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STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

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# NOTICE TO CONTRACTORS

# AND

# SPECIAL PROVISIONS

## FOR CONSTRUCTION ON STATE HIGHWAY IN

**RIVERSIDE COUNTY, IN RIVERSIDE AND MORENO VALLEY ON ROUTE 215 FROM 0.4 KM NORTH OF EUCALYPTUS AVENUE OVERCROSSING TO COLUMBIA AVENUE OVERCROSSING, ON ROUTE 60 FROM 0.6 KM EAST OF DAY STREET UNDERCROSSING TO 0.4 KM WEST OF MAIN STREET OVERCROSSING, ON ROUTE 91 FROM 0.3 KM SOUTH OF UNIVERSITY AVENUE UNDERCROSSING TO 0.1 KM NORTH OF SPRUCE STREET OVERCROSSING .**

**DISTRICT 08, ROUTE 215, 60, 91**

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**For Use in Connection with Standard Specifications Dated JULY 1999, Standard Plans Dated JULY 1999, and Labor Surcharge and Equipment Rental Rates.**

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**CONTRACT NO. 08-334844**

**(DESIGN SEQUENCING CONTRACT)**

**08-Riv-215, 60, 91-60.7/70.6, 22.0/18.5, 32.7/34.7**

**Federal Aid Project**

**ACNHI-215-1(219)92N**
**ACNH-X065(080)N**

**REVISED PER ADDENDUM NO. 2 DATED SEPTEMBER 23, 2003**

**Bids Open: November 6, 2003**
**Dated: September 2, 2003**

**OSD**

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# IMPORTANT SPECIAL NOTICES

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- **Submission of DBE Information**
  Attention is directed to Section 2-1.02B, "Submission of DBE Information," of the special provisions, regarding submittal of the "CALTRANS BIDDER - DBE INFORMATION" form and GOOD FAITH EFFORT (GFE) DOCUMENTATION form.

  ALL bidders shall complete the "CALTRANS BIDDER - DBE INFORMATION" form included in the Proposal and submit it WITH THE BID.

  The apparent successful bidder (low bidder), the second low bidder and the third low bidder shall submit the GOOD FAITH EFFORT (GFE) DOCUMENTATION form by THE FOURTH DAY following bid opening.

  The bidder shall submit written confirmation from each DBE that the DBE is participating in the contract, and include the confirmation with the submittal of the bid or submit it by the time specified for submittal of the GOOD FAITH EFFORT (GFE) DOCUMENTATION form.

  FAILURE TO SUBMIT THE REQUIRED DBE INFORMATION AND THE GFE DOCUMENTATION, IF REQUIRED, BY THE TIMES SPECIFIED WILL BE GROUNDS FOR FINDING THE BID OR PROPOSAL NONRESPONSIVE.

  The provisions regarding the information and supporting documents the bidder should submit to establish the bidder's good faith efforts to meet the DBE goal, and the "DBE Information Good Faith Efforts" form in the Proposal, have been enhanced for clarification.

- **Award of Contract**
  Attention is directed to Section 3, "Award and Execution of Contract," of the special provisions regarding the time in which the contract will be awarded.

- **Design Sequencing:**
  This project is part of a pilot program for "Design Sequencing", per Section 217, et seq., of the Streets and Highways Code (Assembly Bill 405). The purpose of the pilot program is to evaluate Design Sequencing as a tool for acceleration of project completion. Design Sequencing is a method of contracting where bids are based on partial project design, and final design activities are sequenced to permit each construction phase to commence when the design for that phase is complete, before the design of the entire project is complete. The project plans and specifications for this project are not considered complete to construct the work anticipated by the contract, and the Engineer's Estimate may contain anticipated items of work that are not indicated on the project plans. Design, and final project plans, specifications and estimate of quantities, will be completed during construction.

- **Pre-Bid Qualifications:**
  The bidder's attention is directed to Section 2-1.012, "Pre-Bid Qualification Questionnaire," and Section 2-1.013, "Pre-Bid Qualification Review," in the Special Provisions regarding review of the prospective bidder's qualifications to submit a bid for this project.

- **Project Funding:**
  Attention is directed to Section 5-1.117, "Limitation of Payments," of the special provisions regarding payments to the Contractor and availability of funds. The estimated total contract amount for this Design Sequencing contract is $200 million.
  Funds are not presently available for completion of the contract.
  On September 25, 2003, the California Transportation Commission (CTC) will allocate approximately $63 million for construction of this project. Upon the allocation by the CTC, prospective bidders who have obtained project plans, Special Provisions and proposal forms from the Department's Plans and Bid Documents room will be so notified by contract addendum. The Department will also publish a notice on its Website: http://www.dot.ca.gov/hq/esc/oe/special.html If this notice is within 6 weeks of the date set forth in the Notice to Contractors for the opening of bids, the addendum will also postpone the bid opening date to allow additional time for the preparation of bids.
  The remainder of the construction and right of way funds for the project is expected to be obtained through two sales of Grant Anticipation Revenue Vehicle (GARVEE) bonds, in accordance with California Government Code Section 14550. The first bond sale proceeds of $138 million are expected to be available in March, 2004.. An additional $100 million from the second bond sale proceeds is expected to be available in September, 2005. Upon availability of the proceeds from the second bond sale, it is anticipated that the full amount of funding to complete the work of the contract will be available. Section 5-1.117 has been added to the special provisions to assure that payments can be made to the Contractor during the course of the work without exceeding the funds available at any particular time. The work of the contract may only be prosecuted to the extent of funds allocated to the contract.

- **Escrow of Bid Documentation:**
  The bidder's attention is directed to "Escrow of Bid Documentation" of these special provisions.

- **Order of Work:**
  The bidder's attention is directed to "Order of Work" of these special provisions regarding the priority of the work at Iowa Avenue Overcrossing and at Linden Avenue Overcrossing.

- **Project Schedule (Critical Path Method):**
  The bidder's attention is directed to "Project Schedule (Critical Path Method)" regarding additional requirements for Design Sequencing and Limitation of Payments.

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# STANDARD PLANS LIST

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

| | |
|---|---|
| A10A | Abbreviations |
| A10B | Symbols |
| A20A | Pavement Markers and Traffic Lines, Typical Details |
| A20B | Pavement Markers and Traffic Lines, Typical Details |
| A20C | Pavement Markers and Traffic Lines, Typical Details |
| A20D | Pavement Markers and Traffic Lines, Typical Details |
| A24A | Pavement Markings - Arrows |
| A24B | Pavement Markings - Arrows |
| A24C | Pavement Markings - Symbols and Numerals |
| A24D | Pavement Markings - Words |
| A24E | Pavement Markings - Words and Crosswalks |
| RSP A35B | Portland Cement Concrete Pavement (Doweled Transverse Joints) |
| A35C | Portland Cement Concrete Pavement Joint and End Anchor Details |
| A62A | Excavation and Backfill - Miscellaneous Details |
| A62B | Limits of Payment for Excavation and Backfill - Bridge Surcharge and Wall |
| A62C | Limits of Payment for Excavation and Backfill - Bridge |
| A62D | Excavation and Backfill - Concrete Pipe Culverts |
| RSP A62DA | Excavation and Backfill - Concrete Pipe Culverts |
| NSP A63A | Portable Concrete Barrier (Type 60K) |
| NSP A63B | Portable Concrete Barrier (Type 60K) |
| A73A | Object Markers |
| A73B | Markers |
| RSP A73C | Delineators, Channelizers and Barricades |
| A74 | Survey Monuments |
| A75D | Concrete Headlight Glare Screen |
| A76A | Concrete Barrier Type 60 |
| A76B | Concrete Barrier Type 60 |
| A76C | Concrete Barrier Type 60E |
| A76D | Concrete Barrier Type 60G |
| A76E | Concrete Barrier Type 60G |
| A76F | Concrete Barrier Type 60GE |
| A76I | Concrete Barrier Type 60SE |
| A77A | Metal Beam Guard Railing – Typical Wood Post With Wood Block |
| A77AA | Metal Beam Guard Railing – Typical Steel Post With Wood Block |
| A77B | Metal Beam Guard Railing - Standard Hardware |
| A77C | Metal Beam Guard Railing – Wood Post and Wood Block Details |
| A77CA | Metal Beam Guard Railing – Steel Post and Wood Block Details |
| A77D | Metal Beam Guard Railing – Typical Layouts |
| A77E | Metal Beam Guard Railing – Typical Layouts |

| | |
|---|---|
| A77F | Metal Beam Guard Railing – Typical Embankment Widening for End Treatments |
| A77FA | Metal Beam Guard Railing – Typical Line Post Installation |
| RSP A77G | Metal Beam Guard Railing – End Treatment, Terminal Anchor Assembly (Type SFT) |
| A77H | Metal Beam Guard Railing - Anchor Cable and Anchor Plate Details |
| A77I | Metal Beam Guard Railing – End Treatment, Terminal Anchor Assembly (Type CA) |
| A77IA | Metal Beam Guard Railing – End Treatment, Buried Post Anchor |
| A77J | Metal Beam Guard Railing Connections to Bridge Railings, Retaining Walls and Abutments |
| A77K | Metal Beam Guard Railing Connections to Bridge Sidewalks and Curbs |
| RSP A77L | Metal Beam Guard Railing and Single Faced Barrier Railing Terminal System - End Treatments |
| RSP A77M | Metal Beam Guard Railing and Single Faced Barrier Railing Terminal System - End Treatment |
| RSP A77N | Metal Beam Guard Railing and Single Faced Barrier Railing Terminal System - End Treatment |
| A78A | Thrie Beam Barrier – Typical Wood Post With Wood Block |
| A78C | Thrie Beam Barrier – Posts, Blocks and Standard Hardware Details |
| A78D | Thrie Beam Barrier - Miscellaneous Details |
| A78F | Thrie Beam Barrier Connections to Bridge Railing |
| A78I | Thrie Beam Barrier Connection to Concrete Barrier Type 60 |
| RSP A82A | Crash Cushion (Type CAT) |
| A82B | Crash Cushion (Type ADIEM) |
| A85 | Chain Link Fence |
| A87 | Curbs, Dikes and Driveways |
| A88A | Curb Ramp Details |
| A88B | Curb Ramp Details |

GENERAL ROAD WORK (Drainage)

| | |
|---|---|
| RSP D72 | Drainage Inlets |
| D73 | Drainage Inlets |
| D74A | Drainage Inlets |
| D74B | Drainage Inlets |
| D74C | Drainage Inlet Details |
| D75A | Pipe Inlets |
| D75B | Pipe Inlets |
| D75C | Pipe Inlets |
| D77A | Grate Details |
| D77B | Bicycle Proof Grate Details |
| D77C | Alternative Hinged Cover for Type OL and OS Inlets and Trash Rack for Type OCP Inlet |
| D78 | Gutter Depressions |
| 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 |
| RSP D82 | Cast-in-Place Reinforced Concrete Culvert Miscellaneous Details |
| RSP D84 | Box Culvert Wingwalls - Types A, B and C |
| D85 | Box Culvert Wingwalls - Types D and E |
| D86A | Box Culvert Warped Wingwalls |
| 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 |
| D88A | Strut Details for Structural Steel Pipes, Arches and Vehicular Undercrossing |
| RSP D89 | Pipe Headwalls |
| D90 | Pipe Culvert Headwalls, Endwalls and Wingwalls -Types A, B and C |
| D93A | Pipe Riser Connections |
| D93B | Drainage Inlet Riser Connections |
| D93C | Pipe Riser With Debris Rack Cage |
| D94A | Metal and Plastic Flared End Sections |
| D97A | Corrugated Metal Pipe Coupling Details No. 1 - Annular Coupling Band Bar and Strap and Angle Connectors |
| D97B | Corrugated Metal Pipe Coupling Details No. 2 - Hat Band Coupler and Flange Details |
| D97C | Corrugated Metal Pipe Coupling Details No. 3 - Helical and Universal Couplers |
| D97D | Corrugated Metal Pipe Coupling Details No. 4 - Hugger Coupling Bands |
| D97E | Corrugated Metal Pipe Coupling Details No. 5 - Standard Joint |
| D97F | Corrugated Metal Pipe Coupling Details No. 6 - Positive Joint |
| D97G | Corrugated Metal Pipe Coupling Details No. 7 - Positive Joints and Downdrains |
| D97H | Reinforced Concrete Pipe or Non-Reinforced Concrete Pipe - Standard and Positive Joints |
| D98A | Slotted Corrugated Steel Pipe Drain Details |
| D98B | Slotted Corrugated Steel Pipe Drain Details |
| D98C | Grated Line Drain Details |
| D99A | Structural Section Drainage System Details |
| D99B | Edge Drain Outlet and Vent Details |
| D99C | Edge Drain Cleanout and Vent Details |
| D99D | Cross Drain Interceptor Details |
| D101 | Channel Slope Protection Details |
| D102 | Underdrains |

GENERAL ROAD WORK (Planting And Irrigation)

| | |
|---|---|
| H1 | Planting and Irrigation - Abbreviations |
| H2 | Planting and Irrigation - Symbols |
| H3 | Planting and Irrigation Details |
| H4 | Planting and Irrigation Details |
| H5 | Planting and Irrigation Details |
| H6 | Planting and Irrigation Details |
| H7 | Planting and Irrigation Details |
| H8 | Planting and Irrigation Details |

GENERAL ROAD WORK (Temporary Facilities)

| | |
|---|---|
| T1A | Temporary Crash Cushion, Sand Filled (Unidirectional) |
| 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 |
| T7 | Construction Project Funding Identification Signs |

| | |
|---|---|
| T10 | Traffic Control System for Lane Closure On Freeways and Expressways |
| T10A | Traffic Control System for Lane and Complete Closures On Freeways and Expressways |
| T11 | Traffic Control System for Lane Closure On Multilane Conventional Highways |
| T12 | Traffic Control System for Lane Closure On Multilane Conventional Highways |
| T13 | Traffic Control System for Lane Closure On Two Lane Conventional Highways |
| T14 | Traffic Control System for Ramp Closure |
| T15 | Traffic Control System for Moving Lane Closure On Multilane Highways |
| T17 | Traffic Control System for Moving Lane Closure On Two Lane Highways |

BRIDGE

| | |
|---|---|
| RSP B0-3 | Bridge Details |
| RSP B3-1 | Retaining Wall Type 1 - H=1200 Through 9100 mm |
| RSP B3-2 | Retaining Wall Type 1 - H=9700 Through 10 900 mm |
| RSP B3-3 | Retaining Wall Type 1A |
| RSP B3-7 | Retaining Wall Type 5 |
| RSP B3-8 | Retaining Wall Details No. 1 |
| B3-9 | Retaining Wall Details No. 2 |
| RSP B3-11 | Retaining Wall Type 6 - 1829 mm Maximum |
| B7-5 | Deck Drains |
| B7-6 | Deck Drains - Types D-1 and D-2 |
| B7-7 | Deck Drain - Type D-3 |
| B11-7 | Chain Link Railing |
| B11-47 | Cable Railing |
| RSP B11-55 | Concrete Barrier Type 732 |
| RSP B11-56 | Concrete Barrier Type 736 |

ROADSIDE SIGNS

| | |
|---|---|
| RS1 | Roadside Signs, Typical Installation Details No. 1 |
| RS2 | Roadside Signs - Wood Post, Typical Installation Details No. 2 |
| RS4 | Roadside Signs, Typical Installation Details No. 4 |

OVERHEAD SIGNS

| | |
|---|---|
| RSP S1 | Overhead Signs - Truss, Instructions and Examples |
| RSP S2 | Overhead Signs - Truss, Single Post Type - Post Types II Thru VII |
| RSP S3 | Overhead Signs - Truss, Two Post Type - Post Types I-S Thru VII-S |
| S4 | Overhead Signs - Truss, Single Post Type - Structural Frame Members |
| RSP S6 | Overhead Signs - Truss, Structural Frame Details |
| RSP S7 | Overhead Signs -Truss, Frame Juncture Details |
| S9 | Overhead Signs - Walkway Details No. 1 |
| S10 | Overhead Signs - Walkway Details No. 2 |
| RSP S11 | Overhead Signs - Walkway Safety Railing Details |
| RSP S13 | Overhead Signs - Truss, Pile Foundation |
| S40N | Overhead Signs- Tubular, Instructions and Examples |
| S40P | Overhead Signs - Tubular, Single Post Type, Layout and Pipe Selection |
| RSP S40Q | Overhead Signs - Tubular, Two Post Type, Layout and Pipe Selection |
| S40R | Overhead Signs - Tubular, Structural Frame Details No. 1 |
| RSP S40S | Overhead Signs - Tubular, Structural Frame Details No. 2 |
| RSP S40T | Overhead Signs - Tubular, Base Plate and Anchorage Details |

| | |
|---|---|
| RSP S40U | Overhead Signs - Tubular, Foundation Details |

SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

| | |
|---|---|
| ES-1A | Signal, Lighting and Electrical Systems - Symbols and Abbreviations |
| ES-1B | Signal, Lighting and Electrical Systems - Symbols and Abbreviations |
| ES-2A | Signal, Lighting and Electrical Systems - Service Equipment |
| ES-2C | Signal, Lighting and Electrical Systems - Service Equipment Notes, Type III Series |
| ES-2E | Signal, Lighting and Electrical Systems - Service Equipment and Typical Wiring Diagram Type III-B Series |
| ES-2F | Signal, Lighting and Electrical Systems - Service Equipment and Typical Wiring Diagram Type III-C Series |
| ES-3C | Signal, Lighting and Electrical Systems - Controller Cabinet Details |
| ES-3H | Signal, Lighting and Electrical Systems – Irrigation Controller Enclosure Cabinet |
| ES-4A | Signal, Lighting and Electrical Systems - Signal Heads and Mountings |
| ES-4B | Signal, Lighting and Electrical Systems - Signal Heads and Mountings |
| ES-4C | Signal, Lighting and Electrical Systems - Signal Heads and Mountings |
| ES-4D | Signal, Lighting and Electrical Systems - Signal Heads and Mountings |
| ES-4E | Signal, Lighting and Electrical Systems - Signal Heads and Mountings |
| ES-5A | Signal, Lighting and Electrical Systems - Detectors |
| ES-5B | Signal, Lighting and Electrical Systems - Detectors |
| ES-5C | Signal, Lighting and Electrical Systems - Detectors |
| ES-5E | Signal, Lighting and Electrical Systems - Detectors |
| RSP ES-6A | Lighting Standards - Types 15, 21 and 22 |
| RSP ES-6B | Lighting Standards - Types 15 AND 21, Barrier Rail Mounted Details |
| RSP ES-6C | Lighting Standards - Type 15 Slip Base Insert |
| ES-6E | Lighting Standards - Types 30 and 31 |
| RSP ES-6F | Lighting Standards - Type 30 and 31 Base Plate Details |
| ES-6K | Lighting Standards - Type 5 and Type 10, Overhead Sign Mounted |
| ES-7A | Signal Standards - Push Button Posts |
| ES-7B | Signal and Lighting Standards - Type 1 Standards and Equipment Numbering |
| RSP ES-7C | Signal and Lighting Standards - Case 1 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 4.6 m to 9.1 m |
| RSP ES-7D | Signal and Lighting Standards - Case 2 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 4.6 m to 9.1 m |
| RSP ES-7E | Signal and Lighting Standards - Case 3 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 4.6 m to 13.7 m |
| ES-7F | Signal and Lighting Standards - Case 4 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 7.6 m to 13.7 m |
| ES-7G | Signal and Lighting Standards - Case 5 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 15.2 m to 16.8 m |
| ES-7H | Signal and Lighting Standards - Case 5 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 18.2 m to 19.8 m |
| ES-7M | Signal and Lighting Standards - Details No. 1 |
| ES-7N | Signal and Lighting Standards - Details No. 2 |
| ES-8 | Signal, Lighting and Electrical Systems - Pull Box Details |

| | |
|---|---|
| ES-9A | Signal, Lighting and Electrical Systems - Electrical Details, Structure Installations |
| ES-9B | Signal, Lighting and Electrical Systems - Electrical Details, Structure Installations |
| ES-9C | Signal, Lighting and Electrical Systems - Electrical Details, Structure Installations |
| ES-9D | Signal, Lighting and Electrical Systems - Electrical Details, Structure Installations |
| ES-9E | Signal, Lighting and Electrical Systems - Electrical Details, Structure Installations |
| ES-10 | Signal, Lighting and Electrical Systems - Isolux Diagrams |
| ES-11 | Signal, Lighting and Electrical Systems - Foundation Installations |
| ES-13A | Signal, Lighting and Electrical Systems - Splicing Details |
| ES-13B | Signal, Lighting and Electrical Systems - Wiring Details and Fuse Ratings |
| ES-15A | Sign Illumination - Mercury Vapor Sign Illumination Equipment |
| ES-15C | Sign Illumination - Sign Illumination Equipment |
| ES-15D | Sign Illumination - Sign Illumination Control |
| ES-16A | Closed Circuit Television Pole Details |

**DEPARTMENT OF TRANSPORTATION**

# NOTICE TO CONTRACTORS

**THIS IS A DESIGN SEQUENCING CONTRACT**

**CONTRACT NO. 08-334844**

**08-Riv-215,60,91-60.7/70.6, 22.0/18.5, 32.7/34.7**

Sealed proposals for the work shown on the plans entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR CONSTRUCTION ON STATE HIGHWAY IN RIVERSIDE COUNTY, IN RIVERSIDE AND MORENO VALLEY ON ROUTE 215 FROM 0.4 KM NORTH OF EUCALYPTUS AVENUE OVERCROSSING TO COLUMBIA AVENUE OVERCROSSING, ON ROUTE 60 FROM 0.6 KM EAST OF DAY STREET UNDERCROSSING TO 0.4 KM WEST OF MAIN STREET OVERCROSSING, ON ROUTE 91 FROM 0.3 KM SOUTH OF UNIVERSITY AVENUE UNDERCROSSING TO 0.1 KM NORTH OF SPRUCE STREET OVERCROSSING .**

will be received at the Department of Transportation, 3347 Michelson Drive, Suite 100, Irvine, CA 92612-1692, until 2 o'clock p.m. on November 6, 2003, at which time they will be publicly opened and read in Room C - 1116 at the same address.

Proposal forms for this work are included in a separate book entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROPOSAL AND CONTRACT FOR CONSTRUCTION ON STATE HIGHWAY IN RIVERSIDE COUNTY, IN RIVERSIDE AND MORENO VALLEY ON ROUTE 215 FROM 0.4 KM NORTH OF EUCALYPTUS AVENUE OVERCROSSING TO COLUMBIA AVENUE OVERCROSSING, ON ROUTE 60 FROM 0.6 KM EAST OF DAY STREET UNDERCROSSING TO 0.4 KM WEST OF MAIN STREET OVERCROSSING, ON ROUTE 91 FROM 0.3 KM SOUTH OF UNIVERSITY AVENUE UNDERCROSSING TO 0.1 KM NORTH OF SPRUCE STREET OVERCROSSING .**

General work description: Existing freeway to be widened from six lanes to eight lanes, including adding, removing and upgrading interchanges, providing new connectors, and constructing retaining walls and sound walls

This project has a goal of 12 percent disadvantaged business enterprise (DBE) participation.

No prebid meeting is scheduled for this project.

**THIS PROJECT IS SUBJECT TO THE "BUY AMERICA" PROVISIONS OF THE SURFACE TRANSPORTATION ASSISTANCE ACT OF 1982 AS AMENDED BY THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991.**

Bids are required for the entire work described herein.

At the time this contract is awarded, the Contractor shall possess either a Class A license or a combination of Class C licenses which constitutes a majority of the work.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

Bidder inquiries may be submitted to Department of Transportation, District 8, San Bernardino, in the following manner (listed in order of preference):

1. e-mail: Nestor_Corpuz@dot.ca.gov
2. Fax: (909) 383-6739
3. Phone: (909) 383-6322

4. Mail: Department of Transportation
655, 2nd Street
San Bernardino, CA 92402
Attn: CCO / Prebid Inquiry Desk

The Department does not guarantee that bidder inquiries submitted will be responded to on time and to the full satisfaction of the inquirers. Inquiries must be received at least 48 hours prior to the scheduled bid opening.

Responses to bidder inquiries will be communicated to the inquirer either by phone, fax or e-mail. Compiled bidder inquiries and the corresponding responses for selected projects may be posted at the following website:

http://www.dot.ca.gov/hq/esc/oe/

Project plans, special provisions, and proposal forms for bidding this project can only be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, MS #26, Transportation Building, 1120 N Street, Sacramento, California 95814, FAX No. (916) 654-7028, Telephone No. (916) 654-4490. Use FAX orders to expedite orders for project plans, special provisions and proposal forms. FAX orders must include credit card charge number, card expiration date and authorizing signature. Project plans, special provisions, and proposal forms may be seen at the above Department of Transportation office and at the offices of the District Directors of Transportation at Irvine, Oakland, and the district in which the work is situated. Standard Specifications and Standard Plans are available through the State of California, Department of Transportation, Publications Unit, 1900 Royal Oaks Drive, Sacramento, CA 95815, Telephone No. (916) 445-3520.

Cross sections for this project are not available.

The successful bidder shall furnish a payment bond and a performance bond.

The Department of Transportation hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation.

The U.S. Department of Transportation (DOT) provides a toll-free "hotline" service to report bid rigging activities. Bid rigging activities can be reported Mondays through Fridays, between 8:00 a.m. and 5:00 p.m., eastern time, Telephone No. 1-800-424-9071. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report these activities. The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at the Labor Compliance Office at the offices of the District Director of Transportation for the district in which the work is situated, and available from the California Department of Industrial Relations' internet web site at: http://www.dir.ca.gov. The Federal minimum wage rates for this project as predetermined by the United States Secretary of Labor are available through the California Department of Transportation's Electronic Project Document Distribution Site on the internet at http://hqidoc1.dot.ca.gov/. Addenda to modify the Federal minimum wage rates, if necessary, will be issued to holders of "Proposal and Contract" books. Future effective general prevailing wage rates which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

If there is a difference between the minimum wage rates predetermined by the United States Secretary of Labor and the general prevailing wage rates determined by the Director of the California Department of Industrial Relations for similar classifications of labor, the Contractor and subcontractors shall pay not less than the higher wage rate. The Department will not accept lower State wage rates not specifically included in the Federal minimum wage determinations. This includes "helper" (or other classifications based on hours of experience) or any other classification not appearing in the Federal wage determinations. Where Federal wage determinations do not contain the State wage rate determination otherwise available for use by the Contractor and subcontractors, the Contractor and subcontractors shall pay not less than the Federal minimum wage rate which most closely approximates the duties of the employees in question.

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated September 2, 2003

**COPY OF ENGINEER'S ESTIMATE**

**(NOT TO BE USED FOR BIDDING PURPOSES)**

08-334844

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 1 | 860530 | CHANGEBLE MESSAGE SIGN SYSTEM | LS | LUMP SUM | LUMP SUM | |
| 2 | 031943 | COMMUNICATIONS HUB ASSEMBLY | LS | LUMP SUM | LUMP SUM | |
| 3 | 031944 | MICROWAVE WIRELESS DETECTION SENSOR SYSTEM | EA | 6 | | |
| 4 | 031945 | COMMUNICATION HUB STRUCTURE | LS | LUMP SUM | LUMP SUM | |
| 5 | 031946 | MODIFY FIBER OPTIC COMMUNICATION SYSTEM | LS | LUMP SUM | LUMP SUM | |
| 6 | 070012 | PROGRESS SCHEDULE (CRITICAL PATH METHOD) | LS | LUMP SUM | LUMP SUM | |
| 7 | 070018 | TIME-RELATED OVERHEAD | WDAY | 720 | | |
| 8 | 071322 | TEMPORARY FENCE (TYPE CL-1.8) | M | 10 900 | | |
| 9 | 071325 | TEMPORARY FENCE (TYPE ESA) | M | 1760 | | |
| 10 | 074019 | PREPARE STORM WATER POLLUTION PREVENTION PLAN | LS | LUMP SUM | LUMP SUM | |
| 11 | 074020 | WATER POLLUTION CONTROL | LS | LUMP SUM | LUMP SUM | |
| 12 | 120090 | CONSTRUCTION AREA SIGNS | LS | LUMP SUM | LUMP SUM | |
| 13 (S) | 120100 | TRAFFIC CONTROL SYSTEM | LS | LUMP SUM | LUMP SUM | |
| 14 (S) | 120116 | TYPE II BARRICADE | EA | 93 | | |
| 15 (S) | 120120 | TYPE III BARRICADE | EA | 57 | | |
| 16 (S) | 120150 | TEMPORARY PAVEMENT MARKING | M2 | 200 | | |
| 17 (S) | 120159 | TEMPORARY TRAFFIC STRIPE (PAINT) | M | 151 000 | | |
| 18 (S) | 120165 | CHANNELIZER (SURFACE MOUNTED) | EA | 1560 | | |
| 19 (S) | 120200 | FLASHING BEACON (PORTABLE) | EA | 8 | | |
| 20 (S) | 120300 | TEMPORARY PAVEMENT MARKER | EA | 40 200 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 21 (S) | 128650 | PORTABLE CHANGEABLE MESSAGE SIGN | EA | 11 | | |
| 22 (S) | 129000 | TEMPORARY RAILING (TYPE K) | M | 69 200 | | |
| 23 (S) | 129100 | TEMPORARY CRASH CUSHION MODULE | EA | 1440 | | |
| 24 (S) | 129150 | TEMPORARY TRAFFIC SCREEN | M | 66 100 | | |
| 25 | 150221 | ABANDON INLET | EA | 26 | | |
| 26 | 150227 | ABANDON PIPELINE | M | 2240 | | |
| 27 | 150305 | OBLITERATE SURFACING | M2 | 136 000 | | |
| 28 | 150608 | REMOVE CHAIN LINK FENCE | M | 9290 | | |
| 29 | 150630 | REMOVE MARKER | EA | 20 | | |
| 30 | 150662 | REMOVE METAL BEAM GUARD RAILING | M | 6060 | | |
| 31 | 150710 | REMOVE TRAFFIC STRIPE | M | 42 700 | | |
| 32 | 031947 | REMOVE TRAFFIC STRIPE (YELLOW) | M | 35 400 | | |
| 33 | 150711 | REMOVE PAINTED TRAFFIC STRIPE | M | 155 000 | | |
| 34 | 150712 | REMOVE PAINTED PAVEMENT MARKING | M2 | 190 | | |
| 35 | 150722 | REMOVE PAVEMENT MARKER | EA | 26 100 | | |
| 36 | 150742 | REMOVE ROADSIDE SIGN | EA | 390 | | |
| 37 | 150760 | REMOVE SIGN STRUCTURE | EA | 52 | | |
| 38 | 150763 | REMOVE SIGN PANEL | EA | 4 | | |
| 39 | 150806 | REMOVE PIPE | M | 3480 | | |
| 40 | 150820 | REMOVE INLET | EA | 120 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 41 | 150821 | REMOVE HEADWALL | EA | 53 | | |
| 42 | 150826 | REMOVE MANHOLE | EA | 17 | | |
| 43 | 150829 | REMOVE RETAINING WALL | M3 | 1980 | | |
| 44 | 150870 | REMOVE CONCRETE DECK SURFACE | M2 | 85 | | |
| 45 | 151224 | REMOVE DELINEATOR | EA | 100 | | |
| 46 | 031948 | SALVAGE FENCE (CHAIN LINK) | M | 6400 | | |
| 47 | 151272 | SALVAGE METAL BEAM GUARD RAILING | M | 890 | | |
| 48 | 151540 | RECONSTRUCT CHAIN LINK FENCE | M | 170 | | |
| 49 | 152301 | RESET MARKER | EA | 14 | | |
| 50 | 152320 | RESET ROADSIDE SIGN | EA | 170 | | |
| 51 | 152390 | RELOCATE ROADSIDE SIGN | EA | 170 | | |
| 52 | 152443 | ADJUST PIPE INLET TO GRADE | EA | 2 | | |
| 53 | 152604 | MODIFY INLET | EA | 3 | | |
| 54 (S) | 153153 | COLD PLANE ASPHALT CONCRETE PAVEMENT (45 MM MAXIMUM) | M2 | 71 100 | | |
| 55 | 153220 | REMOVE CONCRETE (CHANNEL) | M3 | 1120 | | |
| 56 | 153221 | REMOVE CONCRETE BARRIER | M | 6100 | | |
| 57 | 153225 | PREPARE CONCRETE BRIDGE DECK SURFACE | M2 | 43 | | |
| 58 | 153235 | CLEAN BRIDGE DECK | M2 | 10 760 | | |
| 59 | 049540 | REMOVE CONCRETE STAIRWAY | LS | LUMP SUM | LUMP SUM | |
| 60 | 153246 | REMOVE CONCRETE (MISCELLANEOUS) | M3 | 1160 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 61 | 153250 | REMOVE SOUND WALL | M2 | 3910 | | |
| 62 | 155003 | CAP INLET | EA | 45 | | |
| 63 | 156585 | REMOVE CRASH CUSHION | EA | 12 | | |
| 64 | 157550 | BRIDGE REMOVAL | LS | LUMP SUM | LUMP SUM | |
| 65 | 157560 | BRIDGE REMOVAL (PORTION) | LS | LUMP SUM | LUMP SUM | |
| 66 | 031949 | PUMP STATION REMOVAL | LS | LUMP SUM | LUMP SUM | |
| 67 | 160101 | CLEARING AND GRUBBING | LS | LUMP SUM | LUMP SUM | |
| 68 | 170101 | DEVELOP WATER SUPPLY | LS | LUMP SUM | LUMP SUM | |
| 69 | 180101 | BINDER (DUST PALLIATIVE) | TONN | 50 | | |
| 70 | 190101 | ROADWAY EXCAVATION | M3 | 702 000 | | |
| 71 | 190110 | LEAD COMPLIANCE PLAN | LS | LUMP SUM | LUMP SUM | |
| 72 (F) | 192003 | STRUCTURE EXCAVATION (BRIDGE) | M3 | 31 900 | | |
| 73 (F) | 192020 | STRUCTURE EXCAVATION (TYPE D) | M3 | 650 | | |
| 74 (F) | 192026 | STRUCTURE EXCAVATION (PUMPING PLANT) | M3 | 1060 | | |
| 75 (F) | 192027 | STRUCTURE BACKFILL (PUMPING PLANT) | M3 | 560 | | |
| 76 (F) | 192037 | STRUCTURE EXCAVATION (RETAINING WALL) | M3 | 75 104 | | |
| 77 (F) | 193003 | STRUCTURE BACKFILL (BRIDGE) | M3 | 21 800 | | |
| 78 (F) | 193013 | STRUCTURE BACKFILL (RETAINING WALL) | M3 | 62 776 | | |
| 79 (F) | 193031 | PERVIOUS BACKFILL MATERIAL (RETAINING WALL) | M3 | 710 | | |
| 80 | 193114 | SAND BACKFILL | M3 | 830 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 81 | 194001 | DITCH EXCAVATION | M3 | 2500 | | |
| 82 (F) | 197020 | EARTH RETAINING STRUCTURE | M2 | 9270 | | |
| 83 (F) | 197060 | SOIL NAIL ASSEMBLY | M | 41 850 | | |
| 84 | 198001 | IMPORTED BORROW | M3 | 265 000 | | |
| 85 (S) | 200001 | HIGHWAY PLANTING | LS | LUMP SUM | LUMP SUM | |
| 86 (S) | 031950 | ROCK BLANKET (TYPE 1) | M2 | 28 000 | | |
| 87 (S) | 031951 | INTERLOCKING PAVERS | M2 | 540 | | |
| 88 | 203001 | EROSION CONTROL (BLANKET) | M2 | 5200 | | |
| 89 (S) | 203003 | STRAW (EROSION CONTROL) | TONN | 320 | | |
| 90 (S) | 203014 | FIBER (EROSION CONTROL) | KG | 64 000 | | |
| 91 (S) | 203045 | PURE LIVE SEED (EROSION CONTROL) | KG | 1600 | | |
| 92 (S) | 203056 | COMMERCIAL FERTILIZER (EROSION CONTROL) | KG | 24 000 | | |
| 93 (S) | 203061 | STABILIZING EMULSION (EROSION CONTROL) | KG | 14 000 | | |
| 94 | 204031 | TRANSPLANT PALM TREE | EA | 18 | | |
| 95 (S) | 204099 | PLANT ESTABLISHMENT WORK | LS | LUMP SUM | LUMP SUM | |
| 96 (S) | 208000 | IRRIGATION SYSTEM | LS | LUMP SUM | LUMP SUM | |
| 97 | 208038 | NPS 3 SUPPLY LINE (BRIDGE) | M | 473 | | |
| 98 (S) | 208744 | 300 MM CORRUGATED STEEL PIPE CONDUIT (1.63 MM THICK) | M | 260 | | |
| 99 (S) | 208800 | 300 MM WELDED STEEL PIPE CONDUIT (6.35 MM THICK) | M | 160 | | |
| 100 (S) | 031952 | EXTEND 300MM CONDUIT | M | 35 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 101 | 209801 | MAINTENANCE VEHICLE PULLOUT | EA | 32 | | |
| 102 | 220101 | FINISHING ROADWAY | LS | LUMP SUM | LUMP SUM | |
| 103 | 250101 | CLASS 1 AGGREGATE SUBBASE | M3 | 90 400 | | |
| 104 | 260201 | CLASS 2 AGGREGATE BASE | M3 | 72 800 | | |
| 105 | 260210 | AGGREGATE BASE (APPROACH SLAB) | M3 | 87 | | |
| 106 | 280000 | LEAN CONCRETE BASE | M3 | 24 600 | | |
| 107 | 290201 | ASPHALT TREATED PERMEABLE BASE | M3 | 550 | | |
| 108 | 374002 | ASPHALTIC EMULSION (FOG SEAL COAT) | TONN | 11 | | |
| 109 | 031953 | ASPHALT CONCRETE (TYPE A, BOND BREAKER) | TONN | 1280 | | |
| 110 | 390103 | ASPHALT CONCRETE (TYPE B) | TONN | 400 | | |
| 111 | 390153 | ASPHALT CONCRETE (TYPE A) | TONN | 203 000 | | |
| 112 | 390165 | ASPHALT CONCRETE (OPEN GRADED) | TONN | 25 300 | | |
| 113 | 394002 | PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA) | M2 | 23 300 | | |
| 114 | 031954 | PLACE ASPHALT CONCRETE DIKE (TYPE A, C, E, F) | M | 16 800 | | |
| 115 | 397001 | ASPHALTIC EMULSION (PAINT BINDER) | TONN | 700 | | |
| 116 | 401000 | CONCRETE PAVEMENT | M3 | 39 900 | | |
| 117 | 401066 | CONCRETE PAVEMENT (RAMP TERMINI) | M3 | 2420 | | |
| 118 | 401108 | REPLACE CONCRETE PAVEMENT (RAPID STRENGTH CONCRETE) | M3 | 190 | | |
| 119 | 404092 | SEAL PAVEMENT JOINT | M | 50 000 | | |
| 120 | 404094 | SEAL LONGITUDINAL ISOLATION JOINT | M | 7800 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 121 (S) | 420201 | GRIND EXISTING CONCRETE PAVEMENT | M2 | 60 | | |
| 122 (S) | 490655 | 400 MM CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 742 | | |
| 123 (S) | 490657 | 600 MM CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 1135 | | |
| 124 (S) | 490663 | 1.5 M CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 81 | | |
| 125 (S) | 049541 | 3.6 M CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 1076 | | |
| 126 (S) | 490665 | 1.8 M CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 217 | | |
| 127 (S) | 490671 | 2.4 M CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 74 | | |
| 128 (S) | 490673 | 3.0 M CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 45 | | |
| 129 (S) | 490674 | 4.0 M CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 115 | | |
| 130 | 049542 | FURNISH PILING (CLASS 625) (ALTERNATIVE X) | M | 1738 | | |
| 131 (S) | 049543 | DRIVE PILE (CLASS 625) (ALTERNATIVE X) | EA | 130 | | |
| 132 | 490770 | FURNISH PILING (CLASS 625) (ALTERNATIVE V) | M | 1185 | | |
| 133 (S) | 490771 | DRIVE PILE (CLASS 625) (ALTERNATIVE V) | EA | 91 | | |
| 134 (S) | 498025 | 300 MM CAST-IN-DRILLED-HOLE CONCRETE PILING (SOUND WALL) | M | 120 | | |
| 135 (S) | 498027 | 400 MM CAST-IN-DRILLED-HOLE CONCRETE PILING (SOUND WALL) | M | 4400 | | |
| 136 (S) | 031955 | 400MM CAST-IN-DRILLED-HOLE CONCRETE PILING (TYPE 5 MODIFIED) | M | 210 | | |
| 137 (S) | 500001 | PRESTRESSING CAST-IN-PLACE CONCRETE | LS | LUMP SUM | LUMP SUM | |
| 138 (S) | 500050 | TIEBACK ANCHOR | EA | 218 | | |
| 139 (F) | 510051 | STRUCTURAL CONCRETE, BRIDGE FOOTING | M3 | 5060 | | |
| 140 (F) | 510053 | STRUCTURAL CONCRETE, BRIDGE | M3 | 52 450 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 141 (F) | 510060 | STRUCTURAL CONCRETE, RETAINING WALL | M3 | 24 927 | | |
| 142 (F) | 510069 | STRUCTURE CONCRETE (PUMPING PLANT) | M3 | 200 | | |
| 143 (F) | 510072 | STRUCTURAL CONCRETE, BARRIER SLAB | M3 | 1120 | | |
| 144 | 510086 | STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N) | M3 | 2270 | | |
| 145 | 510087 | STRUCTURAL CONCRETE, APPROACH SLAB (TYPE R) | M3 | 860 | | |
| 146 | 049544 | JACKING SUPERSTRUCTURE | LS | LUMP SUM | LUMP SUM | |
| 147 | 510102 | CLASS A CONCRETE (STRUCTURE) | M3 | 1780 | | |
| 148 (F) | 510220 | CLASS 3 CONCRETE (BACKFILL) | M3 | 400 | | |
| 149 (F) | 510502 | MINOR CONCRETE (MINOR STRUCTURE) | M3 | 1600 | | |
| 150 (F) | 049545 | MINOR CONCRETE (STAIRWAY) | M3 | 46 | | |
| 151 | 510800 | PAVING NOTCH EXTENSION | M3 | 11 | | |
| 152 (F) | 511051 | PLASTER FINISH | M2 | 83 | | |
| 153 (F) | 511064 | FRACTURED RIB TEXTURE | M2 | 10 540 | | |
| 154 (F) | 049546 | SPLITFACE RUNNING BOND TEXTURE | M2 | 9850 | | |
| 155 (F) | 039547 | FRACTURED RIB SPLIT SLATE TEXTURE | M2 | 14 460 | | |
| 156 (F) | 049548 | BEAR RELIEF TEXTURE | M2 | 465 | | |
| 157 | 511106 | DRILL AND BOND DOWEL | M | 600 | | |
| 158 (S) | 512229 | FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (5 M - 10 M) | EA | 39 | | |
| 159 (S) | 512230 | FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (10 M - 15 M) | EA | 51 | | |
| 160 (S) | 512231 | FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (15 M - 20 M) | EA | 65 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 161 (S) | 512232 | FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (20 M - 25 M) | EA | 72 | | |
| 162 (S) | 512233 | FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (25 M - 30 M) | EA | 7 | | |
| 163 (S) | 512234 | FURNISH PRECAST PRESTRESSED CONCRETE GIRDER (30 M - 35 M) | EA | 7 | | |
| 164 (S) | 512500 | ERECT PRECAST PRESTRESSED CONCRETE GIRDER | EA | 241 | | |
| 165 | 515020 | REFINISH BRIDGE DECK | M2 | 21 | | |
| 166 | 515041 | FURNISH POLYESTER CONCRETE OVERLAY | M3 | 3 | | |
| 167 (F) | 515042 | PLACE POLYESTER CONCRETE OVERLAY | M2 | 43 | | |
| 168 (S-F) | 517961 | SOUND WALL (BARRIER) (MASONRY BLOCK) | M2 | 12 034 | | |
| 169 (S-F) | 518002 | SOUND WALL (MASONRY BLOCK) | M2 | 420 | | |
| 170 (S) | 518051 | PTFE SPHERICAL BEARING | EA | 18 | | |
| 171 (S-F) | 518201 | MASONRY BLOCK WALL | M2 | 110 | | |
| 172 (S) | 519117 | JOINT SEAL (MR 30 MM) | M | 315 | | |
| 173 (S) | 519125 | JOINT SEAL ASSEMBLY (MR 70 MM) | M | 14 | | |
| 174 (S) | 519126 | JOINT SEAL ASSEMBLY (MR 80 MM) | M | 53 | | |
| 175 (S) | 519129 | JOINT SEAL ASSEMBLY (MR 101 MM - 160 MM) | M | 63 | | |
| 176 (S) | 519130 | JOINT SEAL ASSEMBLY (MR 161 MM - 240 MM) | M | 14 | | |
| 177 (S) | 519131 | JOINT SEAL ASSEMBLY (MR 241 MM - 320 MM) | M | 110 | | |
| 178 (S) | 519142 | JOINT SEAL (MR 40 MM) | M | 250 | | |
| 179 (S) | 519144 | JOINT SEAL (MR 50 MM) | M | 615 | | |
| 180 (S-F) | 520101 | BAR REINFORCING STEEL | KG | 129 649 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 181 (S) | 520102 | BAR REINFORCING STEEL (BRIDGE) | KG | 9 444 100 | | |
| 182 (S-F) | 520103 | BAR REINFORCING STEEL (RETAINING WALL) | KG | 2 116 181 | | |
| 183 (S-F) | 520113 | BAR REINFORCING STEEL (PUMPING PLANT) | KG | 29 500 | | |
| 184 (F) | 530100 | SHOTCRETE | M3 | 2010 | | |
| 185 (S-F) | 540101 | ASPHALT MEMBRANE WATERPROOFING | M2 | 41 | | |
| 186 (F) | 540102 | TREAT BRIDGE DECK | M2 | 10 755 | | |
| 187 | 540109 | FURNISH BRIDGE DECK TREATMENT MATERIAL (LOW ODOR) | L | 4377 | | |
| 188 (S-F) | 560203 | FURNISH SIGN STRUCTURE (BRIDGE MOUNTED WITH WALKWAY) | KG | 3200 | | |
| 189 (S-F) | 560204 | INSTALL SIGN STRUCTURE (BRIDGE MOUNTED WITH WALKWAY) | KG | 3200 | | |
| 190 (S-F) | 560208 | FURNISH SIGN STRUCTURE (TUBULAR) | KG | 335 430 | | |
| 191 (S-F) | 560209 | INSTALL SIGN STRUCTURE (TUBULAR) | KG | 335 430 | | |
| 192 (S-F) | 560218 | FURNISH SIGN STRUCTURE (TRUSS) | KG | 66 020 | | |
| 193 (S-F) | 560219 | INSTALL SIGN STRUCTURE (TRUSS) | KG | 66 020 | | |
| 194 (S) | 561009 | 920 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION) | M | 670 | | |
| 195 (S) | 561010 | 1070 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION) | M | 30 | | |
| 196 | 562002 | METAL (BARRIER MOUNTED SIGN) | KG | 5620 | | |
| 197 | 566011 | ROADSIDE SIGN - ONE POST | EA | 310 | | |
| 198 | 566012 | ROADSIDE SIGN - TWO POST | EA | 48 | | |
| 199 | 568001 | INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD) | EA | 11 | | |
| 200 | 568016 | INSTALL SIGN PANEL ON EXISTING FRAME | M2 | 70 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 201 (F) | 597600 | PREPARE AND PAINT CONCRETE | M2 | 9880 | | |
| 202 | 620909 | 450 MM ALTERNATIVE PIPE CULVERT | M | 210 | | |
| 203 | 620913 | 600 MM ALTERNATIVE PIPE CULVERT | M | 920 | | |
| 204 | 620919 | 750 MM ALTERNATIVE PIPE CULVERT | M | 330 | | |
| 205 | 650067 | 300 MM REINFORCED CONCRETE PIPE | M | 110 | | |
| 206 | 650069 | 450 MM REINFORCED CONCRETE PIPE | M | 5530 | | |
| 207 | 650075 | 600 MM REINFORCED CONCRETE PIPE | M | 890 | | |
| 208 | 650077 | 750 MM REINFORCED CONCRETE PIPE | M | 710 | | |
| 209 | 650079 | 900 MM REINFORCED CONCRETE PIPE | M | 990 | | |
| 210 | 650081 | 1050 MM REINFORCED CONCRETE PIPE | M | 260 | | |
| 211 | 650084 | 1200 MM REINFORCED CONCRETE PIPE | M | 70 | | |
| 212 | 650085 | 1275 MM REINFORCED CONCRETE PIPE | M | 5 | | |
| 213 | 650086 | 1350 MM REINFORCED CONCRETE PIPE | M | 90 | | |
| 214 | 650092 | 1800 MM REINFORCED CONCRETE PIPE | M | 200 | | |
| 215 | 650595 | 2100 MM REINFORCED CONCRETE PIPE (CLASS V SPECIAL) | M | 140 | | |
| 216 | 655370 | JACKED 1050 MM REINFORCED CONCRETE PIPE (CLASS III) | M | 88 | | |
| 217 | 655373 | JACKED 1500 MM REINFORCED CONCRETE PIPE (CLASS III) | M | 140 | | |
| 218 | 664010 | 300 MM CORRUGATED STEEL PIPE (2.01 MM THICK) | M | 72 | | |
| 219 | 664015 | 450 MM CORRUGATED STEEL PIPE (2.01 MM THICK) | M | 220 | | |
| 220 | 664020 | 600 MM CORRUGATED STEEL PIPE (2.01 MM THICK) | M | 130 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 221 | 664028 | 750 MM CORRUGATED STEEL PIPE (2.01 MM THICK) | M | 20 | | |
| 222 | 664035 | 900 MM CORRUGATED STEEL PIPE (3.51 MM THICK) | M | 30 | | |
| 223 | 664059 | 1800 MM CORRUGATED STEEL PIPE (3.51 MM THICK) | M | 92 | | |
| 224 | 665733 | 450 MM SLOTTED CORRUGATED STEEL PIPE (2.01 MM THICK) | M | 190 | | |
| 225 | 681134 | 80 MM PLASTIC PIPE (EDGE DRAIN) | M | 110 | | |
| 226 | 031956 | 80 MM PLASTIC PIPE SLOTTED (EDGE DRAIN) | M | 1130 | | |
| 227 | 690155 | 200 MM CORRUGATED STEEL PIPE DOWNDRAIN (1.63 MM THICK) | M | 50 | | |
| 228 | 690159 | 300 MM CORRUGATED STEEL PIPE DOWNDRAIN (1.63 MM THICK) | M | 150 | | |
| 229 | 692086 | 200 MM ENTRANCE TAPER | EA | 1 | | |
| 230 | 692088 | 300 MM ENTRANCE TAPER | EA | 7 | | |
| 231 | 692244 | 200 MM DOWNDRAIN SLIP JOINT | EA | 1 | | |
| 232 | 692245 | 300 MM DOWNDRAIN SLIP JOINT | EA | 3 | | |
| 233 | 692382 | 200 MM ANCHOR ASSEMBLY | EA | 1 | | |
| 234 | 692383 | 300 MM ANCHOR ASSEMBLY | EA | 4 | | |
| 235 | 703233 | GRATED LINE DRAIN | M | 650 | | |
| 236 | 703268 | 300 MM CORRUGATED STEEL PIPE RISER (2.01 MM THICK) | M | 2 | | |
| 237 | 703272 | 450 MM CORRUGATED STEEL PIPE RISER (2.77 MM THICK) | M | 3 | | |
| 238 | 703285 | 900 MM CORRUGATED STEEL PIPE RISER (3.51 MM THICK) | M | 28 | | |
| 239 | 049549 | 413 MM WELDED STEEL PIPE CASING (BRIDGE) (NATURAL GAS) | M | 146 | | |
| 240 | 049550 | 508 MM WELDED STEEL PIPE CASING (BRIDGE) (NATURAL GAS) | M | 105 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 241 | 049551 | 610 MM WELDED STEEL PIPE CASING (BRIDGE) | M | 147 | | |
| 242 | 705334 | 300 MM ALTERNATIVE FLARED END SECTION | EA | 7 | | |
| 243 | 705336 | 450 MM ALTERNATIVE FLARED END SECTION | EA | 2 | | |
| 244 | 705338 | 750 MM ALTERNATIVE FLARED END SECTION | EA | 1 | | |
| 245 | 706652 | 900 MM DEBRIS RACK CAGE (H = 1.8 M) | EA | 2 | | |
| 246 | 707133 | 900 MM PRECAST CONCRETE PIPE INLET | EA | 18 | | |
| 247 | 707244 | 900 MM PRECAST CONCRETE PIPE MANHOLE | EA | 14 | | |
| 248 | 720119 | ROCK SLOPE PROTECTION (1T, METHOD A) | M3 | 1640 | | |
| 249 | 721009 | ROCK SLOPE PROTECTION (FACING, METHOD B) | M3 | 120 | | |
| 250 | 721011 | ROCK SLOPE PROTECTION (BACKING NO. 2, METHOD B) | M3 | 23 | | |
| 251 | 721023 | ROCK SLOPE PROTECTION (1/2T, METHOD B) | M3 | 67 | | |
| 252 | 721024 | ROCK SLOPE PROTECTION (1/4T, METHOD B) | M3 | 4 | | |
| 253 | 031957 | CLASS 3 CONCRETE (CHANNEL LINING) | M3 | 630 | | |
| 254 (F) | 721810 | SLOPE PAVING (CONCRETE) | M3 | 430 | | |
| 255 (F) | 049552 | SLOPE PAVING (ROCK BLANKET) | M2 | 830 | | |
| 256 | 729010 | ROCK SLOPE PROTECTION FABRIC | M2 | 1300 | | |
| 257 | 031958 | MINOR CONCRETE (MISC CONSTRUCTION, CURB, CURB AND GUTTER, ISLAND PAVING, DRIVEWAY, SIDEWALK, CURB RAMP) | M3 | 4880 | | |
| 258 (F) | 731517 | MINOR CONCRETE (GUTTER) | M | 4714 | | |
| 259 (S) | 740500 | DRAINAGE PUMPING EQUIPMENT | LS | LUMP SUM | LUMP SUM | |
| 260 (S) | 741001 | PUMPING PLANT ELECTRICAL EQUIPMENT | LS | LUMP SUM | LUMP SUM | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 261 (S-F) | 750001 | MISCELLANEOUS IRON AND STEEL | KG | 34 181 | | |
| 262 (S) | 750010 | MANHOLE FRAME AND COVER | EA | 70 | | |
| 263 (S-F) | 750496 | MISCELLANEOUS METAL (RESTRAINER - PIPE TYPE) | KG | 39 220 | | |
| 264 (S-F) | 750498 | MISCELLANEOUS METAL (RESTRAINER - CABLE TYPE) | KG | 11 450 | | |
| 265 (S-F) | 750501 | MISCELLANEOUS METAL (BRIDGE) | KG | 38 500 | | |
| 266 (S-F) | 049553 | ISOLATION CASING | KG | 39 300 | | |
| 267 (S-F) | 750520 | PUMPING PLANT METAL WORK | KG | 4000 | | |
| 268 (S) | 800381 | CHAIN LINK FENCE (TYPE CL-0.9) | M | 1660 | | |
| 269 (S) | 800391 | CHAIN LINK FENCE (TYPE CL-1.8) | M | 15 400 | | |
| 270 (S) | 802595 | 3.0 M CHAIN LINK GATE (TYPE CL-1.8) | EA | 9 | | |
| 271 (S) | 802672 | 4.9 M CHAIN LINK GATE (TYPE CL-1.8) | EA | 58 | | |
| 272 | 810110 | SURVEY MONUMENT | EA | 60 | | |
| 273 (S) | 820107 | DELINEATOR (CLASS 1) | EA | 200 | | |
| 274 (S) | 820151 | OBJECT MARKER (TYPE L-1) | EA | 16 | | |
| 275 (S) | 832001 | METAL BEAM GUARD RAILING | M | 9350 | | |
| 276 (S) | 833032 | CHAIN LINK RAILING (TYPE 7) | M | 929 | | |
| 277 (S-F) | 833034 | CHAIN LINK RAILING (TYPE 7L) | M | 230 | | |
| 278 (S-F) | 833088 | TUBULAR HANDRAILING | M | 532 | | |
| 279 (S-F) | 049554 | TUBULAR HANDRAILING (STAIRWAY) | M | 80 | | |
| 280 (F) | 833128 | CONCRETE BARRIER (TYPE 25 MODIFIED) | M | 256 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 281 (F) | 833142 | CONCRETE BARRIER (TYPE 26 MODIFIED) | M | 1146 | | |
| 282 (S) | 839310 | DOUBLE THRIE BEAM BARRIER | M | 150 | | |
| 283 (S-F) | 839521 | CABLE RAILING | M | 5821 | | |
| 284 (S) | 839537 | TERMINAL CONNECTOR | EA | 1 | | |
| 285 (S) | 839552 | TERMINAL SECTION (TYPE C) | EA | 1 | | |
| 286 (S) | 839553 | END SECTION | EA | 23 | | |
| 287 (S) | 031959 | TRANSITION RAILING (TYPE WB) | EA | 67 | | |
| 288 (S) | 839559 | TERMINAL SYSTEM (TYPE ET) | EA | 10 | | |
| 289 (S) | 839565 | TERMINAL SYSTEM (TYPE SRT) | EA | 66 | | |
| 290 (S) | 839568 | TERMINAL ANCHOR ASSEMBLY (TYPE SFT) | EA | 66 | | |
| 291 (S) | 839569 | TERMINAL ANCHOR ASSEMBLY (TYPE CA) | EA | 14 | | |
| 292 (S) | 839570 | RETURN SECTION | EA | 1 | | |
| 293 (S) | 839601 | CRASH CUSHION (TYPE CAT) | EA | 9 | | |
| 294 (S) | 839602 | CRASH CUSHION (TYPE CAT) BACKUP | EA | 10 | | |
| 295 (S) | 839603 | CRASH CUSHION (ADIEM) | EA | 1 | | |
| 296 | 839701 | CONCRETE BARRIER (TYPE 60) | M | 2860 | | |
| 297 (F) | 839702 | CONCRETE BARRIER (TYPE 60A) | M | 43 | | |
| 298 | 839703 | CONCRETE BARRIER (TYPE 60C) | M | 1470 | | |
| 299 (F) | 839704 | CONCRETE BARRIER (TYPE 60D) | M | 9435 | | |
| 300 | 839705 | CONCRETE BARRIER (TYPE 60E) | M | 10 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 301 | 839706 | CONCRETE BARRIER (TYPE 60G) | M | 30 | | |
| 302 (F) | 839707 | CONCRETE BARRIER (TYPE 60GA) | M | 33 | | |
| 303 | 839708 | CONCRETE BARRIER (TYPE 60GC) | M | 1370 | | |
| 304 | 839710 | CONCRETE BARRIER (TYPE 60S) | M | 800 | | |
| 305 (F) | 839711 | CONCRETE BARRIER (TYPE 60SA) | M | 40 | | |
| 306 | 839712 | CONCRETE BARRIER (TYPE 60SC) | M | 1240 | | |
| 307 | 031960 | CONCRETE BARRIER (TYPE 60E MODIFIED) | M | 300 | | |
| 308 | 031961 | CONCRETE BARRIER (TYPE 60GE MODIFIED) | M | 170 | | |
| 309 | 031962 | CONCRETE BARRIER (TYPE 60R MODIFIED) | M | 1040 | | |
| 310 (F) | 839717 | CONCRETE BARRIER (TYPE 732 MODIFIED) | M | 11 | | |
| 311 | 031963 | CONCRETE BARRIER (TYPE 60SE MODIFIED) | M | 21 | | |
| 312 (F) | 049555 | CONCRETE BARRIER (TYPE 60D MODIFIED) | M | 544 | | |
| 313 (F) | 839720 | CONCRETE BARRIER (TYPE 732) | M | 777 | | |
| 314 (F) | 839721 | CONCRETE BARRIER (TYPE 732A) | M | 475 | | |
| 315 (F) | 839725 | CONCRETE BARRIER (TYPE 736) | M | 1038 | | |
| 316 (F) | 839726 | CONCRETE BARRIER (TYPE 736A) | M | 2699 | | |
| 317 (F) | 839727 | CONCRETE BARRIER (TYPE 736 MODIFIED) | M | 5865 | | |
| 318 | 839734 | CONCRETE BARRIER (TYPE 736SV) | M | 1270 | | |
| 319 | 031964 | CONCRETE BARRIER (TYPE 736A MODIFIED) | M | 1240 | | |
| 320 | 031965 | CONCRETE BARRIER (TYPE 736S) | M | 75 | | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 321 (F) | 839731 | CONCRETE BARRIER (TYPE 736B) | M | 66 | | |
| 322 (F) | 049556 | CONCRETE BARRIER (TYPE 736A MODIFIED) (RETAINING WALL) | M | 475 | | |
| 323 (F) | 049557 | CONCRETE BARRIER (TYPE 736B MODIFIED) | M | 25 | | |
| 324 (S) | 840515 | THERMOPLASTIC PAVEMENT MARKING | M2 | 1830 | | |
| 325 (S) | 840560 | THERMOPLASTIC TRAFFIC STRIPE (SPRAYABLE) | M | 175 000 | | |
| 326 (S) | 840656 | PAINT TRAFFIC STRIPE (2-COAT) | M | 17 600 | | |
| 327 (S) | 840666 | PAINT PAVEMENT MARKING (2-COAT) | M2 | 1130 | | |
| 328 (S) | 850101 | PAVEMENT MARKER (NON-REFLECTIVE) | EA | 21 700 | | |
| 329 (S) | 850104 | PAVEMENT MARKER (REFLECTIVE-SPECIAL TYPE H) | EA | 1340 | | |
| 330 (S) | 850111 | PAVEMENT MARKER (RETROREFLECTIVE) | EA | 25 700 | | |
| 331 (S) | 850120 | PAVEMENT MARKER (REFLECTIVE-RECESSED) | EA | 1100 | | |
| 332 (S) | 031966 | SIGNAL AND LIGHTING (LOCATION 1, 2, 3, 4, 5, 6, 7) | LS | LUMP SUM | LUMP SUM | |
| 333 (S) | 860640 | IRRIGATION CONTROLLER ENCLOSURE CABINET | EA | 2 | | |
| 334 (S) | 860792 | COMMUNICATION CONDUIT (BRIDGE) | M | 400 | | |
| 335 (S-F) | 860796 | SPRINKLER CONTROL CONDUIT (BRIDGE) | M | 657 | | |
| 336 (S) | 860797 | ELECTRIC SERVICE (IRRIGATION) | LS | LUMP SUM | LUMP SUM | |
| 337 (S) | 031967 | TRAFFIC MONITORING STATION (LOCATION 1, 2, 3, 4, 5, 6, 7, 8, 9, 10) | LS | LUMP SUM | LUMP SUM | |
| 338 (S) | 031968 | MODIFY TRAFFIC MONITORING STATION INCIDENT | LS | LUMP SUM | LUMP SUM | |
| 339 (S) | 031969 | TRAFFIC MONITORING STATION INCIDENT (LOCATION 1, 2) | LS | LUMP SUM | LUMP SUM | |
| 340 (S) | 031970 | CLOSED CIRCUIT TELEVISION SYSTEM (LOCATION 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14) | LS | LUMP SUM | LUMP SUM | |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity | Unit Price | Item Total |
|---|---|---|---|---|---|---|
| 341 (S) | 031971 | RAMP METERING SYSTEM (LOCATION 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14) | LS | LUMP SUM | LUMP SUM | |
| 342 (S) | 031972 | MODIFY SIGNAL AND LIGHTING (LOCATION 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12) | LS | LUMP SUM | LUMP SUM | |
| 343 (S) | 861504 | MODIFY LIGHTING AND SIGN ILLUMINATION | LS | LUMP SUM | LUMP SUM | |
| 344 (S) | 031973 | MODIFY COMMUNICATION HUB ASSEMBLY | LS | LUMP SUM | LUMP SUM | |
| 345 (S) | 031974 | MODIFY TRAFFIC MANAGEMENT CENTER | LS | LUMP SUM | LUMP SUM | |
| 346 (S) | 869075 | SYSTEM TESTING AND DOCUMENTATION | LS | LUMP SUM | LUMP SUM | |
| 347 | 031982 | MOBILIZATION | LS | LUMP SUM | LUMP SUM | |

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

# SPECIAL PROVISIONS

**Annexed to Contract No. 08-334844**

## SECTION 1. SPECIFICATIONS AND PLANS

The work embraced herein shall conform to the provisions in the Standard Specifications dated July 1999, and the Standard Plans dated July 1999, of the Department of Transportation insofar as the same may apply, and these special provisions.

In case of conflict between the Standard Specifications and these special provisions, the special provisions shall take precedence over and shall be used in lieu of the conflicting portions.

The project plans and specifications for this project are not considered to be complete to construct the work anticipated by the contract. Design of the project, including preparation of final project plans, specifications and estimates of quantities, will be completed in sequence after approval of the contract.

Project plan sheets marked, "Preliminary For Bidding Purposes Only", shall not be considered complete as to the design. These plan sheets are provided only to show the scope of the work to be performed and shall only be used for the purpose of bid preparation.

This project comprises three segments. Segment 1 is from SR-91 station “1A” 119+79 to I-215 station “1B” 9+66 (near Columbia I/C) and from SR-60 station “1C” 188+91 to I-215 Down Street OH; Segment 2 is from I-215 Down Street OH to I-215 station 51+69.008; Segment 3 is from I-215 station 51+69.008 to I-215 station “3L” 22+40 (Eucalyptus I/C) and SR-60 station “RIV60” 29+10.

