ratio shall be in conformance with the manufacturer's recommendations. No more material shall be mixed than can be used within the gel time from the time mixing operations are started.

When automatic mixing equipment is used for mixing the sealant, the provisions in the twelfth paragraph in Section 85-1.06, "Placement," shall apply.

95-2.10 (BLANK)

95-2.11 EPOXY RESIN ADHESIVE FOR INJECTION GROUTING OF PORTLAND CEMENT CONCRETE PAVEMENTS

Directions for Use:

Both components and the mixed material shall contain no solvents. The mixing ratio of the components in terms of volume and mass shall be clearly stated. The material shall be suitable for use in the mixing equipment used by the applicator. Epoxy adhesive samples shall be furnished to the Engineer for testing at least 12 days before the expected time of use.

Characteristics of Adhesive:

| Test ^a | California Test | Requirement |
|---|--|-------------|
| Brookfield Viscosity, No. 3 Spindle at 20 rpm, Pa·s at 25°C | 434, Part 4 | 0.9 max. |
| Gel time, minutes | 434, Part 1 | 2 to 15 |
| Slant Shear Strength on Dry Concrete, MPa, after 4 days of cure in air at 25°C ±1°C | 434, Part 5 ^b | 41.4 min. |
| Slant Shear Strength on Wet Concrete, MPa, after 4 days of cure in air at 25°C ±1°C | 434, Part 5 ^b | 21.1 min. |
| Tensile Strength, Mpa | 434, Part 7, except test after 4 days of cure at 25°C ±1°C | 31.0 min. |
| Elongation, % | 434, Part 7, except test after 4 days of cure at 25°C ±1°C | 10 max. |

a The mixing ratio used will be that recommended by the manufacturer.

b For slant shear strength on concrete, delete Sections B-1 and B-5 of California Test 434, Part 5. For dry concrete, use Step "2" below only. For wet concrete, use both Steps "1" & "2":

1 Soak blocks in water for 24 hours at 25°C ±1°C. Remove and wipe off excess water.

2 Mix epoxy as described in California Test 434, Part 1, and apply a coat approximately 250 µm thick to each diagonal surface. Place four 3-mm square pieces of shim stock 305 µm thick on one block to control final film thickness. Before pressing the coated surfaces together, leave the blocks so that the coated surfaces are horizontal until the epoxy reacts slightly to prevent excessive flow.

END OF AMENDMENTS