“The project plans and specifications for this project, are not considered to be complete to construct the work anticipated by the contract. Design for the project, including preparation of final project plans, specifications and estimates of quantities, will be completed in sequences after approval of the contract in conformance of the following:”

| Stage | Segment | Alignment | Description | From: STA | To: STA |
|---|---|---|---|---|---|

**SEQUENCE 1(100 % plans available 5 working days after contract approval)**

| | | | | | |
|---|---|---|---|---|---|
| 1 | 1 | 1A | Strengthen WB SR91 outside shoulder (Fastset PCC) | 119+20.00 | 140+20.00 |
| 1 | 1 | 1A | Strengthen EB SR91 outside shoulder (AC) | 119+60.00 | 135+00.00 |
| 1 | 1 | 1B | Widen I-215 (Peeling off of S-W connector) | 4+35.02 | 6+85.53 |
| 1 | 1 | 1G | Construct portion of S-W connector | 198+92.52 | 199+59.99 |
| 1 | 1 | 1J | Construct RW215-202A | | |
| 1 | 1 | 1P | Construct Riverside Canal Bridge | | . |
| 1 | 1 | Detour 2 | Temp W-N connector detour | 200+00.00 | 203+00.00 |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 1 | Detour 3 | Temp S-W connector detour | +71.28 | 3+14.92 |
| 1 | 2 | 2H1 | WIDEN NB RTE 215 FROM EXIST ETW TO PROPOSED EP | 218+19.44 | 8+79.96 |
| 1 | 2 | 2H1 | WIDEN SB RTE 215 FROM EXIST ETW TO PROPOSED EP | 217+93.66 | 8+61.71 |
| 1 | 2 | 2CL1 | WIDEN NB RTE 215 FROM EXIST ETW TO PROPOSED EP | 19+37.00 | 28+00.00 |
| 1 | 2 | 2CL1 | WIDEN NB RTE 215 FROM EXIST ETW TO PROPOSED EP | 37+00.00 | 43+73.00 |
| 1 | 2 | 2CL1-2CL3 | WIDEN NB RTE 215 FROM EXIST ETW TO PROPOSED EP | 44+25.00 | 51+68.57 |
| 1 | 2 | 2CL1 | WIDEN SB RTE 215 FROM EXIST ETW TO PROPOSED EP | 37+00.00 | 43+88.00 |
| 1 | 2 | VAR | CONSTRUCT THE FOLLOWING RETAINING WALLS, SOUND WALLS AND MSE WALLS: NB-209, 211A,B,C, 217, 219, 221, 11,11A, 21A,B,C, 23, 27, 41, 45, 47A,B,C,D, 49A,B, 51A,B SB- 208, 210, 212, 212B, 218, 220A,B, 10, 26A (UP TO STA 25+50), 38 | SEE RW PLANS FOR LOCATION | |
| 1 | 2 | 2MM1 | REALIGN NB UNIVERSITY AVE ENTRANCE RAMP | 8+79.96 | 12+93.00 |
| 1 | 2 | 2L1 | REALIGN SB UNIVERSITY AVE EXIT RAMP | 8+61.72 | 11+45.00 |
| 1 | 2 | 2R2 | REALIGN WEST CAMPUS DRIVE | 20+85.00 | 24+23.23 |
| 1 | 2 | 2PP1 | CONSTRUCT CANYON CREST BLVD | 14+25.00 | 18+75.00 |
| 1 | 2 | 2Y1 & 2Z1 | CONSTRUCT IOWA AVE OC AND LINDEN ST OC SIMULTANEOUSLY | SEE PLANS | |
| 1 | 2 | 2R1 | CONSTRUCT NB MLK JR BLVD ENTRANCE/EXIT RAMP | 19+37.00 | 26+58.53 |
| 1 | 2 | 2H2 | REALIGN NB CENTRAL AVE ENTRANCE RAMP | 38+70.70 | 42+75.00 |
| 1 | 2 | 2KK1 | REALIGN NB CENTRAL AVE EXIT RAMP | 43+90.00 | 47+64.35 |
| 1 | 2 | 2I1 | REALIGN SB CENTRAL AVE EXIT RAMP | 40+82.22 | 43+95.00 |
| 1 | 2 | 2F1 | CONSTRUCT CENTRAL AVE | 0+00.00 | 23+91.71 |
| 1 | 2 | 2G1 | REALIGN SYCAMORE CANYON BLVD NEAR CENTRAL AVE | 40+75.18 | 43+85.00 |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 2 | | TUNNEL DRAINAGE SYSTEM '155F' UNDER EXIST ROADBED | | |
| 1 | 2 | 2C5 | DETOUR: RE-STRIPE EXISTING SYCAMORE CANYON BLVD. AT MLK JR BLVD EXIT RAMP | 23+53.62 | 27+26.63 |
| 1 | 2 | 2CL1 | GRADE PERMANENT DRAINAGE EASEMENT | 25+62.19 | 30+20.00 |
| 1 | 3 | 3I,3BB | Strengthening SHLD NB I-215/WB SR-60 connector | 14+60.000 "3I" | 65+20.000 "3BB" |
| 1 | 3 | 3I | Strengthening SHLD WB SR-60/SB I-215 connector | 13+20.000 | 15+40.000 |
| 1 | 3 | 3L,3FF | Strengthening SHLD SB I-215 | 10+30.000 "3FF" | 19+20.000 "3L" |
| 1 | 3 | 3L | Strengthening SHLD SB I-215 | 22+40.000 "3L" | 23+20.000 "3L" |
| 1 | 3 | 3SYC | Sycamore CYN widening, retaining wall,portion of drainage systems 166, 167-2 | 6+85.928 | 9+10.000 |
| 1 | 3 | 3C,3BB | Strengthening inside SHLD NB I-215 | 51+69.717 "3C" | 61+00.000 "3BB" |
| 1 | 3 | Detour 7 | Temp Box Springs Rd SB I-215 exit ramp | 11+48.946 | 13+21.062 |
| 1 | 3 | 3C | Jacking drainage system 171 Under exist roadbed only | | |
| 1 | 3 | 3X | Drainage system 173 | | |
| 1 | 3 | Detour 9 | Temp Box Springs widening | 14+28.315 | 15+40.000 |
| 1 | 3 | Detour 12 | Temp Box Springs widening | 10+04.599 | 10+69.127 |
| 1 | 3 | 3CC | Thrie beam barrier near Box Springs Overhead | 12+58.512 | 14+05.231 |
| 1 | 3 | 3P | Portion of Box Springs Rd SB I-215 exit ramp | 13+90.640 | 15+20.000 |
| 1 | 3 | 3Q | Box Springs Rd SB I-215 entrance ramp | 10+00.000 | 11+49.392 |
| 1 | 3 | 3Z | Rivercrest drive CUL-DE-SAC | 9+98.392 | 14+26.684 |
| 1 | 3 | 3M | Truck Bypass connector roads and structures | 11+20.000 | 24+39.483 |
| 1 | 3 | 3N | Truck Bypass connector roads and structures | 11+20.000 "3M" | 15+50.000 "3N" |
| 1 | 3 | 3C | Widening NB I-215, retaining wall | 51+69.717 | 61+30.000 |
| 1 | 3 | 3R | Portion of NB I-215 entrance ramp | 12+85.000 | 14+48.943 |
| 1 | 3 | 3C | Widening SB I-215 and retaining wall | 51+69.717 "3C" | 55+20.000 "3C" |
| 1 | 3 | 3SYC | Barrier and MBGR between Sycamore CYN and SB I-215 | 9+70.000 | 10+80.000 |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 3 | 3C | Jacking drainage system 167 under exist roadbed only | | |
| 1 | 3 | | Drainage systems 173-1, 173-2, 173-3 | | |
| 1 | 3 | Detour 10 ("3R") | Temp Box Springs Rd NB I-215 entrance ramp | 12+85.000 | 14+85.943 |
| 1 | 3 | Detour 11 ("3S") | Temp Box Springs Rd NB I-215 exit ramp | 10+14.313 | 12+00.000 |
| 1 | 3 | 3S,3AA | Widening NB I-215 and portion of Box Springs Rd NB I-215 exit ramp | 12+00.000 "3S" | 61+88.313 "3AA" |
| 1 | 3 | 3L | SB I-215 inside widening | 19+20.000 | 22+40.000 |
| 1 | 3 | 3L,3DD,3I | SB I-215 outside widening,realigned WB SR-60/SB I-215 connector | 14+20.000 "3I" | 22+40.000 "3L" |
| 1 | 3 | | SB I-215 exit ramp at Eucalyptus | | 13+10.000 "3DD" |
| 1 | 3 | 3U | Day St. EB SR-60 entrance ramp | 10+05.000 | 15+96.863 |
| 2 | 1 | 1A | Clear & grub and pave (temp AC) median of SR-91 | 118+76.00 | 140+88.86 |
| 2 | 1 | 1A | Construct SW91-125 | | |
| 2 | 1 | 1B | Widen NB I215 | 2+86.34 | 9+09.43 |
| 2 | 1 | 1B | Widen SB I-215(Peeling off of S-E connector) | 6+68.84 | 8+28.00 |
| 2 | 1 | 1B | Construct RW215-07 | | |
| 2 | 1 | 1B | Construct SW215-202 | | |
| 2 | 1 | 1D | Construct RW215-198 | | |
| 2 | 1 | 1D | Construct RW215-200 | | |
| 2 | 1 | 1J | Construct RW215-202B | | |
| 2 | 1 | 1L | Construct WB SR91 Mission Inn off ramp | 122+82.47 | 125+53.14 |
| 2 | 1 | 1O | Construct E La Cadena Dr | 8+80.00 | 14+40.62 |
| 2 | 1 | 1P | Construct W La Cadena Dr | 3+87.97 | 9+14.08 |
| 2 | 1 | 1Q | Construct Kansas Ave realignment & cul-de-sac | 14+42.92 | 16+03.09 |
| 2 | 1 | 2F | Construct the roadway portion at the north end of the S-E connector | 193+30.00 | 191+17.42 |
| 2 | 1 | 2F | Construct S-E connector abutments and bents | | |
| 2 | 1 | 2F | Construct S-E connector frame 4 | | |
| 2 | 1 | 2F | Construct RW215-05 | | |
| 2 | 1 | 2H1 | Construct I215 Spruce St undercrossing widening | | |

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| 2 | 1 | 2H1 | Construct RW215-201 | | |
| 2 | 1 | 2R | Construct N-W connector abutments and bents | | |
| 2 | 1 | 2R | Construct N-W connector frames 3&5 | | |
| 2 | 1 | | Construct the median bent of the separation bridge | | |
| 2 | 1 | | obliterate existing Kansas Ave | | |
| 3 | 1 | 1A | Widen EB SR91 and Approach Slabs at the west end of University Bridge, Ln # 2 with Fast-set Concrete, Ln #3 with Normal Concrete | 119+80.00 | 121+45.20 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder and lanes # 2, 3 & 4 and University and Mission Inn Approach Slabs | 121+78.06 | 122+82.15 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder and lanes # 3 & 4 | 125+26.90 | 125+85.60 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder and lanes # 2, 3 & 4 | 125+85.60 | 126+84.73 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder and lanes # 2, 3, 4 & 5 and Third Street Approach Slabs | 126+84.73 | 127+78.03 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder and lanes # 3, 4 & 5 | 128+06.61 | 130+30.49 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder and lanes # 3, 4, 5 & aux lane | 130+30.49 | 132+92.96 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder and lanes # 3, 4 & 5 | 132+92.96 | 135+66.81 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder and lanes # 3 & 4 | 135+66.81 | 136+70.29 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder and lane # 4 | 136+70.29 | 137+35.22 |
| 3 | 1 | 1A | Construct EB SR91 right shoulder | 137+35.22 | 137+36.57 |
| 3 | 1 | 1D | Construct N-E connector (portion) | 135+66.81 | 141+83.09 |
| 3 | 1 | 1L | Construct EB SR91 Mission Inn on ramp | 123+03.26 | 126+90.37 |
| 3 | 1 | 1N | Construct EB SR91 Spruce St off ramp | 132+92.96 | 138+04.19 |
| 3 | 1 | 1R | Construct Malta Pl cul-de-sac | 10+00.00 | 10+26.33 |
| 3 | 1 | 1S | Construct La Cadena (or Down) cul-de-sac | 10+00.00 | 10+51.00 |

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| 3 | 1 | 2F | Construct the roadway portion at the east end of the S-E connector | 204+74.95 | 207+21.80 |

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| 3 | 1 | 2H1 | Construct I215 SB widening | 203+31.98 | 208+80.00 |
| 3 | 1 | 2H1 | Construct RW215-208 | | |
| 3 | 1 | Detour 4 | Temp N-E connector detour | 139+87.86 | 142+31.88 |
| 3 | 2 | 2PP1 | RE-PROFILE CANYON CREST BLVD FROM STA 18+70 TO W. CAMPUS INTERSECTION | 18+75.00 | 21+13.58 |
| 3 | 2 | 2PP1 | CONSTRUCT EAST SIDE TIE WALL UNDER UC | 19+60.00 | 20+35.00 |
| 3 | 2 | 2PP1 | Construct West Side Tie-Wall Under UC | 19+62.00 | 20+40.00 |
| 3 | 2 | 2PP1 | CONSTRUCT PORTION OF PUMPING PLANT RELOCATION | 19+40.00 | |
| 3 | 2 | 2C3 | CONSTRUCT RTE 215 MEDIAN BARRIER | 46+31.46 | 51+68.57 |

**SEQUENCE 2(100 % plans available 100 working days after contract approval)**

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| 4 | 1 | 1A (Temp) | Construct temporary EB SR91 collector-distributor road (west end) | 126+13.64 | 127+33.00 |
| 4 | 1 | 1A (Temp) | Construct temporary EB SR91 collector-distributor road (east end) | 134+00.00 | 137+36.00 |
| 4 | 2 | 2C6 | WIDEN SB RTE 215 FROM EXIST ETW TO PROPOSED EP | 13+99.89 | 26+00.00 |
| 4 | 2 | 2BLAINE1 | CONSTRUCT EASTERN HALF OF BLAINE AVE OC BRIDGE REPLACEMENT | 19+59.75 | 20+40.50 |
| 4 | 2 | 2PP1 | CONSTRUCT CANYON CREST BLVD UC BRIDGE WIDENING | 19+65.00 | 20+35.00 |
| 4 | 2 | 2PP1 | COMPLETE CONSTRUCTION OF PUMPING PLANT RELOCATION | 19+40.00 | |
| 4 | 2 | 2C6 | CONSTRUCT MEDIAN BARRIER | 16+64.23 | 17+70.63 |
| 4 | 2 | 2K1 | CONSTRUCT SB UNIVERSITY AVE ENTRANCE RAMP | 11+70.00 | 15+92.95 |
| 4 | 2 | VAR | CONSTRUCT THE FOLLOWING RETAINING WALLS AND SOUND WALLS: 14, 18 | SEE RW PLANS FOR LOCATIONS | |
| 4 | 2 | 2P2 | CONSTRUCT SB MLK JR EXIT RAMP | 18+38.11 | 21+40.00 |
| 4 | 3 | RIV60 | EB SR-60 outside widening | 16+45.489 | 29+10.000 |
| 4 | 3 | | Day St. Undercrossing | | |

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| | | | widening | | |
| 4 | 3 | 3V | Day St. EB SR-60 exit ramp | 10+00.000 | 14+12.000 |

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| 4 | 3 | 3C | The relocated I-215 median barrier | 51+69.717 | 58+32.918 |
| 4 | 3 | 3X | One half of Box Springs Rd overcrossing excluding its approach slabs | | |
| 4 | 3 | 3X | Widening one half of Box Springs Rd including the retaining wall and the dirt Rd | 12+40.000 | 15+83.361 |
| 5 | 1 | 1A | Construct EB SR91 right shoulder and lanes # 2, 3 & 4 | 123+15.00 | 125+26.90 |
| 5 | 1 | 1A | Construct EB SR91 lane # 2 | 125+26.90 | 125+85.60 |
| 5 | 1 | 1A | Construct EB SR91 lane # 4 | 137+35.22 | 137+36.57 |
| 5 | 1 | 1A | Construct EB SR91 right shoulder and lane # 4 | 137+36.57 | 139+35.00 |
| 5 | 1 | 1A | Construct EB SR91 right shoulder | 139+35.00 | 140+23.13 |
| 5 | 1 | 1A | Construct RW91-124A | | |
| 5 | 1 | 1D | Construct remaining portion of N-E connector | 142+29.44 | 145+00.61 |
| 5 | 1 | 1G | Construct portion of S-W connector | 197+80.00 | 198+92.52 |
| 5 | 1 | 1J | Construct portion of W-N connector (full width) | 200+74.46 | 203+40.00 |
| 5 | 1 | 1J | Construct portion of W-N connector (partial width) | 203+40.00 | 205+61.56 |
| 5 | 1 | 2H1 | Widen NB I215 | 200+74.46 | 208+80.00 |
| 5 | 1 | 2H1 | Construct SW & RW215-207 | | |
| 5 | 1 | 2H1 | Construct Down St overhead widening | | |
| 5 | 1 | 2H1 | Construct Chicago St undercrossing widening | | |
| 5 | 1 | 2R | Construct the roadway portion at the east end of the N-W connector | 148+90.00 | 150+66.68 |
| 5 | 1 | 2R | Construct RW215-205 | | |
| 5 | 2 | 2H1 | WIDEN NB RTE 215 FROM EXIST ETW TO PROPOSED EP | 214+38.00 | 218+19.44 |
| 5 | 2 | 2H1 | WIDEN SB RTE 215 FROM EXIST ETW TO PROPOSED EP | 214+00.00 | 217+93.66 |
| 5 | 2 | 2P1 | REALIGN NB BLAINE AVE EXIT RAMP | 214+86.27 | 218+20.00 |
| 5 | 2 | 2N1 | REALIGN SB BLAINE AVE ENTRANCE RAMP | 214+10.95 | 217+93.66 |
| 5 | 2 | 2BLAINE1 | CONSTRUCT EASTERN HALF OF LOCAL STREET | 18+00.00 | 21+25.00 |

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| 5 | 2 | VAR | CONSTRUCT THE FOLLOWING RETAINING WALLS AND SOUND WALLS: 215,216, 218B | SEE RW PLANS | |
| 5 | 3 | | Curb, sidewalk and drainage systems along Day St. | | |
| 5 | 3 | 3X,3R | Remaining portion of Box Springs Rd NB I-215 enterance ramp and one half northside approach slab | 12+40.000 "3X" | 12+85.000 "3R" |
| 6 | 1 | 1A | Construct EB SR91 lane # 2 (fast set PCC) | 135+27.00 | 136+49.00 |
| 6 | 1 | 1A | Construct EB SR91 lane # 3 (fast set PCC) | 136+70.00 | 139+55.00 |
| 6 | 2 | 2BLAINE1 | CONSTRUCT WESTERN HALF OF BLAINE AVE OC | 19+59.75 | 20+40.50 |
| 6 | 3 | Detour 7 | Temp Box Springs Rd SB I-215 exit ramp to higher elevation | 11+48.946 | 13+21.062 |
| 6 | 3 | | Portion of drainage system 171 under portion of sycamore CYN BLVD | | |
| 6 | 3 | 3SYC | Half of Sycamore CYN BLVD and Box Springs Rd intersection | 13+25.000 | 14+80.000 |
| 6 | 3 | RIV60, 3M | EB SR-60 outside widening | 24+39.483 "3M" | 17+20.000 "RIV60" |
| 7 | 1 | 1A | Construct EB SR91 left shoulder and lanes # 1 & 2 and Approach Slab at the east end of Third Street Bridge | 128+04.86 | 135+27.00 |
| 7 | 1 | 1A | Construct EB SR91 left shoulder and lane # 1 | 135+27.00 | 139+55.00 |
| 7 | 1 | 1A | Construct EB SR91 lane # 2 (fast set PCC) | 136+49.00 | 139+55.00 |
| 7 | 1 | 1A | Adjust Third St undercrossing to form crown x-section | | |
| 7 | 1 | 1E | Construct outside widening of E-W loop | +52.36 | 2+85.23 |
| 7 | 1 | 1H | Construct outside widening of E-N loop | 197+26.97 | 199+39.08 |
| 7 | 1 | 1I | Shoulder Strengthning for use as a temp detour | 197+33.00 | 197+80.00 |
| 7 | 1 | 1J | Construct left shoulder widening of W-N connector | 203+64.00 | 205+61.00 |
| 7 | 2 | 2H1 | WIDEN NB RTE 215 FROM EXIST ETW TO PROPOSED EP | 208+80.00 | 214+38.00 |
| 7 | 2 | 2H1 | WIDEN SB RTE 215 FROM EXIST ETW TO PROPOSED EP | 208+80.00 | 214+00.00 |
| 7 | 2 | 2H1/2CL1 | WIDEN NB RTE 215 FROM EXIST ETW TO PROPOSED EP | 8+79.96 | 18+85.00 |

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| 7 | 2 | 2H1/2C6 | WIDEN SB RTE 215 FROM EXIST ETW TO PROPOSED EP | 8+61.71 | 13+99.89 |
| 7 | 2 | 2O1 | REALIGN NB BLAINE AVE ENTRANCE RAMP | 211+34.92 | 214+86.27 |
| 7 | 2 | 2M1 | REALIGN SB BLAINE AVE EXIT RAMP | 211+00.00 | 214+10.95 |
| 7 | 2 | 2BLAINE1 | CONSTRUCT WESTERN HALF OF LOCAL STREET | 18+00.00 | 21+25.00 |
| 7 | 2 | 2OO1 | CONSTRUCT UNIVERSITY AVE OC BRIDGE WIDENING | 19+70.00 | 20+42.00 |
| 7 | 2 | 2NN1 | REALIGN UNIVERSITY AVE EXIT RAMP | 9+41.48 | 14+90.69 |
| 7 | 2 | 2H1 | CONSTRUCT MEDIAN BARRIER | 10+20.00 | 14+04.23 |
| 7 | 2 | 2R1 | CONSTRUCT MLK JR BLVD ENTRANCE/EXIT RAMP | 17+65.00 | 18+85.00 |
| 7 | 2 | 2G2 | CONSTRUCT DETOUR AT SYCAMORE CANYON BLVD AT CENTRAL AVE | 46+04.86 | 48+59.95 |
| 7 | 2 | VAR | CONSTRUCT THE FOLLOWING RETAINING WALLS AND SOUND WALLS: 213, 214, RWSW13, 15, 17 | SEE RW PLANS | |
| 7 | 3 | 3S | Remaining portion of Box Springs Rd SB I-215 exit ramp and one half northside approach slab | 10+00.000 | 12+00.000 |
| 7 | 3 | 3SYC | The remaining half of Sycamore CYN BLVD and Box Springs Rd intersection and drainage system 171 | 13+00.000 | 14+80.000 |
| 7 | 3 | 3AA | NB I-215 temp widening (detour 13) | 62+24.538 | 65+30.000 |

**SEQUENCE 3 (100 % plans available 200 working days after contract approval)**

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| 8 | 1 | 1A (Temp) | Construct temporry pavement for cross over (west end) | 126+80.00 | 127+80.00 |
| 8 | 1 | 1A (Temp) | Construct temporry pavement for cross over (east end) | 135+35.00 | 138+80.00 |
| 8 | 1 | Detour 1 | Construct temporary WB SR91 collector-distributor road | 128+01.86 | 130+24.03 |
| 8 | 2 | 2CC1 | CONSTRUCT MLK JR BLVD UC (INSIDE) | 22+26.00 | 22+94.90 |
| 8 | 2 | 2F1 | CONSTRUCT CENTRAL AVE UC WIDENING | 19+75.00 | 20+25.00 |
| 8 | 2 | 2G2 | CONSTRUCT SYCAMORE CANYON BLVD AT CENTRAL AVE. | 44+00.00 | 49+00.00 |
| 8 | 2 | 2G2 | CONSTRUCT RETAINING | 44+38.00 | 46+90.00 |

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| | | | WALL: RW 44, 46 | | |
| 8 | 2 | 2G2 | CONSTRUCT CONCRETE BARRIER | 46+87.22 | 48+05.00 |
| 8 | 2 | 2G2 | CONSTRUCT THE FOLLOWING RETAINING WALL: 50 | SEE PLANS | |

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| 8 | 3 | 3X | Demolish exist Box Springs Rd overcrossing and construct the remaining half with its southside Approach Slab | 12+58.512 | 14+05.231 |
| 8 | 3 | 3C | NB I-215 outside widening after removal of exist Box Springs Rd overcrossing Deck, Bents, Abutment | 58+00.000 | 58+56.057 |
| 8 | 3 | 3C | Remove portion of exit I-215 barrier | 58+32.918 | 59+30.726 |
| 8 | 3 | 3X | Remaining one half of Box Springs Rd | 12+00.000 | 15+83.361 |
| 8 | 3 | | Demolish portion of NB I-215 Box Springs Rd overhead and construct portion of the one | | |
| 9 | 1 | 1A | Construct portion of WB SR91 right shoulder and lanes # 4, 5 & 6 and Approach Slabs at west end of Third Street Bridge | 126+33.00 | 127+80.00 |
| 9 | 1 | 1A | Construct WB SR91 right shoulder and lanes # 1, 2, 3, 4, 5 & Aux lane | 132+46.00 | 134+05.63 |
| 9 | 1 | 1A | Construct WB SR91 left & right shoulder and lanes # 1, 2, 3, 4, 5 & Aux lane | 134+05.63 | 136+10.56 |
| 9 | 1 | 1A | Construct WB SR91 right shoulder and lanes # 1, 2, 3, 4, & 5 | 136+10.56 | 136+65.10 |
| 9 | 1 | 1A | Construct WB SR91 right shoulder and lanes # 2, 3 & 4 | 136+65.10 | 137+02.91 |
| 9 | 1 | 1A | Construct WB SR91 right shoulder and lanes # 3 & 4 | 137+02.91 | 137+35.70 |
| 9 | 1 | 1A | Construct WB SR91 right shoulder and lanes # 4 | 137+35.70 | 137+65.88 |
| 9 | 1 | 1A | Construct WB SR91 right shoulder | 137+65.88 | 138+06.91 |
| 9 | 1 | 1A | Construct RW91-137A | | |
| 9 | 1 | 1A (Temp) | Construct WB SR91 temporary pavement | 128+05.00 | 134+05.63 |
| 9 | 1 | 1C | Construct the separation widening | | |
| 9 | 1 | 1E | Construct inside widening of E-W loop | +52.36 | 2+85.23 |
| 9 | 1 | 1H | Construct inside widening of E-N loop | 197+26.97 | 199+39.08 |

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| 9 | 1 | 1I | Construct portion of E-S connector | 197+60.00 | 199+08.39 |
| 9 | 1 | 1N | Construct WB SR91 Spruce St entrance ramp | 134+01.46 | 137+69.23 |
| 9 | 1 | Detour 7 | Temp E-S connector detour | 197+00.00 | 197+57.76 |

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| 9 | 2 | 2CC1 | CONSTRUCT MLK JR BLVD UC (OUTSIDE) | 22+26.00 | 22+94.90 |
| 9 | 2 | 2J1 | REALIGN SB CENTRAL AVE ENTRANCE RAMP | 44+20.00 | 48+05.00 |
| 9 | 2 | 2CL1 | WIDEN SB RTE 215 FROM EXIST ETW TO PROPOSED EP | 44+40.00 | 51+68.57 |
| 9 | 3 | 3X | The remaining half of Box Springs Rd overcrossing with its southside approach slab | | |
| 9 | 3 | 3X | Northside approach slab of Box Springs Rd overcrossing | | |
| 9 | 3 | 3C | I-215 inside widening and barrier | 58+32.918 | 59+30.726 |
| 9 | 3 | 3C, 3BB | NB I-215 inside widening | 59+80.000 "3C" | 66+69.094 "3BB" |
| 10 | 1 | 1A | Construct WB SR91 Widening and Approach Slabs at the west end of University Bridge Ln # 2. 3, and Right Shoulder | 119+80.00 | 121+40.00 |
| 10 | 1 | 1A | Construct WB SR91 right shoulder and lanes # 1, 2, 3 & 4 and Approach Slabs at the east end of University and Mission Inn Bridges | 121+72.00 | 126+00.00 |
| 10 | 1 | 1A | Construct WB SR91 portion of lanes # 1, 2, 3 & 4 | 126+00.00 | 127+80.00 |
| 10 | 1 | 1A | Construct WB SR91 portion of lanes # 1, 2, 3 & 4 (fast set PCC) and Approach Slabs at the west end of Third Street Ln # 1, 2, and 3 | 126+00.00 | 127+80.00 |
| 10 | 1 | 1A | Construct WB SR91 right shoulder and lanes # 1, 2, 3, 4, 5 & Aux lane and Approach Slabs at the east end of Third Street | 128+04.80 | 132+46.00 |
| 10 | 1 | 1A | Construct WB SR91 lane # 3 | 137+35.70 | 137+65.88 |
| 10 | 1 | 1A | Construct WB SR91 lane # 3 & 4 | 137+65.88 | 138+06.91 |
| 10 | 1 | 1A | Construct WB SR91 right shoulder and lanes # 3 & 4 | 138+06.91 | 139+53.10 |
| 10 | 1 | 1A | Construct WB SR91 Widening | 139+53.10 | 139+83.03 |
| 10 | 1 | 1A | Construct SW91-129A | | |
| 10 | 1 | 1A | Construct RW91-129B | | |
| 10 | 1 | 1A | Construct SW91-129B | | |

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| 10 | 1 | 1A (Temp) | Construct WB SR91 temp widening | 139+83.03 | 141+19.67 |
| 10 | 1 | 2R | Construct roadway portion at the west end of N-W connector | 129+12.51 | 132+55.00 |

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| 10 | 2 | 2CL1 | WIDEN SB RTE 215 FROM EXIST ETW TO PROPOSED EP | 26+00.00 | 29+00.00 |
| 10 | 2 | 2CL1 | CONSTRUCT MEDIAN BARRIER | 21+05.87 | 25+12.68 |
| 10 | 2 | 2CC1 | CONSTRUCT MLK JR BLVD UNDER BRIDGE | 22+25.00 | 22+90.00 |
| 10 | 2 | 2CC1 | REALIGN MLK JR BLVD | 18+03.39 | 22+25.00 |
| 10 | 2 | 2P2 | CONSTRUCT SB MLK JR EXIT RAMP | 21+40.00 | 21+75.00 |
| 10 | 2 | 2P2 | CONSTRUCT SB MLK JR BLVD ENTRANCE RAMP | 22+00.00 | 27+70.74 |
| 10 | 2 | VAR | CONSTRUCT THE FOLLOWING RETAINING WALLS AND SOUND WALLS: 22, 24A,B, 26B,C, 28 | SEE PLANS | |
| 10 | 3 | Detour 8 | Temp Box Springs Rd | 10+87.389 | 14+54.523 |
| 10 | 3 | | Demolish the remaining portion of NB I-215 Box Springs Rd overhead and construct the remaining portion of the OH | | |
| 11 | 1 | 1A | Construct SR91 median barrier and remaining portions median shoulder and Approach Slabs at the west end of University Bridge | 119+80.00 | 121+75.00 |
| 11 | 1 | 1A | Construct SR91 median barrier, remaining portions median shoulder and EB lane # 1 and Approach Slabs at the east end of University and west end of Mission Inn Bridges | 121+75.00 | 122+77.00 |
| 11 | 1 | 1A | Construct SR91 median barrier | 122+77.00 | 123+11.00 |
| 11 | 1 | 1A | Construct SR91 median barrier, remaining portions median shoulder and EB lane # 1 and Approach Slabs at the east end of Mission Inn and west end of University Bridges | 123+11.00 | 127+80.00 |
| 11 | 1 | 1A | Construct SR91 median barrier | 127+80.00 | 128+05.00 |
| 11 | 1 | 1A | Construct SR91 median barrier and remaining portions median shoulder and Approach Slabs at the east end of Third Street Bridge | 128+05.00 | 136+65.06 |
| 11 | 1 | 1A | Construct SR91 median barrier, remaining portions median shoulder and WB lane # 1 | 136+65.06 | 137+02.90 |

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| 11 | 1 | 1A | Construct SR91 median barrier, remaining portions median shoulder and WB lane # 1 & 2 | 137+02.90 | 139+54.60 |
| 11 | 1 | 1A | Construct SR91 median barrier and remaining portions median shoulder | 139+54.60 | 140+88.86 |

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| 11 | 1 | 1A | Construct Approach Slabs at the west end of University with fast-set Concrete for Eastbound Ln # 1 and Westbound Ln # 1 | | |
| 11 | 1 | 1B | Construct I215 median barrier | 0+00 | 2+44.54 |
| 11 | 1 | 1C | Construct WB SR60 shoulder widening | 194+80.00 | 196+40.00 |
| 11 | 1 | 1G | Construct S-W connector | 194+27.00 | 197+35.00 |
| 11 | 1 | 1H | Construct E-N connector peel off | 195+45.01 | 196+28.90 |
| 11 | 1 | 1I | Construct E-S connector | 192+72.85 | 194+09.00 |
| 11 | 1 | 1I | Construct E-S connector | 194+80.00 | 197+60.00 |
| 11 | 1 | 1I | Construct RW60-194 | | |
| 11 | 1 | Detour 3 | Temp S-W connector detour | 1+30.00 | 3+00.00 |
| 11 | 1 | Detour 6 | Temp S-W connector detour | 193+00.00 | 194+80.00 |
| 11 | 3 | 3P, 3C | Portion of SB I-215 Box Springs Rd exit ramp | 55+20.000 "3C" | 13+90.640 "3P" |
| 12 | 1 | 1A | Construct WB SR91 right shoulder widening | 139+83.03 | 140+88.86 |
| 12 | 1 | 1B | Construct SB I215 right shoulder widening | 0+00 | 4+21.28 |
| 12 | 1 | 1G | Construct remaining portion of S-W connector | 193+67.18 | 194+26.84 |
| 12 | 1 | 1G | Construct remaining portion of S-W connector | 197+35.71 | 197+77.99 |
| 12 | 1 | 1I | Construct remaining portion of E-S connector | 193+51.59 | 194+80.00 |
| 12 | 1 | 1I | Construct remaining portion of E-S connector | 197+14.55 | 197+60.00 |
| 12 | 1 | 2H1 | Construct SR60 collector-distributer road barrier & crash cushion | 191+79.37 | 201+43.55 |
| 12 | 1 | 2H1 | Construct SB I215 right shoulder widening | 197+35.93 | 200+36.00 |
| 12 | 2 | | REMOVE EL CERRITO OVERCROSSING AND OBLITERATE ALL RAMPS | SEE PLANS | |
| 12 | 2 | | OBLITERATE EXIST SURFACE- SYCAMORE CANYON BLVD AT CENTRAL AVE. | SEE PLANS | |
| 12 | 2 | 2CL1 | WIDEN NB RTE 215 FROM EXIST ETW TO PROPOSED EP | 28+00.00 | 37+00.00 |

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| 12 | 2 | 2CL1 | WIDEN SB RTE 215 FROM EXIST ETW TO PROPOSED EP | 29+00.00 | 37+00.00 |
| 12 | 2 | 2CC2 | REALIGN SYCAMORE CANYON BLVD | 30+47.00 | 35+10.00 |
| 12 | 2 | 2CC3 | REALIGN SYCAMORE CANYON BLVD | 30+00.00 | 31+00.00 |

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| 12 | 2 | VAR | CONSTRUCT THE FOLLOWING RETAINING WALLS AND SOUND WALLS: 36 | SEE PLANS | |
| 12 | 3 | 3C,3M | SB I-215 outside widening, remaining portion portion of the truck Bypass connector | 56+48.400 "3C" | 11+20.000 "3M" |
| 12 | 3 | 3AA | Connector barrier between WB SR-60 and NB I-215 | 60+58.731 | 65+82.651 |
| 13 | 2 | 2CL1 | OGAC OVERLAY NB | 18+52.16 | 51+68.57 |
| 13 | 2 | 2CL1 | OGAC OVERLAY SB | 20+54.32 | 51+68.57 |
| 13 | 2 | 2CL1 | FINAL PAVEMENT DELINEATION | 20+00.00 | 51+70.00 |
| 13 | 3 | | OGAC overlay and final delineation | | |

Attention is directed to "Order of Work" of these special provisions.

Should the Department fail to provide the complete design, including final plans, specifications, and estimate of quantities for any Design Sequence within the times specified and, in the opinion of the Engineer, the controlling operation or operations are delayed or interfered with by the delay in providing the complete design, 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. Attention is directed to "Progress Schedule (Critical Path Method)" of these special provisions.

# AMENDMENTS TO JULY 1999 STANDARD SPECIFICATIONS

**UPDATED JUNE 19, 2003**

Amendments to the Standard Specifications set forth in these special provisions shall be considered as part of the Standard Specifications for the purposes set forth in Section 5-1.04, "Coordination and Interpretation of Plans, Standard Specifications and Special Provisions," of the Standard Specifications. Whenever either the term "Standard Specifications is amended" or the term "Standard Specifications are amended" is used in the special provisions, the text or table following the term shall be considered an amendment to the Standard Specifications. In case of conflict between such amendments and the Standard Specifications, the amendments shall take precedence over and be used in lieu of the conflicting portions.

**SECTION 2: PROPOSAL REQUIREMENTS AND CONDITIONS**

Issue Date: June 19, 2003

Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications is amended to read:

**2-1.03 Examination of Plans, Specifications, Contract, and Site of Work**

- The bidder shall examine carefully the site of the work contemplated, the plans and specifications, and the proposal and contract forms therefor. The submission of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the general and local conditions to be encountered, as to the character, quality and scope of work to be performed, the quantities of materials to be furnished and as to the requirements of the proposal, plans, specifications and the contract.
- The submission of a bid shall also be conclusive evidence that the bidder is satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information was reasonably ascertainable from an inspection of the site and the records of exploratory work done by the Department as shown in the bid documents, as well as from the plans and specifications made a part of the contract.
- Where the Department has made investigations of site conditions including subsurface conditions in areas where work is to be performed under the contract, or in other areas, some of which may constitute possible local material sources, bidders or contractors may, upon written request, inspect the records of the Department as to those investigations subject to and upon the conditions hereinafter set forth.
- Where there has been prior construction by the Department or other public agencies within the project limits, records of the prior construction that are currently in the possession of the Department and which have been used by, or are known to, the designers and administrators of the project will be made available for inspection by bidders or contractors, upon written request, subject to the conditions hereinafter set forth. The records may include, but are not limited to, as-built drawings, design calculations, foundation and site studies, project reports and other data assembled in connection with the investigation, design, construction and maintenance of the prior projects.
- Inspection of the records of investigations and project records may be made at the office of the district in which the work is situated, or in the case of records of investigations related to structure work, at the Transportation Laboratory in Sacramento, California.
- When a log of test borings or other record of geotechnical data obtained by the Department's investigation of surface and subsurface conditions is included with the contract plans, it is furnished for the bidders' or Contractor's information and its use shall be subject to the conditions and limitations set forth in this Section 2-1.03.
- In some instances, information considered by the Department to be of possible interest to bidders or contractors has been compiled as "Materials Information." The use of the "Materials Information" shall be subject to the conditions and limitations set forth in this Section 2-1.03 and Section 6-2, "Local Materials."
- When cross sections are not included with the plans, but are available, bidders or contractors may inspect the cross sections and obtain copies for their use, at their expense.
- When cross sections are included with the contract plans, it is expressly understood and agreed that the cross sections do not constitute part of the contract, do not necessarily represent actual site conditions or show location, character, dimensions and details of work to be performed, and are included in the plans only for the convenience of bidders and their use is subject to the conditions and limitations set forth in this Section 2-1.03.
- When contour maps were used in the design of the project, the bidders may inspect those maps, and if available, they may obtain copies for their use.
- The availability or use of information described in this Section 2-1.03 is not to be construed in any way as a waiver of the provisions of the first paragraph in this Section 2-1.03 and bidders and contractors are cautioned to make independent investigations and examinations as they deem necessary to be satisfied as to conditions to be encountered in the performance of the work and, with respect to possible local material sources, the quality and quantity of material available from the property and the type and extent of processing that may be required in order to produce material conforming to the requirements of the specifications.
- The Department assumes no responsibility for conclusions or interpretations made by a bidder or contractor based on the information or data made available by the Department. The Department does not assume responsibility for representation made by its officers or agents before the execution of the contract concerning surface or subsurface conditions, unless that representation is expressly stated in the contract.
- No conclusions or interpretations made by a bidder or contractor from the information and data made available by the Department will relieve a bidder or contractor from properly fulfilling the terms of the contract.

## SECTION 5: CONTROL OF WORK

Issue Date: December 31, 2001

Section 5-1.02A, "Trench Excavation Safety Plans," of the Standard Specifications is amended to read:

**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."

## SECTION 9: MEASUREMENT AND PAYMENT

Issue Date: November 18, 2002

Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications is amended to read:

**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:

A. Initial notice of potential claim.
B. Supplemental notice of potential claim.
C. Full and final documentation of potential claim.
D. 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:

A. The complete nature and circumstances of the dispute which caused the potential claim.

B. The contract provisions that provide the basis of claim.
C. The estimated cost of the potential claim, including an itemized breakdown of individual costs and how the estimate was determined.
D. 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 A and B 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 C and D 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:

A. 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.
B. 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.
C. 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:

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.
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. 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.
4. Other categories as specified by the Contractor or the Engineer.

A. When an adjustment of contract time is requested the following information shall be provided:

1. The specific dates for which contract time is being requested.
2. The specific reasons for entitlement to a contract time adjustment.
3. The specific provisions of the contract that provide the basis for the requested contract time adjustment.
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.

B. 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 A to E 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 retentions, 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.

Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications is amended to read:

**9-1.07B Final Payment and Claims**

- After acceptance by the Director, the Engineer will make a proposed final estimate in writing of the total amount payable to the Contractor, including an itemization of the total amount, segregated by contract item quantities, extra work and other bases for payment, and shall also show each deduction made or to be made for prior payments and amounts to be kept or retained under the provisions of the contract. Prior estimates and payments shall be subject to correction in the proposed final estimate. The Contractor shall 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 thirtieth day after receiving the proposed final estimate. If the thirtieth day falls on a Saturday, Sunday or legal holiday, then receipt of the written approval or statement of claims by the Engineer shall not be later than close of business of the next business day. The Contractor's receipt of the proposed final estimate shall be evidenced by postal receipt. The Engineer's receipt of the Contractor's written approval or statement of claims shall 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:

A. The exclusive identification number that corresponds to the supporting full and final documentation of potential claim.
B. 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:

A. The claim does not have the same nature, circumstances, and basis as the corresponding full and final documentation of potential claim.
B. The claim does not have a corresponding full and final documentation of potential claim.
C. The claim was not included in the written statement of claims.
D. 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.
- Claims for overhead type expenses or costs, 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. Claims for overhead type expenses or costs 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 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:

A. Allowable in conformance with the requirements in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31.
B. Adequately supported by reliable documentation.
C. 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 Contractor files a timely written statement of claims in response to the proposed final estimate, the District that administers the contract will submit a claim position letter to the Contractor by hand delivery or deposit in the U.S. mail within 135 days of acceptance of the contract. The claim position letter will delineate the District's position on the Contractor's claims. If the Contractor disagrees with the claim position letter, the Contractor shall submit a written notification of its disagreement and a written request to meet with the board of review, to be received by the District not later than 15 days after the Contractor's receipt of the claim position letter. The written notification of disagreement shall set forth the basis for the Contractor's disagreement and be submitted to the office designated in the claim position letter. The Contractor's failure to provide a timely written notification of disagreement or timely written request to meet with the board of review shall constitute the Contractor's acceptance and agreement with the determinations provided in the claim position letter and with final payment pursuant to the claim position letter.

• If the Contractor files a timely notification of disagreement with the District claim position letter and a timely request to meet with the board of review, then the board of review, designated by the District Director to review claims that remain in dispute, will meet with the Contractor within 45 days after receipt by the District of the notification of disagreement.

• If the District fails to submit a claim position letter to the Contractor within 135 days after the acceptance of the contract and the Contractor has claims that remain in dispute, the Contractor may request a meeting with the board of review designated by the District Director to review claims that remain in dispute. The Contractor's request for a meeting shall identify the claims that remain in dispute. If the Contractor files a request for a meeting, the board of review will meet with the Contractor within 45 days after the District receives the request for the meeting.

• Attendance by the Contractor at the board of review meeting shall be mandatory. The board of review will review those claims and make a written recommendation thereon to the District Director. The final determination of claims, made by the District Director, will be sent to the Contractor by hand delivery or deposit in the U.S. mail. The Engineer will then make and issue the Engineer's final estimate in writing and within 30 days thereafter the State will pay the entire sum, if any, found due thereon. That final estimate shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

• Failure of the Contractor to conform to the specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract and shall operate as a bar to arbitration in conformance with the requirements in Section 10240.2 of the California Public Contract Code.

## SECTION 19: EARTHWORK

Issue Date: December 31, 2001

The third paragraph of Section 19-1.02, "Preservation of Property," of the Standard Specifications is amended to read:

• In addition to the provisions in Sections 5-1.02, "Plans and Working Drawings," and 5-1.02A, "Excavation Safety Plans," detailed plans of the protective systems for excavations on or affecting railroad property will be reviewed for adequacy of protection provided for railroad facilities, property, and traffic. These plans shall be submitted at least 9 weeks before the Contractor intends to begin excavation requiring the protective systems. Approval by the Engineer of the detailed plans for the protective systems will be contingent upon the plans being satisfactory to the railroad company involved.

## SECTION 42: GROOVE AND GRIND PAVEMENT

Issue Date: December 31, 2001

The last sentence of the first subparagraph of the third paragraph in Section 42-2.02, "Construction," of the Standard Specifications is amended to read:

- After grinding has been completed, the pavement shall conform to the straightedge and profile requirements specified in Section 40-1.10, "Final Finishing."

## SECTION 49: PILING

Issue Date: April 30, 2003

The first paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- Foundation piles of any material shall be of such length as is required to develop the nominal resistance, to obtain the specified penetration, and to extend into the cap or footing block as shown on the plans, or specified in the special provisions.

The fourth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- Modification to the specified installation methods and specified pile tip elevation will not be considered at locations where tension or lateral load demands control design pile tip elevations or when the plans state that specified pile tip elevation shall not be revised.

The sixth and seventh paragraphs in Section 49-1.03, "Determination of Length," of the Standard Specifications are amended to read:

- Indicator compression pile load testing shall conform to the requirements in ASTM Designation: D 1143. The pile shall sustain the first compression test load applied which is equal to the nominal resistance in compression, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of compression load testing.
- Indicator tension pile load testing shall conform to the requirements in ASTM Designation: D 3689. The loading apparatus described as "Load Applied to Pile by Hydraulic Jack(s) Acting at One End of Test Beam(s) Anchored to the Pile" shall not be used. The pile shall sustain the first tension test load applied which is equal to the nominal resistance in tension, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of tension load testing.

The ninth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- For driven piling, the Contractor shall furnish piling of sufficient length to obtain both the specified tip elevation and nominal resistance shown on the plans or specified in the special provisions. For cast-in-drilled-hole concrete piling, the Contractor shall construct piling of such length to develop the nominal resistance in compression and to obtain the specified tip elevation shown on the plans or specified in the special provisions.

The tenth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is deleted.

The fourth paragraph in Section 49-1.04, "Load Test Piles," of the Standard Specifications is amended to read:

- Load test piles and anchor piles which are not to be incorporated in the completed structure shall be removed in conformance with the provisions in Section 15-4.02, "Removal Methods," and the remaining holes shall be backfilled with earth or other suitable material approved by the Engineer.

The first paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

- 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.

The seventh paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

• 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.

The second paragraph in Section 49-1.07, "Driving," of the Standard Specifications is amended to read:

• 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.

Section 49-1.08, "Bearing Value and Penetration," of the Standard Specifications is amended to read:

**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):

$$R_u = (7 * (E_r)^{1/2} * \log_{10} (0.83 * N)) - 550$$

Section 49-3.01, "Description," of the Standard Specifications is amended by deleting the fifth paragraph.

The sixth paragraph in Section 49-4.01, "Description," of the Standard Specifications is amended to read:

• Lifting anchors used in precast prestressed concrete piles without a class designation ending in "C" (corrosion resistant) shall be removed, and the holes filled in conformance with the provisions in Section 51-1.18A, "Ordinary Surface Finish."

The first and second paragraphs in Section 49-4.01, "Description," of the Standard Specifications are amended to read:

• 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."

The fourth paragraph in Section 49-4.03, "Drilled Holes," of the Standard Specifications is amended to read:

• 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.

The first and second paragraphs in Section 49-4.04, "Steel Shells," of the Standard Specifications are amended to read:

• 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.

The first paragraph in Section 49-4.05, "Inspection," of the Standard Specifications is amended to read:

• 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.

The third paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

• 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.

The seventh paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read

• 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.

The ninth paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

• 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.

Section 49-6.02, "Payment," of the Standard Specifications is amended by adding the following paragraphs:

Full compensation for furnishing and placing additional testing reinforcement, for load test anchorages, and for cutting off test piles, shall be considered as included in the contract price paid for piling of the type or class shown in the Engineer's Estimate, and no additional compensation will be allowed.

No additional compensation or extension of time will be made for additional foundation investigation, installation and testing of indicator piling, cutting off piling and restoring the foundation investigation and indicator pile sites, and review of request by the Engineer

## SECTION 50: PRESTRESSING CONCRETE

Issue Date: November 18, 2002

Section 50-1.02, "Drawings," of the Standard Specifications is amended by adding the following paragraph after the second paragraph:

• Each working drawing submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate working drawing submittal.

Section 50-1.05, "Prestressing Steel," of the Standard Specifications is amended to read:

• Prestressing steel shall be high-tensile wire conforming to the requirements in ASTM Designation: A 421, including Supplement I; high-tensile seven-wire strand conforming to the requirements in ASTM Designation: A 416; or uncoated high-strength steel bars conforming to the requirements in ASTM Designation: A 722, including all supplementary requirements. The maximum mass requirement of ASTM Designation: A 722 will not apply.

• In addition to the requirements of ASTM Designation: A 722, for deformed bars, the reduction of area shall be determined from a bar from which the deformations have been removed. The bar shall be machined no more than necessary to remove the deformations over a length of 300 mm, and reduction will be based on the area of the machined portion.

• In addition to the requirements specified herein, epoxy-coated seven-wire prestressing steel strand shall be grit impregnated and filled in conformance with the requirements in ASTM Designation: A 882/A 882M, including Supplement I, and the following:

A. The coating material shall be on the Department's list of approved coating materials for epoxy-coated strand, available from the Transportation Laboratory.
B. The film thickness of the coating after curing shall be 381 µm to 1143 µm.
C. Prior to coating the strand, the Contractor shall furnish to the Transportation Laboratory a representative 230-g sample from each batch of epoxy coating material to be used. Each sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.
D. Prior to use of the epoxy-coated strand in the work, written certifications referenced in ASTM Designation: A 882/A 882M, including a representative load-elongation curve for each size and grade of strand to be used and a copy of the quality control tests performed by the manufacturer, shall be furnished to the Engineer.
E. In addition to the requirements in Section 50-1.10, "Samples for Testing," four 1.5-m long samples of coated strand and one 1.5-m long sample of uncoated strand of each size and reel shall be furnished to the Engineer for testing. These samples, as selected by the Engineer, shall be representative of the material to be used in the work.
F. Epoxy-coated strand shall be cut using an abrasive saw.
G. All visible damage to coatings caused by shipping and handling, or during installation, including cut ends, shall be repaired in conformance with the requirements in ASTM Designation: A 882/A 882M. The patching material shall be furnished by the manufacturer of the epoxy powder and shall be applied in conformance with the manufacturer's written recommendations. The patching material shall be compatible with the original epoxy coating material and shall be inert in concrete.

• All bars in any individual member shall be of the same grade, unless otherwise permitted by the Engineer.

• When bars are to be extended by the use of couplers, the assembled units shall have a tensile strength of not less than the manufacturer's minimum guaranteed ultimate tensile strength of the bars. Failure of any one sample to meet this requirement will be cause for rejection of the heat of bars and lot of couplers. The location of couplers in the member shall be subject to approval by the Engineer.

- Wires shall be straightened if necessary to produce equal stress in all wires or wire groups or parallel lay cables that are to be stressed simultaneously or when necessary to ensure proper positioning in the ducts.
- Where wires are to be button-headed, the buttons shall be cold formed symmetrically about the axes of the wires. The buttons shall develop the minimum guaranteed ultimate tensile strength of the wire. No cold forming process shall be used that causes indentations in the wire. Buttonheads shall not contain wide open splits, more than 2 splits per head, or splits not parallel with the axis of the wire.
- Prestressing steel shall be protected against physical damage and rust or other results of corrosion at all times from manufacture to grouting or encasing in concrete. Prestressing steel that has sustained physical damage at any time shall be rejected. The development of visible rust or other results of corrosion shall be cause for rejection, when ordered by the Engineer.
- Epoxy-coated prestressing steel strand shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the strand from exposure to sunlight, salt spray, and weather. For stacked coils, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the strand to prevent condensation under the covering. Epoxy-coated strand shall not be stored within 300 m of ocean or tidal water for more than 2 months.
- Prestressing steel shall be packaged in containers or shipping forms for the protection of the steel against physical damage and corrosion during shipping and storage. Except for epoxy-coated strand, a corrosion inhibitor which prevents rust or other results of corrosion, shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Engineer, may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or concrete or bond strength of steel to concrete. Packaging or forms damaged from any cause shall be immediately replaced or restored to original condition.
- The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, and the type of corrosion inhibitor used, including the date packaged.
- Prestressing steel for post-tensioning which is installed in members prior to placing and curing of the concrete, and which is not epoxy-coated, shall be continuously protected against rust or other results of corrosion, until grouted, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct. The corrosion inhibitor shall conform to the provisions specified herein.
- When steam curing is used, prestressing steel for post-tensioning shall not be installed until the steam curing is completed.
- Water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 0.01-kg/L. Compressed air used to blow out ducts shall be oil free.
- When prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 10 days after the installation of the prestressing steel, rust which may form during those 10 days will not be cause for rejection of the steel. Prestressing steel installed, tensioned, and grouted in this manner, all within 10 days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel. Prestressing steel installed as above but not grouted within 10 days shall be subject to all the requirements in this section pertaining to corrosion protection and rejection because of rust. The requirements in this section pertaining to tensioning and grouting within 10 days shall not apply to epoxy-coated prestressing steel strand.
- Any time prestressing steel for pretensioning is placed in the stressing bed and is exposed to the elements for more than 36 hours prior to encasement in concrete, adequate measures shall be taken by the Contractor, as approved by the Engineer, to protect the steel from contamination or corrosion.
- After final fabrication of the seven-wire prestressing steel strand, no electric welding of any form shall be performed on the prestressing steel. Whenever electric welding is performed on or near members containing prestressing steel, the welding ground shall be attached directly to the steel being welded.
- Pretensioned prestressing steel shall be cut off flush with the end of the member. For epoxy-coated prestressing steel, only abrasive saws shall be used to cut the steel. The exposed ends of the prestressing steel and a 25-mm strip of adjoining concrete shall be cleaned and painted. Cleaning shall be by wire brushing or abrasive blast cleaning to remove all dirt and residue on the metal or concrete surfaces. Immediately after cleaning, the surfaces shall be covered with one application of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," except that 2 applications shall be applied to surfaces which will not be covered by concrete or mortar. Aerosol cans shall not be used. The paint shall be thoroughly mixed at the time of application and shall be worked into any voids in the prestressing tendons.

The thirteenth paragraph in Section 50-1.08, "Prestressing," of the Standard Specifications is amended to read:

- Prestressing steel in pretensioned members shall not be cut or released until the concrete in the member has attained a compressive strength of not less than the value shown on the plans or 28 MPa, whichever is greater. In addition to these

concrete strength requirements, when epoxy-coated prestressing steel strand is used, the steel shall not be cut or released until the temperature of the concrete surrounding the strand is less than 65°C, and falling.

The fifth paragraph in Section 50-1.10, "Samples for Testing," of the Standard Specifications is amended to read:

• The following samples of materials and tendons, selected by the Engineer from the prestressing steel at the plant or jobsite, shall be furnished by the Contractor to the Engineer well in advance of anticipated use:

A. For wire or bars, one 2-m long sample and for strand, one 1.5-m long sample, of each size shall be furnished for each heat or reel.
B. For epoxy-coated strand, one 1.5-m long sample of uncoated strand of each size shall be furnished for each reel.
C. If the prestressing tendon is a bar, one 2-m long sample shall be furnished and in addition, if couplers are to be used with the bar, two 1.25-m long samples of bar, equipped with one coupler and fabricated to fit the coupler, shall be furnished.

The second paragraph in Section 50-1.11, "Payment," of the Standard Specifications is amended to read:

• The contract lump sum prices paid for prestressing cast-in-place concrete of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in furnishing, placing, and tensioning the prestressing steel in cast-in-place concrete structures, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

## SECTION 51: CONCRETE STRUCTURES

Issue Date: April 16, 2003

The first and second paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications are amended to read:

• 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.

• 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.

The seventh paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended to read:

• 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.

Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended by adding the following paragraphs:

• 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.

The first paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

- The design load for falsework shall consist of the sum of dead and live vertical loads, and an assumed horizontal load. The minimum total design load for any falsework, including members that support walkways, shall be not less than 4800 $N/m^2$ for the combined live and dead load regardless of slab thickness.

The eighth paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

- 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.

The third paragraph in Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended to read:

- 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."

Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended by adding the following paragraphs:

- 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.

Section 51-1.06C, "Removing Falsework," of the Standard Specifications is amended by adding the following paragraph:

- 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.

The sixth paragraph in Section 51-1.09, "Placing Concrete," of the Standard Specifications is amended to read:

- 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.

The table in the ninth paragraph of Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications is amended to read:

| | |
|---|---|
| Tensile strength, percent | -15 |
| Elongation at break, percent | -40; but not less than 300% total elongation of the material |
| Hardness, points | +10 |

The first sentence of the fourth paragraph in Section 51-1.17, "Finish Bridge Decks," of the Standard Specifications is amended to read:

- 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.

Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications is amended by deleting the seventh, thirteenth and fourteenth paragraphs.

The fourteenth paragraph in Section 51-1.23, "Payment," of the Standard Specifications is amended by deleting "and injecting epoxy in cracks".

## SECTION 52: REINFORCEMENT

Issue Date: December 31, 2001

The third paragraph in Section 52-1.04, "Inspection," of the Standard Specifications is amended to read:

- A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall also be furnished for each shipment of epoxy-coated bar reinforcement or wire reinforcement certifying that the coated reinforcement conforms to the requirements in ASTM Designation: A 775/A 775M or A 884/A 884M, respectively, and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement." The Certificate of Compliance shall include all of the certifications specified in ASTM Designation: A 775/A 775M or A 884/A 884M respectively, and a statement that the coating material has been prequalified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

The third paragraph in Section 52-1.08C, "Mechanical Butt Splices," of the Standard Specifications is amended to read:

- The total slip of the reinforcing bars within the splice sleeve after loading in tension to 200 MPa and relaxing to 20 MPa shall not exceed the values listed in the following table. The slip shall be measured between gage points that are clear of the splice sleeve.

| 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 |

The first paragraph in Section 52-1.08C(5), "Sleeve-Lockshear Bolt Mechanical Butt Splices," of the Standard Specifications is amended to read:

- The sleeve-lockshear bolt type of mechanical butt splices shall consist of a seamless steel sleeve, center hole with centering pin, and bolts that are tightened until the bolt heads shear off with the bolt ends left embedded in the reinforcing bars. The seamless steel sleeve shall be either formed into a V configuration or shall have 2 serrated steel strips welded to the inside of the sleeve.

Section 52-1.08F, "Nondestructive Splice Tests," of the Standard Specifications is amended by deleting the seventh paragraph.

## SECTION 55: STEEL STRUCTURES

Issue Date: December 31, 2001

Section 55-3.14, "Bolted Connections," of the Standard Specifications is amended by adding the following after the ninth paragraph:

- 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.

The sixth paragraph of Section 55-4.02, "Payment," of the Standard Specifications is amended to read:

- If a portion or all of the structural steel is fabricated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing the structural steel from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced $5000 or by an amount computed at $0.044 per kilogram of structural steel fabricated, whichever is greater, or in the case of each fabrication site located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced $8000 or by $0.079 per kilogram of structural steel fabricated, whichever is greater.

## SECTION 56: SIGNS

Issue Date: December 31, 2001

Section 56-1.01, "Description," of the Standard Specifications is amended by deleting the third paragraph.

The sixth through the thirteenth paragraphs in Section 56-1.03, "Fabrication," of the Standard Specifications are amended to read:

- 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.
- 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.
- 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.

## SECTION 59: PAINTING

Issue Date: December 31, 2001

Section 59-2.01, "General," of the Standard Specifications is amended by adding the following paragraphs after the first paragraph:

- 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.

The third paragraph of Section 59-2.03, "Blast Cleaning," of the Standard Specifications is amended to read:

- 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.

The first paragraph of Section 59-2.06, "Hand Cleaning," of the Standard Specifications is amended to read:

- 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.

The fourth paragraph of Section 59-2.12, "Painting," of the Standard Specifications is amended to read:

- 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 of specification SSPC-PA2 of the "SSPC: The Society for Protective Coatings."

## SECTION 75: MISCELLANEOUS METAL

Issue Date: December 31, 2001

The table in the tenth paragraph of Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications is amended to read:

| 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 except Grade 1017) |
| 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<br>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.

The table in the eighteenth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

| 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 |

* Maximum stud diameter permitted for mechanical expansion anchors.

The table in the nineteenth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

| 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 |

The table in the twenty-second paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

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 | — |

## SECTION 83: RAILINGS AND BARRIERS

Issue Date: June 13, 2002

The ninth paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- 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.

The eleventh paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- Wood posts and blocks 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 with creosote, creosote coal tar solution, creosote petroleum solution (50-50), pentachlorophenol in hydrocarbon solvent, copper naphthenate, ammoniacal copper arsenate, or ammoniacal copper zinc arsenate. In addition to the preservatives listed above, Southern yellow pine may also be pressure treated with chromated copper arsenate. When other than one of the creosote processes is used, blocks shall have a minimum retention of 6.4 $Kg/m^3$, and need not be incised.

## SECTION 85: PAVEMENT MARKERS

Issue Date: May 16, 2003

The second through fifth paragraphs in Section 85-1.03, "Sampling, Tolerances and Packaging," of the Standard Specifications are amended to read:

**Sampling**

- Twenty markers selected at random will constitute a representative sample for each lot of markers.
- The lot size shall not exceed 25000 markers.

**Tolerances**

- Three test specimens will be randomly selected from the sample for each test and tested in conformance with these specifications. Should any one of the 3 specimens fail to conform with the requirements in these specifications, 6 additional specimens will be tested. The failure of any one of these 6 specimens shall be cause for rejection of the entire lot or shipment represented by the sample.
- The entire sample of retroreflective pavement markers will be tested for reflectance. The failure of 10 percent or more of the original sampling shall be cause for rejection.

Section 85-1.04, "Non-Reflective Pavement Markers," of the Standard Specifications is amended to read:

**85-1.04 Non-Reflective Pavement Markers**

- Non-reflective pavement markers (Types A and AY) shall be, at the option of the Contractor, either ceramic or plastic conforming to these specifications.
- The top surface of the marker shall be convex with a gradual change in curvature. The top, bottom and sides shall be free of objectionable marks or discoloration that will affect adhesion or appearance.
- The bottom of markers shall have areas of integrally formed protrusions or indentations, which will increase the effective bonding surface area of adhesive. The bottom surface of the marker shall not deviate more than 1.5 mm from a flat surface. The areas of protrusion shall have faces parallel to the bottom of the marker and shall project approximately one mm from the bottom.

The second through fourth paragraphs of Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications are deleted.

The table in the fifth paragraph in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications is amended to read:

**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. |

Section 85-1.04B, "Non-Reflective Pavement Markers (Plastic)," of the Standard Specifications is amended to read:

**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.

The sixth and seventh paragraphs in Section 85-1.05, "Retroreflective Pavement Markers," of the Standard Specifications are amended to read:

**Testing**

- Tests shall be performed in conformance with the requirements in California Test 669.

| Test Description | Requirement | | |
|---|---|---|---|
| Bond strength[a] | 3.4 MPa, min. | | |
| Compressive strength[b] | 8900 N, min. | | |
| Abrasion resistance, marker must meet the respective specific intensity minimum requirements after abrasion. | Pass | | |
| Water Soak Resistance | No delamination of the body or lens system of the marker nor loss of reflectance | | |
| | Specific Intensity | | |
| Reflectance | Clear | Yellow | Red |
| 0° Incidence Angle, min. | 3.0 | 1.5 | 0.75 |
| 20° Incidence Angle, min. | 1.2 | 0.60 | 0.30 |
| After one year field evaluation | 0.30 | 0.15 | 0.08 |

a Failure of the marker body or filler material prior to reaching 3.4 MPa shall constitute a failing bond strength test.
b Deformation of the marker of more than 3 mm at a load of less than 8900 N or delamination of the shell and the filler material of more than 3 mm regardless of the load required to break the marker shall be cause for rejection of the markers as specified in Section 85-1.03, "Sampling, Tolerances and Packaging."

- Pavement markers to be placed in pavement recesses shall conform to the above requirements for retroreflective pavement markers except that the minimum compressive strength requirement shall be 5338 N.

The eighth paragraph of Section 85-1.05, "Retrorelective Pavement Markers" of the Standard Specifications is deleted.

The eighth paragraph in Section 85-1.06, "Replacement," of the Standard Specifications is amended to read:

- Epoxy adhesive shall not be used to apply non-reflective plastic pavement markers.

## SECTION 86: SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

Issue Date: June 19, 2003

The seventh paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- 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.

Section 86-2.03, "Foundations," of the Standard Specifications is amended by deleting the eighth paragraph.

The twelfth paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- 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 plate.

The first paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- Standards for traffic signals and lighting, and steel pedestals for cabinets and other similar equipment, shall be located as shown on the plans. 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 contract special provisions.

The second paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- 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.

The fourth paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts" of the Standard Specifications is amended to read:

- 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, "Steel Structures," except as otherwise noted, and the following requirements:

Except as otherwise specified, standards shall be fabricated from sheet steel of weldable grade having a minimum yield strength, after fabrication, of 276 MPa.

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.

When a single-ply 8-mm thick pole is specified, a 2-ply pole with equivalent section modulus may be substituted.

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.

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.

Welds shall be continuous.

The weld metal at the transverse joint shall extend to the sleeve, making the sleeve an integral part of the joint.

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.

The longitudinal welds in steel tubular sections may be made by the electric resistance welding process.

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.

Exposed circumferential welds, except fillet and fatigue-resistant welds, shall be ground flush (-0, +2mm) with the base metal prior to galvanizing or painting.

Circumferential welds and base plate-to-pole welds may be repaired only one time without written permission from the Engineer.

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.

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 of ASTM A6.

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.

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.

No holes shall be made in structural members unless the holes are shown on the plans or are approved in writing by the Engineer.

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.

Mast arms for standards shall be fabricated from material as specified for standards, and shall conform to the dimensions shown on the plans.

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).

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.

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.

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."

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.

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 ASTM Designation: 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.

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.

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.

The seventh paragraph of 86-2.04, "Standards, Steel Pedestals and Posts" of the Standard Specifications is amended to read:

- 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.

Section 86-8.01, "Payment," of the Standard Specifications is amended by adding the following paragraph after the first paragraph:

- If a portion or all of the poles for signal, lighting and electrical systems pursuant to Standard Specification Section 86, "Signals, Lighting and Electrical Systems," is fabricated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for furnishing such items from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced $5000; in addition, in the case where a fabrication site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced an additional $3000 per each fabrication site ($8000 total per site).

## SECTION 88: ENGINEERING FABRIC

Issue Date: January 15, 2002

Section 88-1.02, "Pavement Reinforcing Fabric," of the Standard Specifications is amended to read:

• Pavement reinforcing fabric shall be 100 percent polypropylene staple fiber fabric material, needle-punched, thermally bonded on one side, and conform to the following:

| Specification | Requirement |
|---|---|
| Weight, grams per square meter<br>ASTM Designation: D 5261 | 140 |
| Grab tensile strength<br>(25-mm grip), kilonewtons, min. in each direction<br>ASTM Designation: D 4632 | 0.45 |
| Elongation at break, percent min.<br>ASTM Designation: D 4632 | 50 |
| Asphalt retention by fabric, grams per square meter. (Residual Minimum)<br>ASTM Designation: D 6140 | 900 |

Note: Weight, grab, elongation and asphalt retention are based on Minimum Average Roll Value (MARV)

## SECTION 90: PORTLAND CEMENT CONCRETE

Issue Date: June 19, 2003

Section 90, "Portland Cement Concrete," of the Standard Specifications is amended to read:

## SECTION 90: PORTLAND CEMENT CONCRETE
## 90-1 GENERAL

### 90-1.01 DESCRIPTION

• Portland cement concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, admixtures if used, and water, proportioned and mixed as specified in these specifications.

• The Contractor shall determine the mix proportions for concrete in conformance with these specifications. Unless otherwise specified, cementitious material shall be a combination of cement and mineral admixture. Cementitious material shall be either:

1. "Type IP (MS) Modified" cement; or
2. A combination of "Type II Modified" portland cement and mineral admixture; or
3. A combination of Type V portland cement and mineral admixture.

• Type III portland cement shall be used only as allowed in the special provisions or with the approval of the Engineer.

• Class 1 concrete shall contain not less than 400 kg of cementitious material per cubic meter.

• Class 2 concrete shall contain not less than 350 kg of cementitious material per cubic meter.

• Class 3 concrete shall contain not less than 300 kg of cementitious material per cubic meter.

• Class 4 concrete shall contain not less than 250 kg of cementitious material per cubic meter.

• Minor concrete shall contain not less than 325 kg of cementitious material per cubic meter unless otherwise specified in these specifications or the special provisions.

• Unless otherwise designated on the plans or specified in these specifications or the special provisions, the amount of cementitious material used per cubic meter of concrete in structures or portions of structures shall conform to the following:

| Use | Cementitious Material Content (kg/m3) |
|---|---|
| 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, mineral admixture 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 mineral admixture 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 mineral admixture 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 CEMENT

• Unless otherwise specified, cement shall be either "Type IP (MS) Modified" cement, "Type II Modified" portland cement or Type V portland cement.

• "Type IP (MS) Modified" cement shall conform to the requirements for Type IP (MS) cement in ASTM Designation: C 595, and shall be comprised of an intimate and uniform blend of Type II cement and not more than 35 percent by mass of mineral admixture. The type and minimum amount of mineral admixture used in the manufacture of "Type IP (MS) Modified" cement shall be in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."

• "Type II Modified" portland cement shall conform to the requirements for Type II portland cement in ASTM Designation: C 150.

• In addition, "Type IP (MS) Modified" cement and "Type II Modified" portland cement shall conform to the following requirements:

A. The cement shall not contain more than 0.60-percent by mass of alkalies, calculated as the percentage of $Na_2O$ plus 0.658 times the percentage of $K_2O$, when determined by either direct intensity flame photometry or by the atomic absorption method. The instrument and procedure used shall be qualified as to precision and accuracy in conformance with the requirements in ASTM Designation: C 114;
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 and Type V portland cements shall conform to the requirements in ASTM Designation: C 150 and the additional requirements listed above for "Type II Modified" portland cement, except that when tested in conformance with California Test 527, mortar containing Type III portland cement shall not contract in air more than 0.075 percent.
- Cement used in the manufacture of cast-in-place concrete for exposed surfaces of like elements of a structure shall be from the same cement mill.
- Cement shall be protected from exposure to moisture until used. Sacked cement shall be piled to permit access for tally, inspection, and identification of each shipment.
- Adequate facilities shall be provided to assure that cement meeting the provisions specified in this Section 90-2.01 shall be kept separate from other cement in order to prevent any but the specified cement from entering the work. Safe and suitable facilities for sampling cement shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper, in conformance with California Test 125.
- If cement is used prior to sampling and testing as provided in Section 6-1.07, "Certificates of Compliance," and the cement is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the cement manufacturer or supplier of the cement. If the cement 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.
- Cement furnished without a Certificate of Compliance shall not be used in the work until the Engineer has had sufficient time to make appropriate tests and has approved the cement for use.

**90-2.02 AGGREGATES**

- Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.
- Natural aggregates shall be thoroughly and uniformly washed before use.
- The Contractor, at the Contractor's expense, 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 which 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 shall be in addition to any payments made in conformance with the provisions in Section 90-1.01, "Description."
- No single Cleanness Value, Sand Equivalent or aggregate grading test shall represent more than 250 $m^3$ of concrete or one day's pour, whichever is smaller.
- When the source of an aggregate is changed, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using the aggregates.

**90-2.02A Coarse Aggregate**

• Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, 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.

• 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:

1. coarse aggregate sampled at the completion of processing at the aggregate production plant had a Cleanness Value of not less than 82 when tested by California Test 227; and
2. 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:

1. 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
2. prequalification tests performed in conformance with California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

**90-2.03 WATER**

• In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1000 parts per million of chlorides as Cl, when tested in conformance with

California Test 422, nor more than 1300 parts per million of sulfates as $SO_4$, when tested in conformance with California Test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as $SO_4$, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM Designation: C 109, when compared to the results obtained with distilled water or deionized water, tested in conformance with the requirements in ASTM Designation: C 109.

- In non-reinforced concrete work, the water for curing, for washing aggregates and for mixing shall be free from oil and shall not contain more than 2000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, or more than 1500 parts per million of sulfates as $SO_4$, when tested in conformance with California Test 417.
- In addition to the above provisions, water for curing concrete shall not contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.
- Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis ($Na_2O$ + 0.658 $K_2O$) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

### 90-2.04 ADMIXTURE MATERIALS

- Admixture materials shall conform to the requirements in the following ASTM Designations:

A. Chemical Admixtures—ASTM Designation: C 494.
B. Air-entraining Admixtures—ASTM Designation: C 260.
C. Calcium Chloride—ASTM Designation: D 98.
D. Mineral Admixtures—Coal fly ash; raw or calcined natural pozzolan as specified in ASTM Designation: C 618; silica fume conforming to the requirements in ASTM Designation: C 1240, with reduction of mortar expansion of 80 percent, minimum, using the cement from the proposed mix design.

- Unless otherwise specified in the special provisions, mineral admixtures shall be used in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."

## 90-3 AGGREGATE GRADINGS

### 90-3.01 GENERAL

- Before beginning concrete work, the Contractor shall submit in writing to the Engineer the gradation of the primary aggregate nominal sizes that the Contractor proposes to furnish. If a primary coarse aggregate or the fine aggregate is separated into 2 or more sizes, the proposed gradation shall consist of the gradation for each individual size, and the proposed proportions of each individual size, combined mathematically to indicate one proposed gradation. The proposed gradation shall meet the grading requirements shown in the table in this section, and shall show the percentage passing each of the sieve sizes used in determining the end result.
- The Engineer may waive, in writing, the gradation requirements in this Section 90-3.01 and in Sections 90-3.02, "Coarse Aggregate Grading," 90-3.03, "Fine Aggregate Grading," and 90-3.04, "Combined Aggregate Gradings," if, in the Engineer's opinion, furnishing the gradation is not necessary for the type or amount of concrete work to be constructed.
- Gradations proposed by the Contractor shall be within the following percentage passing limits:

| Primary Aggregate Nominal Size | Sieve Size | Limits of Proposed Gradation |
|---|---|---|
| 37.5-mm x 19-mm | 25-mm | 19 - 41 |
| 25-mm x 4.75-mm | 19-mm | 52 - 85 |
| 25-mm x 4.75-mm | 9.5-mm | 15 - 38 |
| 12.5-mm x 4.75-mm | 9.5-mm | 40 - 78 |
| 9.5-mm x 2.36-mm | 9.5-mm | 50 - 85 |
| Fine Aggregate | 1.18-mm | 55 - 75 |
| Fine Aggregate | 600-µm | 34 - 46 |
| Fine Aggregate | 300-µm | 16 - 29 |

- Should the Contractor change the source of supply, the Contractor shall submit in writing to the Engineer the new gradations before their intended use.

### 90-3.02 COARSE AGGREGATE GRADING

- The grading requirements for coarse aggregates are shown in the following table for each size of coarse aggregate:

| | 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 | |
| Sieve Sizes | Operating Range | Contract Compliance | Operating Range | Contract Compliance | Operating Range | Contract Compliance | Operating Range | Contract Compliance |
| 50-mm | 100 | 100 | — | — | — | — | — | — |
| 37.5-mm | 88-100 | 85-100 | 100 | 100 | — | — | — | — |
| 25-mm | x ± 18 | X ± 25 | 88-100 | 86-100 | — | — | — | — |
| 19-mm | 0-17 | 0-20 | X ± 15 | X ± 22 | 100 | 100 | — | — |
| 12.5-mm | — | — | — | — | 82-100 | 80-100 | 100 | 100 |
| 9.5-mm | 0-7 | 0-9 | X ± 15 | X ± 22 | X ± 15 | X ± 22 | X ± 15 | X ± 20 |
| 4.75-mm | — | — | 0-16 | 0-18 | 0-15 | 0-18 | 0-25 | 0-28 |
| 2.36-mm | — | — | 0-6 | 0-7 | 0-6 | 0-7 | 0-6 | 0-7 |

- In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."
- Coarse aggregate for the 37.5-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," shall be furnished in 2 or more primary aggregate nominal sizes. Each primary aggregate nominal size may be separated into 2 sizes and stored separately, provided that the combined material conforms to the grading requirements for that particular primary aggregate nominal size.
- When the 25-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," is to be used, the coarse aggregate may be separated into 2 sizes and stored separately, provided that the combined material shall conform to the grading requirements for the 25-mm x 4.75-mm primary aggregate nominal size.

### 90-3.03 FINE AGGREGATE GRADING

- Fine aggregate shall be graded within the following limits:

| | Percentage Passing | |
|---|---|---|
| Sieve Sizes | 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. Within these limitations, the relative proportions shall be as ordered by the Engineer, except as otherwise provided in Section 90-1.01, "Description."

• 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 in prestressed or reinforced concrete.

• Calcium chloride shall not be used in concrete except when otherwise specified.

• Mineral admixture used in concrete for exposed surfaces of like elements of a structure shall be from the same source and of the same percentage.

• 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.

### 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.

• When 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.

• If a mineral admixture is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the manufacturer or supplier of the mineral admixture. If the mineral admixture is used in ready-mix 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.

### 90-4.04 REQUIRED USE OF CHEMICAL ADMIXTURES AND CALCIUM CHLORIDE

• When the use of a chemical admixture or calcium chloride 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.

• Calcium chloride shall be dispensed in liquid, flake, or pellet form. Calcium chloride dispensed in liquid form shall conform to the provisions for dispensing liquid admixtures in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures."

### 90-4.05 OPTIONAL USE OF CHEMICAL ADMIXTURES

• The Contractor will be permitted to 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. When 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 as provided in Section 40-1.015, "Cement Content."

## 90-4.08 REQUIRED USE OF MINERAL ADMIXTURES

- Unless otherwise specified, mineral admixture shall be combined with cement to make cementitious material.
- The calcium oxide content of mineral admixtures shall not exceed 10 percent and the available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 618.
- The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," and shall conform to the following:

A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content;
B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:

   1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix;
   2. When the calcium oxide content of a mineral admixture is greater than 2 percent, the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix;
   3. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix

C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

## 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.
- 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."

• Special admixtures, such as "high range" water reducers that may contribute to a high rate of slump loss, shall be measured and dispensed as recommended by the admixture manufacturer and as approved by the Engineer.

### 90-4.11 STORAGE, PROPORTIONING, AND DISPENSING OF MINERAL ADMIXTURES

• Mineral admixtures shall be protected from exposure to moisture until used. Sacked material shall be piled to permit access for tally, inspection and identification for each shipment.

• Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper.

• Mineral admixtures shall be incorporated into concrete using equipment conforming to the requirements for cement weigh hoppers, and charging and discharging mechanisms in ASTM Designation: C 94, in Section 90-5.03, "Proportioning," and in this Section 90-4.11.

• When concrete is completely mixed in stationary paving mixers, the mineral admixture shall be weighed in a separate weigh hopper conforming to the provisions for cement weigh hoppers and charging and discharging mechanisms in Section 90-5.03A, "Proportioning for Pavement," and the mineral admixture and cement shall be introduced simultaneously into the mixer proportionately with the aggregate. If the mineral admixture is not weighed in a separate weigh hopper, the Contractor shall provide certification that the stationary mixer is capable of mixing the cement, admixture, aggregates and water uniformly prior to discharge. 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 prior to discharge that are required to produce a mix that meets the requirements above.

## 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 also that the various sizes shall not become intermixed before proportioning.

• Aggregates shall be stored or stockpiled and handled in a manner that shall 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 mineral admixture for one batch of concrete is a single operation of a switch or starter.

• Proportioning devices shall be tested at the expense of the Contractor 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 mineral admixtures shall have a zero tolerance of ±0.5 percent of the designated total batch mass of the cement and mineral admixture. Equipment for weighing cement or mineral admixture 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 within 1.0 percent of its designated batch mass. When weighed individually, mineral admixture shall be within 1.0 percent of its designated batch mass. When mineral admixture and cement are permitted to be weighed cumulatively, cement shall be weighed first to within 1.0 percent of its designated batch mass, and the total for cement and mineral admixture shall be within 1.0 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, mineral admixture, or cement plus mineral admixture 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 cement, mineral admixture, 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) Modified" 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 mineral admixture 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 mineral admixture are weighed cumulatively, the cement shall be weighed first.

• When cement and mineral admixtures are weighed in separate weigh hoppers**,** the weigh systems for the proportioning of the aggregate, the cement, and the mineral admixture 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 mineral admixture shall be discharged into the mixer simultaneously with the aggregate.

• The scales and weigh hoppers for bulk weighing cement, mineral admixture, or cement plus mineral admixture shall be separate and distinct from the aggregate weighing equipment.

• For batches with a volume 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 at the Contractor's expense on scales designated by the Engineer.

**90-5.03A Proportioning for Pavement**

• Aggregates and bulk cement, mineral admixture, and cement plus mineral admixture 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, mineral admixture, or cement plus mineral admixture 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 mineral admixture hoppers or the cement plus mineral admixture hopper are charged with masses that are within the tolerances specified in Section 90-5.02, "Proportioning Devices."

• When interlocks are required for cement and mineral admixture charging mechanisms and cement and mineral admixtures 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."

• The discharge gate on the cement and mineral admixture hoppers or the cement plus mineral admixture hopper shall be designed to permit regulating the flow of cement, mineral admixture, or cement plus mineral admixture into the aggregate as directed by the Engineer.

• When 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.

• When the discharge from the several bins is controlled by gates, each gate shall be actuated automatically so that the required mass is discharged into the weigh box, after which the gate shall automatically close and lock.

• The automatic weighing system shall be designed so that all proportions required may be set on the weighing controller at the same time.

## 90-6 MIXING AND TRANSPORTING

### 90-6.01 GENERAL

• Concrete shall be mixed in mechanically operated mixers, except that when permitted by the Engineer, batches not exceeding 0.25 $m^3$ may be mixed by hand methods in conformance with the provisions in Section 90-6.05, "Hand-Mixing."

• Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.

• Concrete shall be homogeneous and thoroughly mixed, and there shall be no lumps or evidence of undispersed cement, mineral admixture, or cement plus mineral admixture.

• 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, at the Contractor's expense, 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 jobsite 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 jobsite 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 non-agitating 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 shall 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 non-agitating 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 non-agitating 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.
- When 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 when the temperature of the concrete is 30°C or above, the time allowed may be less than 1.5 hours.
- When non-agitating 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 jobsite shall be accompanied by a weighmaster certificate showing the mix identification number, non-repeating load number, date and time at which the materials were batched, the total amount of water added to the load, and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged with cement. This weighmaster certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.
- Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on a 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be "line feed, carriage return" (LFCR) and "one line, separate record" with allowances for sufficient fields to satisfy the amount of data required by these specifications.
- The Contractor may furnish a weighmaster certificate accompanied by a separate certificate that lists the actual batch masses or measurements for a load of concrete provided that both certificates are imprinted with the same non-repeating load number that is unique to the contract and delivered to the jobsite 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."

### 90-6.05 HAND-MIXING

- Hand-mixed concrete shall be made in batches of not more than 0.25 $m^3$ and shall be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and spread on the platform and the fine aggregate shall be spread on this layer, the 2 layers being not more than 0.3 meters in total depth. On this mixture shall be spread the dry cement and mineral admixture 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. When Type F or Type G chemical admixtures are added to the mix, the penetration requirements shall not apply and the slump shall not exceed 225 mm after the chemical admixtures are added.

| Type of Work | Nominal | | Maximum | |
|---|---|---|---|---|
| | Penetration (mm) | Slump (mm) | Penetration (mm) | Slump (mm) |
| Concrete Pavement | 0-25 | — | 40 | — |
| Non-reinforced concrete facilities | 0-35 | — | 50 | — |
| Reinforced concrete structures | | | | |
| Sections over 300-mm thick | 0-35 | — | 65 | — |
| Sections 300-mm thick or less | 0-50 | — | 75 | — |
| Concrete placed under water | — | 150-200 | — | 225 |
| Cast-in-place concrete piles | 65-90 | 130-180 | 100 | 200 |

• The amount of free water used in concrete shall not exceed 183 kg/m$^3$, plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m$^3$.

• The term free water is defined as the total water in the mixture minus the water absorbed by the aggregates in reaching a saturated surface-dry condition.

• Where 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. The cost of additional cementitious material and water added under these conditions shall be at the Contractor's expense 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.

• When a curing medium consisting of cotton mats, rugs, carpets, 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 mediums.

• 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 in the preceding paragraph, 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. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class B.
5. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class A.
6. Non-pigmented curing compound with fugitive dye conforming to the requirements in ASTM Designation: C 309, Type 1-D, Class A.

- The infrared scan for the dried vehicle from curing compound (1) shall match the infrared scan on file at the Transportation Laboratory.
- The loss of water for each type of curing compound, when tested in conformance with the requirements in California Test 534, shall not be more than 0.15-kg/$m^2$ in 24 hours.
- The curing compound to be used will be specified elsewhere in these specifications or in the special provisions.
- When the use of curing compound is required or permitted elsewhere in these specifications or in the special provisions and no specific kind is specified, any of the curing compounds listed above may be used.
- Curing compound shall be applied at a nominal rate of 3.7 $m^2$/L, unless otherwise specified.
- At any point, the application rate shall be within ±1.2 $m^2$/L of the nominal rate specified, and the average application rate shall be within ±0.5 $m^2$/L of the nominal rate specified when tested in conformance with the requirements in California Test 535. Runs, sags, thin areas, skips, or holidays in the applied curing compound shall be evidence that the application is not satisfactory.
- Curing compounds shall be applied using power operated spray equipment. The power operated spraying equipment shall be equipped with an operational pressure gage and a means of controlling the pressure. Hand spraying of small and irregular areas that are not reasonably accessible to mechanical spraying equipment, in the opinion of the Engineer, may be permitted.
- The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.
- At the time of use, compounds containing pigments shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. A paddle shall be used to loosen all settled pigment from the bottom of the container, and a power driven agitator shall be used to disperse the pigment uniformly throughout the vehicle.
- Agitation shall not introduce air or other foreign substance into the curing compound.
- The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, de-emulsification, or other requisite qualities of a satisfactory working material. Pigmented curing compounds shall be manufactured so that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Settlement of pigment shall be a thoroughly wetted, soft, mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency.
- Curing compounds shall remain sprayable at temperatures above 4°C and shall not be diluted or altered after manufacture.
- The curing compound shall be packaged in clean 1040-L totes, 210-L barrels

or 19-L pails shall be supplied from a suitable storage tank located at the jobsite. 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 shall 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 of California.
- 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 of California.
- 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 or at the jobsite 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 with a class designation ending in C (corrosion resistant) 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," or 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, or 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, or 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.

• 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. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

### 90-8.03 PROTECTING CONCRETE PAVEMENT

• Pavement concrete shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

• 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.

• When 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 at the Contractor's expense.

• 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, at the Contractor's expense, make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures, before placing additional concrete, and shall pay to the State $14 for each in-place cubic meter of concrete represented by the deficient test. If the result of a single compressive strength test at the maximum age specified or allowed is below 95 percent of the specified strength, but is 85 percent or more of the specified strength, the Contractor shall make the corrective changes specified above, and shall pay to the State $20 for each in place cubic meter of concrete represented by the deficient test. In addition, such corrective changes shall be made when

the compressive strength of concrete tested at 7 days indicates, in the judgment of the Engineer, that the concrete will not attain the required compressive strength at the maximum age specified or allowed. Concrete represented by a single test that indicates a compressive strength of less than 85 percent of the specified 28-day compressive strength will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials."

- If the test result indicates that the compressive strength at the maximum curing age specified or allowed is below the specified strength, but is 85 percent or more of the specified strength, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. If the test result indicates a compressive strength at the maximum curing age specified or allowed below 85 percent, the concrete represented by that test will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength and quality of the concrete placed in the work are acceptable. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in conformance with the requirements in ASTM Designation: C 42.
- No single compressive strength test shall represent more than 250 $m^3$.
- When 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. When 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 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.
- 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 non-agitating 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.
- Each load of ready-mixed concrete shall be accompanied by a weighmaster certificate that shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weighmaster certificate shall be clearly marked with the date and time of day when the load left the batching plant and, if hauled in truck mixers or agitators, the time the mixing cycle started.
- A Certificate of Compliance conforming to the provisions in Section 6–1.07, "Certificates of Compliance," shall be furnished to the Engineer, prior to placing minor concrete from a source not previously used on the contract, stating that minor concrete to be furnished meets contract requirements, including minimum cementitious material content specified.

### 90-10.04 CURING MINOR CONCRETE

- Curing minor concrete shall conform to the provisions in Section 90-7, "Curing Concrete."

### 90-10.05 PROTECTING MINOR CONCRETE

- Protecting minor concrete shall conform to the provisions in Section 90-8, "Protecting Concrete," except the concrete shall be maintained at a temperature of not less than 4°C for 72 hours after placing.

### 90-10.06 MEASUREMENT AND PAYMENT

- Minor concrete will be measured and paid for in conformance with the provisions specified in the various sections of these specifications covering concrete construction when minor concrete is specified in the specifications, shown on the plans, or indicated by contract item in the Engineer's Estimate.

## 90-11 MEASUREMENT AND PAYMENT

### 90-11.01 MEASUREMENT

- Portland cement concrete will be measured in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- When it is provided that concrete will be measured at the mixer, the volume in cubic meters shall be computed as the total mass of the batch in kilograms divided by the density of the concrete in kilograms per cubic meter. The total mass of the batch shall be calculated as the sum of all materials, including water, entering the batch. The density of the concrete will be determined in conformance with the requirements in California Test 518.

### 90-11.02 PAYMENT

- Portland cement concrete will be paid for in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- Full compensation for furnishing and incorporating admixtures required by these specifications or the special provisions will be considered as included in the contract prices paid for the concrete involved and no additional compensation will be allowed therefor.
- Should the Engineer order the Contractor to incorporate any admixtures in the concrete when their use is not required by these specifications or the special provisions, furnishing the admixtures and adding them to the concrete will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."
- Should the Contractor use admixtures in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," or Section 90-4.07, "Optional Use of Air-entraining Admixtures," or should the Contractor request and obtain permission to use other admixtures for the Contractor’s benefit, the Contractor shall furnish those admixtures and incorporate them into the concrete at the Contractor’s expense and no additional compensation will be allowed therefor.

# END OF AMENDMENTS

## SECTION 2. PROPOSAL REQUIREMENTS AND CONDITIONS

### 2-1.01 GENERAL

The bidder's attention is directed to the provisions in Section 2, "Proposal Requirements and Conditions," of the Standard Specifications and these special provisions for the requirements and conditions which the bidder must observe in the preparation of the Proposal form and the submission of the bid.

In addition to the subcontractors required to be listed in conformance with Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications, each proposal shall have listed therein the portion of work that will be performed by each subcontractor listed.

The Bidder's Bond form mentioned in the last paragraph in Section 2-1.07, "Proposal Guaranty," of the Standard Specifications will be found following the signature page of the Proposal.

Submit request for substitution of an "or equal" item, and the data substantiating the request to the Department of Transportation, District 8 Construction, MS 1104, 464 West 4th Street, 6th Floor, San Bernardino, Ca 92401-1400, so that the request is received by the Department by close of business on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening.

In conformance with Public Contract Code Section 7106, a Noncollusion Affidavit is included in the Proposal. Signing the Proposal shall also constitute signature of the Noncollusion Affidavit.

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. Each subcontract signed by the bidder must include this assurance.

### 2-1.012 PRE-BID QUALIFICATION QUESTIONNAIRE

Pursuant to Streets and Highways Code Section 217.6, prospective bidders are required to provide prequalification information establishing successful past experience with the proposed work.

Prospective bidders shall submit responses to the "Pre-Bid Qualification Questionnaire", which is included in the Proposal and Contract book for this project. The responses to the "Pre-Bid Qualification Questionnaire" shall be submitted to the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, California 95814 so the information is received by the Department not later than 4:00 p.m. on Monday, October 6, 2003.

Joint venture contractors shall submit a combined "Pre-Bid Qualification Questionnaire" providing responses for all joint venture partners, or each joint venture partner may submit individual responses to the Questionnaire.

Failure of a prospective bidder to submit a "Pre-Bid Qualification Questionnaire" by the time specified will result in a determination by the Department that the prospective bidder is not a responsive bidder and is not qualified for this project, and any bid submitted by the bidder either solely or as a joint venture partner will be returned unopened.

### 2-1.013 PRE-BID QUALIFICATION REVIEW

Not later than seven (7) days after the submittal date specified in "Pre-Bid Qualification Questionnaire" of these special provisions, the Department will inform each prospective bidder of the determination of the bidder's qualification to submit bids for this project. The Department's determination of the prospective bidder's qualifications for performing the work will be based on the bidder's successful past experience with the proposed work, as presented in the "Pre-Bid Qualification Questionnaire".

If the Department determines that a prospective bidder is not qualified to submit a bid for this project, the prospective bidder may request, in writing, a Pre-Bid Qualification Review Meeting to review the responses in the "Pre-Bid Qualification Questionnaire" and the Department's determination. Requests for Pre-Bid Qualification Review Meetings must be submitted to the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, California 95814 so the request is received by the Department not later than 4:00 p.m. on the fourth day, not including Saturdays, Sundays and legal holidays, following receipt of the Department's determination.

At the Pre-Bid Qualification Review Meeting, the prospective bidder shall be prepared to discuss and answer questions relative to the responses to the "Pre-Bid Qualification Questionnaire" and the Department's initial determination that the prospective bidder is not qualified to submit a bid for the project. Based on the responses to the "Pre-Bid Qualification Questionnaire", and the information provided at the Pre-Bid Qualification Review Meeting, the Department will prepare written findings and a final determination regarding the prospective bidder's qualification to submit a bid for this project. The determination of the Department regarding the prospective bidder's qualifications to bid shall be final.

### 2-1.015 FEDERAL LOBBYING RESTRICTIONS

Section 1352, Title 31, United States Code prohibits Federal funds from being expended by the recipient or any lower tier subrecipient of a Federal-aid contract to pay for any person for influencing or attempting to influence a Federal agency or Congress in connection with the awarding of any Federal-aid contract, the making of any Federal grant or loan, or the entering into of any cooperative agreement.

If any funds other than Federal funds have been paid for the same purposes in connection with this Federal-aid contract, the recipient shall submit an executed certification and, if required, submit a completed disclosure form as part of the bid documents.

A certification for Federal-aid contracts regarding payment of funds to lobby Congress or a Federal agency is included in the Proposal. Standard Form - LLL, "Disclosure of Lobbying Activities," with instructions for completion of the Standard Form is also included in the Proposal. Signing the Proposal shall constitute signature of the Certification.

The above-referenced certification and disclosure of lobbying activities shall be included in each subcontract and any lower-tier contracts exceeding $100,000. All disclosure forms, but not certifications, shall be forwarded from tier to tier until received by the Engineer.

The Contractor, subcontractors and any lower-tier contractors shall file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by the Contractor, subcontractors and any lower-tier contractors. An event that materially affects the accuracy of the information reported includes:

A. A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or
B. A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or,
C. A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

**2-1.02 DISADVANTAGED BUSINESS ENTERPRISE (DBE)**

This project is subject to Part 26, Title 49, Code of Federal Regulations entitled "Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs." The Regulations in their entirety are incorporated herein by this reference.

Bidders shall be fully informed respecting the requirements of the Regulations and the Department's Disadvantaged Business Enterprise (DBE) program developed pursuant to the Regulations; particular attention is directed to the following matters:

A. A DBE must be a small business concern as defined pursuant to Section 3 of U.S. Small Business Act and relevant regulations promulgated pursuant thereto.
B. A DBE may participate as a prime contractor, subcontractor, joint venture partner with a prime or subcontractor, vendor of material or supplies, or as a trucking company.
C. A DBE bidder, not bidding as a joint venture with a non-DBE, will be required to document one or a combination of the following:

    1. The bidder will meet the goal by performing work with its own forces.
    2. The bidder will meet the goal through work performed by DBE subcontractors, suppliers or trucking companies.
    3. The bidder, prior to bidding, made adequate good faith efforts to meet the goal.

D. A DBE joint venture partner must be responsible for specific contract items of work, or portions thereof. Responsibility means actually performing, managing and supervising the work with its own forces. The DBE joint venture partner must share in the capital contribution, control, management, risks and profits of the joint venture. The DBE joint venturer must submit the joint venture agreement with the proposal or the DBE Information form required in the Section entitled "Submission of DBE Information" of these special provisions.
E. A DBE must perform a commercially useful function, i.e., must be responsible for the execution of a distinct element of the work and must carry out its responsibility by actually performing, managing and supervising the work.
F. DBEs must be certified by the California Unified Certification Program (CUCP). It is the contractor's responsibility to confirm that the firm is DBE certified as of the date of bid opening. Listings of DBEs certified by the CUCP are available from the following sources:

    1. The Department's DBE Directory, which is published quarterly. This Directory may be obtained from the Department of Transportation, Materiel Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520.
    2. The Department's web site at http://www.dot.ca.gov/hq/bep.
    3. The organizations listed in the Section entitled "DBE Goal for this Project" of these special provisions.

G. Credit for materials or supplies purchased from DBEs will be as follows:

1. If the materials or supplies are obtained from a DBE manufacturer, 100 percent of the cost of the materials or supplies will count toward the DBE goal. A DBE manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.
2. If the materials or supplies are purchased from a DBE regular dealer, 60 percent of the cost of the materials or supplies will count toward the DBE goal. A DBE regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a DBE regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A person may be a DBE regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business as provided in this paragraph G.2. if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not DBE regular dealers within the meaning of this paragraph G.2.
3. Credit for materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer will be limited to the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, provided the fees are reasonable and not excessive as compared with fees charged for similar services.

H. Credit for DBE trucking companies will be as follows:

1. The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting the DBE goal.
2. The DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
3. The DBE receives credit for the total value of the transportation services it provides on the contract using trucks its owns, insures, and operates using drivers it employs.
4. The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
5. The DBE may also lease trucks from a non-DBE firm, including an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.
6. For the purposes of this paragraph H, a lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

I. Noncompliance by the Contractor with the requirements of the regulations constitutes a breach of this contract and may result in termination of the contract or other appropriate remedy for a breach of this contract.
J. Bidders are encouraged to use services offered by financial institutions owned and controlled by DBEs.

**2-1.02A DBE GOAL FOR THIS PROJECT**

The Department has established the following goal for Disadvantaged Business Enterprise (DBE) participation for this project:

Disadvantaged Business Enterprise (DBE): 12 percent

Bidders may use the services of the following firms to contact interested DBEs. These firms are available to assist DBEs in preparing bids for subcontracting or supplying materials.

The following firms may be contacted for projects in the following locations:

| Districts 04, 05 (except San Luis Obispo and Santa Barbara Counties), 06 (except Kern County) and 10: | Districts 08 and 11: |
|---|---|
| See the Department's DBE database at: http://www.dot.ca.gov/hq/bep/ | Padilla & Associates<br>- San Diego<br><br>2725 Congress Street, Suite 1D<br>San Diego, CA 92110<br>Telephone: (619) 725-0843<br>FAX No.: (619) 725-0854 |

| Districts 07, 08, and 12; in San Luis Obispo and Santa Barbara Counties in District 05; and in Kern County in District 06: | Districts 01, 02, 03 and 09: |
|---|---|
| Padilla & Associates<br><br>- Los Angeles<br><br>5675 East Telegraph Rd., Suite A-260<br>Los Angeles, CA 90040<br>Telephone: (323) 728-8847<br>FAX No.: (323) 728-8867 | See the Department's DBE database at:<br>http://www.dot.ca.gov/hq/bep/ |

**2-1.02B SUBMISSION OF DBE INFORMATION**

All bidders shall complete the "CALTRANS BIDDER - DBE INFORMATION" form included in the Proposal and submit it WITH THE BID.

Failure to submit the "CALTRANS BIDDER - DBE INFORMATION" form with the bid will be grounds for finding the bid nonresponsive.

The bidder shall submit written confirmation from each DBE that the DBE is participating in the contract, and include the confirmation with the submittal of the bid or submit it by the time specified for submittal of the GOOD FAITH EFFORT (GFE) DOCUMENTATION form. A copy of a DBE's quote will serve as written confirmation that the DBE is participating in the contract.

Where the bidder has not met the designated DBE goal, it must submit good faith efforts (GFE) documentation to establish that, prior to the bid, it made adequate good faith efforts to meet the goal.

Bidders are cautioned that even though their "CALTRANS BIDDER - DBE INFORMATION" form indicates they will meet the stated DBE goal, they should also submit their GFE documentation within the time specified herein, to protect their eligibility for award of the contract in the event the Department, in its review, finds that the goal has not been met.

The apparent successful bidder (low bidder), the second low bidder and the third low bidder shall complete and submit the GOOD FAITH EFFORT (GFE) DOCUMENTATION form, if they have not met the goal, to the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, California 95814 so the information is received by the Department no later than 4:00 p.m. ON THE FOURTH DAY, not including Saturdays, Sundays and legal holidays, following bid opening. GFE documentation sent by U.S. Postal Service certified mail with return receipt and certificate of mailing and mailed on or before the third day, not including Saturdays, Sundays and legal holidays, following bid opening will be accepted even if it is received after the fourth day following bid opening. Other bidders need not submit GFE documentation unless requested to do so by the Department. When a request is made by the Department, the GFE documentation of the other bidders shall be received by the Department within 4 days of the request, not including Saturdays, Sundays and legal holidays, unless a later time is authorized by the Department.

If it is determined that GFE documentation is needed to determine a bidder's eligibility for award, failure of the bidder to have submitted the GFE documentation by the time specified herein will be grounds for finding the bid or proposal nonresponsive.

It is the bidder's responsibility to make enough work available to DBEs and to select those portions of the work or material needs consistent with the available DBEs to meet the goal for DBE participation.

The bidder's "CALTRANS BIDDER - DBE INFORMATION" form shall include the names, addresses and phone numbers of DBE firms that will participate, with a complete description of work or supplies to be provided by each, and the

dollar value of each DBE transaction. When 100 percent of a contract item of work is not to be performed or furnished by a DBE, a description of the exact portion of that work to be performed or furnished by that DBE shall be included in the DBE information, including the planned location of that work. The work that a DBE prime contractor has committed to performing with its own forces as well as the work that it has committed to be performed by DBE subcontractors, suppliers and trucking companies will count toward the goal.

The bidder's good faith effort (GFE) documentation shall establish that good faith efforts to meet the DBE goal have been made.

In order to establish the bidder's good faith efforts to meet the DBE goal, the bidder should include the following information and supporting documents, as necessary:

A. Items of work the bidder has made available to DBE firms. Identify those items of work the bidder might otherwise perform with its own forces and those items that have been broken down into economically feasible units to facilitate DBE participation. For each item listed, show the dollar value and percentage of the total contract. It is the bidder's responsibility to demonstrate that sufficient work to meet the goal was made available to DBE firms.
B. The names of certified DBEs and the dates on which they were solicited to bid on the project. Include the items of work offered. Describe the methods used for following up initial solicitations to determine with certainty if the DBEs were interested, and the dates of the follow-up. Attach supporting documents such as copies of letters, memos, facsimiles sent, telephone logs, telephone billing statements, and other evidence of solicitation. Bidders are reminded to solicit certified DBEs through all reasonable and available means and provide sufficient time to allow DBEs to respond.
C. For each item of work made available, the DBEs that provided quotes, the selected firm and its status as a DBE, the price quote for each firm, and the name, address and telephone number for each firm. If the firm selected for the item is not a DBE, provide the reasons for the selection.
D. The names and dates of each publication in which a request for DBE participation for the project was placed by the bidder. Attach copies of the published advertisements.
E. The names of agencies, including the firms listed in Section 2-1.02A, "DBE Goal for this Project," and the dates on which they were contacted to provide assistance in contacting, recruiting and using DBE firms. If the agencies were contacted in writing, provide copies of supporting documents.
F. Descriptions of the efforts made to provide interested DBEs with adequate information about the plans, specifications and requirements of the contract to assist them in responding to a solicitation. Where the bidder has provided information, identify the name of the DBE assisted, the nature of the information provided, and date of contact. Provide copies of supporting documents, as appropriate.
G. Descriptions of any and all efforts made to assist interested DBEs in obtaining bonding, lines of credit, insurance, necessary equipment, supplies, and materials (excluding supplies and equipment which the DBE subcontractor purchases or leases from the prime contractor or its affiliate). Where such assistance was provided by the bidder, identify the name of the DBE assisted, nature of the assistance offered, and date. Provide copies of supporting documents, as appropriate.
H. Any additional data to support a demonstration of good faith efforts.

### 2-1.05 ESCROW OF BID DOCUMENTATION

Bid documentation shall consist of all documentary and calculated information generated by the Contractor in preparation of the bid. The bid documentation shall conform to the requirements in these special provisions, and shall be submitted to the Department and held in escrow for the duration of the contract.

The escrowed bid documents will be the only documents accepted from the Contractor regarding preparation of the bid.

In signing the proposal, the bidder certifies that the material submitted for escrow constitutes all the documentary information used in preparation of the bid and that he has personally examined the contents of the container and that they are complete.

Nothing in the bid documentation shall be construed to change or modify the terms or conditions of the contract.

Escrowed bid documentation will not be used for pre-award evaluation of the Contractor's anticipated methods of construction, nor to assess the Contractor's qualifications for performing the work.

Bid documentation shall clearly itemize the Contractor's estimated costs of performing the work. The documentation submitted shall be complete and so detailed as to allow for an in-depth analysis of the Contractor's estimate.

The bid documentation shall include, but not be limited to: quantity takeoffs; rate schedules for the direct costs and the time- and nontime-related indirect costs for labor (by craft), plant and equipment ownership and operation, permanent and expendable materials, insurance and subcontracted work; estimated construction schedules, including sequence and duration and development of production rates; quotations, scoping documents and subcontracts related to subcontractors, manufacturers and suppliers; estimates of field and home office overhead; contingency and margin for each contract item of

work; names of the persons responsible for preparing the bidder's estimate, and other reports, calculations, assumptions and information used by the bidder to arrive at the estimate submitted with the proposal.

The Contractor shall also submit bid documentation for each subcontractor, manufacturer and supplier whose total subcontract or purchase orders exceeds or is expected to exceed $250,000. Subcontractor, manufacturer and supplier bid documentation shall be enclosed with the Contractor's submittal, regardless of whether or not subcontracts or purchase orders have been executed or entered into on the date that bid documentation is submitted for escrow. If at the time that bid documentation is submitted for escrow, the subcontractor, manufacturer or supplier does not have a executed subcontract or purchase orders, and a subcontract or purchase orders is subsequently executed, then a copy of the executed subcontract or purchase orders shall be submitted into escrow within 14 days of the execution of the respective subcontract or purchase orders. The examination of subcontractors', manufacturers' and suppliers' bid documentation will be accomplished in the same manner as for the Contractor's bid documentation. If a subcontractor, manufacturer or supplier is replaced, bid documentation for the new subcontractor, manufacturer or supplier shall be submitted for review and escrow before authorization for the substitution will be granted. Upon request of a subcontractor, manufacturer or supplier, the bid documentation from that subcontractor, manufacturer or supplier shall be reviewed only by the subcontractor, manufacturer or supplier and the Department.

If the bidder is a joint venture, the bid documentation shall include the joint venture agreement, the joint venture estimate comparison and final reconciliation of the joint venture estimate.

Copies of the proposals submitted by the first, second and third low bidders will be provided to the respective bidders for inclusion in the bid documentation to be escrowed.

The first, second, and third apparent low bidders shall present the bid documentation for escrow at the Department of Transportation, 3347 Michelson Drive, Suite 100, Irvine, California, on the first Wednesday between 1:00 p.m. and 2:00 p.m., following the time indicated in the "Notice to Contractors" for the opening of bids. The fourth and subsequent apparent low bidders shall present the bid documentation for escrow if requested by the Department to do so.

Bid documentation shall be submitted as a paper copy in a sealed container, clearly marked with the bidder's name, date of submittal, project contract number and the words, "Bid Documentation for Escrow."

Failure to submit the actual and complete bid documentation as specified herein within the time specified shall be cause for rejection of the proposal.

Upon submittal, the bid documentation of the apparent low bidder will be examined and inventoried by the duly designated representatives of the Contractor and the Department to ensure that the bid documentation is authentic, legible, and in accordance with the terms of this section "Escrow of Bid Documentation." The examination will not include review of, nor will it constitute approval of, proposed construction methods, estimating assumptions or interpretation of the contract. The examination will not alter any conditions or terms of the contract. The acceptance or rejection by the Department that the submitted bid documents are in compliance with this section "Escrow of Bid Documentation" shall be completed within 48 hours of the time the bid documentation is submitted by the Contractor.

At the completion of the examination, the bid documents will be sealed and jointly deposited at an agreed commercial business.

Bid documentation submitted by the second and third apparent low bidders will be jointly deposited at agreed commercial businesses. If the apparent low bid is withdrawn or rejected, the bid documentation of the second low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. If the second low bid is withdrawn or rejected, the bid documentation of the third low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. Bid documentation from subsequent bidders, if requested, will be examined and inventoried in the same manner as specified above, then sealed and deposited in escrow. Upon execution and final approval of the contract or rejection of all bids, the bid documentation will be returned to any remaining unsuccessful bidders.

Any and all components of the escrowed bid documentation may be examined by the designated representatives of both the Department and the Contractor, at any time deemed necessary by either the Department or the Contractor to assist in the negotiation of price adjustments and change orders, or to assist in the potential resolution or in the settlement of claims or disputes. Such a joint review shall be performed within 15 days of receipt of a written request to do so by either party. If the Contractor refuses to participate in the joint examination of any and all components of the escrowed bid documentation as provided herein, such refusal shall be considered as a failure by the Contractor to exhaust administrative claim remedies with respect to the particular protest, notice of potential claim, or claim. In addition, this refusal by the Contractor shall constitute a bar to future arbitration with respect to the protest, potential claim or claim as provided by Section 10240.2 of the California Public Contract Code.

If requested by a Disputes Review Board, the escrowed bid documentation may be utilized to assist the Board in its recommendations.

The bid documentation submitted by the Contractor will be held in escrow until the contract has been completed, the ultimate resolution of all disputes and claims has been achieved and receipt of final payment has been accepted by the Contractor. The escrowed bid documentation will then be released from escrow to the Contractor.

The bid documentation submitted by the bidder is, and shall remain, the property of the bidder, and is subject to only joint review by the Department and the bidder. The Department stipulates and expressly acknowledges that the submitted bid documentation constitutes trade secrets and will not be deemed public records. This acknowledgment is based on the Department's express understanding that the information contained in the bid documentation is not known outside the bidder's business, is known only to a limited extent and only by a limited number of employees of the bidder, is safeguarded while in the bidder's possession, is extremely valuable to the bidder and could be extremely valuable to the bidder's competitors by virtue of it reflecting the bidder's contemplated techniques of construction. The Department acknowledges that the bid documentation includes a compilation of information used in the bidder's business, intended to give the bidder an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation. The Department agrees to safeguard the bid documentation, and all information contained therein, against disclosure, including disclosure of subcontractor bid documentation to the Contractor and other subcontractors to the fullest extent permitted by law. However, in the event of arbitration or litigation, the bid documentation shall be subject to discovery, and the Department assumes no responsibility for safeguarding the bid documentation unless the Contractor has obtained an appropriate protective order issued by the arbitrator or the court.

Full compensation for preparing the bid documentation, presenting it for escrow and reviewing it for escrow and upon request of the Engineer shall be considered as included in the contract prices paid for the various items of work, and no additional compensation will be allowed therefor.

The direct cost of depositing the bid documentation in escrow at the agreed commercial business will be paid by the State.

## SECTION 3. AWARD AND EXECUTION OF CONTRACT

The bidder's attention is directed to the provisions in Section 3, "Award and Execution of Contract," of the Standard Specifications and these special provisions for the requirements and conditions concerning award and execution of contract.

The award of the contract, if it be awarded, will be made within 60 days after the opening of the proposals. This period will be subject to extension for such further period as may be agreed upon in writing between the Department and the bidder concerned. The award, if made, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed and who has met the goal for DBE participation or has demonstrated, to the satisfaction of the Department, adequate good faith efforts to do so. Meeting the goal for DBE participation or demonstrating, to the satisfaction of the Department, adequate good faith efforts to do so is a condition for being eligible for award of contract.

The contract shall be executed by the successful bidder and shall be returned, together with the contract bonds, to the Department so that it is received within 10 days, not including Saturdays, Sundays and legal holidays, after the bidder has received the contract for execution. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816.

A "Payee Data Record" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to facilitate the collection of taxpayer identification data. The form shall be completed and returned to the Department by the successful bidder with the executed contract and contract bonds. For the purposes of the form, payee shall be deemed to mean the successful bidder. The form is not to be completed for subcontractors or suppliers. Failure to complete and return the "Payee Data Record" form to the Department as provided herein will result in the retention of 31 percent of payments due the contractor and penalties of up to $20,000. This retention of payments for failure to complete the "Payee Data Record" form is in addition to any other retention of payments due the Contractor.

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

Attention is directed to the provisions in Sections 8-1.03, "Beginning of Work," 8-1.06, "Time of Completion," 8-1.07, "Liquidated Damages," and 20-4.08, "Plant Establishment Work," of the Standard Specifications and these special provisions.

The Contractor shall begin work within 15 calendar days after the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation.

The work (except plant establishment work) shall be diligently prosecuted to completion before the expiration of **720 WORKING DAYS** beginning on the fifteenth calendar day after approval of the contract. The Contractor shall pay to the State of California the sum of $42,200 per day, for each and every calendar day's delay in finishing the work (except plant establishment work) in excess of the number of working days prescribed above.

The Contractor shall diligently prosecute all work (including plant establishment) to completion before the expiration of **845 WORKING DAYS** beginning on the fifteenth calendar day after approval of the contract. The Contractor shall pay to the State of California the sum of $600 per day, for each and every calendar day's delay in completing the work in excess of the number of working days prescribed above.

In no case will liquidated damages of more than $42,200 per day be assessed.

The time limit specified for the completion of the work to receive an incentive payment contemplated herein is considered insufficient to permit completion of the work to receive an incentive payment by the Contractor working a normal number of hours per day or week on a single shift basis. Should the Contractor fail to maintain the progress of the work in accordance with the "Progress Schedule (Critical Path Method)" required in these special provisions, additional shifts may be required to the extent necessary to ensure that the progress conforms to the above mentioned schedule and that the work will be completed within the time limit specified to receive an incentive payment.

Full compensation for any additional costs occasioned by compliance with the provisions in this section shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

## SECTION 5. GENERAL

## SECTION 5-1. MISCELLANEOUS

### 5-1.01 PLANS AND WORKING DRAWINGS

When the specifications require working drawings to be submitted to the Division of Structure Design, the drawings shall be submitted to: Division of Structure Design, Documents Unit, Mail Station 9, 1801 30th Street, Sacramento, CA 95816, Telephone 916 227-8252.

### 5-1.011 EXAMINATION OF PLANS, SPECIFICATIONS, CONTRACT, AND SITE OF WORK

Attention is directed to "Differing Site Conditions" of these special provisions regarding physical conditions at the site which may differ from those indicated in "Materials Information," log of test borings or other geotechnical information obtained by the Department's investigation of site conditions.

### 5-1.012 DIFFERING SITE CONDITIONS

Attention is directed to Section 5-1.116, "Differing Site Conditions," of the Standard Specifications.

During the progress of the work, if subsurface or latent conditions are encountered at the site differing materially from those indicated in the "Materials Information," log of test borings, other geotechnical data obtained by the Department's investigation of subsurface conditions, or an examination of the conditions above ground at the site, the party discovering those conditions shall promptly notify the other party in writing of the specific differing conditions before they are disturbed and before the affected work is performed.

The Contractor will be allowed 15 days from the notification of the Engineer's determination of whether or not an adjustment of the contract is warranted, in which to file a notice of potential claim in conformance with the provisions of Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and as specified herein; otherwise the decision of the Engineer shall be deemed to have been accepted by the Contractor as correct. The notice of potential claim shall set forth in what respects the Contractor's position differs from the Engineer's determination and provide any additional information obtained by the Contractor, including but not limited to additional geotechnical data. The notice of potential claim shall be accompanied by the Contractor's certification that the following were made in preparation of the bid: a review of the contract, a review of the "Materials Information," a review of the log of test borings and other records of geotechnical data to the extent they were made available to bidders prior to the opening of bids, and an examination of the conditions above ground at the site. Supplementary information, obtained by the Contractor subsequent to the filing of the notice of potential claim, shall be submitted to the Engineer in an expeditious manner.

### 5-1.013 LINES AND GRADES

Attention is directed to Section 5-1.07, "Lines and Grades," of the Standard Specifications.

Stakes or marks will be set by the Engineer in conformance with the requirements in Chapter 12, "Construction Surveys," of the Department's Surveys Manual.

### 5-1.015 LABORATORY

When a reference is made in the specifications to the "Laboratory," the reference shall mean Division of Engineering Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services of the Department of Transportation, or established laboratories of the various Districts of the Department, or other laboratories authorized by the Department to test materials and work involved in the contract. When a reference is made in the specifications to the "Transportation Laboratory," the reference shall mean Division of Engineering Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services, located at 5900 Folsom Boulevard, Sacramento, CA 95819, Telephone (916) 227-7000.

### 5-1.017 CONTRACT BONDS

Attention is directed to Section 3-1.02, "Contract Bonds," of the Standard Specifications and these special provisions.

The payment bond shall be in a sum not less than one hundred percent of the total amount payable by the terms of the contract.

### 5-1.019 COST REDUCTION INCENTIVE

Attention is directed to Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

Prior to preparing a written cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, peer reviews, overall merit of the proposal, and review times required by the Department and other agencies.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in contract time, 50 percent of that contract time reduction shall be credited to the State by reducing the contract working days, not including plant establishment. Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions regarding the working days.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in traffic congestion or avoids traffic congestion during construction, 60 percent of the estimated net savings in construction costs attributable to the cost reduction proposal will be paid to the Contractor. In addition to the requirements in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, the Contractor shall provide detailed comparisons of the traffic handling between the existing contract and the proposed change, and estimates of the traffic volumes and congestion.

### 5-1.02 LABOR NONDISCRIMINATION

Attention is directed to the following Notice that is required by Chapter 5 of Division 4 of Title 2, California Code of Regulations.

**NOTICE OF REQUIREMENT FOR NONDISCRIMINATION PROGRAM**

**(GOV. CODE, SECTION 12990)**

Your attention is called to the "Nondiscrimination Clause", set forth in Section 7-1.01A(4), "Labor Nondiscrimination," of the Standard Specifications, which is applicable to all nonexempt State contracts and subcontracts, and to the "Standard California Nondiscrimination Construction Contract Specifications" set forth therein. The specifications are applicable to all nonexempt State construction contracts and subcontracts of $5000 or more.

### 5-1.022 PAYMENT OF WITHHELD FUNDS

Payment of withheld funds shall conform to Section 9-1.065, "Payment of Withheld Funds," of the Standard Specifications and these special provisions.

Funds withheld from progress payments to ensure performance of the contract that are eligible for payment into escrow or to an escrow agent pursuant to Section 10263 of the California Public Contract Code do not include funds withheld or deducted from payment due to failure of the Contractor to fulfill a contract requirement.

### 5-1.03 INTEREST ON PAYMENTS

Interest shall be payable on progress payments, payments after acceptance, final payments, extra work payments, and claim payments as follows:

A. Unpaid progress payments, payment after acceptance, and final payments shall begin to accrue interest 30 days after the Engineer prepares the payment estimate.
B. Unpaid extra work bills shall begin to accrue interest 30 days after preparation of the first pay estimate following receipt of a properly submitted and undisputed extra work bill. To be properly submitted, the bill must be submitted within 7 days of the performance of the extra work and in conformance with the provisions in Section 9-1.03C, "Records," and Section 9-1.06, "Partial Payments," of the Standard Specifications. An undisputed extra work bill not submitted within 7 days of performance of the extra work will begin to accrue interest 30 days after the preparation of the second pay estimate following submittal of the bill.
C. The rate of interest payable for unpaid progress payments, payments after acceptance, final payments, and extra work payments shall be 10 percent per annum.

D. The rate of interest payable on a claim, protest or dispute ultimately allowed under this contract shall be 6 percent per annum. Interest shall begin to accrue 61 days after the Contractor submits to the Engineer information in sufficient detail to enable the Engineer to ascertain the basis and amount of said claim, protest or dispute.

The rate of interest payable on any award in arbitration shall be 6 percent per annum if allowed under the provisions of Civil Code Section 3289.

**5-1.04 PUBLIC SAFETY**

The Contractor shall provide for the safety of traffic and the public in conformance with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications and these special provisions.

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 1:4 (vertical:horizontal).
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 conform to the provisions in Section 12-3.08, "Temporary Railing (Type K)," of the Standard Specifications. Temporary railing (Type K), conforming to the details shown on 1999 Standard Plan T3, may be used. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance.

Temporary crash cushion modules shall conform to the provisions in "Temporary Crash Cushion Module" of these special provisions.

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.

Full compensation for conforming to the provisions in this section "Public Safety," including furnishing and installing temporary railing (Type K) and temporary crash cushion modules, shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

### 5-1.05 TESTING

Testing of materials and work shall conform to the provisions in Section 6-3, "Testing," of the Standard Specifications and these special provisions.

Whenever the provisions of Section 6-3.01, "General," of the Standard Specifications refer to tests or testing, it shall mean tests to assure the quality and to determine the acceptability of the materials and work.

The Engineer will deduct the costs for testing of materials and work found to be unacceptable, as determined by the tests performed by the Department, and the costs for testing of material sources identified by the Contractor which are not used for the work, from moneys due or to become due to the Contractor. The amount deducted will be determined by the Engineer.

### 5-1.06 REMOVAL OF ASBESTOS AND HAZARDOUS SUBSTANCES

When the presence of asbestos or hazardous substances are not shown on the plans or indicated in the specifications and the Contractor encounters materials which the Contractor reasonably believes to be asbestos or a hazardous substance as defined in Section 25914.1 of the Health and Safety Code, and the asbestos or hazardous substance has not been rendered harmless, the Contractor may continue work in unaffected areas reasonably believed to be safe. The Contractor shall immediately cease work in the affected area and report the condition to the Engineer in writing.

In conformance with Section 25914.1 of the Health and Safety Code, removal of asbestos or hazardous substances including exploratory work to identify and determine the extent of the asbestos or hazardous substance will be performed by separate contract.

If delay of work in the area delays the current controlling operation, the delay will be considered a right of way delay and the Contractor will be compensated for the delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

### 5-1.07 YEAR 2000 COMPLIANCE

This contract is subject to Year 2000 Compliance for automated devices in the State of California.

Year 2000 compliance for automated devices in the State of California is achieved when embedded functions have or create no logical or mathematical inconsistencies when dealing with dates prior to and beyond 1999. The year 2000 is recognized and processed as a leap year. The product shall operate accurately in the manner in which the product was intended for date operation without requiring manual intervention.

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all automated devices furnished for the project.

### 5-1.075 BUY AMERICA REQUIREMENTS

Attention is directed to the "Buy America" requirements of the Surface Transportation Assistance Act of 1982 (Section 165) and the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) Sections 1041(a) and 1048(a), and the regulations adopted pursuant thereto. In conformance with the law and regulations, all manufacturing processes for steel and iron materials furnished for incorporation into the work on this project shall occur in the United States; with the exception that pig iron and processed, pelletized and reduced iron ore manufactured outside of the United States may be used in the domestic manufacturing process for such steel and iron materials. The application of coatings, such as epoxy coating, galvanizing, painting, and other coatings that protect or enhance the value of steel or iron materials shall be considered a manufacturing process subject to the "Buy America" requirements.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for steel and iron materials. The certificates, in addition to certifying that the materials comply with the specifications, shall specifically certify that all manufacturing processes for the materials occurred in the United States, except for the above exceptions.

The requirements imposed by the law and regulations do not prevent a minimal use of foreign steel and iron materials if the total combined cost of the materials used does not exceed one-tenth of one percent (0.1 percent) of the total contract cost or $2500, whichever is greater. The Contractor shall furnish the Engineer acceptable documentation of the quantity and value of the foreign steel and iron prior to incorporating the materials into the work.

### 5-1.08 SUBCONTRACTOR AND DBE RECORDS

The Contractor shall maintain records showing the name and business address of each first-tier subcontractor. The records shall also show the name and business address of every DBE subcontractor, DBE vendor of materials and DBE trucking company, regardless of tier. The records shall show the date of payment and the total dollar figure paid to all of these firms. DBE prime contractors shall also show the date of work performed by their own forces along with the corresponding dollar value of the work.

Upon completion of the contract, a summary of these records shall be prepared on Form CEM-2402 (F) and certified correct by the Contractor or the Contractor's authorized representative, and shall be furnished to the Engineer. The form shall be furnished to the Engineer within 90 days from the date of contract acceptance. $10,000 will be withheld from payment until the Form CEM-2402 (F) is submitted. The amount will be returned to the Contractor when a satisfactory Form CEM-2402 (F) is submitted.

Prior to the fifteenth of each month, the Contractor shall submit documentation to the Engineer showing the amount paid to DBE trucking companies listed in the Contractor's DBE information. This monthly documentation shall indicate the portion of the revenue paid to DBE trucking companies which is claimed toward DBE participation. The Contractor shall also obtain and submit documentation to the Engineer showing the amount paid by DBE trucking companies to all firms, including owner-operators, for the leasing of trucks. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The records must confirm that the amount of credit claimed toward DBE participation conforms with Section 2-1.02, "Disadvantaged Business Enterprise," of these special provisions.

The Contractor shall also obtain and submit documentation to the Engineer showing the truck number, owner's name, California Highway Patrol CA number, and if applicable, the DBE certification number of the owner of the truck for all trucks used during that month for which DBE participation will be claimed. This documentation shall be submitted on Form CEM-2404 (F).

### 5-1.083 DBE CERTIFICATION STATUS

If a DBE subcontractor is decertified during the life of the project, the decertified subcontractor shall notify the Contractor in writing with the date of decertification. If a subcontractor becomes a certified DBE during the life of the project, the subcontractor shall notify the Contractor in writing with the date of certification. The Contractor shall furnish the written documentation to the Engineer.

Upon completion of the contract, Form CEM-2403 (F) indicating the DBE's existing certification status shall be signed and certified correct by the Contractor. The certified form shall be furnished to the Engineer within 90 days from the date of contract acceptance.

### 5-1.086 PERFORMANCE OF DBE SUBCONTRACTORS AND SUPPLIERS

The DBEs listed by the Contractor in response to the provisions in Section 2-1.02B, "Submission of DBE Information," and Section 3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified DBEs, shall perform the work and supply the materials for which they are listed, unless the Contractor has received prior written authorization to perform the work with other forces or to obtain the materials from other sources.

Authorization to use other forces or sources of materials may be requested for the following reasons:

A. The listed DBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract, when such written contract, based upon the general terms, conditions, plans and specifications for the project, or on the terms of such subcontractor's or supplier's written bid, is presented by the Contractor.
B. The listed DBE becomes bankrupt or insolvent.
C. The listed DBE fails or refuses to perform the subcontract or furnish the listed materials.
D. The Contractor stipulated that a bond was a condition of executing a subcontract and the listed DBE subcontractor fails or refuses to meet the bond requirements of the Contractor.
E. The work performed by the listed subcontractor is substantially unsatisfactory and is not in substantial conformance with the plans and specifications, or the subcontractor is substantially delaying or disrupting the progress of the work.
F. It would be in the best interest of the State.

The Contractor shall not be entitled to any payment for such work or material unless it is performed or supplied by the listed DBE or by other forces (including those of the Contractor) pursuant to prior written authorization of the Engineer.

### 5-1.09 SUBCONTRACTING

Attention is directed to the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, and Section 2, "Proposal Requirements and Conditions," and Section 3, "Award and Execution of Contract," of these special provisions.

Pursuant to the provisions of Section 1777.1 of the Labor Code, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a subcontractor on a public works project. This list of debarred contractors is available from the Department of Industrial Relations web site at:

http://www.dir.ca.gov/DLSE/Debar.html.

The provisions in the third paragraph of Section 8-1.01, "Subcontracting," of the Standard Specifications, that the Contractor shall perform with the Contractor's own organization contract work amounting to not less than 50 percent of the original contract price, is not changed by the Federal Aid requirement specified under "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions that the Contractor perform not less than 30 percent of the original contract work with the Contractor's own organization.

Each subcontract and any lower tier subcontract that may in turn be made shall include the "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions. This requirement shall be enforced as follows:

A. Noncompliance shall be corrected. Payment for subcontracted work involved will be withheld from progress payments due, or to become due, until correction is made. Failure to comply may result in termination of the contract.

In conformance with the Federal DBE regulations Sections 26.53(f)(1) and 26.53(f)(2) Part 26, Title 49 CFR:

A. The Contractor shall not terminate for convenience a DBE subcontractor listed in response to Section 2-1.02B, "Submission of DBE Information," and then perform that work with its own forces, or those of an affiliate without the written consent of the Department, and
B. If a DBE subcontractor is terminated or fails to complete its work for any reason, the Contractor will be required to make good faith efforts to substitute another DBE subcontractor for the original DBE subcontractor, to the extent needed to meet the contract goal.

The requirement in Section 2-1.02, "Disadvantaged Business Enterprise (DBE)," of these special provisions that DBEs must be certified on the date bids are opened does not apply to DBE substitutions after award of the contract.

### 5-1.10 PROMPT PROGRESS PAYMENT TO SUBCONTRACTORS

Attention is directed to the provisions in Sections 10262 and 10262.5 of the Public Contract Code and Section 7108.5 of the Business and Professions Code concerning prompt payment to subcontractors.

### 5-1.102 PROMPT PAYMENT OF WITHHELD FUNDS TO SUBCONTRACTORS

The Contractor shall return all moneys withheld in retention from the subcontractor within 30 days after receiving payment for work satisfactorily completed, even if the other contract work is not completed and has not been accepted in conformance with Section 7-1.17, "Acceptance of Contract," of the Standard Specifications. This requirement shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or noncompliance by a subcontractor.

### 5-1.103 RECORDS

The Contractor shall maintain cost accounting records for the contract pertaining to, and in such a manner as to provide a clear distinction between, the following six categories of costs of work during the life of the contract:

A. Direct costs of contract item work.
B. Direct costs of changes in character in conformance with Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications.

C. Direct costs of extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.
D. Direct costs of work not required by the contract and performed for others.
E. Direct costs of work performed under a notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications.
F. Indirect costs of overhead.

Cost accounting records shall include the information specified for daily extra work reports in Section 9-1.03C, "Records," of the Standard Specifications. The requirements for furnishing the Engineer completed daily extra work reports shall only apply to work paid for on a force account basis.

The cost accounting records for the contract shall be maintained separately from other contracts, during the life of the contract, and for a period of not less than 3 years after the date of acceptance of the contract. If the Contractor intends to file claims against the Department, the Contractor shall keep the cost accounting records specified above until complete resolution of all claims has been reached.

**5-1.11 PARTNERING**

The State will promote the formation of a "Partnering" relationship with the Contractor in order to effectively complete the contract to the benefit of both parties. The purpose of this relationship is to maintain a cooperative communication and to mutually resolve conflicts at the lowest responsible management level.

The Contractor may request the formation of a "Partnering" relationship by submitting a request in writing to the Engineer after approval of the contract. If the Contractor's request for "Partnering" is approved by the Engineer, scheduling of a "Partnering Workshop," selecting the "Partnering" facilitator and workshop site, and other administrative details shall be as agreed to by both parties. If agreed to by the parties, additional "Partnering Workshops" will be conducted as needed throughout the life of the contract.

A one-day "Training in Partnering Concepts" session will be conducted regardless of whether the Contractor requests the formation of a "Partnering" relationship. The "Training in Partnering Concepts" session will be conducted locally for the Contractor's and the Engineer's project representatives. The Contractor shall be represented by a minimum of 2 representatives, one being the Contractor's authorized representative pursuant to Section 5-1.06, "Superintendence," of the Standard Specifications. Scheduling of the "Training in Partnering Concepts" session and selection of the trainer and training site shall be determined cooperatively by the Contractor and the Engineer. If, upon the Contractor's request, "Partnering" is approved by the Engineer, the "Training in Partnering Concepts" session shall be conducted prior to the initial "Partnering Workshop."

The costs involved in providing the "Training in Partnering Concepts" trainer and training site will be borne entirely by the State. The costs will be determined in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor the sum of that cost, except no markups will be allowed.

The costs involved in providing the "Partnering Workshop" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Partnering Workshop" facilitator and workshop site in conformance with the provisions in 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, except no markups will be allowed.

All other costs associated with "Training in Partnering Concepts" and "Partnering Workshops" will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

The establishment of a "Partnering" relationship will not change or modify the terms and conditions of the contract and will not relieve either party of the legal requirements of the contract.

**5-1.114 VALUE ANALYSIS**

The Contractor may submit to the Engineer, in writing, a request for a "Value Analysis" workshop. The purpose for having a workshop is to identify value enhancing opportunities and to consider modifications to the plans and specifications that will reduce either the total cost, time of construction or traffic congestion, without impairing, in any manner, the essential functions or characteristics of the project including, but not limited to, service life, economy of operation, ease of maintenance, benefits to the travelling public, desired appearance, or design and safety standards.

To maximize the potential benefits of a workshop, the request should be submitted to the Engineer early in the project after approval of the contract. If the Contractor's request for a "Value Analysis" workshop is approved by the Engineer, scheduling of a workshop, selecting the facilitator and workshop site, and other administrative details shall be determined cooperatively by the Contractor and the Engineer.

The workshop shall be conducted in conformance with the methodology described in the Department's "Value Analysis Team Guide" available at the Department's web site at:

http://www.dot.ca.gov/hq/oppd/value/

The facilitator shall be a Certified Value Specialist (CVS) as recognized by the Society of American Value Engineers (SAVE) International, which may be contacted as follows:

SAVE International, 60 Revere Drive, Northbrook, IL 60062
Telephone 1-847-480-1730, FAX 1-847-480-9282

The Contractor may submit recommendations resulting from a "Value Analysis" workshop for approval by the Engineer as cost reduction incentive proposals in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

The costs involved in providing the "Value Analysis" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Value Analysis" facilitator and workshop site in conformance with the provisions in 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, except no markups will be allowed.

All other costs associated with the "Value Analysis" workshop will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

## 5-1.12 DISPUTE REVIEW BOARD

### 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.

### 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 breech 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 three 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.

**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.

**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 two 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.

**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.

**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.

**RETENTION**

Failure of the Contractor to nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions shall result in the retention of 25 percent of the estimated value of all work performed during each estimate period in which the Contractor fails to comply with the requirements of this section as determined by the Engineer. DRB retentions will be released for payment on the next monthly estimate for partial payment following the date that the Contractor has nominated and approved DRB members and no interest will be due the Contractor.

**DISPUTE REVIEW BOARD AGREEMENT**

A copy of the "Dispute Review Board Agreement" to be executed by the Contractor, State and the 3 DRB members after approval of the contract follows:

Form 6202 Rev (09/01/02)

**DISPUTE REVIEW BOARD AGREEMENT**

_____
(Contract Identification)

Contract No. _____

**THIS DISPUTE REVIEW BOARD AGREEMENT, hereinafter called "AGREEMENT"**, made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ _____ hereinafter called the "CONTRACTOR," and the Dispute Review Board, hereinafter called the "DRB" consisting of the following members:

_____ ,
(Contractor Appointee)

_____ ,
(State Appointee)

and _____
(Third Person)

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRB to assist in resolving disputes; and

WHEREAS, the DRB is composed of three members, one selected by the STATE, one selected by the CONTRACTOR, and the third member selected by the other two members and approved by the parties;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRB members hereto agree as follows:

**SECTION I DESCRIPTION OF WORK**

To assist in the resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The intent of the DRB is to fairly and impartially consider disputes placed before it and provide written recommendations for resolution of these disputes to both parties. The members of this DRB shall perform the services necessary to participate in the DRB's actions as designated in Section II, Scope of Work.

**SECTION II SCOPE OF WORK**

The scope of work of the DRB includes, but is not limited to, the following:

**A. OBJECTIVE**

The principal objective of the DRB is to assist in the timely resolution of disputes between the parties arising from performance of this contract. It is not intended for either party to default on their normal responsibility to amicably and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the mere existence of the DRB will encourage the parties to resolve disputes without resorting to this review procedure. But when a dispute that is serious enough to warrant the DRB's review does develop, the process for prompt and efficient action will be in place.

**B. PROCEDURES**

The DRB shall render written reports on disputes between the parties arising from the construction contract. Prior to consideration of a dispute, the DRB shall establish rules and regulations that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. DRB recommendations, resulting from its consideration of a dispute, shall be furnished in writing to both parties. The recommendations shall be based on facts and circumstances involved in the dispute, pertinent contract provisions, applicable laws and regulations. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered. The DRB shall make recommendations on the merit of the dispute, and if appropriate, recommend guidelines for determining compensation. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.

The DRB shall refrain from officially giving advice or consulting services to anyone involved in the contract. The individual members shall act in a completely independent manner and while serving as members of the DRB shall have no consulting business connections with either party or its principals or attorneys or other affiliates (subcontractors, suppliers, etc.) who have a beneficial interest in the contract.

During scheduled meetings of the DRB as well as during dispute meetings, DRB members shall refrain from expressing opinions on the merits of statements on matters under dispute or potential dispute. Opinions of DRB members expressed in private sessions shall be kept strictly confidential. Individual DRB members shall not meet with, or discuss contract issues with individual parties, except as directed by the DRB Chairperson. Such discussions or meetings shall be disclosed to both parties. Other discussions regarding the project between the DRB members and the parties shall be in the presence of all three members and both parties. Individual DRB members shall not undertake independent investigations of any kind pertaining to disputes or potential disputes, except with the knowledge of both parties and as expressly directed by the DRB Chairperson.

**C. CONSTRUCTION SITE VISITS, PROGRESS MEETINGS AND FIELD INSPECTIONS**

The DRB members shall visit the project site and meet with representatives of the parties to keep abreast of construction activities and to develop familiarity with the work in progress. Scheduled progress meetings shall be held at or near the project site. The DRB shall meet at least once at the start of the project, and at least once every 4 months thereafter. The frequency, exact time, and duration of additional site visits and progress meetings shall be as recommended by the DRB and approved by the parties consistent with the construction activities or matters under consideration and dispute. Each meeting shall consist of a round table discussion and a field inspection of the work being performed on the contract, if necessary. Each meeting shall be attended by representatives of both parties. The agenda shall generally be as follows:

1. Meeting opened by the DRB Chairperson.
2. Remarks by the STATE's representative.
3. A description by the CONTRACTOR's representative of work accomplished since the last meeting; the current schedule status of the work; and a forecast for the coming period.
4. An outline by the CONTRACTOR's representative of potential problems and a description of proposed solutions.
5. An outline by the STATE's representative of the status of the work as the STATE views it.
6. A brief description by the CONTRACTOR's or STATE's representative of potential claims or disputes which have surfaced since the last meeting.
7. A summary by the STATE's representative, the CONTRACTOR's representative, or the DRB of the status of past disputes and potential claims.

The STATE's representative will prepare minutes of all progress meetings and circulate them for revision and approval by all concerned within 10 days of the meeting.

The field inspection shall cover all active segments of the work, the DRB being accompanied by both parties' representatives. The field inspection may be waived upon mutual agreement of the parties.

**D. DRB CONSIDERATION AND HANDLING OF DISPUTES**

Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral, unless otherwise agreed to by all parties. The DRB shall determine the time and location of DRB dispute meetings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. No dispute meetings shall take place later than 30 days prior to acceptance of contract.

Normally, dispute meetings shall be conducted at or near the project site. However, any location that would be more convenient and still provide required facilities and access to necessary documentation shall be satisfactory.

Both parties shall be given the opportunity to present their evidence at these dispute meetings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, applicable laws and regulations, and the facts and conditions surrounding any dispute presented by either party, and that the recommendations concerning any such dispute are advisory and nonbinding on the parties.

The DRB may request that written documentation and arguments from both parties be sent to each DRB member, through the DRB Chairperson, for review before the dispute meeting begins. A party furnishing written documentation to the DRB shall furnish copies of such information to the other party at the same time that such information is supplied to the DRB.

DRB dispute meetings shall be informal. There shall be no testimony under oath or cross-examination. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRB in conformance with acceptance standards established by the DRB. These standards need not comply with prescribed legal laws of evidence.

The third DRB member shall act as Chairperson for dispute meetings and all other DRB activities. The parties shall have a representative at all dispute meetings. Failure to attend a duly noticed dispute meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers written submittals as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals until all aspects of the dispute are thoroughly covered. DRB members shall ask questions, seek clarification, and request further data from either of the parties as may be necessary to assist in making a fully informed recommendation. The DRB may request from either party documents or information that would assist the DRB in making its findings and recommendations including, but not limited to, documents used by the CONTRACTOR in preparing the bid for the project. A refusal by a party to provide information requested by the DRB may be considered by the DRB as an indication that the requested material would tend to disprove that party's position. In large or complex cases, additional dispute meetings may be necessary in order to consider all the evidence presented by both parties. All involved parties shall maintain the confidentiality of all documents and information, as provided in this AGREEMENT.

During dispute meetings, no DRB member shall express an opinion concerning the merit of any facet of the case. DRB deliberations shall be conducted in private, with interim individual views kept strictly confidential.

After dispute meetings are concluded, the DRB shall meet in private and reach a conclusion supported by 2 or more members. Private sessions of the DRB may be held at a location other than the job site or by electronic conferencing as deemed appropriate, in order to expedite the process.

The DRB's findings and recommendations, along with discussion of reasons therefor, shall then be submitted as a written report to both parties. Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and facts and circumstances related to the dispute. The report shall be thorough in discussing the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the issues, and the DRB's interpretation and philosophy in arriving at its conclusions and recommendations. The DRB's report shall stand on its own, without attachments or appendices. The DRB Chairperson shall furnish a copy of the written recommendation report to the DRB Coordinator, Division of Construction, MS 44, P.O. Box 942874, Sacramento, CA 94274.

With prior written approval of both parties, the DRB may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the 2 parties as specified in an approved contract change order. The CONTRACTOR will not be entitled to markups for the payments made for these services.

The DRB shall resist submittal of incremental portions of information by either party, in the interest of making a fully informed decision and recommendation.

The DRB shall make every effort to reach a unanimous decision. If this proves impossible, the dissenting member shall prepare a minority opinion, which shall be included in the DRB's report.

Although both parties should place weight upon the DRB's recommendations, they are not binding. Either party may appeal a recommendation to the DRB for reconsideration. However, reconsideration shall only be allowed when there is new evidence to present, and the DRB shall accept only one appeal from each party pertaining to an individual DRB recommendation. The DRB shall hear appeals in conformance with the terms described in the Section entitled "Dispute Review Board" in the special provisions.

**E. DRB MEMBER REPLACEMENT**

Should the need arise to appoint a replacement DRB member, the replacement DRB member shall be appointed in the same manner as the original DRB members were appointed. The selection of a replacement DRB member shall begin promptly upon notification of the necessity for a replacement and shall be completed within 15 days. This AGREEMENT shall be amended to indicate change in DRB membership.

**SECTION III CONTRACTOR RESPONSIBILITIES**

The CONTRACTOR shall furnish to each DRB member one copy of pertinent documents that are or may become necessary for the DRB to perform their function. Pertinent documents are written notices of potential claim, responses to those notices, drawings or sketches, calculations, procedures, schedules, estimates, or other documents which are used in the performance of the work or in justifying or substantiating the CONTRACTOR's position. The CONTRACTOR shall also furnish a copy of such pertinent documents to the STATE, in conformance with the terms outlined in the special provisions.

**SECTION IV STATE RESPONSIBILITIES**

The STATE will furnish the following services and items:

**A. CONTRACT RELATED DOCUMENTS**

The STATE will furnish to each DRB member one copy of Notice to Contractors and Special Provisions, Proposal and Contract, Plans, Standard Specifications, and Standard Plans, change orders, written instructions issued by the STATE to the CONTRACTOR, or other documents pertinent to any dispute that has been referred to the DRB and necessary for the DRB to perform its function.

**B. COORDINATION AND SERVICES**

The STATE, through the Engineer, will, in cooperation with the CONTRACTOR, coordinate the operations of the DRB. The Engineer will arrange or provide conference facilities at or near the project site and provide secretarial and copying services to the DRB without charge to the CONTRACTOR.

**SECTION V TIME FOR BEGINNING AND COMPLETION**

Once established, the DRB shall be in operation until the day of acceptance of the contract. The DRB members shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE.

**SECTION VI PAYMENT**

**A. ALL INCLUSIVE RATE PAYMENT**

The STATE and the CONTRACTOR shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of $1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of $700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time has been specifically agreed to in advance by the STATE and CONTRACTOR. Time away from the project that has been specifically agreed to in advance by the parties will be compensated at an agreed rate of $125 per hour. The agreed amount of $125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the State, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The STATE will provide, at no cost to the CONTRACTOR, administrative services such as conference facilities and secretarial services to the DRB.

**B. PAYMENTS**

DRB members shall be compensated at the same rate. The CONTRACTOR shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The STATE will reimburse the CONTRACTOR for its share of the costs of the DRB.

The DRB members may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRB member until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

Invoices shall be accompanied by original supporting documents, which the CONTRACTOR shall include with the extra work billing when submitting for reimbursement of the STATE's share of cost from the STATE. The CONTRACTOR will be reimbursed for one-half of approved costs of the DRB. No markups will be added to the CONTRACTOR's payment.

**C. INSPECTION OF COSTS RECORDS**

The DRB members and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

**SECTION VII ASSIGNMENT OF TASKS OF WORK**

The DRB members shall not assign the work of this AGREEMENT.

**SECTION VIII TERMINATION OF DRB MEMBERS**

DRB members may resign from the DRB by providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power or by either party, for failing to fully comply at all times with all required employment and financial disclosure conditions of DRB membership in conformance with the terms of the contract.

**SECTION IX LEGAL RELATIONS**

The parties hereto mutually understand and agree that the DRB member in the performance of duties on the DRB, is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

**SECTION X CONFIDENTIALITY**

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRB, which documents and records are marked "Confidential - for use by the DRB only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRB findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of the DRB. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRB. However, the parties understand that such documents shall be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

**SECTION XI DISPUTES**

Disputes between the parties hereto, including disputes between the DRB members and either party or both parties, arising out of the work or other terms of this AGREEMENT, which cannot be resolved by negotiation and mutual concurrence between the parties, or through the administrative process provided in the contract, shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications.

**SECTION XII VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION**

In the event that any party, including an individual member of the DRB, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

**SECTION XIII FEDERAL REVIEW AND REQUIREMENTS**

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRB in progress, except for private meetings or deliberations of the DRB.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

**SECTION XIV CERTIFICATION OF THE CONTRACTOR, THE DRB MEMBERS, AND THE STATE**

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRB MEMBER

By: _____

Title: _____

DRB MEMBER

By: _____

Title :_____

DRB MEMBER

By :_____

Title :_____

CONTRACTOR

By: _____

Title: _____

CALIFORNIA STATE DEPARTMENT OF TRANSPORTATION

By: _____

Title: _____

### 5-1.13 FORCE ACCOUNT PAYMENT

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.

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, an additional markup of 7 percent will be added to the total cost of that extra work including all markups specified in this section "Force Account Payment". The additional 7 percent markup shall reimburse the Contractor for additional administrative costs, and no other additional payment will be made by reason of performance of the extra work by a subcontractor.

### 5-1.14 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

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

| ITEM CODE | ITEM |
|---|---|
| 390153 | ASPHALT CONCRETE (TYPE A) |
| 390165 | ASPHALT CONCRETE (OPEN GRADED) |
| 290201 | ASPHALT TREATED PERMEABLE BASE |
| 031953 | ASPHALT CONCRETE (TYPE A, BOND BREAKER) |
| 390103 | ASPHALT CONCRETE (TYPE B) |

The compensation payable for asphalt concrete and asphalt treated permeable base will be increased or decreased in conformance with the provisions of this section for paving asphalt 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 adjustment in compensation will be determined in conformance with the following formulae when the item of asphalt concrete or asphalt treated permeable base (or both) is included in a monthly estimate:

A. Total monthly adjustment = AQ

B. For an increase in paving asphalt price index exceeding 10 percent:

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

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

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

D. Where:

A = Adjustment in dollars per tonne of paving asphalt used to produce asphalt concrete and asphalt treated permeable base 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 paving asphalt that was used in producing the quantity of asphalt concrete shown under "This Estimate" on the monthly estimate using the amount of asphalt determined by the Engineer plus the quantity in tonnes of paving asphalt that would have been used in producing the quantity of asphalt treated permeable base shown under "This Estimate" on the monthly estimate using the amount of asphalt specified in the specifications.

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 any 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 paving asphalt 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, Mobil, and Unocal for the Buena Vista, Huntington Beach, Kern River, Long Beach, Midway Sunset, and Wilmington 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.

### 5-1.15 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.

### 5-1.16 PAYMENTS

Attention is directed to Sections 9-1.06, "Partial Payments," and 9-1.07, "Payment After Acceptance," of the Standard Specifications and these special provisions.

For the purpose of making partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications, the amount set forth for the contract items of work hereinafter listed shall be deemed to be the maximum value of the contract item of work which will be recognized for progress payment purposes:

A. Clearing and Grubbing $170,000
B. Develop Water Supply $100,000
C. Progress Schedule (Critical Path Method) $80,000
D. Lead Compliance Plan $30,000

After acceptance of the contract pursuant to the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount, if any, payable for a contract item of work in excess of the maximum value for progress payment purposes hereinabove listed for the item, will be included for payment in the first estimate made after acceptance of the contract.

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. Earth Retaining Structures
B. Soil Nail Assemblies
C. Piling
D. Tieback anchors
E. Prestressing Steel for Post-Tensioned Member (sealed packages only) - including ducts and anchor plates
F. Precast Concrete Girders
G. PTFE Spherical Bearings
H. (Type B) Joint Seals
I. Joint Seal Assemblies
J. Bar Reinforcing Steel
K. Isolation casings
L. Overside drains and appurtenances
M. Welded steel pipe casings
N. Drainage Pumping Equipment
O. Miscellaneous Bridge Metal
P. Miscellaneous Metal (restrainer)
Q. Pumping Plant Metal Work
R. Railings
T. Irrigation Controllers, Field Units, and Base Stations
U. Irrigation Controller Enclosure Cabinet
V. Pipe (Irrigation Systems)
W. Backflow Preventers, Backflow Preventer Assembly Enclosures
X. Sprinklers, and Valves
Y. Irrigation Pump and Equipment and Booster Pump System
Z. Sound Wall (Masonry Block, Precast Concrete Panels)
AA. Metal Sign Structures
BB. Alternaltive Pipe Culvert
CC. Reinforced Concrete Pipe
DD. Downdrain Slip Joint
EE. Anchor Assemblies
FF. Cable Anchorage Systems
GG. Grated Line Drain
HH. Corrugated Steel Pipe and Riser
II. Plastic Pipe
JJ. Alternaltive Flared End Section
KK. Debris Rack Cage
LL. Rock Slope Protection Fabric
MM. Drainage Pumping Equipment
NN. Pumping Plant Electrical Equipment
OO. Miscelleaneous Iron and Steel
PP. Manhole Frame and Cover
QQ. Chain Link Fence (Types CL-0.9, CL-1.8)
RR. Chain Link Gate (Type CL-1.8)
SS. Metal Beam Guard Railing
TT. Double Thrie Beam Barrier

UU. Cable Railing
VV. Terminal Sections and Connectors
WW. End Section
XX. Transition Railing (Type WB)
YY. Terminal System (Types ET and SRT)
ZZ. Terminal Anchor Assembly (Type CA)
AAA. Return Section
BBB. Crash Cushions
CCC. Pavement Markers
DDD. Signal and Lighting Standards
EEE. Signal Heads and Mounting Brackets
FFF. Closed Circuit Television Camera Assemblies
GGG. Innerducts
HHH. Fiber Optic Cable
III. Fiber Optic Conduit

**5-1.17 LIMITATION OF PAYMENTS**

In accordance with Section 171 of the Streets and Highways Code and not withstanding the provisions of the Standard Specifications and these special provisions, it is expressly understood and agreed that the total amount of work done and acceptable materials furnished by the Contractor, including work done and materials furnished by contract change order in accordance with Section 4-1.03, "Changes," of the Standard Specifications, and including any payments made pursuant to the provisions of Section 9-1.065, "Payment of Withheld Funds," of the Standard Specifications, shall not exceed the sum of $35,000,000 prior to April 1, 2004.

The Contractor shall notify the Engineer in writing when it has reason to believe that the costs the Contractor expects to incur under this contract, when added to the costs previously incurred, will exceed $35,000,000.

After the Engineer has notified the Contractor in writing of the availability of the first bond sale proceeds to continue the work of the contract, the total amount of work done and acceptable materials furnished by the Contractor shall not exceed the sum of $170,000,000 prior to October 1, 2005.

The Contractor shall notify the Engineer in writing when it has reason to believe that the costs the Contractor expects to incur under this contract in the next 60 days, when added to the costs previously incurred, will exceed $170,000,000.

Attention is directed to Progress Schedule (Critical Path Method) of these special provisions.

The Contractor shall not continue performance under this contract or otherwise incur costs in excess of the limitations set forth above unless the Engineer has notified the Contractor in writing that additional funds have been allocated to the contract.

All payments to the Contractor will be subject to the availability of funds and, notwithstanding any other provisions of the contract documents, the State shall have no liability to make payments in excess of available funds. No legal liability on the part of the Department for any payment may arise for performance beyond the date upon which the Engineer notifies the contractor that no further funds are available for performance of the contract.

If funds are not available to continue with the work of the project, the Engineer will notify the contractor in writing and will suspend the contract pursuant to Standard Specification 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. The work will be suspended until the Contractor is given written notification by the Engineer that funds are available for additional work on the contract. The Contractor shall resume work upon receipt of the written notice.

If funds are not available for continuation of the contract by the sixtieth ($60^{th}$) day after suspension of the contract by the Engineer, the contract will be terminated by the Department unless the Department and the Contractor have agreed, in writing, to a different date for termination.

Termination of the contract and determination of the total compensation payable to the Contractor shall be governed by the provisions in Section 8-1.11, "Termination of Contract," of the Standard Specifications, except that the maximum payment to the Contractor shall not exceed the payment limit amounts herein specified pursuant to Section 171 of the Streets and Highways Code.

**5-1.18 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.

### 5-1.19 GENERAL MIGRATORY BIRD TREATY ACT

Attention is directed to the Federal Migratory Bird Treaty Act (15 USC 703-711) 50 CFR Part 21 and 50 CFR Part 10, and the California Department of Fish and Game Code Sections 3503, 3513, and 3800, that protect migratory birds, their occupied nests, and their eggs from disturbance or destruction.

Between February 15 and September 1, the Contractor shall notify the Engineer 15 working days prior to beginning work disturbing the ground or vegetation. The Engineer will approve the beginning of work disturbing the ground or vegetation between February 15 and September 1.

The Contractor shall use exclusion techniques directed by the Engineer to prevent migratory birds from nesting on the ground, on structures or in trees, shrubs or other vegetation within the project limits.

Preventing nesting by using appropriate exclusion techniques will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

If evidence of bird nesting is discovered, the Contractor shall not disturb the nesting birds or nests until the birds have naturally left the nests. If evidence of migratory bird nesting is discovered after beginning work, the Contractor shall immediately stop work and notify the Engineer.

Attention is directed to Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications and "Time Related Overhead" of these special provisions.

Nothing in this section shall relieve the Contractor from providing for public safety in conformance with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

### 5-1.20 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 West Fourth Street, San Bernardino, California 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 1601.

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.

### 5-1.21 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

The location of the project is within an area controlled by the Regional Water Quality Control Board. A technically conditioned water quality standards certification has been issued covering work to be performed under this contract. The Contractor shall be fully informed of rules, regulations, and conditions that may govern the Contractor's operations in the areas and shall conduct the work accordingly.

Copies of the order 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 West Fourth Street, San Bernardino, California 92401.

Attention is directed to Section 7-1.11, "Preservation of Property," and Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

Attention is directed to Section 8-1.06, "Time of Completion," of the Standard Specifications. Days when the Contractor's operations are restricted by the requirements of this section shall not be considered to be nonworking days whether or not the controlling operation is delayed.

Attention is directed to Section 8-1.06, "Time of Completion," of the Standard Specifications. Days during which the Contractor's operations are restricted in the floodway by the requirements of this section shall be considered to be nonworking days if these restrictions cause a delay in the current controlling operation or operations.

### 5-1.22 MATERIAL SITES

Local material sites used by the Contractor shall be graded so that, at the time of final inspection of the contract, the sites will drain and will blend in with the surrounding terrain.

At the time of final inspection of the contract, the area should be free of pollution from washing equipment and be free of debris and trash.

Attention is directed to "Water Pollution Control", of these special provisions.

### 5-1.23 AERIALLY 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" of these special provisions.

Portions of the Site Investigation Report are included in the "Material Information" handout. The complete report, entitled "1) Aerial Lead Investigation State Route 215/60 in Riverside from Linden Street to Day Street, January 8, 2001. Apex Environmental, T.O. 08-334801-LR. 2) Aerial Lead Investigation Route 91 from Mary Street to Route 60/215 IC, October 20, 2000. Geofon Consultant, T.O. 08-44840k-LN", is available for inspection at the Department of Transportation, Environmental Engineering, Hazardous Waste, 464 West Fourth Street, San Bernardino, Ca 92401.

Aerially deposited lead is typically found within the top 0.6-m of material in unpaved areas within the highway right of way. Levels of lead found near the project limits range from less than 1.2 to 3,430 mg/kg total lead as analyzed by EPA Test Method 6010 or EPA Test Method 7000 series.

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 in place. The Department will not consider the Contractor a generator of such contaminated materials. Further cleanup, removal or remedial actions for such materials will not be required if handled or disposed of as specified herein.

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:

United States Department of Transportation (USDOT)
United States Environmental Protection Agency (USEPA)
California Environmental Protection Agency (Cal-EPA)
California Department of Health Services
Department of Toxic Substances Control (DTSC), Region 3
California Division of Occupational Safety and Health Administration (Cal-OSHA)
Integrated Waste Management Board
Regional Water Quality Control Board (RWQCB), Region 8 (Santa Ana region)
State Air Resources Control Board
South Coast Air Quality Management District (AQMD)

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:

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

### 5-1.24 STRUCTURE REMOVAL ASBESTOS-CONTAINING MATERIAL

Permits- The Contractor shall notify the South Coast Region of the Air Pollution Control District as required by NESHAP, 40CFR Part 61, and California Air Resources Control Board rules. A copy of the notification form and attachments shall be provided to the Engineer prior to submittal to the Air District. Notification shall take place a minimum of 10 days prior to removal of the structure.

Removal and management of ACM- All work shall be performed by a Contractor who is registered pursuant to Section 6501.5 of the Labor Code and certified pursuant to Section 7058.6 of the Business and Professions Code. Asbestos removal shall conform to Cal OSHA requirements in Title 8 Sections 1529 and 341. Packaging, storage, transporting, and disposing of ACM shall conform to Division 4.5 of Title 22, California Code of Regulations.

All friable material shall be removed in a manner which conforms to OSHA work practice requirements. All non-friable ACM shall be removed and handled to prevent breakage. Non-friable ACM such as asbestos cement pipe shall be disposed of to a landfill facility permitted to take asbestos containing products.

Safety- Attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. Work practices and worker health and safety during any work that results in disturbance of ACM shall conform to Section 1529, "Asbestos," of the Construction Safety Orders, Title 8, of the California Code of Regulations. Written notification of exposure monitoring results shall be submitted to the Engineer upon its completion. Any required written certification of the adequacy of alternative work practices shall be submitted to the Engineer before performing any work. The Contractor shall certify in writing that the personnel performing the work have completed a training program appropriate for the work involved.

The requirements of subsection (d), "Multi-Employer Worksites," of Section 1529, "Asbestos," of the Construction Safety Orders, Title 8, of the California Code of Regulations shall be observed during performance of the work. This shall not be construed as relieving the Contractor from the Contractor's responsibilities as provided in Section 8-1.01, "Subcontracting," of the Standard Specifications.

Full compensation for conforming to the requirements of this section and removing and disposing of the shims containing asbestos material shall be considered as included in the contract lump sum price paid for bridge removal and bridge removal (portion) and no additional compensation will be allowed therefor.

### 5-1.25 ENVIRONMENTALLY SENSITIVE AREA

Attention is directed to the designated Environmentally Sensitive Areas (ESAs) shown on the plans. The exact location of the boundaries of ESAs will be determined by the Engineer and shall be clearly delineated by the placement of temporary fence (Type ESA) as specified in these special provisions.

Vehicle access, storage or transport of materials or equipment, or other project related activities are prohibited within the boundaries of ESAs.

The Contractor shall repair, or perform work to mitigate, damage or impacts to ESAs caused by the Contractor's operations, at the Contractor's expense. If the Engineer determines repairs or mitigation work will be performed by others, or if mitigation fees are assessed the Department, deductions from moneys due or to become due the Contractor will be made for the repair or mitigation costs.

## 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 SIZES OF HIGH STRENGTH STEEL FASTENERS
ASTM Designation: A 325M

| METRIC SIZE SHOWN ON THE PLANS mm x thread pitch | SIZE TO BE SUBSTITUTED inch |
|---|---|
| M16 x 2 | 5/8 |
| M20 x 2.5 | 3/4 |
| M22 x 2.5 | 7/8 |
| M24 x 3 | 1 |
| M27 x 3 | 1-1/8 |
| M30 x 3.5 | 1-1/4 |
| M36 x 4 | 1-1/2 |

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 |

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

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

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

SUBSTITUTION TABLE FOR SIZES OF:

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

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

| METRIC SIZE SHOWN ON THE PLANS mm | SIZE TO BE SUBSTITUTED inch |
|---|---|
| 6 or 6.35 | 1/4 |
| 8 or 7.94 | 5/16 |
| 10 or 9.52 | 3/8 |
| 11 or 11.11 | 7/16 |
| 13 or 12.70 | 1/2 |
| 14 or 14.29 | 9/16 |
| 16 or 15.88 | 5/8 |
| 19 or 19.05 | 3/4 |
| 22 or 22.22 | 7/8 |
| 24, 25, or 25.40 | 1 |
| 29 or 28.58 | 1-1/8 |
| 32 or 31.75 | 1-1/4 |
| 35 or 34.93 | 1-3/8 |
| 38 or 38.10 | 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 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<br><br>Length, mm<br>Diameter, mm | METRIC BOX NAIL, SHOWN ON THE PLANS<br><br>Length, mm<br>Diameter, mm | METRIC SPIKE, SHOWN ON THE PLANS<br>Length, mm<br>Diameter, mm | SIZE TO BE SUBSTITUTED<br>Penny-weight |
|---|---|---|---|
| 50.80<br>2.87 | 50.80<br>2.51 | _____ | 6d |
| 63.50<br>3.33 | 63.50<br>2.87 | _____ | 8d |
| 76.20<br>3.76 | 76.20<br>3.25 | 76.20<br>4.88 | 10d |
| 82.55<br>3.76 | 82.55<br>3.25 | 82.55<br>4.88 | 12d |
| 88.90<br>4.11 | 88.90<br>3.43 | 88.90<br>5.26 | 16d |
| 101.60<br>4.88 | 101.60<br>3.76 | 101.60<br>5.72 | 20d |
| 114.30<br>5.26 | 114.30<br>3.76 | 114.30<br>6.20 | 30d |
| 127.00<br>5.72 | 127.00<br>4.11 | 127.00<br>6.68 | 40d |
| _____ | _____ | 139.70<br>7.19 | 50d |
| _____ | _____ | 152.40<br>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)**

A. Apex, Model 921AR (100 mm x 100 mm)
B. Avery Dennison (formerly Stimsonite), Models C88 (100 mm x 100 mm), 911 (100 mm x 100 mm) and 953 (70 mm x 114 mm)
C. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm)
D. 3M Series 290 (89 mm x 100 mm)
E. 3M Series 290 PSA, with pressure sensitive adhesive pad (89 mm x 100 mm)

**Retroreflective With Abrasion Resistant Surface (ARS)**

(for recessed applications only)

A. Avery Dennison (formerly Stimsonite), Model 948 (58 mm x 119 mm)
B. Avery Dennison (formerly Stimsonite), Model 944SB (51 mm x 100 mm)*
C. Ray-O-Lite, Model 2002 (58 mm x 117 mm)
D. 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**

A. Alpine Products, "D-Dot" and "ANR" (ABS)
B. Apex Universal (Ceramic)
C. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
D. Elgin Molded Plastics, "Empco-Lite" Model 900 (ABS)
E. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
F. Interstate Sales, "Diamond Back" (ABS) and (Polypropylene)
G. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
H. Novabrite Models Adot-w (White) Adot-y (Yellow), (ABS)
I. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
J. Road Creations, Model RCB4NR (Acrylic)
K. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)
L. Zumar Industries, "Titan TM40A" (ABS)

**PAVEMENT MARKERS, TEMPORARY TYPE**

**Temporary Markers For Long Term Day/Night Use (6 months or less)**

A. Apex Universal, Model 924 (100 mm x 100 mm)
B. Elgin Molded Plastics, "Empco-Lite" Model 901 (100 mm x 100 mm)
C. Road Creations, Model R41C (100 mm x 100 mm)
D. 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)

A. Apex Universal, Model 932
B. Bunzl Extrusion, Models T.O.M., T.R.P.M., and "HH" (High Heat)
C. Hi-Way Safety, Inc., Model 1280/1281

**STRIPING AND PAVEMENT MARKING MATERIAL**

**Permanent Traffic Striping and Pavement Marking Tape**

A. Advanced Traffic Marking, Series 300 and 400
B. Brite-Line, Series 1000
C. Brite-Line, "DeltaLine XRP"
D. Swarco Industries, "Director 35" (For transverse application only)
E. Swarco Industries, "Director 60"
F. 3M, "Stamark" Series 380 and 5730
G. 3M, "Stamark" Series 420 (For transverse application only)

**Temporary (Removable) Striping and Pavement Marking Tape (6 months or less)**

A. Advanced Traffic Marking, Series 200

B. Brite-Line, Series 100
C. Garlock Rubber Technologies, Series 2000
D. P.B. Laminations, Aztec, Grade 102
E. Swarco Industries, "Director-2"
F. Trelleborg Industri, R140 Series
G. 3M, Series 620 "CR", and Series A750
H. 3M, Series A145, Removable Black Line Mask
(Black Tape: for use only on Asphalt Concrete Surfaces)
I. Advanced Traffic Marking Black "Hide-A-Line"
(Black Tape: for use only on Asphalt Concrete Surfaces)
J. Brite-Line "BTR" Black Removable Tape
(Black Tape: for use only on Asphalt Concrete Surfaces)
K. Trelleborg Industri, RB-140
(Black Tape: for use only on Asphalt Concrete Surfaces)

**Preformed Thermoplastic (Heated in place)**

A. Avery Dennison, "Hotape"
B. Flint Trading, "Premark," "Premark 20/20 Flex," and "Premark 20/20 Flex Plus"

**Ceramic Surfacing Laminate, 150 mm x 150 mm**

A. Safeline Industries/Highway Ceramics, Inc.

**CLASS 1 DELINEATORS**

**One Piece Driveable Flexible Type, 1700 mm**

A. Bunzl Extrusion, "Flexi-Guide Models 400 and 566"
B. Carsonite, Curve-Flex CFRM-400
C. Carsonite, Roadmarker CRM-375
D. FlexStake, Model 654 TM
E. GreenLine Models HWD1-66 and CGD1-66
F. J. Miller Industries, Model JMI-375 (with soil anchor)

**Special Use Type, 1700 mm**

A. Bunzl Extrusion, Model FG 560 (with 450 mm U-Channel base)
B. Carsonite, "Survivor" (with 450 mm U-Channel base)
C. Carsonite, Roadmarker CRM-375 (with 450 mm U-Channel base)
D. FlexStake, Model 604
E. GreenLine Models HWDU and CGD (with 450 mm U-Channel base)
F. Impact Recovery Model D36, with #105 Driveable Base
G. Safe-Hit with 200 mm pavement anchor (SH248-GP1)
H. Safe-Hit with 380 mm soil anchor (SH248-GP2) and with 450 mm soil anchor (SH248-GP3)

**Surface Mount Type, 1200 mm**

A. Bent Manufacturing Company, Masterflex Model MF-180EX-48
B. Carsonite, "Super Duck II"
C. FlexStake, Surface Mount, Models 704 and 754 TM
D. Impact Recovery Model D48, with #101 Fixed (Surface-Mount) Base
E. Three D Traffic Works "Channelflex" Part No. 522248W

**CHANNELIZERS**

**Surface Mount Type, 900 mm**

A. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
B. Bunzl Extrusion, Flexi-Guide Models FG300LD and FG300UR
C. Carsonite, "Super Duck" (Flat SDF-436, Round SDR-336)
D. Carsonite, "Super Duck II" Model SDCF203601MB "The Channelizer"
E. FlexStake, Surface Mount, Models 703 and 753 TM
F. GreenLine, Model SMD-36

G. Hi-Way Safety, Inc. "Channel Guide Channelizer" Model CGC36
H. Impact Recovery Model D36, with #101 Fixed (Surface-Mount) Base
I. Repo, Models 300 and 400
J. Safe-Hit, Guide Post, Model SH236SMA
K. The Line Connection, "Dura-Post" Model DP36-3 (Permanent)
L. The Line Connection, "Dura-Post" Model DP36-3C (Temporary)
M. Three D Traffic Works "Channelflex" Part No. 522053W

**Lane Separation System**

A. Bunzl "Flexi-Guide (FG) 300 Curb System"
B. Qwick Kurb, "Klemmfix Guide System"
C. Recycled Technology, Inc. "Safe-Lane System"

**CONICAL DELINEATORS, 1070 mm**

(For 700 mm Traffic Cones, see Standard Specifications)

A. Bent Manufacturing Company "T-Top"
B. Plastic Safety Systems "Navigator-42"
C. Radiator Specialty Company "Enforcer"
D. Roadmaker Company "Stacker"
E. TrafFix Devices "Grabber"

**OBJECT MARKERS**

**Type "K", 450 mm**

A. Bunzl, Model FG318PE
B. Carsonite, Model SMD 615
C. FlexStake, Model 701 KM
D. Repo, Models 300 and 400
E. Safe-Hit, Model SH718SMA
F. The Line Connection, Model DP21-4K

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

A. Bent Manufacturing "Masterflex" Model MF-360-24
B. Bunzl Extrusion, Model FG324PE
C. Carsonite, Super Duck II
D. FlexStake, Model 701KM
E. Repo, Models 300 and 400
F. Safe-Hit, Models SH8 24SMA_WA and SH8 24GP3_WA
G. The Line Connection, Model DP21-4Q
H. Three D Traffic Works "Q" Marker, Part No. 531702W

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

**Impactable Type**

A. ARTUK, "FB"
B. Bunzl Extrusion, Models PCBM-12 and PCBM-T12
C. Duraflex Corp., "Flexx 2020" and "Electriflexx"
D. Hi-Way Safety, Inc., Model GMKRM100
E. Plastic Safety Systems "BAM" Models OM-BARR and OM-BWAR
F. Sun-Lab Technology, "Safety Guide Light Model TM-5"
G. Three D Traffic Works "Roadguide" TD9000 Series

**Non-Impactable Type**

A. ARTUK, JD Series
B. Plastic Safety Systems "BAM" Models OM-BITARW and OM-BITARA
C. Vega Molded Products, Models GBM and JD

**THRIE BEAM BARRIER MARKERS**
(For use to the left of traffic)
A. Bunzl Extrusion, "Mini" (75 mm x 254 mm)
B. Duraflex Corp., "Railrider"

**CONCRETE BARRIER DELINEATORS, 400 mm**
(For use to the right of traffic)
A. Bunzl Extrusion, Model PCBM T-16
B. Safe-Hit, Model SH216RBM
C. Sun-Lab Technology, "Safety Guide Light, Model TM16," (75 mm x 300 mm)
D. Three D Traffic Works "Roadguide" TD9416 Series

**CONCRETE BARRIER-MOUNTED MINI-DRUM (260 mm x 360 mm x 570 mm)**
A. Stinson Equipment Company "SaddleMarker"

**SOUND WALL DELINEATOR**
(Applied vertically. Place top of 75 mm x 300 mm reflective element at 1200 mm above roadway)
A. Bunzl Extrusion, PCBM S-36
B. Sun-Lab Technology, "Safety Guide Light, Model SM12," (75 mm x 300 mm)

**GUARD RAILING DELINEATOR**
(Place top of reflective element at 1200 mm above plane of roadway)

**Wood Post Type, 686 mm**

A. Bunzl Extrusion, FG 427 and FG 527
B. Carsonite, Model 427
C. FlexStake, Model 102 GR
D. GreenLine GRD 27
E. J. Miller Model JMI-375G
F. Safe-Hit, Model SH227GRD
G. Three D Traffic Works "Guardflex" TD5100 Series

**Steel Post Type**

A. Carsonite, Model CFGR-327 with CFGRBK300 Mounting Bracket

**RETROREFLECTIVE SHEETING**

**Channelizers, Barrier Markers, and Delineators**

A. Avery Dennison T-6500 Series (Formerly Stimsonite, Series 6200) (For rigid substrate devices only)
B. Avery Dennison WR-6100 Series
C. Nippon Carbide, Flexible Ultralite Grade (ULG) II
D. Reflexite, PC-1000 Metalized Polycarbonate
E. Reflexite, AC-1000 Acrylic
F. Reflexite, AP-1000 Metalized Polyester
G. Reflexite, Conformalight, AR-1000 Abrasion Resistant Coating
H. 3M, High Intensity

**Traffic Cones, 330 mm Sleeves**

A. Reflexite SB (Polyester), Vinyl or "TR" (Semi-transparent)

**Traffic Cones, 100 mm and 150 mm Sleeves**

A. Nippon Carbide, Flexible Ultralite Grade (ULG) II
B. Reflexite, Vinyl, "TR" (Semi-transparent) or "Conformalight"
C. 3M Series 3840

**Barrels and Drums**

A. Avery Dennison WR-6100
B. Nippon Carbide, Flexible Ultralite Grade (ULG) II

C. Reflexite, “Conformalight”, "Super High Intensity" or "High Impact Drum Sheeting"
D. 3M Series 3810

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

A. American Decal, Adcolite
B. Avery Dennison, T-1500 and T-1600 series
C. 3M Engineer Grade, Series 3170

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

A. Avery Dennison, T-2500 Series
B. Kiwalite Type II
C. Nikkalite 1800 Series

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

A. Avery Dennison, T-2500 Series
B. Kiwalite, Type II
C. Nikkalite 1800 Series

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

A. Avery Dennison, T-5500 Series
B. Nippon Carbide, Nikkalite Brand Ultralite Grade II
C. 3M Series 3870

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

A. Avery Dennison, T-6500 Series (Formerly Stimsonite Series 6200)
B. Nippon Carbide, Crystal Grade, 94000 Series

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

A. Avery Dennison, WU-6014 (Fluorescent orange)
B. Novabrite LLC, "Econobrite"
B. Reflexite "Vinyl" (Orange)
C. Reflexite "SuperBright" (Fluorescent orange)
D. Reflexite "Marathon" (Fluorescent orange)
E. 3M Series RS34 (Orange) and RS20 (Fluorescent orange)

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

A. 3M LDP Series 3970

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

A. Avery Dennison, T-7500 Series

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

A. 3M VIP Series 3990 Diamond Grade

**SPECIALTY SIGNS**

A. All Sign Products, STOP Sign (All Plastic), 750 mm
B. Relexite "Endurance" Work Zone Sign (with Semi-Rigid Plastic Substrate)

**SIGN SUBSTRATE**

**Fiberglass Reinforced Plastic (FRP)**

A. Fiber-Brite
B. Sequentia, "Polyplate"
C. Inteplast Group "InteCel" (13 mm for Post-Mounted CZ Signs, 1200 mm or less)

**Aluminum Composite**

A. Alcan Composites "Dibond Material, 2 mm"

B. Mitsubishi Chemical America, Alpolic 350

### 8-1.03 STATE-FURNISHED MATERIALS

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

The following materials will be furnished to the Contractor:

A. Sign panels for roadside signs and overhead sign structures.
B. Sign overlay panels for roadside signs and overhead sign structures.
C. Mast arm sign hanger assemblies
D. Hardware for mounting sign panels as follows:

    1. Blind rivets for mounting overlapping legend at sign panel joints.
    2. Closure inserts.
    3. Aluminum bolts and nuts and steel beveled washers for mounting laminated sign panels on overhead sign structures.
    4. Aluminum bolts, nuts, and washers for mounting overhead formed panels.

E. Padlocks for backflow preventer assembly enclosures, backflow preventer assembly blankets, walk gates, and irrigation controller enclosure cabinets.
F. Disks for survey monuments.
G. Marker panels, including reflectors, for Type N, Type P, and Type R object markers.
H. Light emitting diode (LED's) modules for vehicular traffic signal units, Type A pedestrian signals, flashing beacon units, and sign lighting fixtures.
I. Model 170 controller assemblies, including controller unit, completely wired controller cabinet, and inductive loop detector sensor units.

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

The Contractor shall notify the Engineer not less than 48 hours before State-furnished material is to be picked up by the Contractor. A full description of the material and the time the material will be picked up shall be provided.

State-furnished materials will be furnished to the Contractor at the Department of Transportation Redistribution Warehouse located at 175 West Cluster Street, San Bernardino, CA 92408 at (909) 830-6837 or (909) 830-6833.

### 8-1.04 SLAG AGGREGATE

Aggregate produced from slag resulting from any steel-making process or from air-cooled iron blast furnace slag shall not be used on this project.

### 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.

References to Section 90-2.01, "Portland Cement," of the Standard Specifications shall mean Section 90-2.01, "Cement," of the Standard Specifications.

Mineral admixture shall be combined with cement in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures," of the Standard Specifications for the concrete materials specified in Section 56-2, "Roadside Signs," of the Standard Specifications.

The requirements of Section 90-4.08, "Required Use of Mineral Admixture," of the Standard Specifications shall not apply to Section 19-3.025C, "Soil Cement Bedding," of the Standard Specifications.

The Department maintains a list of sources of fine and coarse aggregate that have been approved for use with a reduced amount of mineral admixture 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. Prior to starting the testing, 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:

A. 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 all tests of the previous 2 sets of concrete samples.
B. 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:

A. 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
B. 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.

The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications and shall conform to the following:

A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:

    1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
    2. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass, and any of the aggregates used are not listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix.
    3. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
    4. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix.
    5. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 7 percent by mass of the total amount of cementitious material to be used in the mix.

C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," of the Standard Specifications specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

Unless otherwise specified, mineral admixture will not be required in portland cement concrete used for precast concrete girders.

The Contractor will be permitted to use Type III portland cement for concrete used in the manufacture of precast concrete members.

## SECTION 8-3. WELDING

### 8-3.01 WELDING

**GENERAL**

Flux core 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 | 2000 |
| D1.4 | 1998 |
| D1.5 | 1995 |
| D1.5 (metric only) | 1996 |

Requirements of the AWS welding codes shall apply unless specified otherwise 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 ANSI/AASHTO/AWS.

Sections 6.1.2 through 6.1.4.3 of AWS D 1.1, Sections 7.1.1 and 7.1.2 of AWS D 1.4, and Sections 6.1.1.1 through 6.1.3.3 of AWS D 1.5 are 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.

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 and Guide for Qualification 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 and Guide for Qualification of Welding Inspectors," or has equivalent qualifications. The QC Inspector shall monitor the Assistant QC Inspector's work, and shall be responsible for signing all reports.

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

Section 6.14.6, "Personnel Qualification," of AWS D 1.1, Section 7.7.6, "Personnel Qualification," of AWS D 1.4, and Section 6.1.3.4, "Personnel Qualification," of AWS D 1.5 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. Only individuals who are 1) certified as an NDT Level II, or 2) 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, shall perform NDT, review the results, and prepare the written reports.

Section 6.5.4, "Scope of Examination," of AWS D 1.1 and Section 7.5.4 of AWS D 1.4 are replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, 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.

Section 6.5.4 of AWS D 1.5 is replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved WPS are met. The QC Inspector shall examine the work to make certain that it meets the requirements of Sections 3 and 9.21. 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 should 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 Nondestructive Testing Other Than Visual," of AWS D 1.1, Section 6.6.5 of AWS D 1.4 and Section 6.6.5 of AWS D 1.5 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 welding codes, in the Standard Specifications, or in these special provisions. Additional NDT required by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Should any welding deficiencies be discovered by this additional NDT, the cost of the testing will not be paid for as extra work but shall be at the Contractor's expense.

Required repair work to correct welding deficiencies, whether discovered by the required visual inspection or NDT, or by additional NDT directed 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.

A sufficient number of QC Inspectors shall be provided to ensure continuous inspection when any welding is being performed. Continuous inspection, as a minimum, shall include (1) having QC Inspectors continually present on the shop floor or project site when any welding operation is being performed, and (2) having a QC Inspector within such close proximity of all welding operations so that inspections by the QC Inspector of each operation, at each welding location, shall not lapse for a period exceeding 30 minutes.

Inspection and approval of all joint preparations, assembly practices, 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 that welding is performed. The QC Inspector shall confirm and document compliance with the requirements of the AWS code criteria and the requirements of these special provisions on all weld joints before welding, during welding, and after the completion of each weld.

When joint details that are not prequalified by the applicable AWS codes are proposed for use in the work, welders using these details shall perform a qualification test plate using the approved WPS variables and the joint detail to be used in production. The test plate shall be the maximum thickness to be used in production. The test plate shall be mechanically or radiographically tested as directed by the Engineer. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

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. 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 work remains satisfactory.

**WELDING QUALITY CONTROL**

Welding quality control shall conform to the requirements in the AWS 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," Section 56-1, "Overhead Sign Structures," Section 75-1.035, "Bridge Joint Restrainer Units," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

The welding of fracture critical members (FCMs) shall conform to the provisions specified in the Fracture Control Plan (FCP) and herein.

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, and approving all correspondence, required submittals, and reports to and from the Engineer.

The QCM shall not be employed or compensated by any subcontractor, or 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 welding is performed at a permanent fabrication or manufacturing facility which is certified under the AISC Quality Certification Program, Category Cbr, Major Steel Bridges.
B. 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. This condition shall apply only 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.

- The welding is performed on pipe pile material at a permanent pipe manufacturing facility where an automatic welding process or seamless pipe operation is used in conformance with the requirements in the applicable welding code as specified elsewhere in these special provisions.

For welding performed at such facilities, the inspection personnel or NDT firms may be employed or compensated by the facility performing the welding.

Prior to submitting the Welding Quality Control Plan (WQCP) required herein, a pre-welding meeting between the Engineer, Contractor, and any entity performing welding 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, 3 copies of a separate WQCP for each item of work for which welding is to be performed.

The Contractor shall allow the Engineer 2 weeks to review the WQCP submittal after a complete plan has been received. Except for work that is welded in conformance with Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, and for pipe piling produced at a permanent manufacturing facility as specified above, no welding shall be performed until the WQCP is approved in writing by the Engineer. Materials welded in conformance with Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, and pipe piling produced at such permanent manufacturing facilities, shall not be incorporated into the work 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 or procedures, QC, or NDT personnel, or updated systems for tracking and identifying welds. The Engineer shall have 3 working 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.

Each WQCP shall include the applicable portions of the following, as determined by the Engineer:

A. The name of the welding firm and any required NDT inspection personnel or firms.
B. A manual prepared by the NDT inspection personnel or firm that shall include equipment, testing procedures, code of safe practices, the Written Practice of the NDT inspection personnel or firm, and the names, qualifications, and documentation of certifications for all personnel to be used.
C. The name of the QCM and the names, qualifications, and documentation of certifications for all QC Inspectors and Assistant QC Inspectors to be used.
D. An organizational chart showing all QC personnel and their assigned QC responsibilities.

E. The methods and frequencies for performing all required quality control procedures, including QC inspection forms to be used, as required by the specifications including:

1. all visual inspections.
2. all NDT including radiographic geometry, penetrameter and shim selection, film quality, film processing, radiograph identification and marking system, and film interpretation and reports.
3. calibration procedures and calibration frequency for all NDT equipment.

F. A system for the identification and tracking of all welds, NDT, and any required repairs, and a procedure for the reinspection of repaired welds. The system shall have provisions for 1) permanently identifying each weld and the person who performed the weld, 2) placing all identification and tracking information on each radiograph, 3) a method of reporting nonconforming welds to the Engineer, and 4) a method of documentation of repairs and reinspection of nonconforming welds.

G. Standard procedures for performing noncritical repair welds. Noncritical repair welds are defined as welds to deposit additional weld beads or layers to compensate for insufficient weld size and to fill limited excavations that were performed to remove unacceptable edge or surface discontinuities, rollover or undercut. The depth of these excavations shall not exceed 65 percent of the specified weld size.

H. The WPS, including documentation of all supporting Procedure Qualification Record (PQR) tests performed, and the name of the testing laboratory who performed the tests, to verify the acceptability of the WPS. The submitted WPS shall be within the allowable period of effectiveness.

I. Documentation of all certifications for welders for each weld process and position that will be used. Certifications shall list the electrodes used, test position, base metal and thickness, tests performed, and the witnessing authority. All certifications shall be within the allowable period of effectiveness.

J. One authorized copy or original code book for each of all AWS welding codes and the FCP which are applicable to the welding to be performed. These codes and the FCP shall become the permanent property of the Department.

K. Forms to be used for Certificates of Compliance, daily production logs, and daily reports.

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

It is expressly understood that the Engineer's approval of the Contractor's WQCP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications. The Engineer's approval shall not constitute a waiver of any requirement of the plans and specifications nor relieve the Contractor of any obligation thereunder; and defective work, materials, and equipment may be rejected notwithstanding approval of the WQCP.

A daily production log for welding shall be kept by the QCM for each day that welding is performed. The log shall clearly indicate the locations of all welding, except partial penetration longitudinal seam welds performed in conformance with Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications. 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 7 days following the performance of any welding. For work welded in conformance with Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, and for piling produced at a permanent manufacturing facility, the following items shall be included in a Welding Report that is to be submitted to the Engineer 48 hours prior to furnishing a Certificate of Compliance for the material:

A. Reports of all visual weld inspections and NDT.
B. Radiographs and radiographic reports, and other required NDT reports.
C. Documentation that the Contractor has evaluated all radiographs and other nondestructive tests and corrected all rejectable deficiencies, and all repaired welds have been reexamined by the required NDT and found acceptable.
D. Daily production log.

Radiographic envelopes shall have clearly written on the outside of the envelope the following information: 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 or a report number, as detailed in the WQCP. In addition, all innerleaves shall have clearly written on them the part description and all included weld numbers, as detailed in the WQCP.

Reports regarding NDT, including radiographs, shall be signed by both the NDT technician and the person that performed the review, and then submitted directly 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.

The Engineer will review the Welding Report to determine if the Contractor is in conformance with the WQCP. Unless otherwise specified, the Engineer shall be allowed 7 working days to review the report and respond in writing after a 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 a 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.

The QC Inspector shall provide reports to the QCM on a daily basis for each day that welding is performed.

Except for noncritical weld repairs, 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. The Contractor shall allow the Engineer one week 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.

**PAYMENT**

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

## SECTION 9. DESCRIPTION OF BRIDGE WORK

The structure work to be done consists, in general, of constructing structures, replacing structures, widening structures, modifying one structure, removing one structure, replacing approach slabs, constructing one pump plant, and constructing retaining walls as shown in the plans and briefly described as follows:

### N215-W91 CONNECTOR
Bridge No. 56-0801G

A 27-span, 6-frame, cast-in-place prestressed concrete box girder structure approximately 1635 meters long, variable depth and variable width supported on single column bents with large diameter cast-in-drilled-hole concrete pile foundations and abutments supported on cast-in drilled hole concrete pile footing foundations.

### SOUTHEAST CONNECTOR (SB215/EB215)
Bridge No. 56-0802F

A 17-span, 5-frame, cast-in-place prestressed concrete box girder structure, approximately 1045 meters long, variable depth and 14 meters wide supported on single column bents with large diameter cast-in-drilled-hole concrete pile foundations and abutments supported on cast-in-drilled-hole concrete pile footing foundations.

### SEPARATION 60/91/215 (WIDEN)
Bridge No. 56-0402

A 4-span cast-in-place reinforced concrete deck on precast girder structure approximately 74 meters long, left side widening varies from 2.3 to 3.6 meters wide, and right side widening varies from 1.3 to 2.5 meters wide, supported on cast-in-drilled-hole pile footing foundations.

**DOWN STREET OVERHEAD (WIDEN)**
Bridge No. 56-0398

A 2-span cast-in-place reinforced concrete deck on precast concrete girder structure approximately 42 meters long, left side widening is approximately 15 meters wide, right side widening is approximately 23 meters wide, supported on Class 625 driven pipe pile footing foundations.

**SPRUCE STREET UNDERCROSSING (WIDEN)**
Bridge No. 56-0399

A 1-span cast-in-place prestressed concrete box girder structure approximately 41 meters long , left side widening varies in width and right side widening is approximately 9 meters wide, supported on spread footing foundations.

**CHICAGO AVENUE OVERHEAD (WIDEN)**
Bridge No. 56-0403

A 5-span cast-in-place reinforced concrete deck on precast prestressed concrete girder structure approximately 97 meters long, left and right side widenings vary in width, supported on Class 625 driven concrete pile footing foundations.

**BLAINE STREET OVERCROSSING (REPLACE)**
Bridge No. 56-0395

A 2-span cast-in-place prestressed concrete box girder structure approximately 81 meters longand 33 meters wide supported on spread footing foundations.

**IOWA AVENUE OVERCROSSING (REPLACE)**
Bridge No. 56-0396

A 2-span cast-in-place prestressed concrete box girder structure approximately 103 meters longand 27 meters wide supported on spread footing foundations.

**LINDEN STREET OVERCROSSING (REPLACE)**
Bridge No. 56-0397

A 2-span cast-in-place prestressed concrete box girder structure approximately 88 meters longand 22 meters wide supported on spread footing foundations.

**UNIVERSITY AVENUE UNDERCROSSING (WIDEN)**
Bridge No. 56-0408

A 1-span cast-in-place reinforced concrete deck on precast girder structure approximately 33 meters long, left and right side widenings vary in width, supported on spread footing foundations.

**CANYON CREST ROAD UNDERCROSSING (WIDEN)**
Bridge No. 56-0085R/L

A 3-span cast-in-place reinforced concrete deck on precast girder structure approximately 34 meters long, left and right side widenings vary in width, supported on spread footing foundations. Construct masonry block soundwall on barrier for left side widening. Construct 2 tieback retaining walls under structure,varying in height, west tieback retaining wall approximately 69 meters longand east tieback retaining wall approximately 81 meters long.

**MARTIN LUTHER KING, JR. UNDERCROSSING**
Bridge No. 56-0803

A 1-span cast-in-place prestressed concrete box girder structure approximately 39 meters long, left widening is approximately 24 meters wide, right widening is approximately 26 meters wide, supported on spread footing foundations.

**CENTRAL AVENUE UNDERCROSSING (WIDEN)**
Bridge No. 56-0504

A 3-span cast-in-place reinforced concrete deck on precast prestressed concrete girder structure approximately 48 meters long, left widening approximately 5 meters wide , right widening approximately 9 meters wide, supported on spread footing foundations. Construct 2 tieback retaining walls under structure, west tieback wall (tieback wall No.1) approximately 80 meters long and east tieback wall (tieback wall No. 2) approximately 73 meters long.

**BOX SPRINGS OVERHEAD TRUCK CONNECTOR**
Bridge No. 56-0805G

A 3-span cast-in-place prestressed concrete slab bridge approximately 60 meters long and 16 meters and varies wide supported on spread footing foundations.

**BOX SRINGS ROAD OVERCROSSING (REPLACE)**
Bridge No. 56-0804

A 4-span cast-in-place prestressed concrete box girder bridge approximately 122 meters long and 31 meters wide supported on spread footing foundations. Construct Type 1 retaining walls at Abutment 5.

**BOX SPRINGS OVERHEAD (REPLACE)**
Bridge No. 56-0082R

A 3-span cast-in-place prestressed concrete slab bridge approximately 40 meters long and 26 meters and varies wide supported on spread footing foundations.

**DAY STREET UNDERCROSSING (WIDEN)**
Bridge No. 56-0447R

A 3-span cast-in-place reinforced concrete box girder bridge approximately 46 meters long and 21 meters and varies wide supported on spread footing foundations.

**EASTBOUND 60 TRUCK CONNECTOR**
Bridge No. 56-0806G

A 5-span cast-in-place prestressed concrete box girder bridge approximately 204 meters long and 13 meters wide supported on single column bents with large diameter cast-in-drilled-hole concrete pile foundations and abutments supported on spread footing foundations.

**RIVERSIDE CANAL (LACADANA DRIVE) BRIDGE**
Bridge No. 56C-0499

A 1-span cast-in-place reinforced concrete slab bridge approximately 8 meters long, and 13 meters wide supported on cast-in-drilled-hole pile footing foundations.

**THIRD STREET UNDERCROSSING (MODIFICATION)**
Bridge No. 56-0316

Replace existing steel girders and reinforced concrete deck with precast prestressed reinforced concrete I girders and reinforced concrete deck for approximately 12 meters of width for the 1-span, approximately 25 meters long structure.

**EL CERRITO OVERCROSSING (REMOVE )**

Bridge No. 56-0503

A 4-span reinforced concrete deck on precast, prestressed reinforced concrete I-girders supported by reinforced concrete drop cap 3-column bents and abutments on spread footing foundations.

Replace approach slabs at the following 3 structures:

**UNIVERSITY AVENUE UNDERCROSSING**
Bridge No. 56-0314

**MISSION INN AVENUE UNDERCROSSING**
Bridge No. 56-0315

**THIRD STREET UNDERCROSSING**
Bridge No. 56-0316

**PUMP STATION AT CANYON CREST**
Bridge No. 56P-0085W

Relocate pump station at Canyon Crest.

Mechanically stabilized embankment of varying heights and various lengths:

**RW215-205**
Bridge No. 56-0815M

**RW215-202A**
Bridge No. 56-0818

**RW215-44**
Bridge No. RW215-44

**RW215-47A**
Bridge No. RW215-47A

**RW215-51B**
Bridge No. 56-0816M

**RETAINING WALL BOX SP-13**
Bridge No. 56-0817M

Soil nail walls of varying heights and various lengths:

**RW215-211A**

**RW215-213**

**RW215-214**

**RW215-215**

**RW215-216**

**RW215-217**

**RW215-219**

**RW215-221**

**RW215-21B**

**RW215-21C**

**RW215-22**

**RW215-23**

**RW215-24**

**RW215-27**

**RW215-38**

**RW215-41**

**RW215-45**

**RW215-46**

Type 1 retaining walls of varying heights and various lengths:

**RW215-198**

**RW215-200**

**RW215-201**

**RW215-202B**
Br. No. 56-RW202B

**RW215-05**
Br. No. RW215-05

**RW91-129B**

**RW91-137A**

Type 1 retaining walls of varying heights and various lengths with masonry block soundwall:

**RW215-21A**

**RW215-207**

## SECTION 10. CONSTRUCTION DETAILS
## SECTION 10-1. GENERAL

### 10-1.00 CONSTRUCTION PROJECT INFORMATION SIGNS

Before any major physical construction work readily visible to highway users is started on this contract, the Contractor shall furnish and erect 4 Type 2 Construction Project Information signs at the locations designated by the Engineer.

The signs and overlays shall be of a type and material consistent with the estimated time of completion of the project and shall conform to the details shown on the plans.

The sign letters, border and the Department's construction logos shall conform to the colors (non-reflective) and details shown on the plans, and shall be on a white background (non-reflective). The colors blue and orange shall conform to PR Color Number 3 and Number 6, respectively, as specified in the Federal Highway Administration's Color Tolerance Chart.

The sign message to be used for fund types shall consist of the following, in the order shown:

| |
|---|
| FEDERAL HIGHWAY TRUST FUNDS |
| STATE HIGHWAY FUNDS |
| RIVERSIDE COUNTY TRANSPORTATION FUNDS |

The sign message to be used for type of work shall consist of the following:

HIGHWAY CONSTRUCTION

The sign message to be used for the Year of Completion of Project Construction will be furnished by the Engineer. The Contractor shall furnish and install the "Year" sign overlay within 10 working days of notification of the year date to be used.

The letter sizes to be used shall be as shown on the plans. The information shown on the signs shall be limited to that shown on the plans.

The signs shall be kept clean and in good repair by the Contractor.

Upon completion of the work, the signs shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the construction project information 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.

### 10-1.01 ORDER OF WORK

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

The work at Iowa Avenue Overcrossing and at Linden Avenue Overcrossing shall be prosecuted as first priorities. Nonconflicting work on other segments of the project may proceed concurrently with work on these overcrossings, provided satisfactory progress is maintained on completion of the overcrossings.

Attention is directed to the "Agreement Regarding Proposed Stream or Lake Alteration, Notification No. 6-2003-097, from the Department of Fish and Game. No vegetation shall be removed from the stream channel or banks of University Wash, Box Springs Creek, and 3 unnamed culvert crossings from February 15 to September 1 to avoid impacts to nesting birds.

Attention is directed to "Railroad Relations and Insurance Requirements" of these special provisions for restrictions.

Soundwall SW91-129A on the Third St. UC, Bridge No. 56-0316 shall begin to be constructed after the closure pour for the left widening of the Third St. UC, Bridge No. 56-0316, is complete.

Attention is directed to "Concrete Pavement (With Doweled Transverse Weakened Plane Joints)" of these special provisions in regards to the Prepaving Conference and the concrete pavement test strip prior to commencing concrete pavement operations.

Attention is directed to "Tunneling" of these special provisions regarding the closure of northbound exit ramp at Central Avenue to provide the jacking pit during tunneling construction.

A first order of work shall be construction of soundwall, SW215-26A (portion) along Sycamore Canyon Blvd. between Sta. 24+58.50 to Sta. 25+50 and all detours and temporary traffic stripes involved in construction of the wall.

Attention is directed to "Structure Removal Asbestos-Containing Material, " elsewhere in these special provisions concerning bridge structures containing asbestos material.

The Contractor shall provide advance written notices to the different University of California at Riverside (UCR) Units and Services, the Riverside Transit Agency, and the Engineer, which will be affected by the following construction activities:

1. Thirty (30) days notice to UCR Transportation and Parking Services (TAPS), Attention: Principal Field Supervisor, 683 Linden Street, Riverside, CA 92521; telephone: (909) 787-2457 or 787-4395; facsimile: (909) 787-5629, prior to closure of all or any portion of UCR parking lots, including estimated duration of closure.

2. Thirty (30) days notice to TAPS prior to relocation of the Canyon Crest Drive parking kiosk to Lot 30, provide a temporary alternate power supply to the kiosk while in Lot 30, and replace the kiosk at completion of construction, including hook-up to power.

3. Thirty (30) days notice to TAPS prior to closing West Campus Drive during which the existing is being connected to the new West Campus Drive.

4. Thirty (30) days notice to UCR Physical Plant, Attn: Maintenance Electrical Supervisor, 3401 Watkins Drive, Riverside, CA 92521; telephone: (909) 787-3112 or 787-3029; facsimile: (909) 787-4596, of any planned interruption in electrical transmission services.

5. Seven (7) days notice to Riverside Transit Agency, 1825 Third Street, Riverside, CA 92507; telephone: (909) 565-5000; facsimile: (909) 565-5001, of any closures or construction activities around the campus that will disrupt their route.

6. Seven (7) days notice to UCR Police Department, 3500 Canyon Crest Drive, Riverside, CA 92521; telephone: (909) 787-5222; facsimile: (909) 683-1639; to UCR Transportation and Parking Services (TAPS); and to the City of Riverside Fire Department, 3775 Fairmount Blvd., Riverside, CA 92501; telephone: (909) 826-5321; facsimile: (909) 826-5585, should there ever be a reason that Canyon Crest Drive will be blocked to the extent that passage cannot be quickly opened to emergency vehicles.

7. Seventy two (72) hours notice to UCR Agricultural Operations, 1060 Martin Luther King, Jr. Blvd., Riverside, CA 92521; telephone (909) 787-5906; facsimile: (909) 787-5139, prior to interruption of irrigation service mains serving the agricultural fields, and provide temporary by-pass service and rebridging of irrigation control wires to ensure that crops obtain sufficient water during construction.

8. Seventy two (72) hours notice to UCR Physical Plant, Attention: Assistant Director of Physical Plant, Landscape and Refuse Services, Riverside, CA 92521; telephone (909) 787-4220 or 787-3029; facsimile: (909) 787-7277, prior to interruption of irrigation service mains on the main campus, and provide temporary by-pass service and rebridging of irrigation control wires to ensure that plant materials obtain sufficient water during construction.

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.

Temporary railing (Type K) and temporary crash cushions shall be secured in place prior to commencing work for which the temporary railing and crash cushions are required.

Attention is directed to "Replace Concrete Pavement (Rapid Strength Concrete)" of these special provisions in regards to providing Pre-Operation Conference and the Just-In-Time Training prior to commencing pavement replacement operations.

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).

Attention is directed to "Water Pollution Control" of these special provisions regarding the submittal and approval of the "Storm Water Pollution Prevention Plan" prior to performing work having potential to cause water pollution.

Complete design of the various sequences of the project will be provided to the Contractor in conformance with the provisions in Section 1, "Specifications and Plans," of these special provisions. Work in any sequence of the project shall not begin until the complete design, including final plans, specifications and estimate of quantities, for that sequence has been provided to the Contractor by the Engineer.

The first order of work shall be to place the order for the traffic signal equipment. The Engineer shall be furnished a statement from the vendor that the order for the traffic signal equipment has been received and accepted by the vendor.

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 “Maintaining Traffic” of these special provisions regarding the scheduled lane closures of West Campus Drive and Canyon Crest Drive and traffic restrictions at John North High School during construction.

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 not proceed concurrently with work in preceding stages, unless approved in writing by the Engineer, 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 asphalt concrete (Type A), asphalt concrete (Open Graded) and portland cement concrete pavement, 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 asphalt concrete (Type A), asphalt concrete (Open Graded) and portland cement concrete pavement has been placed. After completion of the asphalt concrete (Type A), asphalt concrete (Open Graded) and portland cement concrete pavement 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 asphalt concrete (Type A), and asphalt concrete (Open Graded) and per cubic meter for portland cement concrete pavement, and no additional compensation will be allowed therefor.

At the end of each working day if a difference in excess of 0.15-meter exists between the elevation of the existing pavement and the elevation of excavations within 1.5 m for widening to the left of the traveled way, and 2.4 m for widening to the right of the traveled way, material shall be placed and compacted against the vertical cuts adjacent to the traveled way. During excavation operations, native material may be used for this purpose; however, once 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 the material 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, reconstructed, or removed and replaced, the Contractor shall schedule operations so that at the end of each working day there shall be no post holes open nor shall there be any railing or barrier posts installed without the blocks and rail elements assembled and mounted thereon.

Not less than 60 days prior to planting the plants, the Contractor shall furnish the Engineer a statement from the vendor that the order for the plants required for this contract, including inspection plants, has been received and accepted by the vendor. The statement from the vendor shall include the names, sizes, and quantities of plants ordered and the anticipated date of delivery.

The Contractor shall place orders for replacement plants with the vendor at the appropriate time so that the roots of the replacement plants are not in a root-bound condition.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions, regarding restrictions for planting operations.

Attention is directed to "Seedling Plants (Plant Group S)" of these special provisions regarding the time restraints specified for planting seedlings.

Attention is directed to "Willow Cuttings (Plant Group W)" of these special provisions regarding the time restraints specified for planting willow cuttings.

Attention is directed to "Locate Existing Crossovers and Conduits" of these special provisions regarding locating existing irrigation water line crossovers and conduits shown on the plans to be incorporated in the new work. Existing irrigation water line crossovers and conduits shall be located prior to performing work on the irrigation system.

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 shall be installed prior to the installation of other pipe supply lines.

Clearing, grubbing, and earthwork operations shall not be performed in areas where existing irrigation facilities are to remain in place until existing irrigation facilities have been checked for proper operation in conformance with the provisions in "Existing Highway Irrigation Facilities" of these special provisions.

Existing conduits to be extended shall be located in conformance with the provisions in "Extend Irrigation Crossovers" of these special provisions prior to the start of other work in these areas.

Attention is directed to Section 20-5.027B, "Wiring Plans and Diagrams," of the Standard Specifications regarding submittal of working drawings.

Attention is directed to "Irrigation Controller Enclosure Cabinet" of these special provisions regarding preinstalling irrigation components in the irrigation controller enclosure cabinet prior to field installation.

Attention is directed to "Transplant Palm Tree" of these special provisions regarding the time restraints specified for transplanting palm trees.

When 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.

A first order of work shall be to furnish preconstruction shotcrete test panels in conformance with the provisions in "Shotcrete" of these special provisions.

## 10-1.02 SCAFFOLDING

Scaffolding shall be defined in accordance with and shall conform to the Construction Safety Orders of the Division of Occupational Safety and Health and these special provisions.

If scaffolding is constructed for this project over or adjacent to traffic, or suspended from the traveled way, the Contractor shall submit to the Engineer working drawings for scaffolding systems in conformance with Section 5-1.02, "Plans and Working Drawings" of the Standard Specifications and these special provisions.

Scaffolding working drawings shall include the following items:

A. Descriptions, calculations, and values for all loads anticipated during the erection, use, and removal of scaffolding.
B. Methods and equipment for erecting, moving, and removing scaffolding.
C. Design details including bolt layouts, welding details, and any connections to existing structures.
D. Stress sheets including a summary of computed stresses in the (1) scaffolding, (2) connections between scaffolding and any existing structures and (3) existing load supporting members. The computed stresses shall include the effects of erection, movement, and removal of the scaffolding.

The scaffolding manufacturer's name, address, and phone number shall be shown on the working drawings.

The working drawings shall be stamped and signed by an engineer who is registered as a Civil Engineer. In addition, prior to submitting the working drawings to the Engineer, the working drawings shall be stamped and signed by an independent reviewer who is registered as a Civil Engineer in the State of California. The independent reviewer shall not be employed by the same entity preparing the working drawings.

The Contractor shall allow 1 week for the review of a complete submittal for scaffolding working drawings. 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.

Welding for the manufacturing and erection of scaffolding shall conform to the requirements in AWS D1.1 or D1.2 for steel or aluminum construction respectively.

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

## 10-1.03 WATER POLLUTION CONTROL

Water pollution control work shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications and these special provisions.

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 a permit to the Department which governs storm water and non-storm water discharges from its 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, Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation Properties, Facilities, and Activities." 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 from the SWRCB Internet website at: http://www.swrcb.ca.gov/stormwtr/caltrans.html.

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 Associated with Construction Activity," which regulates discharges of storm water and non-storm water from construction activities disturbing 0.4-hectare 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 General 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 from the SWRCB Internet website at: http://www.swrcb.ca.gov/stormwtr/construction.html.

The NPDES permit that regulate this project, as referenced above, are hereafter collectively referred to 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 the Permits available during construction.

The Permits require the preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP shall be prepared in conformance with the requirements of the Permits, the Department's "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual," and the Department's "Construction Site Best Management Practices (BMPs) Manual," including addenda to those permits and manuals issued up to and including the date of advertisement of the project. These manuals are hereinafter referred to, respectively, as the "Preparation Manual" and the "Construction Site BMPs Manual," and collectively, as the "Manuals." Copies of the Manuals may be obtained from the Department of Transportation, Material Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520, and may also be obtained from the Department's Internet website at: http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm.

The Contractor shall know and fully comply with applicable provisions of the Permits and all modifications thereto, the Manuals, and Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from both 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," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The Permits shall apply to storm water and certain permitted non-storm water discharges from areas outside the project site which are directly related to construction activities for this contract including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards and access roads. The Contractor shall comply with the Permits and the Manuals for those areas and shall implement, inspect and maintain the required water pollution control practices. The Engineer shall be allowed full access to these areas during construction to assure Contractor's proper implementation of water pollution control practices. Installing, inspecting and maintaining water pollution control practices on areas outside the highway right of way not specifically arranged and provided for by the Department for the execution of this contract, will not be paid for.

The Contractor shall be responsible for penalties assessed or levied on the Contractor or the Department as a result of the Contractor's failure to comply with the provisions in this section "Water Pollution Control" including, but not limited to, compliance with the applicable provisions of the Permits, the Manuals, and Federal, State and local regulations and requirements as set forth therein.

Penalties as used in this section, "Water Pollution Control," 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 the Permits, the Manuals, or applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

**RETENTION OF FUNDS**

Notwithstanding any other remedies authorized by law, the Department may retain money due the Contractor under the contract, in an amount determined by the Department, up to and including the entire amount of Penalties proposed, assessed, or levied as a result of the Contractor's violation of the Permits, the Manuals, or Federal or State law, regulations or requirements. Funds may be retained by the Department until final disposition has been made as to the Penalties. The Contractor shall remain liable for the full amount of Penalties until such time as they are finally resolved with the entity seeking the Penalties.

Retention of funds for failure to conform to the provisions in this section, "Water Pollution Control," shall be in addition to the other retention amounts required by the contract. The amounts retained for the Contractor's failure to conform to provisions in this section will be released for payment on the next monthly estimate for partial payment following the date when an approved SWPPP has been implemented and maintained, and when water pollution has been adequately controlled, as determined by the Engineer.

When a regulatory agency identifies a failure to comply with the Permits and modifications thereto, the Manuals, or other Federal, State or local requirements, the Department may retain money due the Contractor, subject to the following:

A. The Department will give the Contractor 30 days notice of the Department's intention to retain funds from partial payments which may become due to the Contractor prior to acceptance of the contract. Retention of funds from payments made after acceptance of the contract may be made without prior notice to the Contractor.
B. No retention of additional amounts out of partial payments will be made if the amount to be retained does not exceed the amount being withheld from partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications.
C. If the Department has retained 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 retention was made, the Department shall be liable for interest on the amount retained for the period of the retention. The interest rate payable shall be 6 percent per annum.

During the first estimate period that the Contractor fails to conform to the provisions in this section, "Water Pollution Control," the Department may retain an amount equal to 25 percent of the estimated value of the contract work performed.

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.

**STORM WATER POLLUTION PREVENTION PLAN PREPARATION, APPROVAL AND AMENDMENTS**

As part of the water pollution control work, a Storm Water Pollution Prevention Plan (SWPPP) is required for this contract. The SWPPP shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications, the requirements in the Manuals, the requirements of the Permits, and these special provisions. Upon the Engineer's approval of the SWPPP, the SWPPP shall be considered to fulfill the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications for development and submittal of a Water Pollution Control Program.

No work having potential to cause water pollution, shall be performed until the SWPPP has been approved by the Engineer. Approval shall not constitute a finding that the SWPPP complies with applicable requirements of the Permits, the Manuals and applicable Federal, State and local laws, regulations, and requirements.

The Contractor shall designate a Water Pollution Control Manager. The Water Pollution Control Manager shall be responsible for the preparation of the SWPPP and required modifications or amendments, and shall be responsible for the implementation and adequate functioning of the various water pollution control practices employed. The Contractor may designate different Water Pollution Control Managers to prepare the SWPPP and to implement the water pollution control practices. The Water Pollution Control Managers shall serve as the primary contact for issues related to the SWPPP or its implementation. The Contractor shall submit to the Engineer a statement of qualifications, describing the training, previous work history and expertise of the individual selected by the Contractor to serve as Water Pollution Control Manager. The Water Pollution Control Manager shall have a minimum of 24 hours of formal storm water management training or certification as a Certified Professional in Erosion and Sediment Control (CPESC). The Engineer will reject the Contractor's submission of a Water Pollution Control Manager if the submitted qualifications are deemed to be inadequate.

The SWPPP shall apply to the areas within and those outside of the highway right of way that are directly related to construction operations including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards, and access roads.

The SWPPP shall incorporate water pollution control practices in the following categories:

A. Soil stabilization.
B. Sediment control.
C. Wind erosion control.
D. Tracking control.
E. Non-storm water management.
F. Waste management and materials pollution control.

The SWPPP shall include, but not be limited to, the items described in the Manuals, Permits and related information contained in the contract documents. The SWPPP shall also include a copy of the following: Fish and Game Permits, State Reclamation Board Application, U.S. Army Corps of Engineers Permit, RWQCB 401 Certification, and RWQCB Waste Discharge Requirements for Aerially Deposited Lead Reuse.

The Contractor shall develop and include in the SWPPP the Sampling and Analysis Plan(s) as required by the Permits, and modifications thereto, and as required in "Sampling and Analytical Requirements" of this section.

The Contractor shall develop a Water Pollution Control Schedule that describes the timing of grading or other work activities that could affect water pollution. The Water Pollution Control Schedule shall be updated by the Contractor to reflect changes in the Contractor's operations that would affect the necessary implementation of water pollution control practices.

The Contractor shall complete the "Construction Site BMPs Consideration Checklist" presented in the Preparation Manual and shall incorporate water pollution control practices into the SWPPP. Water pollution control practices include the "Minimum Requirements" and other Contractor-selected water pollution control practices from the "Construction Site BMPs Consideration Checklist" and the "Project-Specific Minimum Requirements" identified in the Water Pollution Control Cost Break-Down of this section.

Within 20 working days after the approval of the contract, the Contractor shall submit 3 copies of the draft SWPPP to the Engineer. The Engineer will have 10 working days to review the SWPPP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the SWPPP within 10 working days of receipt of the Engineer's comments. The Engineer will have 10 working days to review the revisions. Upon the Engineer's approval of the SWPPP, 5 approved copies of the SWPPP, incorporating the required changes, shall be submitted to the Engineer. In order to allow construction activities to proceed, the Engineer may conditionally approve the SWPPP while minor revisions are being completed. 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 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 Contractor shall prepare an amendment to the SWPPP when there is a change in construction activities or operations which may affect the discharge of pollutants to surface waters, ground waters, municipal storm drain systems, or when the Contractor's activities or operations violate a condition of the Permits, or when directed by the Engineer. Amendments shall identify additional water pollution control practices or revised operations, including those areas or operations not identified in the initially approved SWPPP. Amendments to the SWPPP shall be prepared and submitted for review and approval within a time approved by the Engineer, but in no case longer than the time specified for the initial submittal and review of the SWPPP. At a minimum, the SWPPP shall be amended annually and submitted to the Engineer 25 days prior to the defined rainy season.

The Contractor shall keep one copy of the approved SWPPP and approved amendments at the project site. The SWPPP shall be made available upon request 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 by the public shall be directed to the Engineer.

**COST BREAK-DOWN**

The Contractor shall include a Water Pollution Control Cost Break-Down in the SWPPP which itemizes the contract lump sum for water pollution control work. The Contractor shall use the Water Pollution Control Cost Break-Down provided in this section as the basis for the cost break-down submitted with the SWPPP. The Contractor shall use the Water Pollution Control Cost Break-Down to identify items, quantities and values for water pollution control work, excluding Temporary Water Pollution Control Practices for which there are separate bid items. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted with the SWPPP. Partial payment for the item of water pollution control will not be made until the Water Pollution Control Cost Break-Down is approved by the Engineer.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Line items indicated in the Water Pollution Control Cost Break-Down in this section with a specified Estimated Quantity shall be considered "Project-Specific Minimum Requirements." The Contractor shall incorporate Project-Specific Minimum Requirements with Contractor-designated quantities and values into the Water Pollution Control Cost Break-Down submitted with the SWPPP.

Line items indicated in the Water Pollution Control Cost Break-Down in this section without a specified Estimated Quantity shall be considered by the Contractor for selection to meet the applicable "Minimum Requirements" as defined in the Manuals, or for other water pollution control work as identified in the "Construction Site BMPs Consideration Checklist" presented in the Preparation Manual. In the Water Pollution Control Cost Break-Down submitted with the SWPPP, the Contractor shall list only those water pollution control practices selected for the project, including quantities and values required to complete the work for those items.

The sum of the amounts for the items of work listed in the Water Pollution Control Cost Break-Down shall be equal to the contract lump sum price bid for water pollution control. Overhead and profit, except for time-related overhead, shall be included in the individual items listed in the cost break-down.

**WATER POLLUTION CONTROL COST BREAK-DOWN**

**Contract No. 334844**

| ITEM | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | VALUE | AMOUNT |
|---|---|---|---|---|---|
| SS-5 | Soil Binders | M2 | | | |
| SS-8 | Wood Mulching | M2 | | | |
| SS-9 | Earth Dikes/Drainage Swales & Lined Ditches | M | | | |
| SS-10 | Outlet Protection/Velocity Dissipation Devices | EA | | | |
| SS-11 | Slope Drains | EA | | | |
| SS-12 | Streambank Stabilization | LS | | | |
| SC-1 | Silt Fence | M | | | |
| SC-2 | Sediment/Desilting Basin | EA | | | |
| SC-3 | Sediment Trap | EA | | | |
| SC-4 | Check Dam | EA | | | |
| SC-5 | Fiber Rolls | M | | | |
| SC-7 | Street Sweeping and Vacuuming | LS | | | |
| SC-8 | Sandbag Barrier | M | | | |
| SC-10 | Storm Drain Inlet Protection | EA | | | |
| WE-1 | Wind Erosion Control | LS | | | |
| TC-1 | Stabilized Construction Entrance/Exit | EA | | | |
| TC-2 | Stabilized Construction Roadway | EA | | | |
| TC-3 | Entrance/Outlet Tire Wash | EA | | | |
| NS-1 | Water Conservation Practices | LS | | | |
| NS-2 | Dewatering Operations | EA | | | |
| NS-3 | Paving and Grinding Operations | LS | | | |
| NS-4 | Temporary Stream Crossing | EA | | | |
| NS-5 | Clear Water Diversion | EA | | | |
| NS-6 | Illicit Connection/Illegal Discharge Detection and Reporting | LS | | | |
| NS-7 | Potable Water/Irrigation | LS | | | |
| NS-8 | Vehicle and Equipment Cleaning | LS | | | |

| ITEM | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | VALUE | AMOUNT |
|---|---|---|---|---|---|
| NS-9 | Vehicle and Equipment Fueling | LS | | | |
| NS-10 | Vehicle and Equipment Maintenance | LS | | | |
| NS-11 | Pile Driving Operations | LS | | | |
| NS-12 | Concrete Curing | LS | | | |
| NS-13 | Material and Equipment Use over Water | LS | | | |
| NS-14 | Concrete Finishing | LS | | | |
| NS-15 | Structure Demolition/Removal Over or Adjacent to Water | LS | | | |
| WM-1 | Material Delivery and Storage | LS | | | |
| WM-2 | Material Use | LS | | | |
| WM-3 | Stockpile Management | LS | | | |
| WM-4 | Spill Prevention and Control | LS | | | |
| WM-5 | Solid Waste Management | LS | | | |
| WM-6 | Hazardous Waste Management | LS | | | |
| WM-7 | Contaminated Soil Management | LS | | | |
| WM-8 | Concrete Waste Management | LS | | | |
| WM-9 | Sanitary/Septic Waste Management | LS | | | |
| WM-10 | Liquid Waste Management | LS | | | |

**TOTAL** _____

Adjustments in the items of work and quantities listed in the approved cost break-down shall be made when required to address amendments to the SWPPP, except when the adjusted items are paid for as extra work.

No adjustment in compensation will be made to the contract lump sum price paid for water pollution control due to differences between the quantities shown in the approved cost break-down and the quantities required to complete the work as shown on the approved SWPPP. No adjustment in compensation will be made for ordered changes to correct SWPPP work resulting from the Contractor's own operations or from the Contractor's negligence.

The approved cost break-down will be used to determine partial payments during the progress of the work and as the basis for calculating the adjustment in compensation for the item of water pollution control due to increases or decreases of quantities ordered by the Engineer. When an ordered change increases or decreases the quantities of an approved cost break-down item, the adjustment in compensation will be determined in the same manner specified for increases and decreases in the quantity of a contract item of work in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications. If an ordered change requires a new item which is not on the approved cost break-down, the adjustment in compensation will be determined in the same manner specified for extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

If requested by the Contractor and approved by the Engineer, changes to the water pollution control practices listed in the approved cost break-down, including addition of new water pollution control practices, will be allowed. Changes shall be included in the approved amendment of the SWPPP. If the requested changes result in a net cost increase to the lump sum price for water pollution control, an adjustment in compensation will be made without change to the water pollution control item. The net cost increase to the water pollution control item will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

## SWPPP IMPLEMENTATION

Unless otherwise specified, upon approval of the SWPPP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, maintaining, removing, and disposing of the water pollution control practices specified in the SWPPP and in the amendments. Unless otherwise directed by the Engineer, the Contractor's responsibility for SWPPP implementation shall continue throughout temporary suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. Requirements for installation, construction, inspection, maintenance, removal, and disposal of water pollution control practices shall conform to the requirements in the Manuals and these special provisions.

If the Contractor or the Engineer identifies a deficiency in the implementation of the approved SWPPP or amendments, the deficiency shall be corrected immediately unless requested by the Contractor and approved by the Engineer in writing, but shall be corrected prior to the onset of precipitation. If the Contractor fails to correct the identified deficiency by the date agreed or prior to the onset of precipitation, the project shall be in nonconformance with this section, "Water Pollution Control." Attention is directed to Section 5-1.01, "Authority of Engineer," of the Standard Specifications, and to "Retention of Funds" of this section for possible nonconformance penalties.

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

Implementation of water pollution control practices may vary by season. The Construction Site BMPs Manual and these special provisions shall be followed for control practice selection of year-round, rainy season and non-rainy season water pollution control practices.

### Year-Round Implementation Requirements

The Contractor shall have a year-round program for implementing, inspecting and maintaining water pollution control practices for wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control.

The National Weather Service weather forecast shall be monitored and used by the Contractor on a daily basis. An alternative weather forecast proposed by the Contractor may be used if approved by the Engineer. If precipitation is predicted, the necessary water pollution control practices shall be deployed prior to the onset of the precipitation.

Disturbed soil areas shall be considered active whenever the soil disturbing activities have occurred, continue to occur or will occur during the ensuing 21 days. Non-active areas shall be protected as prescribed in the Construction Site BMPs Manual within 14 days of cessation of soil disturbing activities or prior to the onset of precipitation, whichever occurs first.

In order to provide effective erosion control, the Contractor may be directed by the Engineer to apply permanent erosion control in small or multiple units. The Contractor’s attention is directed to "Erosion Control (Type D)" of these special provisions.

### Rainy Season Implementation Requirements

Soil stabilization and sediment control practices shall be provided throughout the rainy season, defined as between August 1 and October 1, and between November 1 and May 1.

An implementation schedule of required soil stabilization and sediment control practices for disturbed soil areas shall be completed no later than 20 days prior to the beginning of each rainy season. The implementation schedule shall identify the soil stabilization and sediment control practices and the dates when the implementation will be 25 percent, 50 percent and 100 percent complete, respectively. For construction activities beginning during the rainy season, the Contractor shall implement applicable soil stabilization and sediment control practices.

Throughout the defined rainy season, the active disturbed soil area of the project site shall be not more than 2 hectares. The Engineer may approve, on a case-by-case basis, expansions of the active disturbed soil area limit. Soil stabilization and sediment control materials shall be maintained on site sufficient to protect disturbed soil areas. A detailed plan for the mobilization of sufficient labor and equipment shall be maintained to deploy the water pollution control practices required to protect disturbed soil areas prior to the onset of precipitation.

### Non-Rainy Season Implementation Requirements

The non-rainy season shall be defined as days outside the defined rainy season. The Contractor's attention is directed to the Construction Site BMPs Manual for soil stabilization and sediment control implementation requirements on disturbed soil areas during the non-rainy season. Disturbed soil areas within the project shall be protected in conformance with the requirements in the Construction Site BMPs Manual with an effective combination of soil stabilization and sediment control.

## MAINTENANCE

To ensure the proper implementation and functioning of water pollution control practices, the Contractor shall regularly inspect and maintain the construction site for the water pollution control practices identified in the SWPPP. The construction site shall be inspected by the Contractor as follows:

A. Prior to a forecast storm.
B. After a precipitation event which causes site runoff.
C. At 24 hour intervals during extended precipitation events.
D. Routinely, a minimum of once every two weeks outside of the defined rainy season.
E. Routinely, a minimum of once every week during the defined rainy season.

The Contractor shall use the Storm Water Quality Construction Site Inspection Checklist provided in the Preparation Manual or an alternative inspection checklist provided by the Engineer. One copy of each site inspection record shall be submitted to the Engineer within 24 hours of completing the inspection.

## REPORTING REQUIREMENTS

### Report of Discharges, Notices or Orders

If the Contractor identifies discharges into surface waters or drainage systems in a manner causing, or potentially causing, a condition of 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 event, notice or order. The report shall include the following information:

A. The date, time, location, nature of the operation, and type of discharge, including the cause or nature of the notice or order.
B. The water pollution control practices deployed before the discharge event, or prior to receiving the notice or order.
C. The date of deployment and type of water pollution control practices deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent reoccurrence.
D. An implementation and maintenance schedule for affected water pollution control practices.

### Report of First-Time Non-Storm Water Discharge

The Contractor shall notify the Engineer at least 3 days in advance of first-time non-storm water discharge events, excluding exempted discharges. The Contractor shall notify the Engineer of the operations causing non-storm water discharges and shall obtain field approval for first-time non-storm water discharges. Non-storm water discharges shall be monitored at first-time occurrences and routinely thereafter.

### Annual Certifications

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

## SAMPLING AND ANALYTICAL REQUIREMENTS

The Contractor is required to implement specific sampling and analytical procedures to determine whether BMPs implemented on the construction site are:

A. preventing pollutants that are known or should be known by permittees to occur on construction sites that are not visually detectable in storm water discharges, to cause or contribute to exceedances of water quality objectives

### Non-Visible Pollutants

The project has the potential to discharge non-visible pollutants in storm water from the construction site. The project SWPPP shall contain a Sampling and Analysis Plan (SAP) that describes the sampling and analysis strategy and schedule to be implemented on the project for monitoring non-visible pollutants in conformance with this section.

The SAP shall identify potential non-visible pollutants that are known or should be known to occur on the construction site associated with the following: (1) construction materials, wastes or operations; (2) known existing contamination due to historical site usage; or (3) application of soil amendments, including soil stabilization products, with the potential to alter pH or contribute toxic pollutants to storm water. Planned material and waste storage areas, locations of known existing contamination, and areas planned for application of soil amendments shall be shown on the SWPPP Water Pollution Control Drawings.

The SAP shall identify a sampling schedule for collecting a sample down gradient from the applicable non-visible pollutant source and a sufficiently large uncontaminated control sample during the first two hours of discharge from rain events during daylight hours which result in a sufficient discharge for sample collection. If run-on occurs onto the non-visible pollutant source, a run-on sample that is immediately down gradient of the run-on to the Department's right of way shall be collected. A minimum of 72 hours of dry weather shall occur between rain events to distinguish separate rain events.

The SAP shall state that water quality sampling will be triggered when any of the following conditions are observed during the required storm water inspections conducted before or during a rain event:

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; and (2) the leak or spill has not been cleaned up prior to the rain event; 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 a rain event or within 24 hours preceding a rain event, and there is the potential for discharge of 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 there is the potential for discharge of pollutants to surface waters or drainage system (unless independent test data are available that demonstrate acceptable concentration levels of non-visible pollutants in the soil amendment).
E. Storm water runoff from an area contaminated by historical usage of the site is observed to combine with storm water, and there is the potential for discharge of pollutants to surface waters or drainage system.

The SAP shall identify sampling locations for collecting down gradient and control samples, and the rationale for their selection. The control sampling location shall be selected where the sample does not come into contact with materials, wastes or areas associated with potential non-visible pollutants or disturbed soil areas. Sampling locations shall be shown on the SWPPP Water Pollution Control Drawings. Only trained personnel shall collect water quality samples and be identified in the SAP. Qualifications of designated sampling personnel shall describe training and experience, and shall be included in the SWPPP. The SAP shall state monitoring preparation, sample collection procedures, quality assurance/quality control, sample labeling procedures, sample collection documentation, sample shipping and chain of custody procedures, sample numbering system, and reference the construction site health and safety plan.

The SAP shall identify the analytical method to be used for analyzing down gradient and control samples for potential non-visible pollutants on the project. For samples analyzed in the field by sampling personnel, collection, analysis, and equipment calibration shall be in conformance with the Manufacturer's specifications. For samples that will be analyzed by a laboratory, sampling, preservation, and analysis shall be performed by a State-certified laboratory in conformance with 40 CFR 136. The SAP shall identify the specific State-certified laboratory, sample containers, preservation requirements,

holding times, and analysis method to be used. A list of State-certified laboratories that are approved by the Department is available at the following internet site: http://www.dhs.ca.gov/ps/ls/elap/html/lablist_county.htm.

**Analytical Results and Evaluation**

The Contractor shall submit a hard copy and electronic copy of water quality analytical results and quality assurance/quality control data to the Engineer within 5 days of sampling for field analyses and within 30 days for laboratory analyses. Analytical results shall be accompanied by an evaluation from the Contractor to determine if down gradient samples show elevated levels of the tested parameter relative to levels in the control sample. If down gradient or downstream samples, as applicable, show increased levels, the Contractor will assess the BMPs, site conditions, and surrounding influences to determine the probable cause for the increase. As determined by the assessment, the Contractor will repair or modify BMPs 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 at a minimum the following information: sample identification number, contract number, constituent, reported value, method reference, method detection limit, and reported detection limit. The Contractor shall document sample collection during rain events.

Water quality sampling documentation and analytical results shall be maintained with the SWPPP on the project site until a Notice of Completion has been submitted and approved.

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."

**PAYMENT**

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 for doing all the work involved in developing, preparing, obtaining approval of, revising, and amending the SWPPP, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Attention is directed to Section 9-1.06, "Partial Payments," and Section 9-1.07, "Payment After Acceptance," of the Standard Specifications. Payments for prepare storm water pollution prevention plan will be made as follows:

A. After the SWPPP has been approved by the Engineer, 75 percent of the contract item price for prepare storm water pollution prevention plan will be included in the monthly partial payment estimate.
B. 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 25 percent of the contract item price for prepare storm water pollution prevention plan will be made in conformance with the provisions in Section 9-1.07.

The contract lump sum price paid for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing, constructing, removing, and disposing of water pollution control practices, including non-storm water management, and waste management and materials pollution water pollution control practices, except those for which there is a contract item of work as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

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 required where appropriate BMPs are not implemented prior to a rain event, or if a failure of a BMP is not corrected prior to a rain event.

For items identified on the approved Water Pollution Control Cost Break-Down, the cost of maintaining the temporary water pollution control practices shall be divided equally by the State and the Contractor as follows:

**Soil Stabilization**

Temporary water pollution control practices except:
SS-1 Scheduling
SS-2 Preservation of Existing Vegetation

**Sediment Control**

Temporary water pollution control practices except:
SC-7 Street Sweeping and Vacuuming

**Wind Erosion Control**

No sharing of maintenance costs will be allowed.

**Tracking Control**

TC-1 Stabilized Construction Entrance/Exit.

**Non-Storm Water Management**

No sharing of maintenance costs will be allowed.

**Waste Management & Materials Pollution Control**

No sharing of maintenance costs will be allowed.

The division of cost will be made by determining the cost of maintaining water pollution control practices 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, improper installation, and replacement of water pollution control practices damaged by the Contractor's negligence, shall not be considered as included in the cost for performing maintenance.

The provisions for sharing maintenance costs shall not relieve the Contractor from the responsibility for providing appropriate maintenance on items with no shared maintenance costs.

Full compensation for non-shared maintenance costs of water pollution control practices, as specified in this section, "Water Pollution Control," shall be considered as included in the contract lump sum price paid for water pollution control and no additional compensation will be allowed therefor.

Water pollution control practices for which there is a contract item of work, will be measured and paid for as that contract item of work.

## 10-1.04 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.

For residents with private backyards adjacent to the Right of Way, before replacing existing fence with a temporary construction fence, a notice shall be sent to the private property owner 30 days in advance. Screen shall be installed along with temporary construction fence to preserve privacy.

Chain link fence fabric shall be woven from 3.76 millimeter (9-gauge) galvanized steel wire. Mesh openings in chain link fence fabric shall be approximately 83 millimeters vertically and 133 millimeters horizontally. Plastic slats shall be manufactured from a high-density virgin polyethylene with ultraviolet inhibitors, shall be green in color, and shall have a flat, tubular cross section with a wall thickness of approximately 0.8 millimeters, approximately 60.5 millimeters wide and length equal to the designated fence height.

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 and screen 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.

## 10-1.041 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 mesh manufactured from polypropylene or polyethylene and shall be orange in color. High visibility fabric may be virgin or recycled polymer materials, or a combination of virgin and recycled polymer materials. No virgin or recycled polymer materials shall contain biodegradable filler materials that degrade the physical or chemical characteristics of the finished fabric. High visibility fabric shall be fully stabilized ultraviolet (UV) resistant. High visibility fabric 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. Posts shall be fir or pine, a minimum of 38 mm x 50 mm in size, and a minimum 1.6 m in length. One end of the post shall be pointed. Posts shall not be treated with wood preservative.
B. Posts shall be steel and 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, as determined by the Engineer.
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. Posts shall be driven into the soil a minimum of 400 mm. Posts shall be spaced at 2-m centers minimum and shall at all times support the fence in a vertical, upright position.
B. Temporary fence (Type ESA) shall be constructed prior to any clearing and grubbing work and a sufficient distance from protected plants to enclose all of the foliage canopy and not encroach upon visible roots of the plants.
C. Temporary fence (Type ESA) shall be located to be unobstructed from view, as determined by the Engineer.

When no longer required for the work, as determined by the Engineer, temporary fence (Type ESA) shall be removed. Removed temporary fence (Type ESA) shall become the property of the Contractor and shall be removed from the site of the work, 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 the second paragraph of 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 occurred.

**MEASUREMENT AND PAYMENT**

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

The contract price paid per meter for temporary fence (Type ESA) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing temporary fence (Type ESA) complete in place, including maintenance and removal and disposal of materials, as specified in these special provisions, and as directed by the Engineer.

## 10-1.05 PRESERVATION OF PROPERTY

Attention is directed to Section 7-1.11, "Preservation of Property," of the Standard Specifications and these special provisions.

Existing trees, and shrubs, that are not to be removed, and are injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor . The minimum size of tree replacement shall be 600 mm box and the minimum size of shrub replacement shall be No. 15 container Replacement planting shall conform to the requirements in Section 20-4.07, "Replacement," of the Standard Specifications. The Contractor shall water replacement plants in conformance with the provisions in Section 20-4.06, "Watering," of the Standard Specifications.

Damaged or injured plants shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-l.13 of the Standard Specifications. At the option of the Contractor, removed trees and shrubs may be reduced to chips. The chipped material shall be spread within the highway right of way at locations designated by the Engineer.

Replacement planting of injured or damaged trees, and shrubs, shall be completed prior to the start of the plant establishment period. Replacement planting shall conform to the provisions in Section 20-4.05, "Planting," of the Standard Specifications.

## 10-1.06 DAMAGE REPAIR

Attention is directed to Section 7-1.16, "Contractor's Responsibility for the Work and Materials," and Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications and these special provisions.

When as a result of freezing conditions (as defined herein) during the plant establishment period, plants have died or, in the opinion of the Engineer, have deteriorated to a point beyond which the plants will not mature as typical examples of their species, the Engineer may direct replacement of the affected plants. The total cost of ordered plant replacement work will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. A freezing condition, for the purpose of this specification, occurs when the temperature at or near the affected area has been officially recorded below 0°C and plants have been killed or damaged to the degree described above.

When the provisions in Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications are applicable, the provisions above for payment of costs for repair of damage due to rain, freezing conditions and drought shall not apply.

## 10-1.07 RELIEF FROM MAINTENANCE AND RESPONSIBILITY

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

## 10-1.08 COOPERATION

Attention is directed to Section 7-1.14, "Cooperation," and Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications and these special provisions.

It is anticipated that work by another contractor (Contract No. 08-463234) to replace planting in Riverside on Route 60 from 1.3 km west of Valley Way UC to 0.4 km West of Route 60/91/215 Separation (KP 6.7 to KP 11.9) may be in progress adjacent to or within the limits of this project during progress of the work on this contract.

It is anticipated that work by another contractor (Contract No. 08-473604) to maintain planting in Riverside on Route 60 from Valley Way UC to 60/91/215 Separation (KP 7.5 to KP 12.2) may be in progress adjacent to or within the limits of this project during progress of the work on this contract.

It is anticipated that work by another contractor (Contract No. 08-0A4104) to retrofit wheelchair ramps in Riverside on Route 60 from Valley Way UC to Linden Street OC (KP 7.5 to KP11.1) and on Route 215 from Valley Way UC to Linden

Street OC (KP 7.5 to KP11.1) may be in progress adjacent to or within the limits of this project during progress of the work on this contract.

It is anticipated that work by another contractor (Contract No. 08-4221U4) to rehabilitate pavement and install fiber optic system in Riverside on Route 91 from Brockton/Mary Street UC UC to Route 60/91/215 Separation (KP 17.4 to KP 21.6) may be in progress adjacent to or within the limits of this project during progress of the work on this contract.

## 10-1.09 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

The Contractor shall submit to the Engineer practicable critical path method (CPM) progress schedules in conformance with these special provisions. Whenever the term "schedule" is used in this section it shall mean CPM progress schedule.

Attention is directed to "Payments" of Section 5 of these special provisions.

The provisions in Section 8-1.04, "Progress Schedule," of the Standard Specifications shall not apply.

### DEFINITIONS

The following definitions shall apply to this section:

A. 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.
B. BASELINE SCHEDULE.—The initial schedule representing the Contractor's work plan on the first working day of the project.
C. CONTRACT COMPLETION DATE.—The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer in conformance with the provisions in Section 8-1.06, "Time of Completion," of the Standard Specifications.
D. 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.
E. 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.
F. 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."
G. EARLY COMPLETION TIME.—The difference in time between an early scheduled completion date and the contract completion date.
H. FLOAT.—The difference between the earliest and latest allowable start or finish times for an activity.
I. 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.
J. NARRATIVE REPORT.—A document submitted with each schedule that discusses topics related to project progress and scheduling.
K. 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.
L. SCHEDULED COMPLETION DATE.—The planned project finish date shown on the current accepted schedule.
M. 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.
N. 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.
O. TOTAL FLOAT.—The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.
P. UPDATE SCHEDULE.—A current schedule developed from the baseline or subsequent schedule through regular monthly review to incorporate as-built progress and any planned changes.

### GENERAL REQUIREMENTS

The Contractor shall submit to the Engineer baseline, monthly update and final update schedules, each consistent in all respects with the time and order of work requirements of the contract. The project work shall be executed in the sequence indicated on the current accepted schedule.

Schedules shall show the order in which the Contractor proposes to carry out the work with logical links between time-scaled work activities, and calculations made using the critical path method to determine the controlling operation or operations. The Contractor is responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

The Contractor shall produce schedules using computer software and shall furnish compatible software for the Engineer's exclusive possession and use. The Contractor shall furnish network diagrams, narrative reports, tabular reports and schedule data as parts of each schedule submittal.

Schedules shall include, but not be limited to, activities that show the following that are applicable to the project:

A. Project characteristics, salient features, or interfaces, including those with outside entities, that could affect time of completion.
B. Project start date, scheduled completion date and other milestones.
C. Work performed by the Contractor, subcontractors and suppliers.
D. Submittal development, delivery, review and approval, including those from the Contractor, subcontractors and suppliers.
E. Procurement, delivery, installation and testing of materials, plants and equipment.
F. Testing and settlement periods.
G. Utility notification and relocation.
H. Erection and removal of falsework and shoring.
I. Major traffic stage switches.
J. Finishing roadway and final cleanup.
K. State-owned float as the predecessor activity to the scheduled completion date.

Schedules shall have not less than 50 and not more than 500 activities, unless otherwise authorized by the Engineer. The number of activities shall 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 shall include the following:

A. A clear and legible description.
B. Start and finish dates.
C. 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.
D. At least one predecessor and one successor activity, except for project start and finish milestones.
E. Required constraints.
F. Codes for responsibility, stage, work shifts, location and contract pay item numbers.

The Contractor may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time shall be considered a resource for the exclusive use of the Contractor. The Contractor 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. The Contractor may also submit for approval a cost reduction incentive proposal in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications that will reduce time of construction.

The Contractor may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. The Contractor shall provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule.

State-owned float shall be 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. The Contractor shall prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action in conformance with the provisions in "Time Impact Analysis" specified herein. The Engineer will document State-owned float by directing the Contractor to update the State-owned float activity on the next update schedule. The Contractor shall 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, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications. The Contractor shall prepare a time impact analysis to determine the effect of the change in conformance with the provisions in "Time Impact Analysis" specified herein, and shall include the impacts acceptable to the Engineer in the next update 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 shall not waive any contract requirements and shall not relieve the Contractor of any obligation thereunder or responsibility for submitting complete and accurate information. Schedules that are rejected shall be corrected by the Contractor and resubmitted to the Engineer within 5 working days of notification by the Engineer, at which time a new review period of one week will begin.

Errors or omissions on schedules shall not relieve the Contractor 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 the Contractor or the Engineer discover that any aspect of the schedule has an error or omission, it shall be corrected by the Contractor on the next update schedule.

**COMPUTER SOFTWARE**

The Contractor shall submit to the Engineer for approval a description of proposed software before delivery. The software shall be the current version of Primavera SureTrak Project Manager for Windows, or equal, and shall be compatible with Windows NT (version 4.0) operating system. If software other than SureTrak is proposed, it shall be capable of generating files that can be imported into SureTrak.

The Contractor shall furnish schedule software and all original software instruction manuals to the Engineer with submittal of the baseline schedule. The furnished schedule software shall become the property of the State and will not be returned to the Contractor. The State will compensate the Contractor in conformance with the provisions in Section 4-1.03, "Extra Work," of the Standard Specifications for replacement of software which is damaged, lost or stolen after delivery to the Engineer.

The Contractor shall instruct the Engineer in the use of the software and provide software support until the contract is accepted. Within 20 working days of contract approval, the Contractor shall 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 the Contractor 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 software other than SureTrak is furnished, then the training session shall be a total of 16-hours for each Department employee.

**NETWORK DIAGRAMS, REPORTS AND DATA**

The Contractor shall include the following for each schedule submittal:

A. Two sets of originally plotted, time-scaled network diagrams.
B. Two copies of a narrative report.
C. Two copies of each of 3 sorts of the CPM software-generated tabular reports.
D. One 1.44-megabyte 90 mm (3.5 inch) floppy diskette containing the schedule data.

The time-scaled network diagrams shall conform to the following:

A. Show a continuous flow of information from left to right.
B. Be based on early start and early finish dates of activities.
C. Clearly show the primary paths of criticality using graphical presentation.
D. Be prepared on E-size sheets, 860 mm x 1120 mm (34 inch x 44 inch).
E. Include a title block and a timeline on each page.

The narrative report shall be organized in the following sequence with all applicable documents included:

A. Contractor's transmittal letter.
B. Work completed during the period.
C. 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.
D. Description of the current critical path.
E. Changes to the critical path and scheduled completion date since the last schedule submittal.
F. Description of problem areas.
G. Current and anticipated delays:

    1. Cause of delay.
    2. Impact of delay on other activities, milestones and completion dates.
    3. Corrective action and schedule adjustments to correct the delay.

H. Pending items and status thereof:

1. Permits
2. Change orders
3. Time adjustments
4. Non-compliance notices

I. Reasons for an early or late scheduled completion date in comparison to the contract completion date.

Tabular reports shall be software-generated and provide information for each activity included in the project schedule. Three different reports shall be sorted by (1) activity number, (2) early start and (3) total float. Tabular reports shall be 215 mm x 280 mm (8 1/2 inch x 11 inch) in size and shall include, as a minimum, the following applicable information:

A. Data date
B. Activity number and description
C. Predecessor and successor activity numbers and descriptions
D. Activity codes
E. Scheduled, or actual and remaining durations (work days) for each activity
F. Earliest start (calendar) date
G. Earliest finish (calendar) date
H. Actual start (calendar) date
I. Actual finish (calendar) date
J. Latest start (calendar) date
K. Latest finish (calendar) date
L. Free float (work days)
M. Total float (work days)
N. Percentage of activity complete and remaining duration for incomplete activities.
O. Lags
P. Required constraints

Schedule submittals will only be considered complete when all documents and data have been provided as described above.

**PRE-CONSTRUCTION SCHEDULING CONFERENCE**

The Contractor shall schedule and the Engineer will conduct a pre-construction scheduling conference with the Contractor's project manager and construction scheduler within 10 working days of the approval of the contract. At this meeting the Engineer will review the requirements of this section of the special provisions with the Contractor.

The Contractor shall submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and shall be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of these special provisions. If the Contractor proposes deviations to the construction staging of the project, then the general time-scaled logic diagram shall also display the deviations and resulting time impacts. The Contractor shall be prepared to discuss the proposal.

At this meeting, the Contractor shall additionally submit the alphanumeric coding structure and the activity identification system for labeling the work activities. To easily identify relationships, each activity description shall 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 will review the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to the Contractor for implementation.

**BASELINE SCHEDULE**

Beginning the week following the pre-construction scheduling conference, the Contractor shall meet with the Engineer weekly until the baseline schedule is accepted by the Engineer to discuss schedule development and resolve schedule issues.

The Contractor shall submit to the Engineer a baseline schedule within 20 working days of approval of the contract. The Contractor shall allow 3 weeks for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal will not be considered complete until the computer software is delivered and installed for use in review of the schedule.

The baseline schedule shall include the entire scope of work and how the Contractor plans to complete all work contemplated. The baseline schedule shall show the activities that define the critical path. Multiple critical paths and near-critical paths shall be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities shall be critical or near critical, unless otherwise authorized by the Engineer.

The baseline schedule shall not extend beyond the number of working days specified in these special provisions. The baseline schedule shall have a data date of the first working day of the contract and not include any completed work to date. The baseline schedule shall not attribute negative float or negative lag to any activity.

If the Contractor submits an early completion baseline schedule that shows contract completion in less than 85 percent of the working days specified in these special provisions, the baseline schedule shall be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of on-site construction activities. The Contractor shall 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 shall show labor crafts and equipment classes to be utilized on the contract. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

**UPDATE SCHEDULE**

The Contractor shall submit an update schedule and meet with the Engineer to review contract progress, on or before the first day of each month, beginning one month after the baseline schedule is accepted. The Contractor shall allow 2 weeks for the Engineer's review after the update schedule and all support data are submitted, except that the review period shall not start until the previous month's required schedule is accepted. Update schedules that are not accepted or rejected within the review period will be considered accepted by the Engineer.

The update schedule shall have a data date of the twenty-first day of the month or other date established by the Engineer. The update schedule shall 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 shall be shown as applicable. Durations for work that has been completed shall be shown on the update schedule as the work actually occurred, including Engineer submittal review and Contractor resubmittal times.

The Contractor 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. The Contractor shall state 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 the Contractor shall submit a time impact analysis as described herein.

**DESIGN SEQUENCING**

The dates specified in Section 1, "Specifications and Plans," of these special provisions, on which the Contractor will be provided the complete design of each project phase, shall be shown as milestones in the baseline schedule, and in subsequent updated and revised schedules.

At the completion of the design for each project phase, the schedule shall be updated showing the actual date the final plans, specifications and estimate of quantities for that phase were provided to the Contractor.

**LIMITATION OF PAYMENTS**

The baseline and subsequent updated schedules shall show the anticipated progress payments to be made to the Contractor and the limits of payments specified in "Limitation of Payments" of these special provisions, with the date the Contractor anticipates reaching the limits and the dates specified being shown as milestones.

After the proceeds of the bond sales become available, the schedule shall be updated showing the actual dates funds became available, anticipated progress payments, and the milestones relative to the next limit of funds.

**TIME IMPACT ANALYSIS**

The Contractor shall submit a written time impact analysis (TIA) to the Engineer with each request for adjustment of contract time, or when the Contractor or Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The TIA shall illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis shall use the accepted schedule that has a data date closest to and prior to the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event being analyzed. The TIA shall 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 shall be equal to the adjustment of contract time. The Engineer may construct and utilize an appropriate project schedule or other recognized method to determine adjustments in contract time until the Contractor provides the TIA.

The Contractor shall submit a TIA in duplicate within 15 working days of receiving a written request for a TIA from the Engineer. The Contractor shall allow the Engineer 2 weeks after receipt to approve or reject the submitted TIA. All approved TIA schedule changes shall be shown on the next update schedule.

If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will be allowed 15 days from the meeting with the Engineer to give notice in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. The Contractor shall only show actual as-built work, not unapproved changes related to the TIA, in subsequent update schedules. If agreement is reached at a later date, approved TIA schedule changes shall be shown on the next update schedule. The Engineer will withhold remaining payment on the schedule contract item if a TIA is requested by the Engineer and not submitted by the Contractor within 15 working days. The schedule item payment will resume on the next estimate after the requested TIA is submitted. No other contract payment will be retained regarding TIA submittals.

**FINAL UPDATE SCHEDULE**

The Contractor shall submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. The Contractor shall provide a written certificate with this submittal signed by the Contractor's project manager and 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.

**RETENTION**

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during each estimate period in which the Contractor fails to submit an acceptable schedule conforming to the requirements of these special provisions as determined by the Engineer. Schedule retentions will be released for payment on the next monthly estimate for partial payment following the date that acceptable schedules are submitted to the Engineer or as otherwise specified herein. Upon completion of all contract work and submittal of the final update schedule and certification, any remaining retained funds associated with this section, "Progress Schedule (Critical Path Method)", will be released for payment. Retentions held in conformance with this section shall be in addition to other retentions provided for in the contract. No interest will be due the Contractor on retention amounts.

**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) shall include 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:

A. 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. Completion of 5 percent of all contract item work.
    2. Acceptance of all schedules and TIAs required to the time when 5 percent of all contract item work is complete.
    3. Delivery of schedule software to the Engineer.
    4. Completion of required schedule software training.

B. 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 TIAs required to the time when 25 percent of all contract item work is complete.

C. 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 TIAs required to the time when 50 percent of all contract item work is complete.

D. 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 TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If the Contractor fails to complete any of the work or provide any of the schedules required by this section, the Engineer shall make an adjustment in compensation in conformance with the provisions 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 furnishing schedules.

**10-1.10 TIME-RELATED OVERHEAD**

The Contractor will be compensated for time-related overhead in conformance with these special provisions.

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.

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 independent 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 the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31. The audit examination and report 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 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 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. Other suspensions mutually agreed upon between the Engineer 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 joint venture partners, subcontractors, suppliers or other parties associated with the Contractor shall be considered as included in the various overhead costs for which the Contractor is compensated, and no additional compensation will be allowed therefor.

For the purpose of making partial payments pursuant to the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications, the number of working days to be paid for time-related overhead in each monthly partial payment will be the number of working days, specified above to be measured for payment that occurred during that monthly estimate period, including compensable suspensions and right of way delays. Working days granted by contract change order due to

extra work or changes in character of the work, will be paid for upon completion of the contract. The amount earned per working day for time-related overhead shall be the lesser of the following amounts:

A) The contract item price.
B) Twenty percent of the original total contract amount divided by the number of working days specified in "Beginning of Work, Time of Completion and Liquidated Damages," of these special provisions.

After the work has been completed, except plant establishment work, as provided in Section 20-4.08, "Plant Establishment Work," of the Standard Specifications, the amount of the total contract item price for time-related overhead not yet paid will be included for payment in the first estimate made after completion of roadway construction work, in conformance with the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications.

**10-1.11 OBSTRUCTIONS**

Attention is directed to Section 8-1.10, "Utility and Non-Highway Facilities," and Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Attention is directed to "Welded Steel Pipe Casing (Bridge)(Natural Gas) of these special provisions for the construction window for the gas utility to complete installation and testing of the natural gas carrier pipe.

Attention is directed to the existence of certain underground facilities that may require special precautions be taken by the Contractor to protect the health, safety and welfare of workers and of the public. Facilities requiring special precautions include, but are not limited to: conductors of petroleum products, oxygen, chlorine, and toxic or flammable gases; natural gas in pipelines greater than 150 mm in diameter or pipelines operating at pressures greater than 415 kPa (gage); underground electric supply system conductors or cables, with potential to ground of more than 300 V, either directly buried or in a duct or conduit which do not have concentric grounded or other effectively grounded metal shields or sheaths.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include, but are not limited to, the following:

| Notification Center | Telephone Number |
|---|---|
| Underground Service Alert-Northern California (USA) | 1-800-642-2444<br>1-800-227-2600 |
| Underground Service Alert-Southern California (USA) | 1-800-422-4133<br>1-800-227-2600 |

All utilities will be relocated before the start of construction except for the following: Installation of the following utility facilities inside the structures will require coordination with the Contractor's operations. The Contractor shall make the necessary arrangements with the utility company, through the Engineer, and shall submit a schedule of work, verified by a representative of the utility company, to the Engineer. The schedule of work shall provide not less than the following number of working days, as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications for the utility company to complete their work:

| AT&T | |
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| Ruben Martinez: (909) 776-3914 | 360 East Alessandro Blvd.<br>Riverside, CA 92508 |
| | |
| CHARTER COMMUNICATIONS | www.Chartercom.com |
| Jun Capulong: (909)343-5171<br>eMail: ccapulong@chartercom.com | 6680 View Park Court<br>Riverside, CA 92503 |
| Erwin Tando: (909)343-5139 cell: 354-8256<br>eMail: etando@chartercom.com | 6680 View Park Court<br>Riverside, CA 92503 |
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| CITY OF RIVERSIDE-SEWER | www.ci.riverside.ca.us |
| L.F. (Sandy) Caldwell: (909)826-5348<br>eMail: Csandy@ ci.riverside.ca.us | 3900 Main Street-3rd Floor<br>Riverside, CA 92522 |
| John Claus: (909) 351-6187<br>johnc@ci.riverside.ca.us | 5950 Acorn Street<br>Riverside, CA 92504 |

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| CITY OF RIVERSIDE-ENERGY DELIVERY | www.ci.riverside.ca.us |
| Mike Torelli: (909)826-5404<br>eMail: mtorelli@ ci.riverside.ca.us | 3900 Main Street-4th Floor<br>Riverside, CA 92522 |
| CITY OF RIVERSIDE-WATER | www.ci.riverside.ca.us |
| Kevin Milligan: (909)826-5793<br>eMail: kmilligan@ ci.riverside.ca.us | 3900 Main Street-4th Floor<br>Riverside, CA 92522 |
| Kevin Munns: (909)826-5820<br>eMail: kmunns@ci.riverside.ca.us | 3900 Main Street-4th Floor<br>Riverside, CA 92522 |
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| EASTERN MUNICIPAL WATER DISTRICT | www.emwd.org |
| Victor Barreto: (909)928-3777 X4439<br>Abe Mendoza: (909)928-3777 X4431 | 2270 Trumble Road<br>Perris, CA 92570 |
| | |
| KINDER-MORGAN | |
| Don Quinn: (714)560-4940 | 1100 Town & Country Road<br>Orange, CA 92868 |
| | |
| SBC-Formerly 'Pacbell' | www.SBC.com |
| Delia Lerma: (714)237-6238 /pgr: (714)268-9621<br>eMail: dl1435@SBC.com | 1265 Van Buren Street, Rm 180<br>Anaheim, CA 92807 |
| Susan Morgan: (714)237-6207 /pgr: (714)268-9621<br>eMail: sm7247@msg.pacbell.com | 1265 Van Buren Street, Rm 180<br>Anaheim, CA 92807 |
| | |
| SOUTHERN CALIFORNIA EDISON-SCE | www.SCE.com |
| Carol Brown: (909)506-5533 /cell: (909)506-5533<br>eMail: browncj@sce.com | 14799 Chestnut Street<br>Westminister, CA 92683 |
| | |
| SEMPRA UTILITIES-Formerly The Gas Company | www.SEMPRAUTILITIES.com |
| Douglas Churchill: (909)335-7756<br>eMail: dchurchill@semprautilities.com | 1981 West Lugonia Ave.<br>Redlands, CA 92374-9720 |
| Ken Kennedy: (909)335-7716<br>eMail: kkennedy@semprautilities.com | 1981 West Lugonia Ave.<br>Redlands, CA 92374-9720 |
| | |
| SPRINT COMMUNICATIONS COMPANY | www.SPRINT.com |
| Chuck Shenk: (562)428-4414 /cell: (562)712-9279<br>eMail: charles.shenk@mail.sprint.com | 6508 Gundry Ave.<br>Long Beach, CA 90805 |
| Mr. Lynn Durrett: (909)873-8022 /cell: (909)334-5754<br>james.l.durrett@mail.sprint.com | 282 S. Sycamore Ave.<br>Rialto, CA 92376 |
| | |
| VERIZON | www.VERIZON.com |
| Tom Driskill: (909)929-9412 | 150 South Juanita<br>Hemet, CA 92543 |
| | |
| WILLIAMS COMMUNICATIONS-WCG | www.WCG.com |
| Jim Silvia: (909)926-5785 /cell: (918)625-4270<br>eMail: | 35099 West Florida, G-7<br>Riverside, CA 92545 |
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| WESTERN MUNICIPAL WATER DISTRICT | www.WMWD.com |

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| Sonia Huff: (909)798-5032<br>eMail: shuff@wmwd.com | 450 Alessandro Blvd.<br>Riverside, CA 92508 |
| | |
| ATC | |
| Scott D. Levine: (858)569-0692 | 9620 Chesapeake Drive, Suite 203 San Diego, CA 92123 |

| UTILITY OWNER / Conduit-Carrier | LOCATION | WORKING DAYS |
|---|---|---|
| City of Riverside-Water-254mm | Box Springs OC<br>(Bridge No. 56-0804 ) | 45 Days |
| SBC- (6) 110mm O.D. / 2H X 3W Stack | Box Springs OC<br>(Bridge No. 56-0804) | 45 Days |
| SCE- (4) 127mm; (2) 152mm | Box Springs OC<br>(Bridge No. 56-0804) | 45 Days |

| UTILITY OWNER / Conduit-Carrier | LOCATION | WORKING DAYS |
|---|---|---|
| City of Riverside-Energy Delivery<br>(4) 127mm; | Blaine Street OC<br>(Bridge No. 56-0395) | 45 Days |
| City of Riverside-Communication<br>(2) 51mm; | Blaine Street OC<br>(Bridge No. 56-0395) | 45 Days |
| SEMPRA Utilities<br>(1) 305mm; | Blaine Street OC<br>(Bridge No. 56-0395) | 45 Days |

| UTILITY OWNER / Conduit-Carrier | LOCATION | WORKING DAYS |
|---|---|---|
| City of Riverside-Energy Delivery<br>(4) 127mm; | Iowa Avenue OC<br>(Bridge No. 56-0396) | 45 Days |
| City of Riverside-Communication<br>(2) 51mm; | Iowa Avenue OC<br>(Bridge No. 56-0396) | 45 Days |

| UTILITY OWNER / Conduit-Carrier | LOCATION | WORKING DAYS |
|---|---|---|
| City of Riverside-Energy Delivery<br>(4) 127mm; | Linden Avenue OC<br>(Bridge No. 56-0397) | 45 Days |
| City of Riverside-Communication<br>(2) 51mm; | Linden Avenue OC<br>(Bridge No. 56-0397) | 45 Days |

| ***AT&T*** | | | |
|---|---|---|---|
| Ruben Martinez: (909) 776-3914 | | 360 East Alessandro Blvd.<br>Riverside, CA 92508 | |
| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
| 1) PROTECT IN PLACE Fiber Optic | Chicago St 8.9m Rt. Sta 20+22 | --- | --- |

| ***ATC*** | | | |
|---|---|---|---|
| Scott D. Levine: (858)569-0692 | | 9620 Chesapeake Drive, Suite 203<br>San Diego, CA 92123 | |
| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
| 1) PROTECT IN PLACE Well | 11.27m Rt Columbia Off Ramp Sta 9+28 +/- | --- | --- |

| ***CITY OF RIVERSIDE-ENERGY DELIVERY*** | | www.ci.riverside.ca.us | |
|---|---|---|---|
| Mike Torelli: (909)826-5404<br>eMail: mtorelli@ ci.riverside.ca.us | | 3900 Main Street-4th Floor<br>Riverside, CA 92522 | |
| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
| 1) ADJUST TO GRADE COR Controller Box | Sycamore Canyon Blvd.<br>13.93m Rt Sta "3SYC" 13+37.29 | 10 | 10 working days |
| 2) ADJUST TO GRADE Electric MH | Sycamore Canyon Blvd.<br>15.0m Rt Sta "3SYC" 14+15.62 | 10 | 10 working days |
| 3) RELOCATE Electric Vault V5946 | W/B Sycamore Canyon Blvd.<br>16.62m Lt Sta "3SYC" 15+56.95<br>Existing Rivercrest Dr. | 45 | 10 working days |
| 4) RELOCATE Underground Electric | Exist. Rivercrest Dr<br>From 0.5m Lt Sta "3N" 10+68.62<br>to 13.80m Lt Sta "3N" 13+50.00 | 10 | 10 working days |
| 5) RELOCATE UG Electric | Exist. Rivercrest Dr<br>From 20.84m Rt Sta "3N" 10+68.62<br>to 4.80m Rt Sta "3N" 13+50.00 | 45 | 10 working days |

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|---|---|---|---|
| 6) RELOCATE UG Electric | Exist. Rivercrest Dr From 13.80m Lt Sta "3N" 13+50.00 to 72.36m Rt Sta "3N" 15+09.58 | 45 | 10 working days |
| 7) RELOCATE UG Electric | From Down St 7.5m Rt Sta 141+94 (PP#36632) To La Cadena Dr 18.5m Rt Sta 12+87 (PP#36641) | --- | 10 working days |
| 8) PROTECT IN PLACE Electrical Overhead until UG Complete | From Blaine St 12.1 m Lt Sta 18+60 to Blaine St 9.8 m Lt Sta 18+95 | --- | --- |
| | From Blaine St 10.3 m Lt Sta 20+98 to Blaine St 10.6 m Lt Sta 21+36 | --- | |
| 9) PROTECT IN PLACE Electrical OH until UG Complete | | | --- |
| | From Iowa Ave 13.1m Lt Sta 20+91 To Linden Ave 12.7 m Rt Sta 19+52 | --- | |
| 10) PROTECT IN PLACE Electrical OH until UG Complete | | | --- |
| | From Iowa Ave 13.1 m Lt Sta 20+91 to Iowa Ave 12.1m Rt Sta 20+32 | --- | |
| | | | --- |
| 11) PROTECT IN PLACE Electrical OH until UG Complete | From Linden Ave 10.3 m Rt Sta 18+99 to Linden Ave 12.7 m Rt Sta 19+53 | --- | |
| | Mainline 42.7m Rt Sta 1009+86 | --- | |
| 12) PROTECT IN PLACE UG Elec until Iowa Br Complete | University Ave 18.1m Lt Sta 21+12 | --- | |
| | From MLK Blvd EB On-Ramp 13.4m Rt Sta 22+99 to MLK Blvd EB On-Ramp 28.2m Rt Sta 25+76 | --- | |
| 13) PROTECT IN PLACE Electrical OH until UG Complete | Proposed El Cerrito Dr 8.4m Rt Sta 31+01 | 90 | |
| 14) PROTECT IN PLACE UG Conduits and Vaults | Sycamore Cyn Blvd 4.9m Lt Sta 35+64 | --- | |
| | From Sycamore Cyn Blvd 2.0 Rt Sta 41+60 to Sycamore Cyn Blvd 23.6m Rt Sta 47+51 | --- | |
| 15) PROTECT IN PLACE UG Elec and Pull Box | | | |
| 16) PROTECT IN PLACE Electrical OH until UG Complete | From 0.54m Lt Malta Pl Sta 10+00+/- to 4.81m Lt Sta 9+86 +/- | 45 | |
| | From 10.44m Lt & Rt New Kansas St Sta 15+20+/- to 5.63m Lt Sta 15+92 +/- | 90 | |

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| 17) RELOCATE Riser and UG Conductor | From 1.58m Rt NE 91 CONN Sta 138+06 +/- to 6.69m Lt E La Cadena Sta 10+51+/- | 45 | |
| 18) PROTECT IN PLACE UG Pull Box | 22.48m Rt N 215 Sta 6+96 +/- | 45 | |
| | E 215 & E La Cadena Dr | 45 | |
| 20) RELOCATE UG Elec | | | |
| 21) RELOCATE UG Elec | | | |
| 22) RELOCATE UG Elec | | | |
| 23) RELOCATE UG Elec | | | |

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| ***CITY OF RIVERSIDE-SEWER*** | www.ci.riverside.ca.us |
| L.F. (Sandy) Caldwell: (909)826-5348<br>eMail: Csandy@ ci.riverside.ca.us | 3900 Main Street-3rd Floor<br>Riverside, CA 92522 |

| Description of Work on Utiltiy Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
|---|---|---|---|
| 1) RELOCATE 686MM VCP | Sycamore Canyon Blvd.<br>From 1.53m Rt Sta "3SYC" 8+34.08<br>to 3.28m Lt Sta "3SYC" 9+84.64 | 45 | 10 working days |
| 2) PROTECT Sewer MH | Sycamore Canyon Blvd.<br>9.88m Rt Sta "3SYC" 9+09.71 | --- | --- |
| 3) RELOCATE Sewer MH | Sycamore Canyon Blvd.<br>3.22m Lt Sta "3SYC" 9+70.14 | 10 | 10 working days |
| 4) RELOCATE Sewer MH | Box Spring Rd Exit Ramp<br>2.17m Rt Sta "3P" 14+07.57 | 10 | 10 working days |
| 5) RELOCATE Sewer MH | Box Spring Rd Entrance Ramp<br>7.31m Rt Sta "3Q" 11+05.75 | 10 | |
| 6) RELOCATE Sewer MH | Box Spring Rd Exit/Entrance Ramps<br>From 15.61m Rt Sta "3P" 14+03.50<br>to 18.18m Rt Sta "3Q" 11+09.27 | 10 | 10 working days |
| 7) PROTECT Sewer Line | Sycamore Canyon Blvd.<br>5.50m Lt Sta "3SYC" 13+19.00 | --- | 10 working days |
| 8) ADJUST Sewer MH | | | |
| 9) RELOCATE | Sycamore Canyon Blvd.<br>3.76m Lt Sta "3SYC" 13+58.02 | 10 | --- |

| | | | |
|---|---|---|---|
| Sewer Line | | | |
| 10) RELOCATE Sewer Line | Sycamore Canyon Blvd. From 10.76m Lt Sta "3SYC" 13+97.28 to 85.02m Lt Sta "3SYC" 15+07.84 | 45 | 10 working days |
| 11) RELOCATE Sewer MH | Box Spring Rd. Exit Ramp from 2.17m Rt Sta "3P" 14+07.57 to 10.54m Rt Sta "3Q" 10+00.00 | 45 | 10 working days |
| 12) ADJUST Sewer MH | Box Spring Rd. Entrance Ramp 10.33m Rt Sta "3Q" 10+16.41 | 10 | 10 working days |
| 13) ADJUST Sewer MH | Rivercrest Dr. 1.18m Rt Sta "3Z" 12+78.17 | 10 | 10 working days |
| 14) RELOCATE 203mm PVC Sewer | Rivercrest Dr. 7.44m Lt Sta "3Z" 13+02.62 | 10 | 10 working days |
| 15) ADJUST Sewer MH | Rivercrest Dr. From 1.18m Rt Sta "3Z" 12+78.17 to 7.44m Lt Sta "3Z" 13+02.62 | 45 | 10 working days |
| 16) ADJUST Sewer MH | Rivercrest Dr. 8.04m Rt Sta "3Z" 13+06.07 | 10 | 10 working days |
| 17) RELOCATE 203mm PVC Sewer | Rivercrest Dr. 1.13m Lt Sta "3Z" 13+94.59 | 10 | 10 working days |
| 18) RELOCATE Sewer Metering Station MH | Rivercrest Dr. From 8.04m Rt Sta "3Z" 13+06.07 to 1.13m Lt Sta "3Z" 13+94.59 | 45 | 10 working days |
| 19) ADJUST Sewer to Grade | SR-60 45.13m Rt Sta "RIV60" 14+92.60 | 45 | 10 working days |
| 20) ADJUST Sewer to Grade | Blaine St 0.6 m Lt Sta 20+80.1<br>Blaine St 5.4 m Lt Sta 18+80.5 | 10<br>10 | 10 working days |
| 21) ADJUST Sewer MH to Grade | From Central Ave STA 1+45 To Central Ave STA 3+20 | 10 | 10 working days<br>10 working days |
| 22) ADJUST Sewer MH to Grade | From Sycamore Cyn Blvd STA 46+90 To Sycamore Cyn Blvd STA 48+42 | 10 | 10 working days |
| 23) RELOCATE Sewer MH | 13.03m Lt N-W 91 CONN Sta 130+38+/-<br>23.00 m Rt 91 Sta 130+38+/- | 45<br>45 | 10 working days<br>10 working days |
| 24) RELOCATE Sewer MH | 1.15m Rt Spruce Off Ramp Sta 133+32+/- | 45 | 10 working days |
| 25) RELOCATE Sewer MH | From Malta CL Sta 9+74+/- to 4.47m Lt Sta 10+00+/- | --- | 10 working days |

| | | | |
|---|---|---|---|
| | 3.32m Rt Kansas Sta 13+31+/- | 10 | --- |
| 26) PROTECT 203mm Sewer | 3.38m Rt Kansas Sta 14+04+/- | 10 | 10 working days |
| 27) ADJUST Sewer MH to Grade | 1.83m Lt Kansas Sta 14+07+/- | 10 | 10 working days |
| 28) ADJUST Sewer MH to Grade | 7.08m Lt La Cadena Dr Sta 13+98+/- | 10 | 10 working days |
| 29) ADJUST Sewer MH to Grade | 2.50m +/- Rt 1S Sta 10+18+/- | 10 | 10 working days |
| 30) ADJUST Sewer MH to Grade | 4.79m +/- Rt 1S Sta 10+28+/- | 10 | 10 working days |
| 31) ADJUST Sewer MH to Grade | 2.00m +/- Lt & 2.00m +/- Rt Kansas Sta 14+12+/- | --- | 10 working days |
| 32) ADJUST Sewer MH to Grade | 2<br>5.45m Rt N-E 215 CONN Sta 138+74+/- | --- | --- |
| 33) PROTECT Sewer | From 25.45m Rt N-E 215 CONN Sta 138+74+/- to 4.79m Lt 1S Sta 10+31+/- | --- | --- |
| 34) PROTECT Sewer | 25.45m Rt N-E 215 CONN Sta 138+74+/- | --- | --- |
| 35) PROTECT Sewer | From 46.43m Lt 215 S-W CONN Sta 196+92+/- to 26.59m Lt Sta 198+24+/- | 45 | --- |
| 36) PROTECT Sewer | 4.02m Lt 215 S-W CONN Sta 197+78+/-<br>6.26m Lt 215 S-W CONN Sta 197+24+/- | 45<br>45 | 10 working days |
| 37) RELOCATE Sewer | CL W La Cadena Sta 3+88+/- | 10 | 10 working days |
| 38) RELOCATE Sewer | 0.43m Rt W La Cadena Sta 3+98+/- | 10 | 10 working days |
| 39) RELOCATE Sewer | 3.91m Rt W La Cadena Sta 4+00+/- | 10 | 10 working days |
| 40) ADJUST Sewer MH to Grade | 0.64m Rt W La Cadena Sta 7+83+/- | 10 | 10 working days |
| 41) ADJUST Sewer MH to Grade | 5.54m Rt W La Cadena Sta 8+76+/- | 10 | 10 working days |
| 42) ADJUST Sewer MH to Grade | | | 10 working days |
| 43) ADJUST Sewer MH to Grade | | | 10 working days |
| 44) ADJUST Sewer MH | | | |

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|---|---|---|---|
| to Grade | | | |

| ***CITY OF RIVERSIDE-WATER*** | www.ci.riverside.ca.us |
|---|---|
| Kevin Milligan: (909)826-5793<br>eMail: kmilligan@ci.riverside.ca.us<br>Kevin Munns: (909)826-5820<br>eMail: kmunns@ci.riverside.ca.us | 3900 Main Street-4th Floor<br>Riverside, CA 92522 |

| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
|---|---|---|---|
| 1) RELOCATE Water Line | From Spruce St 3.3m Rt Sta 20+29 to N-W Connector 12.2m Lt Sta 146+61 | 45 | 10 working days |
| 2) PROTECT IN PLACE Water Line Until Blaine OC Complete | Along Blaine Ave From Sta 19+40 to 20+61 | --- | --- |
| 3) RELOCATE Water Line | From Sycamore Cyn Blvd 1.3m Rt Sta 31+22 to Sycamore Cyn Blvd 2.5m Rt Sta 34+33 | 45 | 10 working days |
| 4) RELOCATE Water Line | From Central Ave 2.3m Lt Sta 20+24 To Central Ave 2.3m Lt Sta 21+95 | 45 | 10 working days |
| 5) RELOCATE Water Line | From Proposed Central Ave 7.5m Rt Sta 3+47 to Proposed Central Ave 18.3m Rt Sta 2+42 | 45 | 10 working days |
| 6) PROTECT IN PLACE | Sycamore Canyon Blvd STA 46+60 | --- | --- |
| 7) PROTECT IN PLACE until bore/pit between Iowa and Linden crossing freeway complete | From Iowa Ave 5.6m Rt Sta 20+65 to Iowa Ave 4.6m Rt Sta 19+25 | --- | --- |
| 8) PROTECT IN PLACE until bore/pit between Iowa and Linden crossing freeway complete | From Linden St. 6.3m Rt Sta 18+80 to Iowa Ave 3.6m Rt Sta 20+64 | --- | --- |
| 9) PROTECT IN | From Linden St. 4.4m Rt Sta 19+41 to Iowa Ave 4.7m Rt Sta 20+59 | --- | --- |
| | From Linden St 2.3m Rt Sta 18+83 to Iowa Ave 6.7m Sta 20+78 | --- | |

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|---|---|---|---|
| PLACE until bore/pit between Iowa and Linden crossing freeway complete | 27.39m Rt Rte 91 Sta 130+29+/- | 45 | --- |
| 10) PROTECT IN PLACE until bore/pit between Iowa and Linden crossing freeway complete | 41.63m Rt Rte 91 Sta 133+16+/- | 10 | 10 working days |
| | On Malta PL Sta 9+90+/- | 20 | |
| 11) RELOCATE Water Vault | Between Sta 10+10+/- to Sta 10+24+/- of E La Cadena Dr. | 20 | 10 working days |
| 12) RELOCATE Water Valve | 6.70m Lt E La Cadena Dr. Sta 10+11+/- | 10 | 10 working days |
| 13) ADJUST (3) Water Valves | From 6.47m Lt Kansas Ave. Sta 14+06+/- to 6.55m Lt Kansas Ave. Sta 14+16+/- | --- | 10 working days |
| 14) ADJUST (3) Water Valves | 2.27m Lt E La Cadena Dr. Sta 14+04+/- | 10 | 10 working days |
| 15) RELOCATE Fire Hydrant | 3.26m Lt Kansas Ave. Sta 15+93+/- | 10 | 10 working days |
| 16) PROTECT IN PLACE Water Line | From 19.78m Rt N-E Connector Sta 138+53+/- to 51.05m Rt N-E Connector Sta 139+19+/- | 45 | --- |
| 17) RELOCATE Fire Hydrant | 24.60m Rt N-E Connector Sta 138+64+/- | 20 | 10 working days |
| 18) RELOCATE Fire Hydrant | | 45 | 10 working days |
| 19) RELOCATE Water Line | From 7.56m Lt to 58.60m Rt S-E Connector | 20 | 10 working days |
| | S 215 & Strong St | 10 | |
| 20) RELOCATE Water Valves & Meters | 4.50m Lt S-E Connector Sta 193+85+/- | 45 | 10 working days |
| 21) RELOCATE Water Line | From 0.1m Lt S-E Connector Sta 192+38+/- to 3.40m Lt Sta 194+52+/- | 45 | 10 working days |
| 22) RELOCATE Water Valves & Meters | From 29.0m Rt to 16.1m Lt W. La Cadena Sta 5+79+/- | 20 | 10 working days |
| | S 215 & Knoll way St | 10 | |
| 23) RELOCATE Fire Hydrant | | 45 | 10 working days |

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|---|---|---|---|
| 24) RELOCATE Water Line | 21.0m Lt W. La Cadena Dr. Sta 5+58+/- | 20 | 10 working days |
| 25) RELOCATE Water Line | From 29.5m Rt W. La Cadena Dr Sta 5+54+/- to 2.40m Lt W. La Cadena Dr. Sta 8+77+/- | 10 | 10 working days |
| 26) RELOCATE Water Valves & Meters | Between Sta 5+54 to 8+77 on W La Cadena Dr | 20 | 10 working days |
| 27) RELOCATE Fire Hydrant | 7.83m Lt W. La Cadena Dr Sta 8+70+/- | | 10 working days |
| 28) RELOCATE Water Line | W La Cadena & Spring Garden St | | 10 working days |
| 29) RELOCATE Water Valves & Meters | | | 10 working days |
| 30) RELOCATE Fire Hydrant | | | 10 working days |
| 31) RELOCATE Water Valves & Meters | | | 10 working days |

| ***CHARTER COMMUNICATIONS*** | www.Chartercom.com |
|---|---|
| Jun Capulong: (909)343-5171<br>eMail: ccapulong@chartercom.com<br>Erwin Tando: (909)343-5139 cell: 354-8256<br>eMail: etando@chartercom.com | 6680 View Park Court<br>Riverside, CA 92503 |

| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
|---|---|---|---|
| 1) RELOCATE Television Fiber Optic (FO)-Underground (UG) | Sycamore Canyon Blvd. 7.40m Rt Sta "3SYC" 7+37.68 | 30 | 10 working days |
| 2) RELOCATE TVFO-UG | Sycamore Canyon Blvd. From 7.03m Rt Sta "3SYC" 6+91.87 to 8.06m Rt Sta "3SYC" 8+84.92 | 30 | 10 working days |

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|---|---|---|---|
| 3) RELOCATE TVFO-UG | Sycamore Canyon Blvd. 14.7m Rt Sta "3SYC" 9+20 | 30 | 10 working days |
| 4) RELOCATE TVFO-UG | Sycamore Canyon Blvd. 14.8m Rt Sta "3SYC" 9+70 | 30 | |
| 5) PROTECT IN PLACE- FO-UG | Watkins Dr - Central Ave From Central Ave 5.4m Lt Sta 22+03 to Central Ave 13.0m Lt Sta 0+23 | --- | 10 working days |
| 6) PROTECT IN PLACE FO-OH until RELO with COR-E Power Pole (PP) to UG Completed | From Existing Sycanore Cyn Blvd 12.4m Rt Sta 44+19 to Sycamore Cyn Blvd 23.6m Rt Sta 47+50 | --- | --- |

| ***EASTERN MUNICIPAL WATER DISTRICT*** | ***www.emwd.org*** |
|---|---|
| Victor Barreto: (909)928-3777 X4439<br>Abe Mendoza: (909)928-3777 X4431 | 2270 Trumble Road<br>Perris, CA 92570 |

| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
|---|---|---|---|
| 1) RELOCATE water line | I-215 Truck Bypass Connector 21.59m Rt Sta "3N" 10+74.59 | 45 | 10 working days |
| 2) RELOCATE water line | I-215 Truck Bypass Connector From 19.25m Rt Sta "3N" 10+80.00 to 27.79m Rt Sta "3N" 10+83.82 | 45 | 10 working days |
| 3) RELOCATE water line | I-215 Truck Bypass Connector From 15.28m Rt Sta "3N" 10+87.41 to 27.28m Rt Sta "3N" 10+95.55 | 45 | 10 working days |
| 4) RELOCATE water line | I-215 Truck Bypass Connector From 6.82m Lt Sta "3N" 10+75.03 to 16.64m Rt Sta "3N" 10+84.79 | 45 | 10 working days |
| 5) RELOCATE water line | I-215 Truck Bypass Connector From 9.31m Lt Sta "3N" 10+82.49 to 14.11m Rt Sta "3N" 10+91.76 | 45 | 10 working days |
| 6) RELOCATE water line | I-215 Truck Bypass Connector From 21.59m Rt Sta "3N" 10+74.59 to 3.91m Rt Sta "3N" 13+49.77 | 45 | 10 working days |
| | I-215 Truck Bypass Connector 2.45m Rt Sta "3N" 11+48.46 | 45 | |

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|---|---|---|---|
| | I-215 Truck Bypass Connector<br>5.59m Lt Sta "3N" 12+39.34 | 45 | |
| 7) RELOCATE water line | I-215 Truck Bypass Connector<br>4.24m Lt Sta "3N" 13+00.00 | 45 | 10 working days |
| 8) RELOCATE water line | I-215 Truck Bypass Connector<br>From 3.91m Rt Sta "3N" 13+49.77<br>to 8.20m Rt Sta "3Z" 14+26.68 | 45 | 10 working days |
| 9) RELOCATE water line | Rivercrest Dr.<br>14.87m Lt Sta "3Z" 12+80.90 | 45 | 10 working days |
| 10) RELOCATE water line | Rivercrest Dr.<br>24.24m Lt Sta "3Z" 12+98.54<br>Rivercrest Dr.<br>23.69m Rt Sta "3Z" 13+49.59 | 45<br>45 | 10 working days |
| 11) RELOCATE water line | | | 10 working days |
| 12) RELOCATE water line | | | 10 working days |
| 13) RELOCATE water line | | | 10 working days |

| ***KINDER-MORGAN*** | | | |
|---|---|---|---|
| Don Quinn: (714)560-4940 | | 1100 Town & Country Road<br>Orange, CA 92868 | |
| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
| 1) RELOCATE Fuel Line | Rte 60 WB/215 NB Connector<br>From 29.12m Lt Sta "3AA"<br>63+14.13<br>to 94.79m Rt Sta "3M" 14+80.00 | 45 | 10 working days |

| ***SBC-Formerly 'Pacbell'*** | www.SBC.com |
|---|---|
| Delia Lerma: (714)237-6238 /pgr: (714)268-9621<br>eMail: dl1435@SBC.com<br>Susan Morgan: (714)237-6207 /pgr: (714)268-9621<br>eMail: sm7247@msg.pacbell.com | 1265 Van Buren Street, Rm 180<br>Anaheim, CA 92807 |

| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
|---|---|---|---|
| 1) RELOCATE Telephone (T) & Fiber Optic (FO) | Sycamore Canyon Blvd.<br>From 5.12m Lt Sta "3SYC" 6+86.00<br>to 7.28m Lt Sta "3SYC" 9+84.59 | 180 | 10 working days |
| 2) RELOCATE Tel MH & Vault | Sycamore Canyon Blvd.<br>4.72m Lt Sta "3SYC" 8+37.08 | 90 | 10 working days |
| 3) RELOCATE- T & FO-Underground (UG) | Sycamore Canyon Blvd.<br>From 7.28m Lt Sta "3SYC" 9+84.59<br>to 7.17m Lt Sta "3SYC" 11+80.00 | 180 | 10 working days |
| 4) RELOCATE -T & FO –UG | Box Spring Rd.<br>From 19.81m Lt Sta "3X" 12+53.86<br>to 19.30m Lt Sta "3X" 12+68.81 | 180 | 10 working days |
| 5) PROTECT until UNDERGROUND RELOCATION Complete: T & FO Overhead | Box Spring Rd.<br>From 19.81m Lt Sta "3X" 12+53.86<br>to 5.17m Lt Sta "3X" 14+61.21 | --- | --- |
| 6) RELOCATE –T- Underground | Box Spring Rd.<br>From 3.93m Lt Sta "3X" 14+43.70<br>to 16.74m Lt Sta "3Q" 11+02.72 | 90 | 10 working days |
| 7) RELOCATE -T & FO Underground | Box Spring Rd.<br>From 3.93m Lt Sta "3X" 14+43.70<br>to 16.74m Lt Sta "3Q" 11+02.72 | 90 | 10 working days |
| 8) RELOCATE -T & FO Vault | Box Spring Rd. Exit/Entrance Ramps<br>16.74m Lt Sta "3Q" 11+02.72 | 90 | 10 working days |
| 9) RELOCATE -T & FO Underground | Box Spring Rd. Exit/Entrance Ramps<br>From 16.60m Rt Sta "3P" 13+97.47<br>to 18.02m Rt Sta "3Q" 11+22.90 | 90 | 10 working days |
| 10) RELOCATE –T- Underground | SB Box Spring Rd. Exit Ramp<br>From 19.53m Rt Sta "3P" 14+04.61<br>to 15.67m Rt Sta "3P" 14+14.50 | 90 | 10 working days |
| 11) PROTECT IN | Box Spring Rd.<br>0.48m Rt Sta "3X" 14+78.47 | --- | |
| | Box Spring Rd<br>4.87m Lt Sta "3X" 15+43.92 | 10 | 1<br>10 working days |
| | Box Spring Rd. | 90 | |

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|---|---|---|---|
| PLACE -T & FO Underground | From 5.17m Lt Sta "3X" 14+61.21 to 16.87m Lt Sta "3X" 15+59.03 | | --- |
| 12) ADJUST MH to Grade | I-215 30m RT STA 208+97.3 I-215 31m LT STA 209+49.7 | --- | |
| 13) RELOCATE -T & FO Overhead | From MLK Blvd 17.4m Rt Sta 19+71 to Sycamore Canyon Blvd 7.28m Lt Sta "3SYC" 9+85 | 180 | 10 working days |
| 14) PROTECT IN PLACE –T Conduit UG | From 39.71m Rt E91 Spruce Off Ramp Sta 134+60+/- to 5.80m Rt & 12.46 Lt Sta 136+34+/- | 90 | 10 working days |
| 15) RELOCATE -T UG | 3.37m Rt S-W 215 CONN Sta 193+65 +/- | 20 | --- |
| 16) RELOCATE -T UG | 5.68m Lt W La Cadena Dr Sta 4+01 +/- | 20 | 10 working days |
| 17) RELOCATE –Vault | 4.62m Lt W La Cadena Dr Sta 3+97 +/- | 20 --- | 10 working days |
| 18) ADJUST Vault | 14.19m Rt Columbia Off Ramp Sta 9+95 +/- | --- | |
| 19) ADJUST Vault | From 15.10m Rt Columbia Off Ramp Sta 9+95 +/- to 19.62m Rt Sta 10+16+/- | | 10 working days |
| 20) PROTECT IN PLACE Vault | | | 10 working days |
| 21) PROTECT IN PLACE –T Conduit UG | | | |

| ***SEMPRA UTILITIES-Formerly The Gas Company*** | ***www.SEMPRAUTILITIES.com*** |
|---|---|
| Douglas Churchill: (909)335-7756<br>eMail: dchurchill@semprautilities.com<br>Ken Kennedy: (909)335-7716<br>eMail: kkennedy@semprautilities.com | 1981 West Lugonia Ave.<br>Redlands, CA 92374-9720 |

| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1) PROTECT IN PLACE underground gas line | Sycamore Canyon Blvd.<br>From 6.0m Rt Sta "3SYC" 44+45<br>To 4.12m Rt Sta "3SYC" 9+68 | --- | --- |
| 2) PROTECT IN PLACE underground gas line | Sycamore Canyon Blvd.<br>5.96m Rt Sta "3SYC" 8+75.07 | --- | --- |
| 3) PROTECT IN PLACE underground gas line | Sycamore Canyon Blvd.<br>4.40m Rt Sta "3SYC" 9+70.16 | --- | --- |
| 4) RELOCATE underground gas line | Box Spring Rd.<br>From 14.73m Rt Sta "3X" 14+46.15 | 45 | 10 working days |
| 5) RELOCATE underground gas line | Box Spring Rd. Exit/Entrance Ramps<br>From 16.06m Rt Sta "3P" 14+16.17<br>to 14.80m Rt Sta "3Q" 10+26.51 | 45 | 10 working days |
| 6) RELOCATE gas meter | Box Spring Rd. Exit Ramp<br>18.54m Rt Sta "3P" 14+15.72 | 10 | 10 working days |
| 7) RELOCATE underground gas line | Box Spring Rd. Entrance Ramp<br>From 12.93m Rt Sta "3Q" 10+00.00<br>to 5.30m Rt Sta "3Q" 10+80.00 | 45 | 10 working days |
| 8) RELOCATE underground gas line | Box Spring Rd.<br>From 13.40m Rt Sta "3X" 14+63.03<br>to 5.26m Rt Sta "3X" 15+42.55 | 45 | 10 working days |
| 9) RELOCATE underground gas line | Box Spring Rd.<br>From 0.0m Sta "3X" 14+80.00<br>to 12.38m Rt Sta "3X" 14+83.51 | 45 | 10 working days |
| 10) RELOCATE underground gas line | Day St.<br>7.45m Rt Sta "DAY" 21+44.08 | 45 | 10 working days |
| 11) PROTECT IN PLACE underground gas line | Box Spring Rd.<br>From 5.26m Rt Sta "3X" 15+42.55<br>to 42.60m Lt Sta "3AA" 62+60.00 | --- | 10 working days |
| 12) PROTECT IN PLACE underground gas line | Box Spring Rd.<br>From 42.60m Lt Sta "3AA" 62.60.00<br>to 55.76m Lt Sta "3AA" 63+29.62 | --- | --- |
| 13) PROTECT IN PLACE UG Gas Line until Blaine OC Complete | Along Blaine Ave From Sta 19+40 to 20+61 | --- | --- |
| 14) PROTECT IN PLACE underground | Along Existing Sycamore Cyn Blvd Sta from Sta 25+81 to Sta 41+60 | --- | --- |
| | From Proposed Sycamore Cyn Blvd Sta 41+00 to 41+60 | 45 | --- |
| | From Proposed Sycamore Cyn Blvd Sta 41+60 to 44+30 | --- | --- |

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|---|---|---|---|
| gas line<br><br>15) RELOCATE underground gas line<br><br>16) PROTECT IN PLACE underground gas line<br><br>17) RELOCATE underground gas line<br><br>18) PROTECT IN PLACE underground gas line<br><br>19) RELOCATE underground gas line<br><br>20) ADJUST TO GRADE Gas Valve<br><br>21) RELOCATE underground gas line<br><br>22) RELOCATE underground gas line<br><br>23) PROTECT IN PLACE underground gas line | From Existing Sycamore Cyn Blvd Sta 44+20 to 44+45<br><br>Sycamore Canyon Blvd. From 6.0m Rt Sta "3SYC" 44+45 To 4.12m Rt Sta "3SYC" 9+68<br><br>From 42.52m Rt E91 Spruce Off Ramp Sta 134+60+/- to 15.91m LT Sta 136+33+/-<br><br>2.68m Rt Kansas St. Sta 13+31 +/-<br><br>From 0.78m Lt S-W 215 CONN Sta 199+23 +/- to 4.90m Rt W La Cadena Dr Sta 3+91 +/-<br><br>From 31.05m Lt S-215 Sta 2+60 +/- to 23.06 Lt Sta 9+14.27<br><br>From 26.63m Rt to 45.20m Lt N-215 Sta 7+92 +/- | 45<br><br>---<br><br>45<br><br>10<br><br>45<br><br>45<br><br>---<br><br>10 working days | 10 working days<br><br>---<br><br>10 working days<br><br>---<br><br>10 working days<br><br>10 working days<br><br>10 working days<br><br>---<br><br>10 working days<br><br>---<br><br>---<br><br>---

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| ***VERIZON*** | www.VERIZON.com |
|---|---|
| Tom Driskill: (909)929-9412 | 150 South Juanita<br>Hemet, CA 92543 |

| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
|---|---|---|---|
| 1) RELOCATE telephone vault and manhole | I-215 Truck Bypass Connector<br>7.01m Rt Sta "3N" 11+32.53 | 45 | 10 working days |
| 2) RELOCATE telephone-underground | I-215 Truck Bypass Connector<br>From 7.01m Rt Sta "3N" 11+32.53<br>to 30.00m Lt Sta "3Z" 12+58.52 | 45 | 10 working days |
| 3) RELOCATE telephone vault and manhole | I-215 Truck Bypass Connector<br>5.02m Lt Sta "3N" 12+61.68 | 45 | 10 working days |
| | Rivercrest Dr.<br>8.09m Lt Sta "3Z" 12+71.34 | 45 | |
| 4) RELOCATE telephone vault and manhole | Rivercrest Dr.<br>From 30.00m Lt Sta "3Z" 12+58.52<br>to 12.24m Rt Sta "3Z" 14+09.86 | 45 | 10 working days |
| 5) RELOCATE telephone-underground | | | 10 working days |

| ***WESTERN MUNICIPAL WATER DISTRICT*** | www.WMWD.com |
|---|---|
| Sonia Huff: (909)798-5032<br>eMail: shuff@wmwd.com | 450 Alessandro Blvd.<br>Riverside, CA 92508 |

| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
|---|---|---|---|
| 1) PROTECT IN PLACE Water Line | Box Spring Rd.<br>24.15m Rt Sta "3X" 13+51.60 | --- | --- |
| 2) PROTECT IN PLACE Water Line | Box Spring Rd.<br>From 24.15m Rt Sta "3X" 13+51.60<br>to 5.16m Rt Sta "3X" 14+60.00 | --- | --- |
| 3) CASING NEEDS TO BE EXTENDED – | I-215 SB/60 EB Connector<br>From 59.66m Rt Sta "3CC" 12+40.00<br>to 36.64m Rt Sta "3CC" 12+50.94 | 30 | 10 working days |
| 4) CASING NEEDS TO BE EXTENDED | Box Spring Rd.<br>1.77m Lt Sta "3X" 15+03.04 | 30 | 10 working days |
| 5) CASING NEEDS TO BE EXTENDED – | Box Spring Rd.<br>2.94m Lt Sta "3X" 15+03.33 | 30 | 10 working days |
| 6) CASING NEEDS TO BE EXTENDED – | I-215 SB/60 EB Connector<br>From 36.64m Rt Sta "3CC" 12+50.94<br>to 40.25m Lt Sta "3CC" 12+89.62 | 30 | 10 working days |

| ***WIILLIAMS COMMUNICATIONS*** | www.WCG.com |
|---|---|
| Jim Sylvia: (909) 926-5785 Cell: (918) 625-4270<br>eMail: James.Silvia@wcg.com | 35099 West Florida, G-7<br>Riverside, CA 92545 |

| Description of Work on Utility Facility | Approximate Location | Working Days | Advance Notice Prior to Rough Sub Grade Operations |
|---|---|---|---|
| 1) PROTECT until bore completed under Iowa then, RELOCATE Cable / Communication Fiber Optic | From Iowa Ave 9.9m Rt Sta 19+20<br>to Iowa Ave 9.9m Rt 20+80 | --- | --- |
| 2) RELOCATE Cable / Communication Fiber Optic | 14.19m Rt Columbia Off Ramp Sta<br>10+01 +/- | 90 | 10 working days |

**10-1.111 RIGHT OF WAY OBSTRUCTIONS**

Attention is directed to the occupied improvements located within the right of way at:

Route 215, from approximately 36 meters left of Station 4+14 to approximately 36 meters left of Station 4+73.
Route 91, from approximately 268 meters right of Station 137+12 to approximately 267 meters right of Station 137+63.
Route 91, from approximately 232 meters right of Station 137+47 to approximately 358 meters right of Station 138+82.
Route 215, from approximately 43 meters right of Station 12+59 to approximately 186 meters right of Station 15+44.
Route 215, from approximately 151 meters right of Station 12+15 to approximately 55 meters right of Station 12+60.
Route 215, from approximately 121 meters right of Station 218+92 to approximately 100 meters right of Station 219+61.
Route 91, from approximately 36 meters left of Station 130+25 to approximately 52 meters left of Station 131+40.
Route 215, from approximately 194 meters right of Station 15+39 to approximately 192 meters right of Station 15+54.
Route 91, from approximately 33 meters right of Station 136+12 to approximately 98 meters right of Station 136+57.

It is anticipated that these improvements will be vacated and removed by December 1, 2003.

Attention is directed to the occupied improvements located within the right of way at:

Route 215, from approximately 36 meters left of Station 5+74 to approximately 36 meters left of Station 6+04.
Route 215, from approximately 36 meters left of Station 4+72 to approximately 36 meters left of Station 5+39.
Route 215, from approximately 38 meters left of Station 3+14 to approximately 42 meters left of Station 3+93.
Route 215, from approximately 36 meters left of Station 7+63 to approximately 36 meters left of Station 8+07.
Route 215, from approximately 58 meters right of Station 25+96 to approximately 68 meters right of Station 26+11.
Route 215, from approximately 15 meters left of Station 206+41 to approximately 23 meters left of Station 206+56.
Route 215, from approximately 38 meters right of Station 206+36 to approximately 38 meters right of Station 206+52.
Route 215, from approximately 2 meters left of Station 206+40 to approximately 27 meters right of Station 206+53.
Route 215, from approximately 41 meters right of Station 217+93 to approximately 91 meters right of Station 218+82.

It is anticipated that these improvements will be vacated and removed by January 1, 2004.

Attention is directed to the occupied improvements located within the right of way at:

Route 91, from approximately 29 meters right of Station 133+72 to approximately 53 meters right of Station 134+42.
Route 215, from approximately 51 meters right of Station 201+67 to approximately 60 meters right of Station 204+25.
Route 215, from approximately 51 meters right of Station 200+63 to approximately 82 meters right of Station 201+85.
Route 215, from approximately 52 meters right of Station 202+89 to approximately 140 meters right of Station 204+95.
Route 215, from approximately 45 meters right of Station 199+18 to approximately 47 meters right of Station 199+69.
Route 215, from approximately 33 meters left of Station 199+50 to approximately 58 meters left of Station 199+98.
Route 215, from approximately 313 meters right of Station 199+75 to approximately 339 meters right of Station 200+43.

It is anticipated that these improvements will be vacated and removed by February 1, 2004.

Attention is directed to the occupied improvements located within the right of way at:

Route 91, from approximately 57 meters right of Station 135+06 to approximately 123 meters right of Station 136+36.

It is anticipated that these improvements will be vacated and removed by March 1, 2004.

Attention is directed to the occupied improvements located within the right of way at:

Route 91, from approximately 36 meters left of Station 138+10 to approximately 85 meters left of Station 138+95.
Route 91, from approximately 50 meters left of Station 133+06 to approximately 40 meters left of Station 134+30.

Route 215, from approximately 60 meters left of Station 218+25 to approximately 57 meters left of Station 220+09.

It is anticipated that these improvements will be vacated and removed by April 1, 2004.

Attention is directed to the occupied improvements located within the right of way at:

Route 91, from approximately 38 meters left of Station 136+00 to approximately 32 meters left of Station 136+75.

It is anticipated that these improvements will be vacated and removed by August 14, 2004.

The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any action coercive in nature to the occupants of these improvements who have not yet moved from the improvements.

In the event that the improvements mentioned above are not removed by the date specified and, if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the improvements not being removed by the date specified, the State will compensate the Contractor for the delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

**10-1.12 DUST CONTROL**

Dust control shall conform to the provisions in Section 10, "Dust Control," of the Standard Specifications.

**10-1.13 MOBILIZATION**

Mobilization shall conform to the provisions in Section 11, "Mobilization," of the Standard Specifications and these special provisions.

No payment will be made for mobilization upon completion of 5 percent of the original contract amount.

When the monthly partial payment estimate of the amount earned, not including the amount earned for mobilization, is 10 percent or more of the original contract amount, or on April 20, 2004, whichever is later, the total amount earned for mobilization shall be 75 percent of the contract item price for mobilization or 7.5 percent of the original contract amount, whichever is the lesser, and that amount will be included in the estimate for payment.

**10-1.14 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES**

Flagging, signs, and all other 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 traffic control devices are defined as those devices that are small and lightweight (less than 45 kg), and have been in common use for many years. The devices shall be known to be crashworthy by crash testing, crash testing of similar devices, or years of demonstrable safe performance. Category 1 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 traffic control devices. Self-certification shall be provided by the manufacturer or Contractor and shall include the following: date, Federal Aid number (if applicable), expenditure authorization, district, county, route and kilometer post of project limits; company name of certifying vendor, street address, city, state and zip code; printed name, signature and title of certifying person; and an indication of which Category 1 traffic control devices will be used on the project. The Contractor may obtain a standard form for self-certification from the Engineer.

Category 2 traffic control devices are defined as those items that are small and lightweight (less than 45 kg), that are not expected to produce significant vehicular velocity change, but may otherwise be potentially hazardous. Category 2 traffic control devices include: barricades and portable sign supports.

Category 2 devices purchased on or after October 1, 2000 shall be on the Federal Highway Administration (FHWA) Acceptable Crashworthy Category 2 Hardware for Work Zones list. This list is maintained by FHWA and can be located at the following internet address: http://safety.fhwa.dot.gov/fourthlevel/hardware/listing.cfm?code=workzone. The Department maintains a secondary list at the following internet address: http://www.dot.ca.gov/hq/traffops/signtech/signdel/pdf.htm.

Category 2 devices that have not received FHWA acceptance, and were purchased before October 1, 2000, may continue to be used until they complete their useful service life or until January 1, 2003, whichever comes first. Category 2 devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer by the start of the project. The label shall be readable. After January 1, 2003, all Category 2 devices without a label shall not be used on the project.

If requested by the Engineer, the Contractor shall provide a written list of Category 2 devices to be used on the project at least 5 days prior to beginning any work using the devices. For each type of device, the list shall indicate the FHWA acceptance letter number and the name of the manufacturer.

Full compensation for providing self-certification for crashworthiness of Category 1 traffic control devices and for providing a list of Category 2 devices used on the project and labeling Category 2 devices as specified shall be considered as included in the prices paid for the various contract items of work requiring the use of the Category 1 or Category 2 traffic control devices and no additional compensation will be allowed therefor.

### 10-1.141 CONSTRUCTION AREA SIGNS

Construction area signs 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 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.

Attention is directed to "Construction Project Information Signs" of these special provisions regarding the number and type of construction project information signs to be furnished, erected, maintained, and removed and disposed of.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar 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-Northern California (USA) | 1-800-642-2444<br>1-800-227-2600 |
| Underground Service Alert-Southern California (USA) | 1-800-422-4133<br>1-800-227-2600 |

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.

Sign substrates for stationary mounted construction area signs may be fabricated from fiberglass reinforced plastic as specified under "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

The Contractor may be required to cover certain signs during the progress of the work. Signs that are no longer required or that convey inaccurate information to the public shall be immediately covered or removed, or the information shall be corrected. Covers for construction area signs shall be of sufficient size and density to completely block out the complete face of the signs. The retroreflective face of the covered signs shall not be visible either during the day or at night. Covers shall be fastened securely so that the signs remain covered during inclement weather. Covers shall be replaced when they no longer cover the signs properly.

### 10-1.15 MAINTAINING TRAFFIC

Attention is directed to Sections 7-1.08, "Public Convenience," 7-1.09, "Public Safety," and 12, "Construction Area Traffic Control Devices," of the Standard Specifications and to the provisions in "Public Safety" of these special provisions and these special provisions. Nothing in these special provisions shall be construed as relieving the Contractor from the responsibilities specified in Section 7-1.09.

Attention is directed to "Railroad Relations and Insurance" of these special provisions for temporary clearances.

Lane closures shall conform to the provisions in section "Traffic Control System for Lane Closure" of these special provisions.

Driving access to residents and businesses on Sycamore Canyon Boulevard, Rivercrest Drive, Roberta Street, Kansas Avenue, La Cadena West Drive, and La Cadena Drive shall be maintained at all times throughout the construction duration.

Closures of West Campus Drive and Canyon Crest Drive as shown on the stage construction plans shall be between June 18, 2004 to September 14, 2004. The scheduled closure shall be restricted only to the following construction limits:

A) At Campus Drive: From Sta 18+72.9 to Sta 20+85
B) At Canyon Crest Drive: From Sta 18+75 to Sta 21+13.6

A contingency plan shall be provided by the Contractor to the Engineer to open one (1) lane in each direction of traffic for both the West Campus Drive and Canyon Crest Drive in case construction will not be completed after September 14, 2004. This plan shall be submitted and approved by the Engineer 30 days prior to this date.

Pedestrian access through construction areas shall be provided at all times during construction of West Campus Drive and Canyon Crest Drive.

During construction of Linden, Iowa, and Blaine Bridge Overcrossings, service trucks and delivery materials and construction equipment to the work site shall not be allowed to pass at 3rd/Blaine Street in the vicinity of John North High School between 6:45 AM-8:15 AM and 2:20 PM-3:15PM Monday through Friday during the months of September through June and between 7:30 AM-8:00 AM and 12:00 PM-12:30 PM Monday through Friday during the months of July and August.

A flagman shall be provided by the Contractor during those hours to direct traffic for vehicles in and out of John North High School during the tying of the new profile to the existing pavement at Blaine Street.

Compensation for furnishing flagman at John North High School will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. In addition to the provisions set forth in "Public Safety" of these special provisions, whenever work to be performed on the freeway traveled way (except the work of installing, maintaining and removing traffic control devices) is within 1.8 m of the adjacent traffic lane, the adjacent traffic lane shall be closed.

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 being constructed adjacent to and 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.

N215-W91 Connector, Bridge No 56-801G
At Poplar Street off-ramp

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 7.5 | 4.6 |
| | | | |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 7 | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

N215-W91 Connector, Bridge No 56-801G
At Spruce Street OC (span 9)

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 16.4 | 4.6 |
| Pedestrian Openings | 2 | 1.2 | 3.0 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 7 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

N215-W91 Connector, Bridge No 56-801G
At Spruce Street UC (span 25)

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 19.4 | 4.6 |
| Pedestrian Openings | 2 | 1.2 | 3.0 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R, L, and C | 7 meters with C staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

N215-W91 Connector, Bridge No 56-801G
E215-S91 Connector (existing)

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 8.4 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

N215-W91 Connector, Bridge No 56-801G
E215-S91 Connector (proposed)

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 8.4 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

N215-W91 Connector, Bridge No 56-801G
At Route 91

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 2 | 23.3 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R, L, and C | 12 meters with C staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

N215-W91 Connector, Bridge No 56-801G
At Eastbound 91-Northbound 215 loop

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 2 | 9.4 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 12 meters staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

N215-W91 Connector, Bridge No 56-801G
At Route 215

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings, to Beaumont | 1 | 12.9 | 4.6 |
| Vehicle Openings to Ontario and College District | 1 | 19.2 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R, L, and C | 12 meters with C staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

N215-W91 Connector, Bridge No 56-801G
At Westbound 91 – Northbound 215 detour

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 15.3 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

N215-W91 Connector, Bridge No 56-801G
At Down Street

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 12.3 | 4.6 |
| Pedestrian Openings | 1 | 1.2 | 3.0 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 7 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
S-W Connector

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 7.5 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
S-W Connector & Detour

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 9.2 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L | 12 meters staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
Rte 215 to Beaumont & Detour

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 20 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L<br>C | 12 meters<br>12 m staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
Rte 215 to Ontario & Detour

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 16.1 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L<br>C | 12 meters<br>12 m staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
E-W Connector
(North side of loop)

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 7.2 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
E-W Connector (Proposed)
(North side of loop)

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 9.4 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L | 12 meters staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
E-W Connector
(South side of loop)

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 7.2 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
E-W Connector (Proposed)
(South side of loop)

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 9.4 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L | 12 meters staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
Rte 215 to Ontario & Collector Distribution

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 19.2 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L<br>C | 12 meters<br>12 m staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
Rte 215 to Beaumont

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 12.9 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
N-E Connector & Detour

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 12.5 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
N-E Connector

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 11.7 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
Down Street

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 11.1 m | 4.60 m |
| Pedestrian Openings | 1 | 1.2 m | 3.0 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L | 7 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
Spruce Street Off Ramp

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 7.5 m | 4.6 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Southeast Connector (Br. No. 56-0802F)
Spruce Street

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 14.0 | 4.6 |
| Pedestrian Openings | 2 | 1.2 | 3.0 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R & L<br>C | 7 meters staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Separation 60/91/215, Bridge No. 56-0402

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 2 | 18.3 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R, L, and C | 12 meters with C staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Down Street OH (widen), Bridge No. 56-0398
At Down Street

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 12.3 | 4.6 |
| Pedestrian Openings | 1 | 1.2 | 3 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 7 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Spruce Street UC (widen), Bridge No. 56-0399
At Spruce Street

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 2 | 8.2 | 4.6 |
| Pedestrian Openings | 2 | 1.2 | 3 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 7 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Chicago Avenue OH (widen), Bridge No. 56-0403
At Chicago Avenue

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 2 | 9.0 | 4.6 |
| Pedestrian Openings | 2 | 1.2 | 3 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 meters staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Blaine St UC, Bridge No. 56-0395
At Route 215

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 2 | 21.9 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R, L, C | 12 meters with C staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Iowa Avenue OC, Bridge No. 56-0396
At Route 215

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 2 | 21.9 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R, L, C | 12 meters with C staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Linden Avenue OC, Bridge No. 56-0397
At Route 215

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 2 | 21.9 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R, L, C | 12 meters with C staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Martin Luther King Blvd. UC, Bridge No. 56-0803R/L
At Martin Luther King Blvd

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 2 | 9.6 | 4.6 |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 meters staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Box Springs Road OC (Replace)(Br. No. 56-0804)
Northbound Rte 215

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 10.80 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 12 meters staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Box Springs Road OC (Replace)(Br. No. 56-0804)
Southbound Rte 215

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 14.40 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Day Street Undercrossing (Widen)(Br. No. 56-0477)
Day Street

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 15.24 m | 4.60 m |
| Pedestrian Openings East Side Only | 1 | 1.5 m | 3.0 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L<br>C | 12 meters<br>12 m staggered half space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Eastbound 60 Truck Connector(Br. No. 56-0806G)
"3I" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 6.40 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Eastbound 60 Truck Connector (Br. No. 56-0806G)
"3FF" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 11.28 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Eastbound 60 Truck Connector (Br. No. 56-0806G)
"D" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 11.28 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 meters | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Eastbound 60 Truck Connector(Br. No. 56-0806G)
"O" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 7.62 m | 4.60 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 12 meters staggered half 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.

Personal vehicles of the Contractor's employees shall not be parked on the traveled way or shoulders including any section closed to public traffic.

The Contractor shall notify local authorities of the Contractor's intent to begin work at least 10 days before work is begun. The Contractor shall cooperate with local authorities relative to handling traffic through the area and shall make arrangements relative to keeping the working area clear of parked vehicles.

Whenever 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.

On 2-lane, 2-way roadways, whenever vehicles or equipment are parked on the shoulder within 1.8 m of a traffic lane, the shoulder area shall be closed with fluorescent traffic cones or portable delineators placed on a taper in advance of the parked vehicles or equipment and along the edge of the pavement at 7.5 m intervals to a point not less than 7.5 m past the last vehicle or piece of equipment. A minimum of 9 cones or portable delineators shall be used for the taper. A C23 (Road Work Ahead) or C24 (Shoulder Work Ahead) sign shall be mounted on a portable sign stand with flags. The sign shall be placed where designated by the Engineer.

No two consecutive entrance ramps or two consecutive exit ramps in the same direction of travel shall be closed concurrently.

Advance special message signs shall be placed 10 days in advance of the ramp closure. The contractor shall notify the engineer not less than 5 calendar days prior to installing the advance ramp closure warning signs.

Lanes and ramps shall be closed only during the hours shown on the charts and "Table Z" included in this section "Maintaining Traffic." Except work required under Sections 7-1.08 and 7-1.09, work that interferes with public traffic shall be performed only during the hours shown for lane closures.

No lane closures, shoulder closures, or other traffic restrictions will be allowed on special day(s) as shown on "Table Z".

Designated legal holidays are as shown on "Table Z".

Minor deviations from the requirements of this section concerning hours of work which do not significantly change the cost of the work may be permitted upon the written request of the Contractor, if in the opinion of the Engineer, public traffic will be better served and the work expedited. These deviations shall not be adopted by the Contractor until the Engineer has approved the deviations in writing. All other modifications will be made by contract change order.

**Chart No. 1**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 60 KP 18.5-19.8 (EB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | 2 | 2 | 2 | |
| Fridays | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | 2 | 2 | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | 2 | 2 | 2 | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | 2 | |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 2**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 60 KP 18.5-19.8 (WB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | 2 | 2 | 1 | |
| Fridays | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | 2 | 2 | 1 | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | | | | | | | | | | | | | | 2 | 2 | 2 | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | 1 | |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 3**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 60 KP 18.5-19.8 (EB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | X | | | | | | | | | | | | | | | | X | X | X |
| Fridays | X | X | X | X | X | X | | | | | | | | | | | | | | | | | X | X |
| Saturdays | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | X | X | X |
| Sundays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | X | X | X |

Legend:

| X | Ramp may be closed |
|---|---|

| | No work that interferes with public traffic will be allowed |
|---|---|

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 4**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 60 KP 18.5-19.8 (WB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | | | | | | | | | | | | | | | | | X | X | X |
| Fridays | X | X | X | X | X | | | | | | | | | | | | | | | | | X | X | X |
| Saturdays | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | X | X | X |
| Sundays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | X | X | X |

Legend:

| X | Ramp may be closed |
|---|---|

| | No work that interferes with public traffic will be allowed |
|---|---|

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 5**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 91 KP 32.6-34.8 (EB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Wednesdays | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | 2 | 1 | |
| Thursdays through Fridays | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | 2 | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | 2 | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | 2 | 1 | |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

**1.** Closures may not be allowed during certain upcoming special events.

**2.** 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.

**3.** The length of each closure shall not exceed 3 kilometers.

**4.** **4. In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 6**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 91 KP 32.6-34.8 (WB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 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 | 1 | 2 | | | | | | | | | | | | | | | | 2 | 2 |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | 1 |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 7**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 91 KP 32.6-34.8 (EB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Wednesdays | X | X | X | X | X | X | | | | | | | | | | | | | | | | | X | X | |
| Thursdays through Fridays | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | X | |
| Saturdays | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | X | |
| Sundays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | X | X | |

Legend:

| X | Ramp may be closed |
|---|---|

| | No work that interferes with public traffic will be allowed |
|---|---|

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 8**
**EA 08-334844**
**RampLane Requirements**

Location: Riv 91 KP 32.6-34.8 (WB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | | | | | | | | | | | | | | | | | X | X | X | |
| Fridays | X | X | X | X | X | | | | | | | | | | | | | | | | | | X | X | |
| Saturdays | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | X | X | |
| Sundays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | X | X | X | |

Legend:

| X | Ramp may be closed |
|---|---|

| | No work that interferes with public traffic will be allowed |
|---|---|

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 9**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 215 KP 68.9-69.6 (NB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | 2 | 2 | 1 | |
| Fridays | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | 2 | 2 | 2 | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | 2 | 2 | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | 1 | |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 10**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 215 KP 68.9-69.6 (SB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | 2 | 2 | 1 | |
| Fridays | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | 2 | 2 | 2 | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | 2 | 2 | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | 1 | |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 11**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 215 KP 68.9-69.6 (NB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | X | | | | | | | | | | | | | | | | X | X | X |
| Fridays | X | X | X | X | X | X | | | | | | | | | | | | | | | | X | X | X |
| Saturdays | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | X | X |
| Sundays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | X | X | X |

Legend:

X Ramp may be closed

No work that interferes with public traffic will be allowed

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 12**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 215 KP 68.9-69.6 (SB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | | | | | | | | | | | | | | | | | X | X | X |
| Fridays | X | X | X | X | X | | | | | | | | | | | | | | | | | X | X | X |
| Saturdays | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | X | X |
| Sundays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | X | X | X |

Legend:

X Ramp may be closed

No work that interferes with public traffic will be allowed

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 13**
**EA 08-334844**
**Connector Lane Requirements**

Location: Riv 60/91/215 connectors (all directions)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 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 | C | | | | | | | | | | | | | | | | | | | C |

Legend:

| | |
|---|---|
| C | Connector may be closed |
| | No work that interferes with public traffic will be allowed |

**REMARKS:**

**1.** Closures may not be allowed during certain upcoming special events.

**2.** 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.

**3.** No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.

**4.** In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 14**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 215 KP 63.5-68.6 (SB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 1 | 3 | | | | | | | | | | | | | | | 3 | 3 | 2 | 2 | |
| Fridays | 1 | 1 | 1 | 1 | 1 | 3 | | | | | | | | | | | | | | | | 3 | 3 | 2 | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | | | | | | | | | | | | | 3 | 3 | 3 | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | | | | | | | | | | 3 | 3 | 3 | 2 | |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| 3 | Three adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 15**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 215 KP 63.5-68.6 (NB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 3 | | | | | | | | | | | | | | | 3 | 3 | 2 | 2 | 1 | |
| Fridays | 1 | 1 | 1 | 1 | 3 | | | | | | | | | | | | | | | | 3 | 2 | 2 | 2 | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | | | | | | | | | | | | 3 | 3 | 3 | 2 | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | | | | | | | | | | | 3 | 2 | 2 | |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| 3 | Three adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 16**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 215 KP 63.5-68.6(SB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | X | | | | | | | | | | | | | | | X | X | X | X | |
| Fridays | X | X | X | X | X | X | | | | | | | | | | | | | | | | X | X | X | |
| Saturdays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | X | X | X | |
| Sundays | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | X | X | X | X | |

Legend:

| | |
|---|---|
| X | Ramp may be closed |
| | No work that interferes with public traffic will be allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 17**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 215 KP 63.5-68.6 (NB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | | | | | | | | | | | | | | | X | X | X | X | X | |
| Fridays | X | X | X | X | X | | | | | | | | | | | | | | | | X | X | X | X | |
| Saturdays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | X | X | X | X | |
| Sundays | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | X | X | X | |

Legend:

| | |
|---|---|
| X | Ramp may be closed |
| | No work that interferes with public traffic will be allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 18**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 215 KP 62.3-62.8 (SB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | | 2 |
| Fridays | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | | | | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | | | 2 |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 19**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 215 KP 62.3-62.8 (NB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | 2 | 2 | 1 | |
| Fridays | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | 2 | 2 | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | | | 2 | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | | 2 | |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 20**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 215 KP 62.3-62.8 (SB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | X |
| Fridays | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | |
| Saturdays | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | |
| Sundays | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | X |

Legend:

X Ramp may be closed

No work that interferes with public traffic will be allowed

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 21**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 215 KP 62.3-62.8 (NB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | | | | | | | | | | | | | | | | | | X | X | X | |
| Fridays | X | X | X | X | | | | | | | | | | | | | | | | | | | X | X | |
| Saturdays | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | X | |
| Sundays | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | X | |

Legend:

X Ramp may be closed

No work that interferes with public traffic will be allowed

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance and exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 22**
**EA 08-334844**
**Connector Lane Requirements**

Location: Riv 215 (SB) to Riv 60 (EB) Connector

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | 1 |
| Fridays | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | 1 |

Legend:

| | |
|---|---|
| 1 | A minimum of one paved ramp lane, not less than 3.3m wide, shall be open for use by public traffic |
| | No work that interferes with public traffic will be allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance (and only in one direction) will be closed at any time period.

**Chart No. 23**
**EA 08-334844**
**Connector Lane Requirements**

Location: Riv 215 (SB) to 215 (SB) Connector

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | 1 |
| Fridays | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | 1 |

Legend:

| | |
|---|---|
| 1 | A minimum of one paved ramp lane, not less than 3.3m wide, shall be open for use by public traffic |
| | No work that interferes with public traffic will be allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 24**
**EA 08-334844**
**Connector Lane Requirements**

Location: Riv 215 (SB) to 215 (NB) Connector

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 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 | A minimum of one paved ramp lane, not less than 3.3m wide, shall be open for use by public traffic |
| | No work that interferes with public traffic will be allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 25**
**EA 08-334844**
**Connector Lane Requirements**

Location: Riv 60 (WB) to 215 (NB) Connector

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | 1 | 1 | |
| Fridays | 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 | A minimum of one paved ramp lane, not less than 3.3m wide, shall be open for use by public traffic |
| | No work that interferes with public traffic will be allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 26**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 60 KP 21.4-23 (EB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | 2 | 2 | 1 |
| Fridays | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | 2 | 2 |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | 2 | 2 | 2 |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | 1 |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 27**
**EA 08-334844**
**Multilane Lane Requirements**

Location: Riv 60 KP 21.4-23 (WB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | 2 | 2 | 2 | 1 |
| Fridays | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | 2 | 2 | 2 | 1 |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | | | 2 | 2 | 2 |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | 1 |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel |
| 2 | Two adjacent lanes open in direction of travel |
| | No lane closure allowed |

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. The length of each closure shall not exceed 3 kilometers.
4. **In the same direction**, consecutive closures shall be not less than 2 kilometers apart and lanes shall be closed on the same side of the roadbed.

**Chart No. 28**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 60 KP 21.4-23 (EB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | | | | | | | | | | | | | | | | | X | X | X | |
| Fridays | X | X | X | X | X | | | | | | | | | | | | | | | | | | X | X | |
| Saturdays | X | X | X | X | X | X | X | | | | | | | | | | | | | | | X | X | X | |
| Sundays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | X | X | X | |

Legend:

| X | Ramp may be closed |
|---|---|

| | No work that interferes with public traffic will be allowed |
|---|---|

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

**Chart No. 29**
**EA 08-334844**
**Ramp Lane Requirements**

Location: Riv 60 KP 21.4-23 (WB)

| | a.m. | | | | | | | | | | | | p.m. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM HOUR TO HOUR | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mondays through Thursdays | X | X | X | X | X | | | | | | | | | | | | | | | | X | X | X | X | |
| Fridays | X | X | X | X | X | | | | | | | | | | | | | | | | X | X | X | X | |
| Saturdays | X | X | X | X | X | X | X | | | | | | | | | | | | | | | X | X | X | |
| Sundays | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | X | X | X | |

Legend:

| X | Ramp may be closed |
|---|---|

| | No work that interferes with public traffic will be allowed |
|---|---|

**REMARKS:**

1. Closures may not be allowed during certain upcoming special events.
2. 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.
3. No two consecutive (entrance or exit) ramps to be closed in each direction simultaneously.
4. In interchanges, only one entrance ramp (and only in one direction) will be closed at any time period.

# Table "Z"

## District 8 Lane Closure Restrictions For Designated Legal Holidays

| If Holiday falls on | Thu | Fri | Sat | Sun | Mon | Tue | Wed | Thu | Fri | Sat | Sun | Mon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Friday** | x | **H/SD** xx | xx | xx | x | | | | | | | |
| **Saturday** | x | xx | **H/SD** xx | xx | x | | | | | | | |
| **Sunday** | | x | xx | **H/SD** xx | xx | | | | | | | |
| **Monday** | | x | xx | xx | **H/SD** xx | x | | | | | | |
| **Tuesday** | | | | | x | **H/SD** xx | | | | | | |
| **Wednesday** | | | | | | x | **H/SD** xx | | | | | |
| **Thursday** | | | | | | | x | **H/SD** xx | xx | xx | xx | x |

**H =** **Designated Legal Holiday**
January 1st, Third Monday in February, Last Monday in May, July 4th, First Monday in September, November 11th, Thanksgiving Day, December 25th

**SD =** **Special Day/Event**
**Days:** Include Martin Luther King Day, Lincoln's Birthday, Cesar Chavez, Columbus Day and December 26th through December 31st. **No closure** is allowed on these days.
**Events:** See District 8 Special Events List

| | |
|---|---|
| | Refer to Lane Closure Charts in the Special Provisions (if applicable) |
| x | **Preceding the designated Holiday,** the full width of the traveled way shall be open for use by public traffic **after 6 am** |
| x | **Following the designated Holiday**, the full width of the traveled way shall be open for use by public traffic **until 6 pm** |
| xx | The full width of the traveled way shall be open for use by public traffic at **all times.** **No lane closures** will be allowed. |

# 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 Event Dates† | Website | Contact # |
|---|---|---|---|---|---|---|
| Glen Helen Blockbuster Pavilion | 215<br>15 | ***<br>** | University Pkwy to I-15/215 connector<br>I-60 to Devore Road | Various events May-Oct yearly See web site | www.avalonconcerts.com | 909-886-8742 |
| Route 66 Rendezvous | 215 | ** | Mill St. to 5th St | Sept 19-22,2002 | www.route-66.org | 909-889-3980 |
| California Speedway | 10<br>15<br>210<br>66<br>60 | ***<br>***<br>***<br>***<br>*** | LA I-57 to SBD I-215<br>I-15/215 split in Devore to SR-91<br>Haven to Sierra<br>Haven to Cherry<br>I-15 to County Line | 3/23-24,2002<br>4/6-7,2002<br>4/27-28,2002<br>6/21-23,2002<br>11/02-3,2002 | www.californiaspeedway.com | 909-429-5000 |
| Temecula Balloon and Wine Festival | 15 | ** | SR-79 (Winchester Rd.) and Rancho California | 6/8-10,2002 | www.ci.riverside.ca.us/living/annualevents.htm or www.ci.temecula.ca.us | 909-694-6411 or 909-676-5090 |
| Bob Hope/Chrysler Classic | 10 | ** | Palm Springs off ramp at SR-111 | 1/27-2/2,2003 | www.bhcc.com | 760-346-6329 |
| Dinah Shore/Nabisco Classic | 10 | ** | Palm Springs off ramp at SR-111 | 3/25-31,2002 | www.nabiscochampionship.com | 760-324-4546 |

† The dates and days of events change yearly. Contact numbers and websites have been provided so exact dates can be verified.

** 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 asphalt concrete, portland cement concrete or timber. 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. 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.

Precast concrete members shall not be cast, assembled or stored within the right of way of Route 215 or within the median or within 6 meters of the edge of public traveled way. During work on the members, no workers, equipment or materials shall occupy any area within 1.2 m of the edge of the existing pavement except as permitted during lane closures.

Erection of precast girders over Route 91, 215 for Separation 60/91/215, Bridge No. 56-0402 shall be undertaken on one span at a time. During precast girder erection, public traffic in the lanes over which girders are being placed shall be routed around the work area under the adjacent span over Route 91, 215 or Route 215 by means of a local detour as shown on the plans.

Erection of precast girders over Third Street, Chicago Avenue, Down Street, Canyon Crest Drive, Central Avenue, and University Avenue shall be undertaken on one span at a time. During girder erection, public traffic in the lanes over which girders are being placed shall be stopped for periods of time not to exceed 30 minutes. Following each time traffic is stopped, the accumulated traffic shall pass through the work before another closure is made.

Erection and removal of falsework at locations where falsework openings are required shall be undertaken one location at a time. During falsework erection and removal, public traffic in the lanes over which falsework is being erected or removed shall be routed around the work area on adjacent streets or where 2 falsework openings are called for at one location, the public traffic may be routed through the work and through the opening for the opposing lanes of traffic by means of a local detour as shown on the plans. Erection shall include all adjustments or removal of falsework components prior to concrete placement that contribute to the horizontal stability of the falsework system**.** Removal shall include lowering falsework, blowing sand from sand jacks, turning screws on screw jacks, and removing wedges.

During pile installation or column installation work at SE Connector (Bridge No. 56-0802F), NW Connector (Bridge No. 56-0801G) and EB 60 Connector (Bridge No. 56-0477R), public traffic in the lanes adjacent to which a pile or column is being installed shall be routed around the work area by means of a local detour as shown on the plans. Pile installation or column installation work shall include, but not be limited to, the installation of permanent steel casing, installation and removal of temporary steel casing, installation of pile reinforcing steel cages, installation of column reinforcing steel cages, erection and removal of column formwork, adequately securing cages and formwork into place, and any other pile or column construction activity that may impede or affect safe passage of public traffic.

During bridge removal work at Box Springs Road Overcrossing (Replace)(Bridge No. 56-0804), public traffic in the lanes over which bridge removal is taking place shall be routed around the work area by means of a local detour as shown on the plans.

Local detours shall be not less than 3 m in width, adjacent to the median side of the opposing traffic lanes, and shall not encroach on the lanes.

Rerouting traffic during erection or removal of falsework, pile installation or column installation work, and bridge removal work shall be undertaken in conformance with the provisions in "Maintaining Traffic" of these Special Provisions for the period necessary for erecting or removing falsework, installing piles or columns, or removing a bridge.

Regardless of the construction procedure, methods and equipment selected, the Contractor shall have necessary materials and equipment on the site to erect or remove the falsework or to remove a bridgein any one span or over any one opening, and to install a pile or column, prior to detouring public traffic, and shall erect or remove the falsework, remove a bridge, or install a pile or column in an expeditious manner in order that inconvenience to public traffic will be at a minimum.

### 10-1.151 CLOSURE REQUIREMENTS AND CONDITIONS

Lane closures shall conform to the provisions in "Maintaining Traffic" of these special provisions and these special provisions.

The term closure, as used herein, is defined as the closure of a traffic lane or lanes, including ramp or connector lanes, within a single traffic control system.

#### CLOSURE SCHEDULE

By noon Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Friday noon through the following Friday noon.

The Closure Schedule shall show the locations and times when the proposed closures are to be in effect. The Contractor shall use the Closure Schedule request forms furnished by the Engineer. Closure Schedules submitted to the Engineer with incomplete, unintelligible or inaccurate information will be 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.

Amendments to the Closure Schedule, including adding additional closures, shall be submitted to the Engineer, in writing, at least 3 working days in advance of a planned closure. Approval of amendments to the Closure Schedule will be at the discretion of the Engineer.

The Contractor shall confirm, in writing, all scheduled closures by no later than 8:00 a.m. 3 working days prior to the date on which the closure is to be made. Approval or denial of scheduled closures will be made no later than 4:00 p.m. 2 working days prior to the date on which the closure is to be made. Closures not confirmed or approved will not be allowed.

Confirmed closures that are cancelled due to unsuitable weather may be rescheduled at the discretion of the Engineer for the following working day.

#### CONTINGENCY PLAN

The Contractor shall prepare a contingency plan for reopening closures to public traffic. The Contractor shall submit the contingency plan for a given operation to the Engineer within one working 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. The Contractor shall not make any further closures 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 working days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to any compensation for the suspension of work resulting from the late reopening of closures.

For each 15-minute interval, or fraction thereof past the time specified to reopen the closure, on Routes 60, 91, and 215, the Department will deduct $5,200 per interval from moneys due or that may become due the Contractor under the contract.

**COMPENSATION**

The Contractor shall notify the Engineer of any delay 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 within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09:

A. 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 any compensation for amendments to the Closure Schedule that are not approved.
B. The Contractor is denied a confirmed closure.

Should the Engineer direct the Contractor to remove a closure prior to the time designated in the approved Closure Schedule, any delay to the Contractor's schedule due to removal of the closure will be considered a right of way delay within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09.

**10-1.16 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.

On 2-lane, 2-way roadways, one-way traffic shall be controlled through the project in conformance with the plan entitled "Traffic Control System for Lane Closure on Two Lane Conventional Highways" and these special provisions.

On 2-lane, 2-way roadways, utilizing a pilot car will be at the option of the Contractor. If the Contractor elects to use a pilot car, the cones shown along the centerline on the plan need not be placed. The pilot car shall have radio contact with personnel in the work area. The maximum speed of the pilot car through the traffic control zone whall be 40 kilometers per hour (25 miles per hour)

**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.

Flashing arrow signs shall be in the caution display mode when used on 2-lane, 2-way highways.

Truck-mounted attenuators (TMA) for use in moving lane closures shall be any of the following approved models, or equal:

A. Hexfoam TMA Series 3000, Alpha 1000 TMA Series 1000 and Alpha 2001 TMA Series 2001, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076, Telephone (312) 467-6750.

   1. Distributor (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX (916) 387-9734.
   2. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274.

B. Cal T-001 Model 2 or Model 3, manufacturer and distributor: Hexcel Corporation, 11711 Dublin Boulevard, P.O. Box 2312, Dublin, CA 94568, Telephone (510) 828-4200.
C. 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 1-800-654-8182.

Each TMA shall be individually identified with the manufacturer's name, address, TMA model number, and a specific serial number. The names and numbers shall each be a minimum 13 mm high and located on the left (street) side at the lower front corner. The TMA shall have a message next to the name and model number in 13 mm high letters which states, "The bottom of this TMA shall be _____ mm ± _____ mm above the ground at all points for proper impact performance." Any TMA which is damaged or appears to be in poor condition shall not be used unless recertified by the manufacturer. The Engineer shall be the sole judge as to whether used TMAs supplied under this contract need recertification. Each unit shall be certified by the manufacturer to meet the requirements for TMA in conformance with the standards established by the Transportation Laboratory.

Approvals for new TMA designs proposed as equal to the above approved models shall be in conformance with the procedures (including crash testing) established by the Transportation Laboratory. For information regarding submittal of new designs for evaluation contact: Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, California 95819.

New TMAs proposed as equal to approved TMAs or approved TMAs determined by the Engineer to need recertification shall not be used until approved or recertified by the Transportation Laboratory.

**PAYMENT**

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor (except for flagging costs), 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. Flagging costs will be paid for as provided in Section 12-2.02, "Flagging Costs," of the Standard Specifications.

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.

## 10-1.161 TRAFFIC CONTROL SYSTEM FOR RAMP CLOSURES

At the times and locations specified under "Maintaining Traffic" of these special provisions, ramps shall be closed in conformance with the details shown on the plans, the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, and these special provisions.

The provisions in this section will not relieve the Contractor of the responsibility to provide additional devices or take measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

If components used for closing a ramp 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.

When ramp closures are made for work periods only, at the end of each work period, components used for the ramp closure, 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.

RAMP CLOSED signs (SC6-3) shall be used to inform motorists of the temporary closing of a freeway or expressway entrance or exit ramp for not more than one day.

RAMP CLOSED signs (SC6-4) shall be used to inform motorists of the temporary closing of a freeway or expressway entrance or exit ramp for more than one day.

The SC6-3 or SC6-4 signs shall be installed at least 7 calendar days prior to closing the ramp, but not more than 14 days in advance of the ramp closure. The Contractor shall notify the Engineer not less than 2 calendar days prior to installing the SC6-3 or SC6-4 signs. The SC6-3 or SC6-4 signs shall be stationary mounted at locations shown on the plans and shall remain in place and visible to motorists during ramp closures.

The Contractor shall be responsible for maintaining accurate and timely information on the SC6-3 or SC6-4 signs. The SC6-3 or SC6-4 signs, when no longer required or when the information becomes outdated, shall be immediately covered or removed, or the sign message shall be updated.

Full compensation for providing the ramp closures shown on the plans, including furnishing, installing, maintaining, covering, and removing SC6-3 and SC6-4 signs, shall be considered as included in the contract prices paid for the various items of work involved and no separate payment will be made therefor.

## 10-1.17 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 Manual of Traffic Controls published by the Department or as relieving the Contractor from the responsibilities specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

### GENERAL

Whenever the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place prior to opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided at all times for traveled ways open to public traffic. On multilane roadways (freeways and expressways) edgeline delineation shall be provided at all times for traveled ways open to public traffic.

The Contractor shall perform the work necessary to establish the alignment of temporary pavement delineation, including required lines or marks. Surfaces to receive 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.

Temporary pavement markers, including underlying adhesive, and removable traffic tape which are applied to the final layer of surfacing or existing pavement to remain in place or which conflicts with a subsequent or new traffic pattern for the area shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

## TEMPORARY LANELINE AND CENTERLINE DELINEATION

Whenever lanelines or centerlines are obliterated and temporary pavement delineation to replace the lines is not shown on the plans, the minimum laneline and centerline delineation to be provided for that area 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 pavement 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. The temporary pavement markers shall be placed in conformance with the manufacturer's instructions. Temporary pavement markers for long term day/night use (6 months or less) shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place the temporary pavement markers in areas where removal of the temporary pavement markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary pavement markers listed for short term day/night use (14 days or less), shall be placed on longitudinal intervals of not more than 7.3 m and shall be used for a maximum of 14 days on lanes opened to public traffic. Prior to 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, the Contractor shall replace the temporary pavement markers and provide additional temporary pavement delineation and shall bear the cost thereof. 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.

Where "no passing" centerline pavement delineation is obliterated, the following "no passing" zone signing shall be installed prior to opening the lanes to public traffic. C18 (ROAD CONSTRUCTION AHEAD) or C23 (ROAD WORK AHEAD) signs shall be installed from 300 m to 600 m ahead of "no passing" zones. R63 (DO NOT PASS) signs shall be installed at the beginning and at every 600-m interval within "no passing" zones. For continuous zones longer than 3 km, W71 (NEXT _____ MILES) signs shall be installed beneath the C18 or C23 signs installed ahead of "no passing" zones. R64 (PASS WITH CARE) signs shall be installed at the end of "no passing" zones. The exact location of "no passing" zone signing will be as determined by the Engineer and shall be maintained in place until permanent "no passing" centerline pavement delineation has been applied. The signing for "no passing" zones, shall be removed when no longer required for the direction of public traffic. The signing for "no passing" zones shall conform to the provisions in "Construction Area Signs" of these special provisions, except for payment.

Full compensation for furnishing, placing, maintaining, and removing the temporary pavement markers (including underlying adhesive, layout (dribble) lines to establish alignment of temporary pavement markers or used for temporary laneline and centerline delineation and signing specified for "no passing" zones) for those areas where temporary laneline and centerline delineation is not shown on the plans and for providing equivalent patterns of permanent traffic lines for those areas when required, shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

## TEMPORARY EDGELINE DELINEATION

On multilane roadways (freeways and expressways), whenever edgelines are obliterated and temporary pavement delineation to replace those edgelines is not shown on the plans, the edgeline delineation to be provided for those areas adjacent to lanes open to public traffic shall be as follows:

A. Temporary pavement delineation for right edgelines shall, at the option of the Contractor, consist of either a solid 100-mm wide traffic stripe of the same color as the stripe the temporary edgeline delineation replaces, or traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 30 m.
B. Temporary pavement delineation for left edgelines shall, at the option of the Contractor, consist of either solid 100-mm wide traffic stripe of the same color as the stripe the temporary edgeline delineation replaces, traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 30 m or temporary pavement markers placed at longitudinal intervals of not more than 1.8 m. Temporary pavement markers used for temporary left edgeline delineation shall be one of the types of 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.

The lateral offset for traffic cones, portable delineators or channelizers used for temporary edgeline delineation shall be as 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 the hours of the day that the portable 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.

The quantity of channelizers used as temporary edgeline delineation will not be included in the quantity of channelizers to be paid for. Full compensation for furnishing, placing, maintaining and removing temporary edgeline delineation for those areas where temporary edgeline delineation is not shown on the plans 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.

**TEMPORARY TRAFFIC STRIPE (PAINT)**

Temporary traffic stripe consisting of painted traffic stripe shall be applied and maintained at the locations shown on the plans. The painted temporary traffic stripe shall be complete in place at the location shown prior to opening the traveled way to public traffic. Removal of painted temporary traffic stripe will be required.

Temporary painted traffic stripe shall conform to the provisions in "Paint Traffic Stripes and Pavement Markings" of these special provisions, except for payment. At the option of the Contractor, either one or 2 coats shall be applied regardless of whether on new or existing pavement.

At the Contractor's option, temporary removable striping tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be used instead of painted temporary traffic stripes. When traffic stripe tape is used in place of painted temporary traffic stripes, the tape will be measured and paid for by the meter as temporary traffic stripe (paint).

When painted traffic stripe is specified for temporary left edgeline delineation, temporary pavement markers placed at longitudinal intervals of not more than 1.8 m may be used in place of the temporary painted traffic stripe. Temporary pavement markers shall be one of the types of temporary pavement markers listed for long term day/night use (6 months or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. When temporary reflective pavement markers are used in place of temporary painted traffic stripe, payment for those temporary pavement markers will be made on the basis of the theoretical quantity of temporary traffic stripe (paint) required for the left edgeline the temporary pavement markers replace.

**TEMPORARY PAVEMENT MARKING (PAINT)**

Temporary pavement marking consisting of painted pavement marking shall be applied and maintained at the locations shown on the plans. The painted temporary pavement marking shall be complete in place at the location shown prior to opening the traveled way to public traffic. Removal of painted temporary pavement marking will not be required.

Temporary painted pavement marking shall conform to the provisions in "Paint Traffic Stripes and Pavement Markings" of these special provisions, except for payment. At the option of the Contractor, either one or 2 coats shall be applied regardless whether on new or existing pavement.

At the Contractor's option, temporary removable pavement marking tape or permanent pavement marking tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be used instead of painted temporary pavement markings. When pavement marking tape is used, regardless of which type of tape is placed, the tape will be measured and paid for by the square meter as temporary pavement marking (paint).

**TEMPORARY PAVEMENT MARKERS**

Temporary pavement markers shall be applied at the locations shown on the plans. The pavement markers shall be applied complete in place at the locations shown prior to opening the traveled way to public traffic.

Temporary pavement markers shown on the plans shall be, at the option of the Contractor, one of the temporary pavement markers for long term day/night use (6 months or less) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary pavement markers shall be placed in conformance with the manufacturer's instructions and shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used in areas where removal of the pavement markers will be required.

Where the temporary pavement delineation shown on the plans for lanelines or centerlines consists entirely of a pattern of broken traffic stripe and pavement markers, the Contractor may use groups of the temporary pavement markers for long term day/night use (6 months or less) in place of the temporary traffic stripe tape or painted temporary traffic stripe. The groups of pavement markers shall be spaced as shown on the plans for a similar pattern of permanent traffic line, except pavement markers shown to be placed in the gap between the broken traffic stripe shall be placed as part of the group to delineate the pattern of broken temporary traffic stripe. The kind of laneline and centerline delineation selected by the

Contractor shall be continuous within a given location. Payment for those temporary pavement markers used in place of temporary traffic stripe will be made on the basis of the theoretical length of the patterns of temporary traffic stripe (tape) or temporary traffic stripe (paint).

Retroreflective pavement markers conforming to the provisions in "Pavement Markers" of these special provisions may be used in place of temporary pavement markers for long term day/night use (6 months or less) except to simulate patterns of broken traffic stripe. Placement of the retroreflective pavement markers used for temporary pavement markers shall conform to the provisions in "Pavement Markers" of these special provisions except the waiting period provisions before placing the pavement markers on new asphalt concrete surfacing as specified in Section 85-1.06, "Placement," of the Standard Specifications shall not apply and epoxy adhesive shall not be used to place pavement markers in areas where removal of the pavement markers will be required.

**MEASUREMENT AND PAYMENT**

Temporary traffic stripe (paint) and temporary pavement marking (paint) will be measured and paid for in the same manner specified for paint traffic stripe (1-coat) and paint pavement marking (1-coat) in Section 84-3.06, "Measurement," and Section 84-3.07, "Payment," of the Standard Specifications.

Temporary pavement markers, shown on the plans, will be measured and paid for by the unit in the same manner specified for retroreflective pavement markers in Section 85-1.08, "Measurement," and Section 85-1.09, "Payment," of the Standard Specifications. Temporary pavement markers used for temporary laneline and centerline delineation for areas which are not shown on the plans will not be included in the quantities of temporary pavement markers to be paid for. Full compensation for removing temporary pavement markers, when no longer required, shall be considered as included in the contract unit price paid for temporary pavement marker and no separate payment will be made therefor.

## 10-1.18 PORTABLE FLASHING BEACON

Portable flashing beacons conforming to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications shall be furnished, placed and maintained at the locations shown on the plans or where designated by the Engineer.

If flashing beacons are displaced or are not in an upright position from any cause, during the progress of the work, the Contractor shall immediately repair and repaint or replace the flashing beacons in their original locations.

After initial placement, if flashing beacons are moved from location to location as ordered by the Engineer, the cost of the moves will be paid for as extra work as provided in Section 4–1.03D of the Standard Specifications.

The quantity of flashing beacon (portable) to be paid for will be measured by the unit as determined from actual count in place at the locations shown on the plans or at other locations designated by the Engineer. Each flashing beacon will be counted once at each location shown on the plans or at other locations determined by the Engineer. Repaired or replacement portable flashing beacons placed at the locations will not be considered as additional units for payment purposes. Portable flashing beacons 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 beacon (portable) 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, replacing, and removing portable flashing beacons, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.181 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.

### 10-1.182 PORTABLE CHANGEABLE MESSAGE SIGN

Portable changeable message signs shall be furnished, placed, operated, and maintained at those locations shown on the plans or where designated by the Engineer 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 "Maintaining Traffic" of these special provisions regarding the use of the portable changeable message signs.

### 10-1.183 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.

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), conforming to the details shown on Standard Plan T3 may be used. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance and vertical holes are not drilled in the top of the temporary railing to secure temporary traffic screen to the temporary railing.

Attention is directed to "Public Safety" and "Order of Work" of these special provisions.

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.

### 10-1.184 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.

### 10-1.185 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.

## 10-1.186 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.

Attention is directed to "Public Safety", "Order of Work", and "Temporary Railing" of these special provisions.

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 m 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.

At the Contractor's option, the modules for use in sand filled temporary crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or TrafFix Sand Barrels manufactured after March 31, 1997, or equal:

A. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076. Telephone 1-312-467-6750, FAX 1-800-770-6755

   1. Distributor (North): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828. Telephone 1-800-884-8274, FAX 1-916-387-9734
   2. Distributor (South): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805. Telephone 1-800-222-8274, FAX 1-714-937-1070

B. TrafFix Sand Barrels, manufactured by TrafFix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672. Telephone 1-949 361-5663, FAX 1-949 361-9205

   1. Distributor (North): United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112. Telephone 1-408 287-4303, FAX 1-408 287-1929
   2. Distributor (South): Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448. Telephone 1-800-559-7080, FAX 1-805 929-5786

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 kilograms 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 shall be placed on movable pallets or frames conforming to the 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 m of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods 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 the provisions in "Public Safety" of these special provisions 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.

## 10-1.19 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.

Except as otherwise provided for damaged materials in Section 15-2.04, "Salvage," of the Standard Specifications, the metal railing and post including bridge railing materials to be salvaged shall remain the property of the State, and shall be cleaned, palletized, packaged, bundled, tagged, and hauled to the District Regional Recycle Center per instructions of the District Regional Recycle Center Coordinator, and stockpiled.

The Contractor shall notify the Engineer and the District Regional Recycle Coordinator, telephone (909)383-6919 a minimum of 48 hours prior to hauling salvaged material to the Recycle Center.

Plans of the existing bridges and bridge maintenance records may be requested by fax from the Office of Structure Maintenance and Investigations, 1801 30th Street, Sacramento, CA, Fax (916) 227-8357, and are available at the Office of Structure Maintenance and Investigations, Los Angeles, CA, Telephone (213) 897-6156.

Plans of the existing bridges available to the Contractor are reproductions of the original contract plans with significant changes noted and working drawings and do not necessarily show normal construction tolerances and variances. Where dimensions of new construction required by this contract are dependent on the dimensions of the existing bridges, the Contractor shall verify the controlling field dimensions and shall be responsible for adjusting dimensions of the work to fit existing conditions.

For structure widenings, existing footing concrete which 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 such work will be paid for as extra work as provided in Section 4-l.03D of the Standard Specifications.

### EXISTING PAINT SYSTEMS

The existing paint system on Bridge Number 56-0316, Third St. UC, consists of red lead primer and aluminum finish paints. Any work that disturbs the existing paint system will expose workers to health hazards and will (1) produce debris containing heavy metal in amounts that exceed the thresholds established in Titles 8 and 22 of the California Code of Regulations or (2) produce toxic fumes when heated. All debris produced when the existing paint system is disturbed shall be contained.

#### Debris Containment and Collection Program

Prior to starting work, the Contractor shall submit a debris containment and collection program to the Engineer in conformance with the provisions in 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 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." Approval of the compliance programs by the Engineer will not be required. The compliance programs shall be reviewed and signed by a Certified Industrial Hygienist (CIH) who is certified in comprehensive practice by the American Board of Industrial Hygiene (ABIH). Copies of all air monitoring or jobsite inspection reports made by or under the direction of the CIH in conformance with Section 1532.1, "Lead," shall be furnished to the Engineer within 10 days after the date of monitoring or inspection.

Full compensation for furnishing the Engineer with the submittals and for implementing the programs required by this safety and health section shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

**Debris Handling**

Debris produced when the existing paint system is disturbed shall not be temporarily stored on the ground. Debris accumulated inside the containment system shall be removed before the end of each work shift. Debris shall be stored in approved, leakproof containers and shall be handled in such a manner that no spillage will occur.

Disposal of debris produced when the existing paint system is disturbed shall be performed in conformance with all applicable Federal, State, and Local hazardous waste laws. Laws that govern this work include:

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

Except as otherwise provided herein, debris produced when the existing paint system is disturbed shall be disposed of by the Contractor at an approved Class 1 disposal facility in conformance with the requirements of the disposal facility operator. The debris shall be hauled by a transporter currently registered with the California Department of Toxic Substances Control using correct manifesting procedures and vehicles displaying current certification of compliance. The Contractor shall make all arrangements with the operator of the disposal facility and perform any testing of the debris required by the operator.

At the option of the Contractor, the debris produced when the existing paint system is disturbed may be disposed of by the Contractor at a facility equipped to recycle the debris, subject to the following requirements:

A. Copper slag abrasive blended by the supplier with a calcium silicate compound shall be used for blast cleaning.
B. The debris produced when the existing paint system is disturbed shall be tested by the Contractor to confirm that the solubility of the heavy metals is below regulatory limits and that the debris may be transported to the recycling facility as a non-hazardous waste.
C. The Contractor shall make all arrangements with the operator of the recycling facility and perform any testing of the debris produced when the existing paint system is disturbed that is required by the operator.

Full compensation for debris handling and disposal shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

**REPAIR EXISTING ROADBED**

Where shown on the plans or designated by the Engineer, broken, failed or other unsatisfactory portions of the existing roadbed and subgrade shall be removed and disposed of and the resulting hole shall be backfilled as directed by the Engineer.

Removing and replacing existing pavement and subgrade will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

**ABANDON PIPE LINE**

Existing pipelines, where shown on the plans to be abandoned, shall be abandoned in place or, at the option of the Contractor, the pipelines shall be removed and disposed of. Resulting openings into existing structures that are to remain in place shall be plugged with commercial quality concrete containing not less than 300 kg of cement per cubic meter.

Abandoning pipelines in place shall conform to the following:

A. Pipelines that intersect the side slopes shall be removed to a depth of not less than one meter measured normal to the plane of the finished side slope, before being abandoned.
B. Pipelines 300 mm in diameter and larger, shall, at the Contractor's option, be backfilled with either sand, controlled low strength material or slurry cement backfill conforming to the provisions in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications by any method acceptable to the Engineer that completely fills the pipe. Sand backfill material shall be clean, free draining, and free from roots and other deleterious substances.
C. The ends of pipelines shall be securely closed by a 150 mm thick tight fitting plug or wall of commercial quality concrete.

Pipelines shall not be abandoned until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended pipeline abandonment.

If the Contractor elects to remove and dispose of a pipeline 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 pipeline has been abandoned in place.

Backfill will be measured by the cubic meter determined from the dimensions of the pipelines 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 pipelines 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, and structure excavation, shall be considered as included in the contract price paid per meter for abandon pipeline and no additional compensation will be allowed therefor.

**ABANDON INLET**

Existing pipe inlets and concrete drainage inlets, where shown on the plans to be abandoned, shall be abandoned.

The top portion of the inlets shall be removed to a depth of 1 m below finished grade.

Removed frames and grates shall be disposed of.

**SALVAGE METAL BEAM GUARD RAILING**

Existing metal beam guard railing, where shown on the plans to be salvaged, shall be removed and salvaged.

Existing concrete anchors or steel foundation tubes shall be completely removed and disposed of. Full compensation for removing and disposing of concrete anchors or steel foundation tubes shall be considered as included in the contract price paid per meter for salvage 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 salvage metal beam guard railing and no separate payment will be made 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 CHAIN LINK FENCE**

Existing chain link fence, where shown on the plans to be removed, shall be removed and disposed of.

Full compensation for disposing of chain link fence 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.

**SALVAGE FENCE (CHAIN LINK)**

Existing chain link fence, where shown on the plans to be salvaged, shall be removed and salvaged.

Full compensation for removing chain link fence shall be considered as included in the contract price paid per meter for salvage fence (chain link) and no separate payment will be made therefor.

**REMOVE CRASH CUSHION**

Existing crash cushion, where shown on the plans to be removed, shall be removed and disposed of.

Full compensation for disposing of crash cushions to be removed, shall be considered as included in the contract price paid per module for removecrash cushion and no separate payment will be made therefor.

**REMOVE SIGN STRUCTURE**

Existing sign structures, where shown on the plans to be removed, shall be removed and disposed of.

Overhead sign structure removal shall consist of removing posts, frames, portions of foundations, sign panels, walkways with safety railings, and sign lighting electrical equipment.

A sign structure shall not be removed until the structure is no longer required for the direction of public traffic.

Concrete foundations may be abandoned in place, except that the top portion, including anchor bolts, reinforcing steel, and conduits shall be removed to a depth of not less than 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 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. Residue produced from when yellow thermoplastic and yellow paint are removed may contain heavy metals in concentrations that exceed thresholds established by the California Health and Safety Code and 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 30 days after accumulating 100 kg of residue and dust. The Contractor shall make necessary arrangements with the operator of the disposal facility to test the yellow thermoplastic and yellow paint residue as required by the facility and these special provisions. Testing shall include, at a minimum, (1) Total Lead and Chromium by EPA Method 7000 series and (2) Soluble Lead and Chromium by California Waste Extraction Test. From the first 3360 L of waste or portion thereof, if less than 3360 L of waste are produced, a minimum of four randomly selected samples shall be taken and analyzed. From each additional 840 L of waste or portion thereof, if less than 840 L are produced, a minimum of one additional random sample shall be taken and analyzed. 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 15 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. 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 5.

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. Sweeping equipment shall not be used. 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 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 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, a manifest shall be used, and the transporter shall be registered with the California Department of Toxic Substance Control. The Engineer will obtain the United States Environmental Protection Agency Identification Number and sign all manifests as the generator within 2 working days of receiving sample test results and approving the test methods.

The Contractor shall assume that the yellow paint removed is not regulated under the Federal Resource Conservation and Recovery Act (RCRA). Additional disposal costs for removal residue regulated under RCRA, as determined by test results required by the disposal facility, 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.

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 shall be considered as included in the contract items paid per meter for remove traffic stripe andremove painted traffic stripe (yellow) or per square meter for remove painted pavement marking and no separate payment will be made therefor.

**REMOVE DRAINAGE FACILITY**

Existing box culverts, inlets, headwalls, pipes, manholes, V-ditches, risers, andcleanouts , 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.

Remove cleanout and remove riser will be measured and paid for by each as remove inlet.

**REMOVE ROADSIDE SIGN AND SIGN PANEL**

Existing roadside signs, and sign panels at those locations shown on the plans to be removed, shall be removed and disposed of.

Existing roadside signs and sign panels 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.

Full compensation for salvaging sign panels shall be considered as included in the contract unit price paid for remove roadside sign and sign panel and no separate payment will be made therefor.

**REMOVE MARKER AND DELINEATOR**

Existing markers and delineators, at those locations shown on the plans to be removed, shall be removed and disposed of.

**RECONSTRUCT CHAIN LINK FENCE**

Existing chain link fence, at the locations shown on the plans, shall be removed and reconstructed.

Fence removed in excess of that required for reconstructing chain link fence shall be disposed of. Full compensation for removing and disposing of excess fence shall be considered as included in the contract price paid per meter for reconstruct chain link fence and no separate payment will be made therefor.

**RESET ROADSIDE SIGN AND MARKER**

Existing roadside signs and markers, where shown on the plans to be reset, shall be removed and reset.

Each roadside sign or marker shall be reset on the same day that the sign or marker is removed.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

**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.

**ADJUST INLET**

Existing pipe inlets and concrete drainage inlets shall be adjusted as shown on the plans.

Portland cement concrete shall be minor concrete or may be produced from commercial quality concrete containing not less than 350 kilograms of cement per cubic meter.

Where inlets are located in areas to be paved or surfaced, no individual structure shall be constructed to final grade until the paving or surfacing has been completed immediately adjacent to the structure.

The contract unit price paid for adjust inlet shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in adjusting inlets, including removing portions of inlets, bar reinforcing steel, concrete 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.

**MODIFY INLET**

Existing pipe inlets and concrete drainage inlets shall be adjusted as shown on the plans.

Portland cement concrete shall be minor concrete or may be produced from commercial quality concrete containing not less than 350 kilograms of cement per cubic meter.

The contract price paid per modify inlet shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in modifying inlets, including removing portions of inlets, bar reinforcing steel, concrete 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.

**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.

## 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 typical cross sections or as designated by the Engineer. The final cut shall result in a uniform surface conforming to the typical cross sections. 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 asphalt concrete has not been placed to the level of existing pavement before the pavement is to be opened to public traffic a temporary asphalt concrete taper shall be constructed. Asphalt concrete 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.

Asphalt concrete for temporary tapers shall be commercial quality and may be spread and compacted by any method that will produce a smooth riding surface. Temporary asphalt concrete 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 asphalt concrete for and constructing, maintaining, removing, and disposing of temporary asphalt concrete 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.

Portland cement concrete shall be minor concrete or may be produced from commercial quality aggregates and cement containing not less than 350 kg of cement per cubic meter.

Inlets shall be removed to a depth of at least 0.3-m below the grading plane.

Concrete removal shall be performed without damage to portions of the inlet that are to remain in place. Damage to existing concrete, which is to remain in place, shall be repaired by the Contractor to a condition equal to that existing prior to the beginning of removal operations. The repair of existing concrete damaged by the Contractor's operations shall be at the Contractor's expense.

Existing reinforcement that is to be incorporated in the new work shall be protected from damage and shall be thoroughly cleaned of adhering material before being embedded in the new concrete.

The quantity of capping inlets will be determined as units from actual count.

The contract unit price paid for cap inlet shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in capping inlets, including removing portions of inlets, rounding bottoms of inlets, bar reinforcing steel, and structure excavation and structure backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**EXISTING HIGHWAY IRRIGATION FACILITIES**

Existing irrigation facilities within the limits of work shall remain in place. Irrigation facilities that are damaged by the Contractor's operation shall be reported immediately to the Engineer.

Existing below ground irrigation facilities will be marked by the Engineer. Marked Irrigation facilities damaged by the Contractor's operations shall be repaired or replaced at the Contractor's expense. The replacement and repair of damaged unmarked below ground irrigation facilities will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Water shall be maintained in conformance with the provisions in Section 20-5.025, "Maintain Existing Water Supply," of the Standard Specifications.

**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 shall consist of removing bridges at the following locations:

**BRIDGE REMOVAL, LOCATION A**
**BLAINE STREET OVERCROSSING**
(Br. No. 56-0395)

Bridge removal, location A shall consist of removing Blaine St. Overcrossing (Bridge No. 56-0395), a continuous 4-span reinforced concrete box girder on 4-column bents and open-end seated abutments supported on spread footings.

**BRIDGE REMOVAL, LOCATION B**
**IOWA AVENUE OVERCROSSING**
(Br. No. 56-0396)

Bridge removal, location B shall consist of removing Iowa Avenue OC (Bridge No. 56-0396), a continuous 4-span reinforced concrete box girder on 4-column bents and open-end seated abutments supported on spread footings.

**BRIDGE REMOVAL, LOCATION C**
**LINDEN STREET OVERCROSSING**
(Br. No. 56-0397)

Bridge removal, location C shall consist of removing Linden St OC (Bridge No. 56-0397) a continuous 4-span reinforced concrete box girder on 4-column bents and open-end seated abutments supported on spread footings.

**BRIDGE REMOVAL, LOCATION D**
**EL CERRITO OVERCROSSING**
(Br. No. 56-0503)

Bridge removal, location D shall consist of removing El Cerrito OC (Bridge No. 56-0503) a 4-span reinforced concrete deck on precast prestressed I girders structure on 3-column drop cap bents and open-end seated abutments supported on spread footings. Bridge removal includes removal of spread footings.

**BRIDGE REMOVAL, LOCATION E**
**(For Box Springs Road Overcrossing (Replace) (Bridge No. 56-0804))**
**SANTA MARIA ROAD OVERCROSSING formerly FISCHER ROAD OC**
(Bridge No. 56-0505)

Bridge removal, location E shall consist of removing, a simply supported 4-span precast prestressed concrete "I" girders (spans 2 and 3) and reinforced concrete "T" beams (spans 1 and 4) with continuous reinforced concrete deck with asphalt concrete overlay approximately 64 meters long and 14 meters wide, on reinforced concrete 3-column bents and open-end diaphragm abutments, all supported on spread footings. Remove to the bottom of the spread footings at the abutments and Bent 3. Salvage metal railing and posts from the Type 5 and Type 1 barrier railings.

**BRIDGE REMOVAL, LOCATION F**
**BOX SPRINGS ROAD OVERHEAD RIGHT BRIDGE**
(Br. No.56-0082R)

Bridge removal, location F shall consist of removing Box Springs OH (Bridge No. 56-0082R), a 5-span continuous reinforced concrete "T" beams with reinforced concrete deck with asphalt concrete overlay approximately 37 meters long and 20 meters wide, on reinforced concrete 7- and 8-column bents all supported on spread footings with cantilevered end spans; and removing and disposing of the existing sacked concrete slope protection at both abutments. Salvage metal railing and posts from the Type 1 barrier railings.

Bridge removal (portion) shall consist of removing portions of bridges at the following locations:

**BRIDGE REMOVAL (PORTION), LOCATION A**
**60/91/215 SEPARATION**
(Br. No. 56-0402)

Bridge removal (portion), location A shall consist of removing portions of an existing reinforced concrete deck, curb, concrete barriers, metal railing, and portions of abutment as shown on the plans at this location.

**BRIDGE REMOVAL (PORTION), LOCATION B**
**DOWN STREET OVERHEAD**
(Br. No. 56-0398)

Bridge removal (portion), location B shall consist of removing portions of an existing reinforced concrete deck, curb, concrete barriers, metal railing, and portions of abutment as shown on the plans at this location.

**BRIDGE REMOVAL (PORTION), LOCATION C**
**SPRUCE STREET UNDERCROSSING**
(Br. No. 56-0399)

Bridge removal (portion), location C shall consist of removing portions of an existing reinforced concrete deck overhang, concrete barriers, metal railing, and portions of retaining wall and abutment footing as shown on the plans at this location.

**BRIDGE REMOVAL (PORTION), LOCATION D**
**CHICAGO AVENUE OVERHEAD**
(Br. No. 56-0403)

Bridge removal (portion), location D shall consist of removing portions of an existing reinforced concrete deck overhang, concrete barrier, metal railing, and portions of abutment as shown on the plans at this location.

**BRIDGE REMOVAL (PORTION), LOCATION E**
**UNIVERSITY AVENUE UNDERCROSSING**
(Br. No. 56-0408)

Bridge removal (portion), location E shall consist of removing portions of an existing reinforced concrete deck overhang, concrete barrier, metal railing, and portions of abutment as shown on the plans at this location.

**BRIDGE REMOVAL (PORTION). LOCATION F**
**CANYON CREST ROAD UNDERCROSSING**
(Br. No. 56-0085R/L)

Bridge removal (portion), location F shall consist of removing portions of an existing reinforced concrete deck overhang, concrete barrier, metal railing, and portions of abutment as shown on the plans at this location.

**BRIDGE REMOVAL (PORTION), LOCATION G**
**CENTRAL AVENUE UNDERCROSSING**
(Br. No. 56-0504)

Bridge removal (portion), location G shall consist of removing portions of an existing reinforced concrete deck overhang, concrete barrier, metal railing, and portions of abutment as shown on the plans at this location.

**BRIDGE REMOVAL (PORTION), LOCATION H**
**DAY STREET UNDERCROSSING**
(Br. No. 56-447R)

Bridge removal (portion), location H shall consist of removing Type 1 barrier railing and overhang, portions of the wingwalls, and a portion of the asphalt concrete deck surfacing, and concrete barrier as shown on the plans at this location. Salvage metal railing and posts.

**BRIDGE REMOVAL (PORTION), LOCATION I**
**THIRD STREET UNDERCROSSING**
(Br. No. 56-0316)

Bridge removal (portion), location I shall consist of removing portions of an existing reinforced concrete deck, steel girders, and concrete barrier railing as shown on the plans at this location.

Asbestos-containing material is present in the shims between the concrete parapet and the attached metal railing posts of the Type 1 and Type 5 barrier railings on the bridges or portions of bridges to be removed. Monitoring, removal and disposal of shims containing asbestos shall conform to the provisions in "Structure Removal Asbestos-Containing Material."

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:

**1.** The removal sequence, including staging of removal operations.
**2.** Equipment locations on the structure during removal operations.
**3.** Temporary support shoring or temporary bracing.
**4.** Locations where work is to be performed over traffic, utilities, or railroad property.
**5.** Details, locations, and types of protective covers to be used.
**6.** Measures to assure that people, property, utilities, and improvements will not be endangered.
**7.** 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 |
|---|---|
| Down St. OH (widen), Br. No. 56-0398 | 9 |
| Chicago Ave. OH,(widen), Br. No. 56-0403 | 9 |
| El Cerrito OC, Br. No. 56-0503 | 4 |
| Box Springs Rd OC (Replace), (Br. No. 56-0804) | 9 |
| Box Springs OH Rt Bridge (Replace), (Br. No. 56-0082R) | 9 |

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:

**1.** The closure of roadways to public traffic shall conform to the provisions in "Order of Work" and "Maintaining Traffic" of these special provisions.

**2.** 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.

**3.** 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.

**4.** 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.

**5.** Temporary support shoring and temporary bracing shall be used in conjunction with preliminary work when necessary to insure the stability of the bridge.

**6.** 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.

**7.** 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.

**8.** 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:

**1.** 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 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.

**2.** 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," "Temporary Railings" of these special provisions.

**3.** 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.

4. 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.
5. 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.
6. At locations where only bridge railing is to be removed, the protective cover shall extend from the face of the exterior girder or at least 0.6-m inside of the bridge railing to be removed, whichever is less, to at least 1.2 m beyond the outside face of the bridge railing.
7. 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.

H. 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 9.8 m shall be provided for the passage of public traffic.
I. 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.
J. 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.
K. 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.

**CLEAN BRIDGE DECK**

This work shall consist of cleaning the portland cement concrete bridge deck surface as shown on the plans and as specified in these special provisions.

The deck surface shall be cleaned by abrasive blasting and shall be dry when blast cleaning is performed.

Traffic stripes, pavement markings, and pavement markers shall be removed as specified in these special provisions during the process of cleaning the deck.

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.

Nothing in these special provisions shall relieve the Contractor from the responsibilities provided in Section 7-1.09, "Public Safety," of the Standard Specifications.

After abrasive cleaning, loose material shall be blown from visible cracks using high pressure air, and the entire deck surface shall be cleaned by manual or power sweeping.

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.

If the surface becomes contaminated at any time prior to placing the penetrating sealer, the affected surface shall be cleaned by abrasive blasting followed by manual or power sweeping.

Except otherwise provided, removed materials 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.

Cleaning bridge deck surface will be measured by the square meter of surface that is cleaned, based on field measurement of the completed work.

The contract price paid per square meter for clean bridge deck shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cleaning the bridge deck, including removing contrast treatment except slurry or chip seal contrast treatment, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Removal of slurry or chip seal contrast treatment will be paid for as extra work in conformance with the provisions in Section 4-l.03D, "Extra Work," of the Standard Specifications.

**REMOVE ASPHALT CONCRETE SURFACING**

Existing asphalt concrete surfacing shall be removed to the top of existing portland cement concrete slab at bridge decks and bridge approaches as shown on the plans and as described in these special provisions.

At Canyon Crest Crest Rd UC (widen), Bridge No. 56-0085RL, the Contractor shall verify the depth of asphalt concrete surfacing at a minimum of one location on each shoulder every 30 meters..

At Day Street UC (widen), Bridge No. 56-0477R, the Contractor shall verify the depth of asphalt concrete surfacing at a minimum of one location on the shoulder every 30 meters.

The method of removal shall be selected by the Contractor. Equipment or procedures that damage the remaining concrete surface, as determined by the Engineer, shall not be used.

Cold milling equipment may be used to remove asphalt concrete surfacing, except that at least 13 mm of asphalt concrete surfacing shall remain on the deck after the cold milling operation. Removal of the remaining 13 mm of asphalt concrete surfacing shall be performed by other means as selected by the Contractor.

If the Contractor elects to use cold milling equipment, the cold milling equipment shall have the capability to 1) remove concrete a minimum depth of 6 mm, 2) provide a surface relief of no more than 6 mm, and 3) maintain a 4-mm grade tolerance; and shall have the following features:

A. 3 or 4 riding tracks.
B. An automatic grade control system with an electronic averaging system having 3 sensors on each side of the equipment.
C. A conveyer system that leaves no debris on the bridge.
D. A drum that operates in an up-milling direction.
E. Bullet tooth tools with tungsten carbide steel cutting tips.
F. A 16-mm maximum tool spacing.
G. A maximum operating mass of 25400 kg.

The Contractor shall select which sensors are activated during the milling operation to produce the profile required as shown on the plans.

The cold milling equipment shall have a complete set of new tooth tools at the beginning of the job, and the tooth tools shall be replaced as necessary to perform the work satisfactorily.

The Contractor shall provide personnel on each side of the milling drum to monitor the milling operation and maintain radio communication with the operator at all times during the milling operation.

The outline of the asphalt concrete to be removed shall be cut with a power-driven saw to a depth of not less than 50 mm before removing the surfacing. Surfacing shall be removed without damage to surfacing that is to remain in place. Any damage to pavement which is to remain in place shall be repaired to a condition satisfactory to the Engineer, or the damaged pavement shall be removed and replaced with new asphalt concrete when ordered by the Engineer. Repairing or removing and replacing pavement damaged outside the limits of surfacing to be removed shall be at the Contractor's expense and will not be measured or paid for.

All removed materials 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.

Full compensation for removing asphalt concrete surfacing as shown on the plans shall be considered as included in the contract lump sum price paid for bridge removal (portion), and no additional compensation will be allowed therefor.

**PREPARE CONCRETE BRIDGE DECK SURFACE**

This work shall consist of preparing and cleaning the portland cement concrete deck surface by blowing clean the deck surface, as shown on the plans and as described in these special provisions.

All laitance and surface contaminants including, but not limited to, rust, oil, paint, joint material, and other foreign material shall be cleaned from the surface of the existing concrete deck.

If the surface becomes contaminated at any time prior to placing the primer for the overlay, the 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. Removal of the residue shall be performed by a vacuum attachment operating concurrently with the abrasive blasting operation.

Nothing in these special provisions shall relieve the Contractor from the responsibility to conform with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

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.

Equipment or procedures that leave fractured aggregate or otherwise damage the concrete surface which is to remain shall not be used.

Removal of slurry or chip seal contrast treatment will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

All removed materials 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.

Preparing concrete bridge deck surface will be measured by the square meter of surface which is prepared to receive the overlays, based on dimensions shown on the plans.

The contract price paid per square meter for prepare concrete bridge deck surface shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing the concrete bridge deck surface, except removal of slurry or chip seal contrast treatment, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**REMOVE CONCRETE DECK SURFACE**

This work shall consist of removing portions of the portland cement concrete deck surface to a depth of 25 mm, abrasive blasting, and blowing clean the deck surface, as shown on the plans for Third Street UC, Bridge No. 56-0316, and as described in these special provisions.

The method of concrete removal shall be selected by the Contractor except that scarifiers, coldplaners, scabblers, and similar types of equipment or procedures that leave fractured aggregate or otherwise damage the concrete surface to remain shall not be used. Cold milling equipment may be used only when the depth of concrete removal is 25 mm or less.

Coarse aggregate remaining above the specified removal depth shall be firmly embedded in the remaining concrete.

High pressure water jet equipment, when used, shall have rotating jets and be rated at no less than 200 MPa. Adequate means shall be used to prevent water from the jetting operation from flowing across traffic lanes, or flowing into gutters or waterways.

Cold milling equipment shall have the capability to 1) remove concrete a minimum depth of 6 mm, 2) provide a surface relief of no more than 6 mm, and 3) maintain a 4-mm grade tolerance; and shall have the following features:

A. 3 or 4 riding tracks.
B. An automatic grade control system with an electronic averaging system having 3 sensors on each side of the equipment.
C. A conveyer system that leaves no debris on the bridge.
D. A drum that operates in an up-milling direction.
E. Bullet tooth tools with tungsten carbide steel cutting tips.
F. A 16-mm maximum tool spacing.
G. A maximum operating mass of 25400 kg.

The Contractor shall select which sensors are activated during the milling operation to produce the profile required as shown on the plans.

The cold milling equipment shall have a complete set of new tooth tools at the beginning of the job, and the tooth tools shall be replaced as necessary to perform the work satisfactorily.

The Contractor shall provide personnel on each side of the milling equipment to monitor the milling operation and maintain radio communication with the operator at all times during the milling operation.

The surface of the deck, following concrete removal, shall be abrasive blast cleaned. The deck shall be dry when blast cleaning is performed.

If the surface becomes contaminated at any time prior to placing the overlay, the 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. Removal of the residue shall be performed by a vacuum attachment operating concurrently with the abrasive blasting operation.

Nothing in these special provisions shall relieve the Contractor from the responsibility to conform with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

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.

All removed materials 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.

Remove concrete deck surface will be measured by the square meter of concrete deck surface to be removed based on dimensions shown on the plans.

The contract price paid per square meter for remove concrete deck surface shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing concrete deck surface, except removing unsound concrete, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**REMOVE CONCRETE**

Concrete, where shown on the plans to be removed, shall be removed.

The pay quantities of concrete to be removed for retaining wall, v-ditch and box culvert will be measured by the cubic meter, remove soundwall will be measured by the square meter and remove concrete barrier will be measured by meter measured before and during 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.

**PUMP STATION REMOVAL**

**WORK INCLUDED**

The Contractor shall provide all labor, tools, equipment, permits and materials as required for the demolition, removal, and proper disposal of structures, equipment, piping, concrete, and debris from the pump stations located at Route 91 “1A Line” station 132+32 30Lt and at Canyon Crest Drive station 19+76 10Rt. Work shall include disconnecting and capping of all utilities to the station, removal and disposal of mechanical and electrical equipment inside and adjacent to the pump station, demolition and removal of all structures within the pump station, including the roof, walls, floor, foundation and piles. All removed equipment shall become the property of the Contractor.

The Contractor shall provide all materials and equipment in suitable and adequate quantity as required to accomplish the pump station removal.

Shoring of excavation during demolition shall include adequate bracing conforming to the applicable safety orders of OSHA and the State of California Division of Industrial Safety

**DEMOLITION COORDINATION**

The Contractor shall coordinate all stages of demolition work with the Engineer.

**SUBMITTALS**

A. The Contractor shall submit the proposed sequence of operations including, but not limited to the following:

1. Preliminary pump stations assessments for hazardous materials.
2. Notifying and coordinating with affected utility owners.
3. Securing of required permits and approvals from governing agencies as needed.
4. Erecting temporary protection as needed.
5. Shutting-off and capping of existing utilities.
6. Securing of the site and providing fire safety measures as needed.
7. Hazardous materials abatement as needed.
8. Sequencing of procedures for actual demolition and removal operations for pump station.
9. Cleaning and restoring the site.

B. Submittals and any re-submittals will be acted upon by the Engineer and transmitted to the Contractor within 15 working days after receipt by the Engineer.

**BLASTING**

The use of blasting at the project site for the disposal of refuse, debris, and waste materials resulting from demolition and site clearing shall not be permitted.

**ELECTRICAL DEMOLITION**

The Contractor shall make all arrangements for temporary power for the demolition work. The Contractor shall furnish and install all conduits, conductors, meter socket and other necessary equipment for the temporary service. At the end of the

contract, the Contractor shall remove this equipment as his property. Temporary power work shall be considered as included in the contract lump sum price paid for pump station removal and no additional compensation will be allowed therefor. All electrical demolition work shall at all times be conducted by the Contractor in a safe and proper manner to avoid injury from electrical shock to the State's, City's and Contractor's personnel. The Contractor shall coordinate work with the Resident Engineer. At no time shall live electrical wiring or connections, which can be energized; be accessible to Contractor, State and City employees, or other personnel without suitable protection or warning signs.

**QUALITY ASSURANCE**

The Contractor shall comply with all applicable State and local code requirements including, but not limited to:

1. American National Standard Institute "Safety Requirements for Demolition" ANSI AID.G, latest edition.
2. CAL and Federal OSHA regulations.

**UTILITIES DISCONNECTION**

The Contractor shall refer to the "Obstructions" section elsewhere in the Standard Specifications Provisions on utilities disconnection.

**PUMP STATION HAZARDOUS MATERIALS ASSESSMENT**

Prior to demolishing the pump stations, the Contractor shall perform preliminary hazardous material assessments of the existing pump stations to document the potential presence of hazardous materials. Hazardous materials include asbestos, lead and any other material which requires management, handling and transportation, treatment, storage or disposal according to the requirements of the Federal Resource, Conservation and Recovery Act (RCRA) and associated regulation 42 U.S.C. 6901 et seq. and 40 CFR Part 260 et seq.) or the California Hazardous Waste Control Law and associated regulations (Health and Safety Code 25000 et seq. and 22 CCR 66260 et seq.). The preliminary hazardous material assessment of the existing pump stations shall start as early as possible to allow adequate lead-time for pump demolition and to avoid delays in scheduled roadway and/or structural works in the vicinity.

After performing the preliminary pump station hazardous materials assessments, the Contractor shall propose and submit any hazardous material testing required to the Engineer for approval. If upon approval for hazardous material testing and the presence of hazardous material is determined, the Contractor shall submit to the Engineer the final demolition strategy which shall include any existing hazardous material remediation / abatement or site-specific mitigation plan within 15 working days prior to beginning pump station removal work for approval. Submittals and re-submittals will be acted upon by the Engineer and transmitted to the Contractor within 15 working days after receipt by the Engineer. The Contractor shall refer to the section, “Pump Station Demolition Hazardous Materials Procedures” in these special provisions.

**DEMOLITION**

The Contractor shall be responsible for the methods of demolition and all necessary safety precautions during the operation.

The Contractor shall prepare project record drawings showing all capped utilities, shoring, bracing, and underpinning, if required, left permanently in place.

The Contractor shall remove debris from the work site daily, unless otherwise directed. All items removed, demolished and abandoned shall become the property of the Contractor. Disposal of all materials from the site shall be performed in compliance with all applicable local, state and federal codes, and requirements.

**PUMP STATION DEMOLITION HAZARDOUS MATERIALS PROCEDURES**

**SUMMARY**

General requirements and procedures for hazardous materials related work activities, as applicable, to the pump station removal work and the existing conditions at the pump station site.

**DEFINITIONS**

A. Abatement - Primary work involving the removal, containment, control or treatment of hazardous materials.
B. Hazardous Materials Control - Incidental work procedures for control of releases of project-related hazardous materials, including containment, enclosure, wetting, controlled renovation and demolition procedures, and removal and disposal.

C. Asbestos - A generic name given to a number of naturally occurring hydrated mineral silicates that possess a unique crystalline structure, are incombustible in air, and are separate into fibers. Asbestos includes any material that contains greater than 0.1 percent by weight the asbestiform varieties of chrysotile (serpentine); crocidolite (riebecklite); amosite (cummingtonite-grunerite); anthophyllite; tremolite; and actinolite. For the purposes of determining respiratory protection and worker protection both the asbestiform and non-asbestiform varieties of the above materials and any of these materials that have been chemically treated or altered shall be considered asbestos.
D. Asbestos-Containing Material (ACM) - Any material which contains more than one-tenth of one percent asbestos by weight.
E. Hazardous Waste:

1. Waste material, including asbestos, loose and peeling lead-based paints, PCB ballasts, and any other material which requires management, handling transport, treatment, storage or disposal according to the requirements of the Federal Resource, Conservation and Recovery Act (RCRA) and associated regulation 42 U.S.C. 6901 et seq. and 40 CFR Part 260 et seq.) or the California Hazardous Waste Control Law and associated regulations (Health and Safety Code 25000 et seq. and 22 CCR 66260 et seq.).
2. References to hazardous material or contaminated material incorporate definitions of hazardous pollutants, hazardous contaminants, hazardous material, hazardous substance, hazardous waste, toxic pollutants and toxic substance applicable in accordance with Federal, State, regional and local statutes, laws, regulations and policies.

F. Lead - Metallic lead, all inorganic lead compounds and organic lead soaps, and excluding all other organic lead compounds.
G. Lead-Containing - Any material, coating, substrate or product which contains metallic lead, all inorganic lead compounds and organic lead soaps, and excluding all other organic lead compounds.
H. Mercury - A silvery-white liquid metallic element commonly used in thermometers, barometers, and fluorescent light tubes.
I. Any regulated metallic compound including cadmium, chromium, zinc; includes all metals commonly referred to as California Assessment Metals (CAM 17).
J. Polychlorinated Biphenyls (PCBs) - Chemical compound commonly found in lighting ballasts, wet transformers, and in electrical equipment which uses dielectric fluids.

**SUBMITTALS**

If hazardous material testings show that hazardous materials are present the Contractor shall submit the following to the Engineer.

A. SITE-SPECIFIC MITIGATION PLAN (SSMP)

1. The Contractor shall submit to the Engineer a site-specific Mitigation Plan (SSMP) for approval not less than 15 calendar days prior to the commencement of any excavation. The State reserves the right to modify or reject the Contractor's SSMP.
2. No shoring, excavation, or other site work shall begin until the SSMP has been reviewed and approved by the Engineer.
3. The SSMP shall conform to all the requirements of this section and shall include, but not be limited to:

a. Means and methods for suppressing and controlling asbestos-containing serpentine fibers, dust and other contaminants/ nuisances .
b. Means and methods of excavating, staging, handling, loading, treating, hauling and disposing of all excavated material, including soil and groundwater, in accordance with all federal, state and local requirements. Descriptions shall include planned order of excavation (including shoring installation and other critical path work) and methods of moving excavated material from the excavation to the haul trucks.
c. Proposed details of the treatment and/or disposal process of excavated materials, whether landfill disposal, incineration, bio-remediation or other process.
d. A list of the names and locations of all proposed legal disposal sites, regulatory approvals, and details of soil acceptance criteria granted to all proposed disposal sites.
e. Description of means used to prohibit public access to the construction site.
f. A description of the procedure which the Contractor proposes to use for on-site weighing of the excavated material as well as the means by which Contractor proposes to document the weight of each truckload or

container load of excavated material removed from the project site and to relate the weight of that load to its appropriate hazardous waste manifest form.

g. Description of traffic routing and handling of excavated material.
h. Description of groundwater dewatering and disposal using settling tanks or any other feasible method approved by the Engineer.
i. Drainage/Erosion Control.

**PROJECT CONDITIONS**

A. The Contractor shall pay all costs associated with the compliance with applicable hazardous materials regulations or requirements incurred by Contractor or its subcontractors for this Project.
B. The Contractor shall take precautions necessary to protect the health and safety of construction workers, site visitors, State and City personnel, outside consultants, public and others from exposure to hazardous materials.
C. The Contractor shall take precautions necessary to insure all surrounding properties or adjacent occupied areas are protected from any contamination from all hazardous materials from the Work site.
D. The Contractor shall make results and findings from proposed hazardous material tests available to appropriate subcontractors.
E. The Contractor shall pay for all proposed hazardous material tests. Obtain and pay for all sampling and profiling analyses required for waste disposal. Analyses shall be performed by California DOHS-accredited laboratories.
F. The Contractor shall minimize generation and migration of hazardous and contaminated materials, waste, dust, fumes and debris.
G. Prevent contamination or further contamination of any material or area by hazardous or contaminated material, waste, dust, fumes or debris.
H. The Contractor shall avoid mixing or concentrating removed, or demolished materials so as to increase the cost of disposing of such materials required to be disposed as hazardous or contaminated wastes.
I. The Contractor shall retain, and the State will not indemnify against, any liability of Contractor resulting from the activities or duties which are the responsibility of Contractor under the terms of the Contract, including but not limited to present or future liability arising from the arrangement of transportation or disposal of any hazardous or contaminated material, whether on or off-site.
J. Pursuant to 29 CFR 1926.1101, the Contractor shall be deemed to exercise general supervisory authority over the work covered by said standard, even though the Contractor is not qualified to serve as the asbestos "Competent Person," as defined by the standard. As supervisor of the entire project, the Contractor shall ascertain whether its subcontractors are in compliance with the standard and shall require its subcontractors to come into compliance with said standard when necessary.

**QUALIFICATIONS**

A. If hazardous material testings show that hazardous materials are present, the Contractor shall assign qualified person as The Hazardous Materials Supervisor directly responsible under Contractor's Superintendent having the necessary training to be knowledgeable in the identification, control, and management of the hazardous materials on-site. The Hazardous Materials Supervisor shall be responsible for the following:

1. Enforcing safe work and hygiene practices in compliance with the Mitigation Plan approved by the State.
2. Advising subcontractors of potential hazards and minimum general requirements of the Mitigation Plan.
3. Coordination of subcontractors regarding hazardous material procedures and controls.
4. Establishing and maintaining restricted work areas.
5. Requiring proper use of personal protective equipment.
6. Communicating approved modified safety requirements to site personnel.
7. Notification and coordinating signing of waste manifests with the State.

B. Hazardous Materials Handlers - Only qualified persons shall engage in hazardous material-related work. The Contractor and subcontractor personnel who come into contact with, are exposed to, disturb, operate equipment or otherwise handle hazardous or contaminated material, or debris shall have appropriate hazard communication and required training, personal and medical monitoring, and shall be certified to wear appropriate personal protective equipment as required by the applicable laws and regulations. Special qualifications which may be required depending on the Contractor's means and methods include, but are not limited to, the following:

1. Asbestos-Related Work Involving Asbestos-containing Materials:

    a. Valid asbestos handling license issued by the California State Contractors Licensing Board (SCLB) and a valid current Certificate of Registration for Asbestos-Related Work as issued by the California Department of Industrial Relations - Division of Occupational Safety and Health (Cal/OSHA).
    b. Work shall be completed under the on-site supervision of a Competent Person as defined by OSHA Regulation 29 CFR Part 1926.1101 (8 CCR 1529 in California).
    c. All abatement workers shall have AHERA training with annual 8-hour refresher training, annual medical exams for the use of respiratory protection, and 6-month fit test of appropriate respirators.

2. Lead-Hazard Work - Lead awareness training, annual medical examinations and approval for the use of respiratory protection, and semi-annual fit testing of respirators complying with Cal/OSHA regulation 8 CCR 1532.1 affecting lead-based paints and lead construction hazards including, but not limited to:

    a. Demolishing or salvaging structural items where lead or material containing lead are present.
    b. Removing or encapsulating materials containing lead.
    c. Constructing, altering, repairing or renovating structures, substrates, or portions thereof, that contain lead or materials containing lead.
    d. Installing of products containing lead.
    e. Cleaning-up of lead contamination.
    f. Transporting, disposing, storing, or containing lead or lead-containing materials on the site or other locations where construction and renovation activities are performed.

3. Lead Abatement Work - California Department of Health Services (DOHS) approved Lead Workers training, annual medical examinations and approval for the use of respiratory protection, and semi-annual fit testing of respirators under the direct supervision of a DOHS approved Lead Abatement Supervisor complying with Cal/OSHA regulation 8 CCR 1532.1 affecting lead-based paints and lead construction hazards, including, but not limited to:

    a. Working in an environment where lead exposures exceed 30 $g/m^3$.
    b. Abating lead-based paints including, but not limited to, abatement of loose and peeling lead-based paints, demolition and disposal of concrete-encased primed structural steel, and stripping of lead coatings from structural steel prior to torching or welding.

4. PCB Ballast-Related Work - Removal of leaking or damaged PCB ballasts from lighting fixtures shall be completed by a trained worker, wearing protective gloves and following safety procedures as outlined in the Mitigation Plan. Hazardous waste shall be handled according to the U.S. Environmental Protection Agency's Standards 40 CFR 761.60 and 761.65 (22 CCR Section 66699(b) in California).

C. Hazardous Materials Haulers shall:

1. Possess during the hauling of hazardous material, applicable federal, state, and local vehicle insurance requirements, valid driver's license, vehicle registration and licenses, and a current Class 1 Certification of Compliance from the California Highway Patrol affixed to each vehicle or container.
2. Possess a Hazardous Substance Removal Certification granted by the State of California Contractor's Licensing Board and other required certifications and insurance.

The Contractor shall be responsible for informing drivers of hauling vehicles about:

    a. The nature of the material hauled.
    b. Recommended or required routes to and from the site.
    c. Applicable City street use regulations and requirements, and State of California Department of Transportation (CalTrans) codes, regulations and requirements.
    d. The City's requirements for proper handling and transportation of hazardous waste.
    e. The legal maximum loads for each vehicle.
    f. The Traffic Control Plan

**REGULATORY REQUIREMENTS**

A. Hazardous and contaminated materials and hazardous waste shall be handled according to applicable laws and regulations in effect at the time of disturbance, transport or disposal of said hazardous materials or waste and requirements of the Contract Documents.
B. The Contractor is alerted to and shall familiarize itself to the following laws and regulations regarding the generation, management, characterization and disposal of hazardous waste:

1. Resources Conservation and Recovery Act, 42 U.S.C. Section 6901 et seq. and regulations 40 CFR Part 260 et seq.
2. California Health and Safety Code, Division 20 and regulations, and 22 CCR Section 66000 et seq.
3. For asbestos hazards - Comply with the applicable requirements of the Cal/OSHA Construction Asbestos Standard, 8 CCR Section 1529, and BAAQMD Regulation 11, Rule 2.
4. For lead hazards - Comply with the applicable requirements of the Cal/OSHA Lead in Construction Standard, 88 CCR Section 1532.1, and Cal/EPA Regulation 22 CCR Section 66000, et seq.

**SUSPECT CONDITION**

A. Notify Engineer of suspect conditions for testing by the Engineer. Do not remove or disturb suspect materials until tested and approved.
B. Promptly notify the Engineer of differing conditions.

**ASBESTOS HAZARD CONTROL PROCEDURES**

A. Activities Not Specified in this Section - Asbestos-containing materials shall not be disturbed by cutting, sawing, grinding, pulverizing, crumbling, breaking, or otherwise rendered friable or airborne unless these activities are conducted under the requirements of all applicable regulations and guidelines.

1. Work of asbestos-containing materials shall be completed by a qualified Asbestos Abatement Contractor.

B. Demolition of non-ACM obstructing known intact ACM:

1. Remove non-contaminated and non-asbestos materials for access using standard dust control procedures as required for painted assemblies, etc.
2. Minimize disturbances to substrates concealing friable or damaged asbestos-containing materials, such as laid-in ceiling tiles concealing asbestos-containing fireproofing, demolition of non-ACM partitions which may destabilize sprayed-on asbestos-containing acoustical finishes, etc. Work impacting asbestos-containing materials shall be completed by qualified workers only.
3. Remove and dispose of non-contaminated waste, where feasible. Alert the Contractor's Hazardous Material Supervisor of contaminated conditions for proper removal and disposal and cordon off the affected areas where contamination is encountered. Do not dry sweep affected wastes and debris.

C. Unexpected Exposure to Known or Suspect Intact ACM:

1. Where asbestos materials are intact, such as intact pipe lagging, proceed to remove the affected substrate and immediately label the asbestos material with a "caution" sign to prevent unintentional disturbances.
2. Where asbestos materials uncovered are damaged or unknown asbestos contaminated conditions are encountered, discontinue work in the immediate contaminated area, and alert the Contractor's Hazardous Materials Supervisor of the conditions for proper removal and disposal.

D. Unexpected Release of Asbestos into the Environment:

1. Cordon off the immediate area (3 to 6 m radius average minimum).
2. Notify the Contractor's Hazardous Materials Supervisor for proper removal and disposal using wet methods and HEPA-filtered vacuums. Clean-up affected area under the direction of a competent person with 16-hour minimum EPA Operations and Maintenance asbestos training and by workers with 2-hours asbestos awareness training minimum unless exposures exceed the permissible exposure limit of 0.1 fibers/cc.
3. Decontaminate or dispose of friable waste in double 6-mil thick goosenecked labeled waste bags for manifesting and disposal.

## LEAD HAZARD CONTROL PROCEDURES

A. Activities Not Specified in this Section:

1. Dry sweeping of debris and removal of surface coatings by torch or flame.
2. Disturbance of lead-painted or lead-coated surfaces scheduled to remain within the structure(s) by cutting, sawing, grinding, or other construction operations without adequate dust controls.
3. Eating, smoking and drinking in or in the proximity of lead hazard operations.
4. Removal of lead-containing coatings with a torch or flame, except as a result of unavoidable welding or torching of back-to-back structural elements that cannot be adequately previously abated without affecting the integrity of the structure.
5. The use of steam cleaning and compressed air removal methods.
6. Use of abrasive removal equipment without local HEPA exhausts or dust collectors.

B. Handling:

1. For existing lead-painted or lead-coated surfaces which are indicated to remain, advise workers of the potential hazard.
2. For areas where handling or disturbance of loose or peeling paints only are required, verify that the paint that remains on interior walls, ceilings and other surfaces in areas of active work, as applicable, is adhered to the substrate sufficiently to support eventual repainting. Paints that peel or loosen during wetting shall be handled and removed as specified in this Section.
3. Clean debris and surfaces with HEPA-filtered vacuums or wet methods. Dry sweeping is not permitted.
4. Shoveling, wet seeping, and brushing may be used only where vacuuming or other equally effective methods have been tried and are found to be ineffective.
5. Loose debris and scraped materials shall be treated as hazardous waste, unless otherwise approved by the State. Construction waste coated with intact lead based paint may be disposed of as construction debris in accordance with the Cal/EPA requirements.
6. Workers shall decontaminate themselves and appropriate equipment prior to eating, drinking and smoking.

C. Cleaning: Perform daily "housekeeping" on project site including, but not limited to:

1. Clean-up of loose debris and contamination daily prior to leaving the job site, or covering with tarpaulins to prevent disturbances.
2. Daily clean-up of traffic areas using a HEPA vacuum or wet methods.
3. Repair of torn or damaged protective barriers.

D. Field Quality Control:

1. Maintain airborne lead dust levels within the construction zone and throughout the site below Cal/OSHA's Project Action Level of 30 micrograms per cubic meter (□g/m$^3$). Levels above the Project Action Level may require an upgrade in respiratory protection for all affected workers, as well as amended work practices and clean-up of affected areas at no additional cost to the State.
2. Maintain airborne lead dust levels at the site's property line or at adjoining occupied non-construction areas below the EPA's National Ambient Air Quality Standard (NAAQS) of 1.5 micrograms per cubic meter. Exceeding this level may require further isolation of work areas, amended work practices and clean-up of affected areas at no additional cost to the State.

## PCB BALLAST HANDLING PROCEDURES

A. Identification of PCB ballasts - All ballasts not specifically labeled "non-PCB" or "PCB free" shall be considered PCB-containing.
B. Activities Not Specified in this Section - Removal of ballast from the fixtures without hazard awareness training as indicated by Contractor's Hazardous Materials Supervisor.
C. Procedure for Handling Leaking PCB Ballasts:

1. Workers removing ballasts from fixtures shall wear protective clothing and nitrile or neoprene gloves.
2. Leaking ballasts pose a health and safety hazard and shall be removed by a trained worker only.

3. Wipe down the fixture showing signs of overheated or leaking ballasts with paper towels after the unit has been cooled to room temperature.
4. Follow with additional wiping with an organic solvent, e.g., mineral spirits or isopropyl alcohol.
5. Place leaking ballasts and rags into a plastic bag, which is tied-off and secured.
6. Pack the ballasts in steel drums for hazardous waste disposal.

D. Procedure for Disposal of PCB Ballasts:

1. Pack PCB ballasts and bagged leaking ballasts and rags into a steel drum, sealed, labeled, and transport to an approved incinerator following manifest procedures as specified in this Section.
2. Absorbent material, such as kitty litter, shall be used as a cushion and absorbent within the drums.
3. Do not exceed the incinerator's drum loading requirements, typically 350 to 500 pounds per drum.
4. Transport hazardous waste for disposal per the requirements under 22 CCR Section 66268.110.
5. Dispose of as a hazardous waste per EPA Regulation 40 CFR 761.60 and 761.65 and Cal/EPA Regulation 22 CCR Section 66508.

**MEASUREMENT AND PAYMENT**

The contract lump sum price for pump station removal shall include full compensation for furnishing all labor, materials, tools, equipment, preliminary pump station assessment and reporting, proposed hazardous material testing, and incidentals, and for doing all the work involved in the sub-sections "Pump Station Removal," and "Pump Station Demolition Hazardous Material Procedures," as specified in these special provisions, and as directed by the Engineer.

## 10-1.20 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.

Attention is directed to "General Migratory Bird Treaty Act" elsewhere in these special provisions.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

At locations where there is no grading adjacent to a bridge or other structure, clearing and grubbing of vegetation shall be limited to 1.5 m outside the physical limits of the bridge or structure.

Existing vegetation outside the areas to be cleared and grubbed shall be protected from injury or damage resulting from the Contractor's operations.

Activities controlled by the Contractor, except cleanup or other required work, shall be confined within the graded areas of the roadway.

Nothing herein shall be construed as relieving the Contractor of the Contractor's responsibility for final cleanup of the highway as provided in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

## 10-1.21 WATERING

Developing a water supply and applying watering shall conform to the provisions in Section 17, "Watering," of the Standard Specifications and these special provisions.

Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions regarding availability of water.

## 10-1.22 DUST PALLIATIVE

Furnishing and applying dust palliative shall conform to the provisions in Section 18, "Dust Palliative," of the Standard Specifications.

## 10-1.23 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Structure excavation and structure backfill adjacent to the Type 1 retaining wall used to support the reinforced concrete pipe located within the limits of the Earth Retaining Structure, Location E (RW 215-51B) as shown on the plans shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications.

Difficult earthwork at Box Springs Overhead Truck Connector (Bridge No. 56-00805G) is anticipated due to the requirements of bent footings founded in decomposed granitic rock,and abutment footings placed on material that has been overexcavated and replaced with structure backfill.

Difficult earthwork at Box Springs Road Overcrossing (Replace)(Bridge No. 56-0804) is anticipated due to seasonal ground water fluctuations, and the requirements of bent footings founded in decomposed granitic rock..

Difficult earthwork at Box Springs Overhead Right Bridge (Replace)(Bridge No. 56-00082R) is anticipated due to the requirements of bent footings founded in decomposed granitic rock, and abutment footings placed on material that has been over excavated and replaced with structure backfill.

Difficult earthwork at Day Street Undercrossing (Widen)(Bridge No. 56-0477) is anticipated due to the requirements of bent footings founded in decomposed granitic rock, and abutment footings placed on material that has been overexcavated and replaced with structure backfill.

Difficult foundation work is anticipated at soil nail walls due to the presence of utilities at variouslocations.Difficult foundation work is anticipated at retaining wall RW215-44 due to the presence of granitic rock outcrop between STA 46+00 and 46+30.

Difficult foundation work is anticipated at RW215-24 due to the presence of caving soils.Attention is directed to "Material Containing Aerially Deposited Lead" of these special provisions.

When a layer of specified material is not to be placed on the basement material, the finished grading plane shall not vary more than 30 mm above or below the grade established by the Engineer. The requirements for obtaining a relative compaction of 95 percent, as provided in the first 2 paragraphs in Section 19-5.03, "Relative Compaction (95 Percent)," of the Standard Specifications, shall not apply when a layer of specified material is not to be placed on the basement material.

When portland cement concrete pavement is to be placed on the grading plane, the grading plane shall not extend above the grade established by the Engineer.

When portland cement concrete base is to be placed on the grading plane, the grading plane shall not extend above the grade established by the Engineer.

The grading plane of embankments beneath structure approach slabs and beneath the thickened portion of sleeper slabs shall not project above the grade established by the Engineer.

Surplus excavated material not designated or determined to contain 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 40.

For every stage of construction, the Contractor shall use all available suitable material excavated in that stage before imported borrow is used.

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 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.

Settlement periods are required for the bridge approach embankments at the bridges listed in the following table.

At the bridge bents listed in the following table, excavation for the footings, drilling holes for cast-in-place piles, or driving the foundation piles at each location shall not be done until the expiration of the settlement period for the embankment at the adjacent abutment of the same structure or an adjacent structure.

Route 60/91/215 Separation
Br. No. 56-0402

| Abutment Number | Bent Number | Settlement Period, Days |
|---|---|---|
| | | |
| 1 | 2 | 30 |
| 5 | 4 | 30 |

SE Connector
Br. No. 56-0802F

| Abutment Number | Bent Number | Settlement Period, Days |
|---|---|---|
| 1 | 2 | 60 |
| 18 | 17 | 60 |

N215-W91 Connector
Br. No. 56-0801G

| Abutment Number | Bent Number | Settlement Period, Days |
|---|---|---|
| | | |
| 1 | 2 | 60 |
| 28 | 27 | 60 |

The duration of the required settlement period at each location will be determined by the Engineer and will not exceed the number of days listed in the tables of settlement data.

The removal of surplus embankment material placed as a surcharge 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.

At the locations and to the limits shown on the plans, material below the bottom of bridge footings shall be removed and replaced with structure backfill material in conformance with the placing and compacting requirements for structure backfill. The relative compaction shall be not less than 95 percent. At the option of the Contractor, the replacement material at Down Street Overhead (widen), Br. No. 56-0398, may be lean concrete in conformance with the requirements for lean concrete base. If lean concrete is used to backfill the subexcavation, all concrete shall be placed against the undisturbed native material at the bottom of the subexcavation. The material under the existing foundations shall not be subexcavated. Removal of the material will be measured and paid for by the cubic meter as structure excavation (bridge) and furnishing, placing, and compacting the structure backfill replacement material will be measured and paid for by the cubic meter as structure backfill (bridge).

Bent spread footings located at the following locations shall have footing concrete placed neat against undisturbed rock at the bottom of the footing. If the bottom of footing elevation shown on the plans does not place bent footings on bedrock, excavation shall continue to the top of bedrock as determined by the Engineer, and backfilled with concrete backfill to the bottom of footing elevation. Concrete backfill shall be Class 3 concrete (backfill) conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions. Removal and disposal of the material will be measured and paid for by the cubic meter as structure excavation (bridge).

| Bridge Name | Bent Number Spread Footing |
|---|---|
| Box Springs OH Truck Connector (Br. No. 56-0805G) | Bent 2<br>Bent 3 |
| Box Springs Rd OC (Replace) (Br. No. 56-0804) | Bent 2<br>Bent 3<br>Bent 4 |
| Box Springs OH Right Bridge (Replace) (Br. No. 56-0082R) | Bent 2<br>Bent 3 |
| Day Street UC (Widen) (Br. No. 56-0477) | Bent 2<br>Bent 3 |

Concrete backfill will be measured and paid for by the cubic meter as Class 3 concrete (backfill) in the same manner specified for structure backfill in Section 19-3.07, "Measurement," and Section 19-3.08, "Payment," of the Standard Specifications. If the suitable foundation material has been disturbed by the Contractor's operations, the material is to be removed and replaced with Class 3 concrete (backfill), at the Contractor's expense, to a condition at least equal to the undisturbed foundation as determined by the Engineer.

All bridge bent and abutment spread footing excavations shall be inspected and approved by the Engineer. The Contractor shall notify the Engineer in writing not less than 7 calendar days prior to the completion of a bridge footing excavation. The Contractor shall allow the Engineer not less than 5 calendar days for the bridge footing excavation to be inspected and approved prior to placing any forms, bar reinforcing steel or concrete into the footing excavation.

In the event the Engineer fails to complete the inspection and approval of the bridge footing excavation 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 approval of the bridge footing excavation, 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.

At the locations and to the limits shown on the plans, material below the bottom of retaining wall footings shall be removed and replaced with Class 2 aggregate base material in conformance with the placing and compacting requirements for structure backfill. The relative compaction shall be not less than 95 percent. Removal of the material will be measured and paid for by the cubic meter as structure excavation (retaining wall) and furnishing, placing, and compacting the replacement material will be measured and paid for by the cubic meter as structure backfill (retaining wall).

At the footings where material is removed and replaced, as described herein, a relative compaction of not less than 95 percent shall be obtained for a minimum depth of 150 mm below the bottom of excavation.

No backfill material shall be deposited against the back of Type 6 retaining walls until the grout has developed a strength of not less than 10 MPa in compression or until the grout has been in place for 28 days, whichever occurs first.

Geocomposite drain for retaining walls shall conform to the details shown on the plans and the following:

A. Attention is directed to "Engineering Fabrics" under "Materials" and "Concrete Barrier" of these special provisions.
B. 1. Except at Retaining Wall 215-219, 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.
   2. At Retaining Wall 215-219, 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 239 kPa.
C. 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 produces the required flow rate and complies with these special provisions. The Certificate of Compliance shall be accompanied by a flow capability graph for the geocomposite drain showing flow rates for externally applied pressures and hydraulic gradients. The flow capability graph shall be stamped with the verification of an independent testing laboratory.
D. Filter fabric for the geocomposite drain shall conform to the provisions for fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications.

E. 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.
F. 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 nonconnecting corrugations shall be placed with the corrugations approximately perpendicular to the drainage collection system.
G. 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 wrap-around at edges, the added fabric shall overlap the fabric on the geocomposite drain at least 150 mm and be attached thereto.
H. 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 minimum 150-mm overlap.
I. Plastic pipe shall conform to the provisions for edge drain pipe and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications.
J. Treated permeable base to be placed around the slotted plastic pipe at the bottom of the geocomposite drain shall be cement treated permeable base conforming to the provisions for cement treated permeable base in Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.
K. The treated permeable base shall be enclosed with a high density polyethylene sheet or PVC geomembrane, not less than 250 µm thick, which is bonded with a suitable adhesive to the concrete and geocomposite drain. Surfaces to receive the polyethylene sheet shall be cleaned before applying the adhesive. The treated permeable base shall be compacted with a vibrating shoe type compactor.

Pervious backfill material in connection with bridge work will be measured and paid for by the cubic meter as structure backfill (bridge).

Pervious backfill material within the limits of payment for retaining walls will be measured and paid for by cubic meter as structure backfill (retaining wall).

If structure excavation or structure backfill involved in 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 paid for at the contract price per cubic meter for structure excavation (bridge) or structure backfill (bridge).

Structure excavation (soil nail wall) will be measured and paid for as structure excavation (retaining wall). Structure backfill (soil nail wall) will be measured and paid for as structure backfill (retaining wall).

Structure excavation (tieback wall) will be measured and paid for as structure excavation (retaining wall). Structure backfill (tieback wall) will be measured and paid for as structure backfill (retaining wall).

Structure excavation designated as (Type D), for footings at the locations shown on the plans, will be measured and paid for by the cubic meter as structure excavation (Type D). Ground water or surface water is expected to be encountered at these locations, but seal course concrete is not shown or specified. Structure excavation for footings at locations not designated on the plans as structure excavation (Type D), and where ground or surface water is encountered, will be measured and paid for by the cubic meter as structure excavation (bridge).

Full compensation for geocomposite drain behind retaining walls shall be considered as included in the contract price paid per cubic meter for structure backfill (retaining wall) and no additional compensation will be allowed therefor.

Structure excavation and structure backfill for the Type 1 retaining wall used to support the reinforced concrete pipe within the limits of the Earth Retaining Structure, Location E will be measured and paid for by the square meter as earth retaining structure.

### 10-1.24 EARTH RETAINING STRUCTURES

Earth retaining structures, consisting of mechanically stabilized embankment, shall conform to the details shown on the plans and these special provisions.

The following earth retaining structures shall be mechanically stabilized embankment retaining walls:

**EARTH RETAINING STRUCTURE, LOCATION A**
**RETAINING WALL 215-205**
**(Bridge No. 56-0815M)**

**EARTH RETAINING STRUCTURE, LOCATION B**
**RETAINING WALL 215-202A**
**(Bridge No. 56-0818)**

**EARTH RETAINING STRUCTURE, LOCATION C**
**RETAINING WALL 215-44**
**(Bridge No. RW215-44)**

**EARTH RETAINING STRUCTURE, LOCATION D**
**RETAINING WALL 215-47A**
**(Bridge No. RW215-47A)**

**EARTH RETAINING STRUCTURE, LOCATION E**
**RETAINING WALL 215-51B**
**(Bridge No. 56-0816M)**

**EARTH RETAINING STRUCTURE, LOCATION F**
**RETAINING WALL BOX SP-13**
**(Bridge No. 56-0817M)**

At the Contractor's option, one of the following acceptable alternative earth retaining systems may be constructed:

| Proprietary Earth Retaining System | Address and Phone Number |
|---|---|
| Reinforced Earth (1.52 meter square concrete face panels) | The Reinforced Earth Company<br>20381 Lake Forest Drive, Suite B-2<br>Lake Forest, CA 92630<br>(949) 587-3060<br>www.reinforcedearth.com |
| Retained Earth (1.52-meter square concrete face panels) | Foster Geotechnical<br>1660 Hotel Circle North - Suite 304<br>San Diego, CA 92108<br>(619) 688-2400<br>www.lbfoster.com |
| MSE Plus (1.82 meter width by 1.52 meter height concrete face panels, and 1.52 meter square concrete face panels) | SSL<br>4740 Scotts Valley Drive, Suite "E"<br>Scotts Valley, CA 95066<br>(831) 430-9300 |
| | |

Only one type of earth retaining system shall be used at any one location.

Only square or rectangular panels shall be allowed.

The above list of acceptable alternative earth retaining systems has been selected from the Department's current list of prequalified earth retaining systems and is limited only to those systems determined to have characteristics suitable for this project. Among the alternatives shown, some systems may be proprietary.

The list of prequalified earth retaining systems has been developed from data previously furnished by suppliers or manufacturers of each system. Approval of additional earth retaining systems is contingent on the system meeting the full range of parameters for which prequalification is required. The prequalification requirements can be obtained from the Office of Structure Design, Mail Station 9-2/9I, 1801 30th Street, Sacramento, CA 95816.

**WORKING DRAWINGS**

If the Contractor elects to use a proprietary earth retaining system from the list of acceptable alternative systems, the Contractor shall submit complete working drawings for each installation of the system to the Office of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

For initial review, 4 sets of drawings shall be submitted. After review between 6 and 12 sets, as requested by the Engineer, shall be submitted to OSD for final approval and use during construction.

Working drawings shall be 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.

The Contractor shall verify the existing ground elevations at the site before preparing the working drawings. The working drawings shall contain all information required for the proper construction of the system at each location including existing ground line at face of wall as verified at the site and any required revisions or additions to drainage systems or other facilities. The working drawings shall include "General Notes" which contain design parameters, material notes, and wall construction procedures. The working drawings shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California. The Contractor shall allow the Engineer 4 weeks to review the drawings after a complete set has been received.

Unless otherwise specified, at the completion of each structure for which working drawings were submitted, and if the work detailed in these working drawings is permanent, the Contractor shall submit to the Engineer one set of corrected as-built prints 279 mm x 432 mm in size and on 75-g/m$^2$ (minimum) bond paper, showing as built conditions. As-built drawings that are common to more than one structure shall be submitted for each structure.

## MATERIALS

### Earthwork

Excavation and backfill shall conform to the details shown on the plans, the provisions in Section 19, "Earthwork," of the Standard Specifications, and these special provisions.

Difficult earthwork is anticipated at Earth Retaining Structure, Location E and Earth Retaining Structure, Location F due the removal of a portion of the granitic rock. Rock excavation equipment is required.

Structure backfill for earth retaining structures with metallic soil reinforcement 1) shall consist of material free from organic material and substantially free of shale or other soft, poor durability particles, 2) shall not contain slag aggregate or recycled materials such as glass, shredded tires, portland cement concrete rubble, asphaltic concrete rubble, or other unsuitable material as determined by the Engineer, and 3) shall conform to the following requirements:

| Gradation Requirements | | |
|---|---|---|
| Sieve Size | Percentage Passing | California Test |
| 159-mm | 100 | 202 |
| 75-mm | 78 - 100 | 202 |
| 4.75-mm | ---- | 202 |
| 600-µm | 0 - 60 | 202 |
| 75-µm | 0 - 25 | 202 |

| Property Requirements | | |
|---|---|---|
| Test | Requirement | California Test |
| Sand Equivalent | 12 min. | 217 |
| Plasticity Index | 10 max. | 204 |
| Minimum Resistivity | 1500 ohm-cm min. | 643 |
| Chlorides | < 500 ppm | 422 |
| Sulfates | < 2000 ppm | 417 |
| pH | 5.5 to 10.0 | 643 |

If 12 percent or less passes the No. 75-µm sieve and 50 percent or less passes the No. 4.75-mm sieve, the Sand Equivalent and Plasticity Index requirements shall not apply.

Permeable material shall be used for the portion of the structure backfill for earth retaining structures with soil reinforcement within the limits shown on the plans. Permeable material shall be Class 1, Type B, conforming to the provisions in Section 68-1.025, "Permeable Material," of the Standard Specifications and the following requirements:

| Property Requirements | | |
|---|---|---|
| Test | Requirement | California Test |
| Minimum Resistivity | 1500 ohm-cm min. | 643 |
| Chlorides | < 500 ppm | 422 |
| Sulfates | < 2000 ppm | 417 |
| pH | 5.5 to 10.0 | 643 |

Water used for earthwork or dust control within 150 meters of the earth retaining structures with metallic soil reinforcement shall conform to the provisions for water in Section 90-2.03, "Water," of the Standard Specifications.

**Concrete**

Concrete used in precast and cast-in-place reinforced concrete members of earth retaining structures 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 concrete leveling pads for the Mechanically Stabilized Embankment (MSE) system shall conform to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. Leveling pad shall be placed on uniform foundation material.

**Reinforcement**

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

**Galvanizing**

Soil reinforcement, connecting elements, and other steel components that are in contact with the earth shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

**Inspection Wire**

If a proprietary alternative system is selected, inspection elements representative of the particular soil reinforcement shall be furnished in the same number and approximate location as shown on the plans for the MSE system.

The threaded end of the inspection wire may be formed before or after galvanizing. The end 100 mm of the wire shall be coated with 2 applications of an approved unthinned commercial quality zinc-rich primer (organic vehicle type). The threaded end of the wire shall be encapsulated with corrosion inhibiting, mastic filled, round vinyl enclosure secured with a nylon tie as shown on the plans. If the threaded end is galvanized after threading, the threads shall be cleaned before painting. There shall be no damage to the unthreaded portion of the galvanized inspection wire.

**Drainage System**

The drainage system shall conform to the details shown on the plans and these special provisions.

Corrugated steel pipe shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications.

Perforated steel pipe underdrains and underdrain outlets and risers shall conform to the provisions in Section 68-1, "Underdrains," of the Standard Specifications.

The class of rock used for rock slope protection at drain pipe outlets shall be No. 3 Backing, and shall conform to the provisions in Section 72-2, "Rock Slope Protection," of the Standard Specifications.

Filter fabric shall conform to the provisions for fabric for underdrains in Section 88-1.03, "Filter Fabric," of the Standard Specifications, and these special provisions.

Adhesive for bonding filter fabric to concrete panels shall be commercial grade.

**Soil Reinforcement**

Soil reinforcement shall conform to the details shown on the plans and these special provisions.

MW70 and MW130 steel wire shall conform to the requirements in ASTM Designation: A 82. The welded wire mat shall conform to the requirements in ASTM Designation: A 185. MD70 and MD130 deformed steel wire may be substituted for MW70 and MW130 steel wire, respectively. The welded wire mat utilizing deformed steel wire shall conform to the requirements in ASTM Designation: A 496 and ASTM Designation: A 497.

The button on button-headed wires shall conform to the provisions in Section 50-1.05, "Prestressing Steel," of the Standard Specifications.

The coupler at the mat connection shall be a seamless steel sleeve. The coupler shall be applied over the button-headed wires and swaged by means of a hydraulic press. The coupler shall develop the minimum tensile strength of the wire without exceeding a total slip of the wires of 5.0 mm.

Splicing of the welded wire mat along its length shall be by a mechanical coupler, which shall develop the minimum tensile strength of the wire. The mechanical coupler shall be approved by the Engineer.

### Miscellaneous

Resin bonded cork for horizontal joints shall conform to the requirements in ASTM Designation: D 1752, Type II with a compressive load of not less than 690 kPa.

Pipe for the pipe pin shall conform to the requirements in ASTM Designation: A 53, Standard weight, except the amount of the zinc coating per square meter of actual surface shall average not less than 610 g and no individual specimen shall be less than 550 g.

## CONSTRUCTION

Earth retaining structures shall be constructed to the lines, grades, and details shown on the plans, and shall conform to these special provisions.

### Earthwork

Structure backfill material shall be placed and compacted simultaneously with the erection of the facing panels. Placement and compaction shall be accomplished without distortion of the soil reinforcement or displacement of facing panels. Structure backfill at the front of the wall shall be completed prior to backfilling more than 4 m above the bottom of the lowermost face element.

Structure backfill for earth retaining structures with soil reinforcement shall be compacted to a relative compaction of not less than 90 percent, except when the backfill is within 50 meters of a bridge abutment or for a minimum depth of one meter below the grading plane for the width between the outer edges of shoulders, the backfill shall be compacted to a relative compaction of not less than 95 percent.

A relative compaction of not less than 95 percent shall be obtained for embankment under earth retaining structures with soil reinforcement within the limits established by inclined planes sloping 1:1.5 (vertical:horizontal) out and down from lines 0.3-m outside the bottom limits of structure backfill, including permeable material when required.

Sheepsfoot or grid-type rollers shall not be used for compacting material within the limits of the soil reinforcement. Hand-held or hand-guided compacting equipment shall be used to compact structure backfill material within one meter of the facing panels.

At each level of the soil reinforcement the structure backfill shall be constructed to a plane 45 mm above the elevation of the soil reinforcement connection and shall start one meter from the back of the face panel and extend for at least the remaining length of soil reinforcement. This grading shall be complete before placing the next layer of soil reinforcement.

Permeable material and filter fabric shall be placed along with structure backfill as shown on the plans. Compaction of the permeable material for the drainage system outside the limits of the soil reinforcement is not required, and equipment shall not be operated directly on the permeable material or filter fabric. If a sloped layer of permeable material is placed to facilitate the work or to satisfy safety considerations, the vertical limits of permeable material shall remain unchanged, and the thickness of the layer of permeable material shall be measured normal to the slope.

Permeable material shall be placed in layers not exceeding 0.6-m in thickness.

### Filter Fabric

Filter fabric shall be placed at the locations and in conformance with the details shown on the plans and these special provisions.

Immediately prior to placing filter fabric, the subgrade to receive the filter fabric shall conform to the compaction and elevation tolerance specified for the material involved and shall be free of loose or extraneous material and sharp objects that may damage the filter fabric during installation.

Filter fabric shall be handled and placed in conformance with the manufacturer's recommendations.

Filter fabric shall be stretched, aligned, and placed in a wrinkle-free manner.

Adjacent borders of filter fabric shall be stitched or overlapped from 300 mm to 450 mm. The preceding roll shall overlap the following roll in the direction the material is being spread or shall be stitched. When filter 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 filter fabric manufacturer. The stitches shall number 2 to 3 per centimeter of seam.

If the filter fabric is damaged during installation, it shall be repaired by placing a piece of filter fabric that is large enough to cover the damaged area and which meets the overlap requirement.

During spreading of the permeable material, a minimum of 150 mm of the material shall be maintained between the filter fabric and the Contractor's equipment. Where structure backfill material is to be placed on filter fabric, a minimum of 450 mm of structure backfill material shall be maintained between the filter fabric and the Contractor's equipment. Equipment or vehicles shall not be operated or driven directly on filter fabric.

### Concrete

Concrete for the leveling pads shall be placed at least 24 hours prior to erecting face panels.

Architectural treatment shown on the plans on exposed surfaces of precast and cast-in-place members shall conform to the provisions in "Architectural Surface (Textured Concrete)" of these special provisions.

### Mechanically Stabilized Embankment System

If the Contractor elects to construct one of the earth retaining structures shown on the plans, the structure shall conform to the lines, grades, and details shown on the plans and these special provisions.

Concrete panel surfaces, which are to receive filter fabric, shall be dry and thoroughly cleaned of dust and deleterious materials.

After placement of an inspection element and placement of backfill to a level at least 0.6-m above the inspection element, the void in the face panel shall be dry packed with portland cement mortar as shown on the plans. Dry pack shall conform to the provisions in Section 51-1.135, "Mortar," of the Standard Specifications, except that the proportion of cement to sand shall be that required to achieve a 28-day mortar compressive strength of 7 MPa to 10 MPa.

### Proprietary Earth Retaining Systems

If the Contractor elects to construct one of the acceptable proprietary alternative earth retaining systems, the structure shall be constructed to the lines and grades shown on the plans. Vertical and horizontal alignment shall be checked at every course throughout the erection process. The construction shall include a drainage system where shown on the plans, and shall conform to the details shown on the approved working drawings, approved proprietary system details, and these special provisions.

The top of wall profile of alternative earth retaining systems shall conform to the profile shown on the plans. The top of leveling pad elevations shall be at or below the elevations shown on the plans. The height and length to be used for any system shall be the minimums for that system that will effectively retain the earth behind the structure for the loading conditions and the contours, profile, or slope lines shown on the plans. The length of soil reinforcement for any system shall be not less than that shown on the plans. In addition, if the plans or special provisions indicate limiting parameters for alternative systems, the system shall conform to those parameters.

The top of face panels, assuming no leveling pad settlement, shall be covered by the coping lip or concrete barrier slab lip at a minimum of 170 mm. The coping height may be increased from 460 mm to 600 mm maximum along the entire length of the wall at the Contractor's expense.

The top level of soil reinforcement shall be placed parallel to the top of the concrete panel at a distance below the top of the wall as shown on the plans. The top level of soil reinforcement shall also be 1) placed a minimum of 75 mm below the bottom of the barrier slab lip or the bottom of the concrete gutter behind coping and 2) placed a minimum of 125 mm below the top edge of the concrete panel.

## MEASUREMENT AND PAYMENT

Earth retaining structures will be measured and paid for by the square meter. Regardless of the type of earth retaining structure actually constructed, the square meter area for payment will be based on the length and vertical height of each section of mechanically stabilized embankment system shown on the plans which was or would have been constructed. The vertical height of each section will be taken as the difference in elevation on the outer face from the top of leveling pad to the top of wall profile.

The contract price paid per square meter for earth retaining structure shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the earth retaining structure at each location shown on the plans and inspection elements, including earthwork, leveling pad, coping, bearing pads, and drainage systems, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Structural concrete, barrier slab shall be paid for as specified in "Concrete Structures" of these special provisions. Full compensation for structure excavation and for furnishing and compacting structure backfill adjacent to the Type 1 retaining wall located within the limits of the Earth Retaining Structure, Location E (RW 215-51B) shall be considered as included in the contract price paid per square meter for earth retaining structure and no separate payment will be allowed therefor.

Full compensation for revisions to the barrier support, drainage system, or other facilities made necessary by the use of an alternative earth retaining system shall be considered as included in the contract price paid per square meter for earth retaining structure, and no separate payment will be made therefor.

## 10-1.25 SOIL NAIL WALL EARTHWORK

Soil nail wall earthwork, consisting of excavating for soil nail wall construction and backfilling around completed soil nail walls, shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications and these special provisions.

### Working Drawings

The Contractor shall submit a complete working drawing submittal for earthwork for each soil nail wall to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Working drawings for soil nail wall earthwork shall be 559 mm by 864 mm in size. 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 for final approval and use during construction.

Working drawings for wall earthwork shall show the State assigned designations for the contract number, structure number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post on each drawing and calculation sheet. The Contractor's name, address, and telephone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner.

The working drawings for soil nail wall earthwork shall contain all information required for the construction and quality control of the earthwork, including the following:

A. A proposed schedule and detailed construction sequence. Construction sequence shall include measures to ensure wall and slope stability during all stages of wall construction including provisions for discontinuous rows of soil nails.
B. Methods of excavation to the staged lifts indicated and types of excavation equipment.
C. Temporary shoring plans.
D. Drilling methods and equipment including proposed drill hole size and any variation of these along the alignments.
E. Information on space requirements for installation equipment.
F. A detailed construction dewatering plan addressing all elements necessary to divert, control, and dispose of surface water and ground water.

A supplement to the working drawings shall include the following:

A. Independently checked calculations for wall and slope stability during all stages of wall construction including geotechnical assessment of information provided by the Department for this contract. At the Contractor's option, the Contractor may conduct additional geotechnical investigation for the purpose of developing soil nail wall earthwork working drawings.
B. Information on provisions for working in the proximity of underground facilities.

The working drawings and supplement shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California.

The Contractor shall allow the Engineer 4 weeks to review the working drawings and supplement after a complete submittal has been received.

Should the Engineer fail to review the complete working drawing submittal within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the soil nail wall earthwork working drawing submittal, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

### Excavation

Care shall be taken during excavation for soil nail walls to prevent disturbing the natural foundation materials behind the face of excavation. During initial mass grading, the Contractor shall not excavate the full wall height to the wall alignment as shown on the plans, but the Contractor shall maintain a working berm of native material in front of the wall to serve as a work bench for the drill equipment. The working berm shall extend out from the wall a minimum distance of 6 m and shall be cut down from that point at the slope shown on the approved wall earthwork working drawings. The original ground beyond the wall alignment for the back or ends of the wall as shown on the plans shall not be over excavated. Any such over

excavation shall be restored by the Contractor, at the Contractor's expense, using methods and materials approved in writing by the Engineer. Soil stabilization methods or temporary backing or lagging placed behind the excavation face may be required to prevent disturbing the natural foundation materials.

Excavation for walls shall be limited to that area which can be nailed and covered with shotcrete during the same work shift in which the excavation is done. Subsequent excavation shall not be made within 3 m of previously nailed and covered portions of the wall until those nailed and covered portions are structurally complete. A portion of the wall will be considered structurally complete when the soil nail assemblies have been installed, the shotcrete cover has set, specified testing has been completed for that portion of the wall, and the test results have been furnished to the Engineer.

Excavation to the final wall alignment for the full wall height shall incorporate a working berm which shall be constructed from the top down in a staged lift sequence as shown on the approved wall earthwork working drawings. The ground level in front of the wall face shall not be excavated more than one meter below the level of the row of soil nails to be installed in that same lift.

In addition to the working berm described above, the Contractor shall maintain a stabilizing berm of undisturbed material to support the excavation face during soil nail installation. The stabilizing berm shall extend horizontally from the bottom of the shotcrete a minimum distance of 0.3-m and shall be cut down from that point at a slope as shown on the approved wall earthwork working drawings.

After soil nails are complete in place for a given lift, the stabilizing berm shall be removed during excavation to the final wall alignment. The complete excavated face shall be cleaned of all loose materials, mud, rebound, and other materials that could prevent or reduce shotcrete bond to the excavated face and soil nails.

Temporary backing or lagging for excavation at soil nail walls may be left in place if approved in writing by the Engineer. There shall be no voids behind temporary backing or lagging that is left in place. Fillers used to eliminate voids between the excavation face and temporary backing or lagging shall be dimensionally stable, non-deteriorating material capable of supporting the earth pressures in both water saturated and dry conditions.

The Contractor shall remove all cobbles, boulders or portions of boulders, rubble, or debris which are encountered at the final wall alignment during wall face excavation and which protrude from the excavated face more than 50 mm into the design shotcrete thickness as shown on the plans. Such over excavation shall be backfilled with shotcrete.

The Contractor shall immediately notify the Engineer of the occurrence of raveling or local instability of the final wall face excavation due to the presence of groundwater, soil conditions, equipment vibration, or other causes.

Unstable areas shall be temporarily stabilized by means of buttressing the exposed excavation face with an earth berm or other methods approved in writing by the Engineer. Construction of the wall in unstable areas shall be suspended until remedial measures, submitted by the Contractor, and approved by the Engineer, have been taken.

The Contractor shall protect installed soil nails during excavation and subsequent operations. Any soil nails damaged during construction shall be replaced by the Contractor, at the Contractor's expense.

### MEASUREMENT AND PAYMENT

Excavation and backfill for soil nail wall construction will be measured and paid for as structure excavation (retaining wall)and structure backfill (retaining wall).

Full compensation for working drawings and supplements, and for furnishing, constructing and removing shoring, working berms, and stabilizing berms, if required, for soil nail wall construction shall be considered as included in the contract price paid per cubic meter for structure excavation (retaining wall) and no additional compensation will be allowed therefor.

Full compensation for shotcrete used to fill voids created by the removal of cobbles and boulders or other obstructions shall be considered as included in the contract price paid per cubic meter for shotcrete and no additional compensation will be allowed therefor.

## 10-1.251 SOIL NAIL ASSEMBLY

Soil nail assemblies and test soil nail assemblies, consisting of drilling holes in natural foundation materials, installing and grouting steel bars in drilled holes, anchorage systems, and testing of test soil nail assemblies, shall conform to the details shown on the plans, the provisions of the Standard Specifications, and these special provisions.

Foundation recommendations are included in the "Information Handout" available to the Contractor in conformance with the provisions in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Attention is directed to "Order of Work" and "Soil Nail Wall Earthwork" of these special provisions.

### WORKING DRAWINGS

The Contractor shall submit a complete working drawing submittal for soil nail assemblies to the Office of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard

Specifications. All working drawings for soil nail assemblies shall be 559 mm by 864 mm in size. For initial review, 5 sets of drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to OSD for final approval and use during construction.

Working drawing submittals for soil nail assemblies shall show the State assigned designations for the contract number, structure number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer post on each drawing and calculation sheet. The Contractor's name, address, and phone and FAX numbers shall also be shown on the working drawings. Each working drawing sheet shall be numbered in the lower right hand corner of the sheet.

The working drawing submittal for soil nail assemblies shall contain all information required for the construction and quality control of the soil nail wall, including the following:

A. The proposed schedule and detailed construction sequence of the installation and grouting of soil nails, application of shotcrete, and construction of cast-in-place reinforced concrete.
B. Complete details and specifications of the soil nail and test soil nail, including encapsulation materials and method of grouting the encapsulation, anchorage system, and type of packers or other appropriate devices to be used to ensure partial length grouting of test soil nails.
C. Grout mix designs and procedures involved in testing grout.
D. Grout placement procedures and equipment including minimum required cure time.
E. Details of the equipment proposed for testing soil nails, including jacking frame and appurtenant bracing, and the method and equipment for determining any displacement of the test soil nail relative to the grout during application of test loads.
F. Information on space requirements for installation equipment.
G. Drilling methods and equipment.

The working drawing submittal shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California.

The Contractor shall allow the Engineer 4 weeks to review the soil nail working drawings after a complete submittal has been received. No soil nails shall be fabricated or installed until the Engineer has approved, in writing, the working drawing submittal for soil nail assemblies.

Should the Engineer fail to review the complete working drawing submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the soil nail working drawing submittal, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

## MATERIALS

The materials specified below shall be used for construction of soil nail assemblies and test soil nail assemblies.

### Soil Nail

Soil nails shall conform to the provisions for bar reinforcement in Section 52, "Reinforcement," of the Standard Specifications. When Grade 420 soil nails are shown on the plans, the soil nails shall also conform to the requirements in ASTM Designation: A 615/A 615M or A706/A706M. When Grade 520 soil nails are shown on the plans, the soil nails shall also conform to the requirements in ASTM Designation: A 615/A 615M. The soil nail shall be either a reinforcing bar encapsulated full length in a grouted corrugated plastic sheathing or an epoxy coated reinforcing bar partially encapsulated in a grouted corrugated plastic sheathing. The bar shall be centered in the sheathing and the space between the sheathing and the bar shall be filled with grout. The epoxy coating shall have a minimum thickness of 305 µm.

Soil nail assemblies shall be lengthened or additional soil nail assemblies shall be installed when ordered by the Engineer. The lengthening or addition of soil nail assemblies, when ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Soil nails shall have a minimum length of 150 mm of thread on the anchorage end. Threading may be continuous spiral deformed ribbing provided by the bar deformations or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, the bar size shall be the next larger bar designation number from that shown on the plans and coarse threads shall be used. The epoxy coating at the anchorage end of epoxy coated bars may be omitted for a maximum length of 150 mm. Metal surfaces of assembled splices of epoxy coated bars shall be epoxy coated.

Corrugated plastic sheathing shall be either polyvinyl chloride (PVC) or high density polyethylene (HDPE). The minimum sheathing wall thickness shall be 1.0 mm.

HDPE shall have a density between 0.940 and 0.960-g/cm$^3$ when measured in conformance with the requirements in

ASTM Designation: D 792, A-2.

The sheathing shall have sufficient strength to prevent damage during construction operations and shall be watertight, chemically stable without embrittlement or softening, and nonreactive with concrete.

Splicing of soil nails shall be made only at the locations shown on the plans or at ends of soil nails which the Engineer has ordered to be lengthened.

**Test Soil Nail**

Test soil nails shall conform to the provisions for bar reinforcement in Section 52, "Reinforcement," of the Standard Specifications, and shall be of a size and grade determined by the Contractor.

Test soil nail assemblies shall be lengthened or additional test soil nail assemblies shall be installed when ordered by the Engineer. The lengthening or addition of test soil nail assemblies, when ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Test soil nails need not be epoxy coated or encapsulated in grouted plastic sheathing.

Splicing of test soil nails shall be made only at locations outside of the bonded length.

**Anchorage System**

Anchorage for soil nails shall conform to the details shown on the plans and the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications, except that nuts, washers, wedges, and bearing plates to be fully encased in concrete, grout, or shotcrete need not be galvanized. Concrete anchors on the bearing plates shall conform to the provisions for stud connectors in Section 55-2, "Materials," of the Standard Specifications.

The ultimate strength of the soil nail anchorage shall be at least the value shown below for the size of the soil nail bar shown on the plans.

| BAR SIZE | ANCHORAGE ULTIMATE STRENGTH (kilonewtons) | |
|---|---|---|
| | Grade 420 | Grade 520 |
| No. 16 | 123 | 137 |
| No. 19 | 178 | 198 |
| No. 22 | 240 | 267 |
| No. 25 | 314 | 350 |
| No. 29 | 401 | 446 |
| No. 32 | 508 | 565 |

**Grout**

Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. California Test 541 will not be required nor will the grout be required to pass through a screen with a 1.80-mm maximum clear opening prior to being introduced into the grout pump. Fine aggregate may be added to the grout mixture of portland cement and water in drilled holes 150 mm or greater in diameter, but only to the extent that the cement content of the grout is not less than 600 kilograms per cubic meter of grout. Fine aggregate, if used, shall conform to the provisions in Section 90-2, "Materials," and Section 90-3, "Aggregate Gradings," of the Standard Specifications. Grout with fine aggregate shall have a nominal penetration equal to or greater than 90 mm when measured in conformance with California Test 533, and shall have an air content of equal to or less than 2 percent when measured in conformance with California Test 504. Air entraining admixtures shall not be used for grout with fine aggregate.

The consistency of grout with fine aggregate shall be verified prior to use by producing a batch to be tested. 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 grout in the soil nails. Grout for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow testing in conformance with California Test 533. The test batch shall demonstrate that the proposed grout mix achieves the specified nominal penetration. Upon completion of the testing, the grout 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.

**CONSTRUCTION**

Soil nails shall be installed in drilled holes in an expeditious manner so that caving or deterioration of the drilled hole does not occur. No portion of the drilled hole shall be left open for more than 60 minutes prior to soil nail placement and grouting unless otherwise approved by the Engineer.

Difficult soil nail assembly construction is anticipated due to caving soils, utilities at various locations, and traffic control.

**Drilling**

Drilling equipment shall be designed to drill straight and clean holes. The drilling method and the size and capability of the drilling equipment shall be as approved in the working drawings. Drill rigs shall have the capability of anchorage installation and grout placement through the use of drill casing or hollow-stem augers.

At locations where caving conditions are anticipated, sufficient casing and auger lengths shall be available on site to maintain uninterrupted installation of anchors.

At locations where hard drilling conditions such as rock, cobbles, boulders, or obstructions are anticipated, a down hole pneumatic hammer drill rig and drill bit shall be available on site to drill holes for soil nail assemblies.

Drilled holes for walls shall not extend beyond the right-of-way or easement limits as shown on the plans or as specified in these special provisions.

Holes shall be drilled in the natural foundation materials. Holes for test soil nail assemblies shall be of the same diameter as those for the production soil nail assemblies they represent.

Holes shall be cleaned to remove material resulting from the drilling operations and to remove any other material that would impair the strength of the soil nail assemblies or test soil nail assemblies. Foreign material dislodged or drawn into the holes during construction of the assemblies shall be removed. Water for cleaning holes shall not be used, unless full hole length hollow-stem augers or casing is maintained in the same hole during cleaning and soil nail assembly installation. Soil nail assemblies and test soil nail assemblies shall not be installed in the drilled holes until the holes have been inspected by the Engineer.

**Installing Soil Nails and Test Soil Nails**

Soil nails and test soil nails shall be installed in the drilled holes using centralizers. Centralizers shall adequately support the bar in the center of the drilled hole and shall be spaced at a maximum of 1.5 m on center along the length of the bar, and 0.5-m from the end of the bar.

Where the soil nail cannot be completely inserted, the Contractor shall remove the bar and clean or redrill the hole to permit unobstructed installation. Partially installed bars shall not be driven or forced into the drilled hole and will be rejected. When open-hole drilling methods are being used, the Contractor shall have hole cleaning tools on-site suitable for cleaning drilled holes along their full length just prior to bar insertion and grouting.

**Grouting**

The length of drilled hole shall be verified and recorded by the Contractor before grouting.

Grout shall be injected at the low end of the drilled hole and shall fill the drilled hole with a dense grout free of voids or inclusion of foreign material. Cold joints shall not be used in grout placement. Soil nails shall be grouted full length.

Only the bonded length of test soil nails shall be initially grouted. Initial grouting shall be confined to the bonded length by packers or other approved devices. For test soil nails, grouting of the remainder of the drilled hole shall not be done until pullout tests have been completed and approved by the Engineer.

After placing the grout for soil nails and test soil nails, they shall remain undisturbed for the cure time stated in the approved soil nail working drawings.

**Securing Soil Nails**

Any remaining void at the exterior end of the drilled hole for a soil nail assembly shall be filled with shotcrete and the soil nail secured at the face of the shotcrete. The steel bearing plate shall be seated with full bearing on the shotcrete surface and the nut for the soil nail shall be hand tightened before the initial set of the shotcrete. The nut shall be made wrench tight after the shotcrete has set for 24 hours, unless a shorter time is approved by the Engineer.

**Securing Test Soil Nails**

Testing shall be performed against a temporary bearing yoke which bears directly on the shotcrete facing. Test loads transmitted through the temporary bearing yoke shall not fracture the shotcrete or cause displacement or sloughing of the soil surrounding the drilled hole. No part of the yoke shall bear within 150 mm of the edge of blockout.

Test soil nails shall be removed to behind the front face of the shotcrete after testing has been completed. The remaining length of void in the drilled hole shall be grouted and the blockout in the shotcrete facing filled with either grout or shotcrete.

**TESTING**

Test soil nail assemblies shall be pullout tested by the Contractor in the presence of the Engineer. A pullout test shall consist of incrementally loading the assembly until either the pullout test load has been held for one minute or the total measured movement of the soil nail exceeds 50 mm, at which point the load shall be recorded as part of the test data and submitted to the Engineer at the conclusion of each test.

The Contractor shall monitor and record total movement of the test soil nail relative to the grout during application of the test load.

Applied test loads shall be determined by using either a calibrated pressure gage or a load cell. Movements of the end of the soil nail, relative to an independent fixed reference point, shall be measured and recorded to the nearest 25 µm at each increment of load, including the ending alignment load, during the load tests.

The pressure gage shall have an accurately reading dial at least 150 mm in diameter. Each jack and its gage shall be calibrated as a unit with the cylinder extension in the approximate position that it will have at final jacking force, and shall be accompanied by a certified calibration chart. Each jack and pressure gage assembly shall be calibrated in conformance with Section 50-1.08, "Prestressing," of the Standard Specifications. The load cell shall be calibrated and shall be provided with an indicator capable of measuring the test load in the soil nail. The range of the load cell shall be such that the lower 10 percent of the manufacturer's rated capacity will not be used in determining the jacking force.

The test load may be verified by State forces with either State-furnished load cells or pressure cells, or with State-furnished Vibra-Tension equipment operated in conformance with the requirements of California Test 677. The Contractor shall provide sufficient labor, equipment, and material to install and support such testing equipment at the soil nails and to remove the testing equipment after the testing is complete, as ordered by the Engineer.

The pullout test procedures shall conform to the following:

A. The pullout test shall be conducted by measuring and recording the test load applied to the test soil nail and the test soil nail end movement at each load listed in the following loading schedule.

PULLOUT TEST LOADING SCHEDULE

AL
0.20M
0.30M
0.40M
0.50M
0.60M
0.70M
0.80M
0.90M
1.00M (PULLOUT TEST LOAD)
AL

(M = MAXIMUM TEST LOAD (kN) = $0.0141\sigma_b D$)

Where $\sigma_b$=Ultimate bond stress between grout and drilled hole as shown on the plans, in kPa; and D=actual drilled hole diameter, in millimeters.

(AL = ALIGNMENT LOAD = 0.1M)

B. Each increment of load shall be applied in less than one minute and held for at least one minute but not more than 2 minutes, except that the load equal to 0.70M shall be held for 10 minutes. During the 10-minute load hold, the movement of the end of the soil nail shall be measured at 1, 2, 3, 4, 5, 6, and 10 minutes. The observation period for the 10-minute load hold shall start when the pump begins to apply the increment of load from 0.60M to 0.70M. If the creep movement measured between one minute and 10 minutes at 0.70M is less than one mm, the load shall continue to be increased incrementally to 1.00M, then reduced to the ending alignment load. The test soil nail assembly shall be considered acceptable if 1) the creep movement measured between one minute and 10 minutes is less than one mm, 2) the total measured movement is greater than 80 percent of the theoretical elastic elongation of the test nail unbonded length at the 1.0M load, and 3) the total measured movement is less than 50 mm.

C. If the load of 0.70M cannot be maintained for 10 minutes with one mm or less creep movement, the 0.70M load shall be maintained for an additional 50 minutes. Total movement shall be measured at 15, 20, 25, 30, 45, and 60 minutes. If the test load is held for 60 minutes, a creep curve showing the creep movement between 10 minutes and 60 minutes shall be plotted as a function of the logarithm of time. If the creep curve plotted from the movement data indicates a creep rate of less than 2.0 mm for the last log cycle of time, the load shall continue to be increased

incrementally to 1.00M, then reduced to the ending alignment load. The test soil nail assembly shall be considered acceptable if 1) the creep curve plotted from the movement data indicates a creep rate of less than 2.0 mm for the last log cycle of time, 2) the total measured movement is greater than 80 percent of the theoretical elastic elongation of the test nail unbonded length at the 1.0M load, and 3) the total measured movement is less than 50 mm.

D. The soil nail shall be unloaded only after completion of the test.

Test soil nails that fail to meet acceptance criteria shall be extracted when requested by the Engineer. Full compensation for extracting test soil nails shall be considered as included in the contract price paid per meter for soil nail assembly, and no separate payment will be made therefor.

The Contractor shall furnish to the Engineer complete test results for each soil nail assembly tested. Data for each test shall list key personnel, test loading equipment, test soil nail location, hole diameter and depth, bond length, type of soil, method of drilling, and amount of ground water encountered within the bond length. Test data shall also include the dates and times of drilling, test soil nail installation, grouting, and testing. The test load and amount of displacement shall be included in the test data when any displacement of the test soil nail relative to the grout occurs during application of the test load.

**MEASUREMENT**

Soil nail assembly and test soil nail assembly will be measured and paid for by the meter. The length to be paid for will be the length of soil nail assembly or test soil nail assembly measured along the bar centerline from the back face of shotcrete to the tip end shown on the plans or ordered in writing by the Engineer.

**PAYMENT**

The contract price paid per meter for soil nail assembly shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the soil nail assemblies, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Test soil nail assemblies will be paid for as soil nail assembly.

Full compensation for testing of the test soil nail assemblies shown on the plans shall be considered as included in the contract price paid per meter for soil nail assembly, and no separate payment will be made therefor.

Full compensation for repair of all damage to existing structures and all other damage done by drilling shall be considered as included in the contract price paid per meter for soil nail assembly, and no additional compensation will be allowed therefor.

Full compensation for furnishing, installing, and removing casing shall be considered as included in the contract price paid per meter for soil nail assembly, and no additional compensation will be allowed therefor.

The quantities of trial batch grout will not be included in any contract item of work, and full compensation for furnishing, producing, and disposing of trial batches shall be considered as included in the contract price paid per meter for soil nail assembly, and no additional compensation will be allowed therefor.

## 10-1.26 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 aluminum and aluminum-coated culverts nor 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. When controlled low strength material is used as structure backfill for pipe culverts, the sections of pipe culvert in contact with the controlled low strength material shall conform to the requirements of Chapter 850 of the Highway Design Manual using the minimum resistivity, pH, chloride content, and sulfate content of the hardened controlled low strength material. Minimum resistivity and pH shall be determined in conformance with the requirements of California Test 643. The chloride content shall be determined in conformance with the requirements of California Test 422 and the sulfate content shall be determined in conformance with the requirements of California Test 417.
C. 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.
D. 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.

## 10-1.27 MATERIAL CONTAINING AERIALLY DEPOSITED LEAD

Earthwork involving materials containing aerially deposited lead shall conform to the provisions in "Earthwork" and this section "Material Containing Aerially Deposited Lead" of these special provisions.

Attention is directed to "Aerially Deposited Lead" of these special provisions.

Type Y material contains aerially deposited lead in average concentrations greater than or equal to 5.0 mg/L Soluble Lead and between 0 - 350 mg/kg (inclusive) Total Lead, as tested using the California Waste Extraction Test. Type Y material locations - are shown on the plans. These materials shall be placed as shown on the plans, unless otherwise directed by the Engineer, and covered with a minimum 0.3-m layer of non-hazardous soil or pavement. These materials are hazardous waste regulated by the State of California that may be reused as permitted under the Variance of the Department of Toxic Substances Control. 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 project limits. In order to conform to the requirements of these provisions, it may be necessary to stockpile materials for subsequent stages or construct some embankments out of stage or 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 aerially deposited lead. 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 for review and acceptance at least 15 days prior to beginning work in areas containing aerially deposited lead.

The Contractor shall not work in areas containing aerially 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 aerially deposited lead, personnel who have no prior training or are not current in their training status, including State 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 State personnel by the Contractor. The number of State personnel will be 5.

The Engineer will notify the Contractor of acceptance or rejection of any 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 the Excavation and Transportation Plan to the Engineer. The Engineer will have 7 days to review the Excavation and Transportation Plan. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the Excavation and Transportation 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 Excavation and Transportation Plan, 3 additional copies of the Excavation and Transportation Plan incorporating the required changes shall be submitted to the Engineer. Minor changes or clarifications to 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 Excavation and Transportation Plan while minor revisions or amendments to the Plan are being completed.

The Contractor shall prepare a written, project specific Excavation and Transportation Plan establishing the procedures the Contractor will use to comply with requirements for excavating, transporting, and placing (or disposing) of material containing aerially deposited lead. The Excavation and Transportation Plan shall conform to the regulations of the Department of Toxic Substance Control and the California Division of Occupational Safety and Health Administration (Cal-OSHA). The sampling and analysis plans 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. Dust control measures
F. Transportation equipment and routes
G. Method for preventing spills and tracking material onto public roads
H. Truck waiting and staging areas
I. Example of Bill of Lading to be carried by trucks transporting Type Y material. The Bill of Lading shall contain: US DOT description including shipping name, hazard class, and ID number; handling codes; quantity of material; volume of material. Copies of the bills of lading shall be provided to the Engineer upon placement of Type Y material in its final location. Trucks carrying Type Y material shall not leave the highway right of way.
J. Spill Contingency Plan for material containing aerially deposited lead

**DUST CONTROL**

Excavation, transportation, placement, and handling of materials containing aerially 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 aerially deposited lead.

Stockpiles of material containing aerially 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 these hazardous materials, and the Contractor will not be obligated for further cleanup, removal, or remedial action for such materials 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.

**DISPOSAL**

Surplus materials whose lead content is not known shall be analyzed for aerially deposited lead by the Contractor prior to removing the materials from within the project limits. The Contractor shall submit a sampling and analysis plan and the name of the analytical laboratory to the Engineer at least 15 days prior to beginning sampling or analysis. The Contractor shall use a laboratory certified by the California Department of Health Services. Sampling shall be at a minimum rate of one sample for each 150 $m^3$ of surplus material and tested for lead using EPA Method 6010 or 7000 series.

Sampling, analyses, and reporting of results for surplus materials not previously sampled will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

**MEASUREMENT AND PAYMENT**

Full compensation for roadway excavation containing aerially deposited lead of the types shown in the plan, will be measured and paid for in the same manner specified for roadway excavation, in Section 19, "Earthwork," of the Standard Specifications, and no additional compensation will be allowed therefor.

Full compensation for preparing an approved Excavation and Transportation Plan, transporting material containing aerially deposited lead reused in the work from location to location, shall be considered as included in the contract prices paid per cubic meter for roadway excavation , and no additional compensation will be allowed therefor.

No payment for stockpiling of material containing aerially deposited lead will be made, unless the stockpiling is ordered by the Engineer.

## 10-1.28 TUNNELING

Tunneling shall consist of mechanically placing a pipe at the locations shown on the plans, in conformance to Section 65-1.05, "Jacking Pipe," of the Standard Specifications, these special provisions, and as directed by the Engineer.

Attention is directed to Sections 7-1.08, "Public Convenience," and 7-1.09, "Public Safety," of the Standard Specifications and to the provisions in "Order of Work," "Water Pollution Control," and "Quality Control," of these special provisions.

**TUNNELING OPERATIONS**

Required pipe tunnel locations and lengths are as shown on the Plans. The Contractor shall submit a proposed plan of tunnel operation that shall include but not be limited to drawings showing details for the following operations:

1. Tunnel Shaft bracing and dimensions
2. Tunnel supports and thrust block details
3. Method of backpacking tunnel supports
4. Method of transporting pipe in tunnel
5. Bracing to prevent pipe shifting and flotation
6. Pressure concrete mix design, placement method and equipment
7. Method of muck disposal
8. Temporary drainage and ventilation of the excavation
9. Method of drilling probe holes, ahead of each tunnel face and testing the probe hole to detect the presence of water and gases
10. Method of monitoring ground surface settlement
11. Method of verification of soil consistency using Cone Penetration Tests (CPT) or other approved method.

The Tunneling operations listed above shall be submitted in accordance with the provisions in "Submittals," of these special provisions.

The tunneling operations have been classified "Potentially Gassy" by the State of California, Department of Industrial Relations, Division of Occupational Safety and Health (CAL/OSHA) under Section 8422 of the Tunnel Safety Orders. The Tunnel Contractor shall notify CAL/OSHA Mining and Tunneling Unit to schedule a Pre-Job Conference prior to commencing any activity associated with construction of the tunneling project in accordance with CAL/OSHA Underground Classification No. C 055-065-03T Amended 12/02. The Tunnel Contractor shall contact Mr. Pete Dizon, CAL/OSHA Mining and Tunneling Unit, 242 East Airport Drive, Suite 105, San Bernardino, CA 92408, Tel. No. (909) 383-6782. A copy of the CAL/OSHA "Underground Classification" is available for review at Department of Transportation, District 8, 6th Floor, MS-971, 464 W. 4th Street, San Bernardino, CA 92401-1400.

The northbound exit ramp to Central Ave. shall be closed to provide the jacking pit as shown on the plans. All other tunneling work shall be performed without disruption to public traffic at any stage of construction.

The Contractor shall place sound blankets at tunnel portals and access shafts to minimize noise levels. Such action shall not relieve the Contractor from complying with sound control requirements and light attenuation requirements in accordance with local ordinances, provisions of "Sound Control Requirements" of these special provisions, and the Standard Specifications.

Temporary construction lighting shall be provided in accordance with the provisions of Section 86-6.11, "Falsework Lighting" of the Standard Specifications.

All temporary construction lighting fixtures shall be properly aimed to preclude glare to residents. In addition, temporary lighting fixtures shall not become a public inconvenience or nuisance.

Unless otherwise approved by the Engineer, once the tunneling operations have commenced, the Contractor shall continue tunneling operations until the pipe has been installed to the locations shown on the plans.

A copy of the "Geotechnical Design Report for Storm Drain Pipe Jacking" is available for review at Department of Transportation, District 8, 6th Floor, MS-971, 464 W. 4th Street, San Bernardino, CA 92401-1400.

The Contractor shall become fully informed of, and comply with, the applicable provisions of the Federal, State, and local regulations that govern the Contractor's tunneling operations.

The Contractor shall be responsible for the costs and for any liability imposed by law that result from the Contractor's failure to comply with the requirements set forth by, but not limited to, Federal, State and local regulations.

**QUALITY CONTROL**

The Contractor shall conform to the following:

1. Certification – The Contractor shall have drawings and calculations prepared and certified by an Engineer registered in the State of California and experienced in the tunneling operations used for this Contract.
2. The Contractor shall provide certification indicating that pre-cast segments, if used, meet specification requirements before delivery.
3. The Contractor shall provide Certificates of Compliance for the materials used in the tunneling procedure.
4. The Contractor shall prepare daily tunnel inspection reports in accordance with a format approved by the Engineer and submit these reports to the Engineer at the end of each shift.
5. If a support liner is used, the Contractor shall perform initial support liner deformation measurements and submit these measurements to the Engineer. In the event that measurements meet or exceed limits specified by the manufacturer or compromise the safety of individuals involved in the tunneling operation or the public, the Contractor shall inform the Engineer of the situation and provide an alternative for corrective action.
6. The Contractor shall monitor the ground surface for settlement or heaving prior to and during the entire tunneling operation. Survey control points at both surface and subgrade levels shall be established along the alignment of the pipeline at locations approved by the Engineer. The Contractor shall provide a detailed plan for monitoring ground surface movement (settlement or heave) due to the jacking, tunneling, or microtunneling operation. The plan shall address the method and frequency of measurement of movement of structures, roadways, and any other area of concern within 6m of the tunnel at a maximum spacing of 30-m or as required by the Engineer. A detailed plan for corrective actions to be taken should settlement or heaving of the ground be detected over the tolerance (12-mm maximum allowable) shall be information submitted under the general section of this special provision by the Contractor for approval. Before starting dewatering, jacking or tunneling operations, the Contractor shall ensure that subsurface settlement indicators, and ground surface settlement reference points have been installed.
7. The Contractor shall provide a continuous tunnel shield guidance system to maintain proper tunnel line and grade alignment control to ensure joint alignment and closure. The System shall consist of computerized guidance and location control system lasers and targets with devices to indicate pitch and roll of the shield and provide continuous and reliable position, point on alignment and corrective actions to ensure alignment tolerances of 75-mm maximum. The

Contractor shall provide a system, which provides continuous printed and visual display. Printed output shall present data on a form acceptable to the Engineer. The Contractor shall notify the Engineer if the tunnel line and grade alignment exceeds the maximum tolerance and correct the position.

8. The Contractor shall immediately notify the Engineer when the maximum pressure of the jacking system (if used) is reached, regardless of the reason.
9. The Contractor shall drill probe holes ahead of each tunnel face and test probe hole to detect presence of gases and groundwater. The Contractor shall prepare and provide a Contingency Plan in the event that gas or groundwater is detected. The plan shall describe methods by which the Contractor shall respond and mitigate the situation.
10. CPT test results prior to and after tunneling shall be compared based on the value of cone tip resistance averaged from a selected zone at any corresponding locations. If the cone tip resistance after tunneling is less than 50 percent of the resistance prior to tunneling, the Contractor shall be responsible for the damage and implement the remediation plan in accordance with the approved plan specified in the "Work Plan". To densify the loose layers, the Contractor may select any method or a combination of several methods of densification such as grouting as long as the end results achieve the target value of soil consistency. Acceptance of densification shall be based on the following performance criteria:

    a. An average cone tip resistance for each CPT sounding location in the loose zone should be at least 2.50-kPa (60 tsf).
    b. No single point of cone tip resistance should be less than 1.67-kPa (40 tsf).

    After completion of densification work for each section, CPT tests shall be performed at selected locations to verify that the soil consistency meets the criteria described above. In a special case for the soil layer where the average cone tip resistance is less than 2.50-kPa (60 tsf) prior to tunneling, the resistance after tunneling shall be no less than the average cone tip resistance prior to tunneling.

**SUBMITTALS**

The Contractor shall submit the following prior to commencing work:

1. Prior to starting the tunneling work including pit construction, the Contractor shall submit Plans and Working Drawings of, but not limited to, the pit bracing, casing (or conduit), jacking head proposed to be used, locations and details for any intermediate joints, and details for securing headway in an emergency for review and approval. The Engineer will have four(4) weeks to review the Plans and Working Drawings. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the Plans and Working Drawings within two(2) weeks of receipt of the Engineer's comments. The Engineer will have two(2) weeks to review the revisions and approve the Plans and Working Drawings.
2. Plans and Working Drawings for tunneling operations shall be prepared and signed by an Engineer registered as a Civil or Structural Engineer in the State of California.
3. The Contractor shall submit Working Drawings for:

    a. Tunnel and shafts including plans and schedule for tunneling operations.
    b. Tunnel Excavating Equipment, including drawings and specifications.
    c. Method of filling expansion gaps.
    d. Methods of installing initial tunnel support system either of precast concrete segments or of steel ribs with non-combustible lagging, and methods of expansion using structural steel or other approved struts and contact grouting behind the system used.
    e. Methods of placing cast-in-place concrete liners, if used.
    f. Method of controlling line and grade of shields and initial tunnel support system.
    g. Method of removing soil support structures at cut-and-cover structures.
    h. Details for tunnel and cut-and-cover structure interfaces, where indicated.
    i. Gas and water detection instruments and procedures.
    j. Program for fire prevention and mitigation.
    k. Tunnel access at Work Access Shafts.
    l. Means and method of drilling probe hole in each tunnel face.
    m. Ground settlement monitoring.
    n. Layout of CPT soundings shall be submitted with the Work Plan and CPT tests shall be performed prior to and after tunneling along the alignment of pipeline to verify the soil consistency of the subsurface soil. The tests shall be performed to a depth of approximately 900-mm above the crown of the pipe at the locations approved by the Engineer. A minimum of 10 sounding locations around the roadway area is required.

4. The Contractor shall provide permits for disposing of excavated material and for tunnel drainage.
5. The Contractor shall provide test and monitoring reports to the Engineer as required by CAL/OSHA for dust, toxic and hazardous gases and other atmospheric impurities in the working environment.
6. The Contractor shall prepare and provide a Contingency Plan for the event that gas or groundwater is detected describing methods by which the Contractor shall respond and mitigate the situation.
7. The Contractor shall provide a detailed Plan for Corrective Action should settlement or heaving of the pavement be detected to be over the tolerance (12 mm maximum).
8. The Contractor shall provide a Contingency Plan for the event of cave-in, blowout, tunnel excavation failure or equipment failure.
9. The Contractor shall provide manufacturer's product data and certification that materials meet specification requirements.
10. The Contractor shall provide a certification that precast segments meet specification requirements before delivery.
11.

**WORKSITE CONDITIONS**

The Contractor shall maintain clean working conditions inside the tunnel. Remove muck spills, grout spills, and other material that is not to be used for tunneling. At the completion of each shift, the Contractor shall clean the tunnel to the satisfaction of the Engineer.

Emergency Work – Whenever there is an emergency, or stoppage of work which is likely to endanger the excavation, adjacent roadways or structures, the Contractor shall maintain sufficient forces for 24 hours a day, including weekends and holidays, to resolve the emergency or hazardous condition until it is corrected.

**EXCAVATION**

Access shafts or portals shall be located where shown on the plans or designated in the specifications. Where no such locations are given, the Contractor shall have the option of determining such locations subject to approval by the Engineer. In general, access shafts or portals will not be permitted within street intersections. Shafts, jacking pits, and tunnels shall conform with Trench Safety Standards and OSHA excavation, trenching, and shoring standards which are contained in the Code of Federal Regulations 29 (CFR) 1926.650-1926.653 and CAL/OSHA Regulations.

A bentonite slurry may be used as a lubricant during jacking operations. The lubricating slurry should not be allowed to advance ahead of the pipe unless approved by the Engineer. Also, a qualified mud engineer will be required.

The tolerance of the overcut shall comply with and the work of jacking shall conform to applicable provisions of Section 65-1.05, "Jacking Pipe", of the Standard Specifications.

Drilling shall be performed in such a manner as to avoid undue shattering or loosening of material. The Contractor shall remove material, which is likely to fall or appears dangerous to workers or the work. The fact that such removal may enlarge the excavation beyond the required limits shall not relieve the Contractor from the necessity of performing such Work, and the Contractor shall not be entitled to any additional compensation by reason of such tunnel enlargement. When soil conditions dictate, the tunneling equipment must be capable of removing cobbles and boulders. The excavation system shall be fully capable of excavating any material that will be encountered. Blasting is not permitted.

Loose material in the invert shall be removed to a reasonably clean rock surface or undisturbed foundation prior to placing pipe bedding and installing pipe. Deep depressions may be filled with suitable material approved by the Engineer. The work of removing loosened invert material and filling the resulting depressions or enlargement of the tunnel from overshooting or overexcavating shall be considered a part of tunnel excavation and no additional compensation will be allowed therefor.

Temporary excavations must be properly sloped, shored, or braced. Excavations shall be in conformance with all applicable provisions of Sub-Section 19-3, "Structure Excavation and Backfill", of the Standard Specifications. Excavated soil shall not be stockpiled adjacent to the excavation pit, it shall be set back at least 2.0 m from the top edge of the excavation pit.

**DEWATERING**

Groundwater – if groundwater is encountered, the Contractor shall be fully informed of all rules, regulations and conditions that may govern the Contractor's operations and shall conduct the work accordingly.

Dewatering shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications and these special provisions.

Historic groundwater level information may be obtained from the Engineer.

If dewatering is required, the Contractor shall obtain all necessary permits and approvals prior to beginning dewatering operations, including required water testing, water treatment and water disposal requirements.

Full compensation for dewatering shall be considered as included in the contract price paid per meter for 2100 mm reinforced concrete pipe and no additional compensation will be allowed therefor.

Dewatering for tunneling shall conform to Section 19-3.04, "Water Control and Foundation Treatment", of the Standard Specifications.

**TUNNEL SUPPORTS**

Unless otherwise shown on the plans, the materials used for tunnel supports may be timber, metal, concrete, or a combination thereof at the option of the Contractor. Steel liner plates, if used, shall be provided with grout connections sufficient in number to permit backpacking by means of grout, should such action prove necessary. Tunnel supports shall conform to the requirements set forth in the Tunnel Safety Orders of the State of California. The Contractor shall submit drawings of tunnel supports proposed to be used. Such drawings shall include full details of the proposed tunnel supports (including connections), longitudinal and transverse bracing and foot blocks, the proposed method of pipe installations, the proposed method of backpacking tunnel supports, and other pertinent details.

The tops of foot blocks shall be installed below the pipe barrel a distance of one-sixteenth the pipe diameter or a minimum of 100-mm, whichever is greater. Transverse timber struts, spreaders, and footings will be permitted only where necessary to support horizontal thrust from the tunnel sides. Timber bracing, where necessary, may be left in place provided it lies entirely below the bottom of the pipe the distance specified herein for foot blocks and does not occupy more than 15-percent of the bottom area of the tunnel.

Vertical and horizontal clearance dimensions between pipe sockets and the inside face of continuous tunnel supports, lagging, splining, or steel liner plates as specified herein or as shown on the Plans, will be considered minimum dimensions. The clearance dimensions between pipe sockets and such intermittent timber and steel members as timber sets or steel rib sets are also minimum dimensions and no encroachment within the dimensions specified will be permitted. It shall be the responsibility of the Contractor to increase tunnel dimensions where necessary in order to provide adequate room for workers and equipment and such space shall be at no increase in cost to the State.

Unless otherwise specified or shown on the plans, the minimum clearances shall be as follows:

1. For tunnels to be backfilled with pressure concrete, the minimum side clearance at the spring line of pipe sockets to continuous steel or timber shall be 300-mm and to intermittent sets or ribs shall be 250-mm.
2. The minimum overhead clearance from pipe sockets to nearest inside face of any steel or timber member shall be 250-mm.
3. For tunnels to be backfilled with air-blown mortar or mortar sand, the minimum side clearance at the spring line of pipe sockets shall be as for pressure concrete backfill specified above, but the minimum overhead clearance shall be increased to 450-mm.
4. The minimum side and top clearances prescribed herein shall be increased by 75-mm for pipe without projecting sockets or collars and shall apply to the barrel of the pipe.

The Contractor will be required to do such reconstruction of tunnel supports at his own expense, as may be necessary to meet the foregoing requirements. The State may make minor revisions in the horizontal tunnel alignment where possible in sections at least 15-m long to minimize the extent of such reconstruction. Similar changes in vertical alignment will generally not be approved.

Timber collar braces and, to the extent practicable, timber supports, lagging and blocking shall be removed prior to backfilling tunnels, except where such removals would be hazardous to persons or the structure. Material to remain in place shall be cleaned of adhering tunnel muck or other material not suitable for backfill.

**BACKPACKING TUNNEL SUPPORTS**

Voids behind temporary or permanent tunnel support systems, including overbreak, cave-ins, and chimneys, shall be backpacked as specified herein. Backpacking shall be placed progressively as soon as practicable after placement of tunnel supports. When ordered by the Engineer, the Contractor shall place backpacking immediately. The non-backpacked length of tunnel shall be held to the minimum practicable for the method of backpacking utilized by the Contractor.

Tunnels in rock supported by timber lagging steel liner plate, or bolted steel plate tunnel lining shall be backpacked either with pressure grout or soil-cement except that tunnel spoil may be used to the mid-height of the tunnel. The Contractor shall backpack behind lagging or sheeting in tunnels with either pressure grout or tunnel spoil all voids greater than 0.03 cubic meters in volume or when directed by the Engineer.

Tunnels in rock or soils and supported by timber or steel sets with partial timber or metal lagging may be backpacked to the mid-height of the tunnel with tunnel spoil.

Spaces not filled with such backpacking shall be filled at the time of, and with material selected for, tunnel backfilling around the pipe.

Tunnel spoil used for backpacking shall be selected from the better spoil material available, and shall contain sufficient fines to fill voids. Such material shall be rammed into place. Soft or wet clay may be used only if satisfactory compaction

can be obtained. Otherwise, the Contractor will be required to import granular material for backpacking at no additional cost to the State.

Provisions regarding backpacking and backfilling shall apply to such tunnels except that if the roof of any such tunnel, or portion thereof, is sloped upward toward the ends of the tunnel for the full width of the excavation at an angle of 45 degrees or greater with the horizontal, the backfill within the sloped portion of the tunnel may be made with material removed from the excavation and densified by flooding or jetting, or mechanically compacted to a minimum relative density of 85 percent.

If the supporting base of any substructure is disturbed or any sewer or storm drain is exposed or partially exposed, it shall be supported with a concrete wall.

Soil cement for backpacking lagged or fully lined tunnels shall consist of slightly moistened mixture of one part cement to 5 parts of granular material selected from the tunnel spoil when such material is suitable. Otherwise, granular material shall be imported at the Contractor's expense. The soil cement shall be thoroughly mixed and rammed into place immediately following placement of tunnel supports. The placement interval shall not exceed three rings of liner plate or the distance between tunnel sets. Mechanically or pneumatically operated tampers shall be used to ram the soil-cement into place unless another placing method is approved by the Engineer.

**TUNNEL BACKFILL**

Pipe laying operations in tunnels shall not precede tunnel backfill by more than 45 m without the approval of the Engineer. Longer reaches may be approved if tunnel clearances are increased from the minimums shown in order to obtain additional working space around the pipe.

The space between the tunnel supports and the pipe shall be completely backfilled with the materials and methods specified herein. The backfill material shall be forced or packed into the crevices and around the timber sets or steel ribs from the tunnel invert to its crown. The Contractor shall provide wedging or bracing as needed to ensure against pipe movement during placement of backfill.

Backfill for tunnels in rock shall be limited to pressure concrete or air-blown mortar.

The approval of the use of air-blown mortar for backfill is contingent upon the prior backpacking of tunnel supports with acceptable materials other than air-blown mortar.

Unless the Plans for tunnels to be constructed in soil require the use of pressure concrete or air-blown mortar for backfill, the Contractor may use mortar sand for backfill.

Mortar sand shall be placed with a pneumatic gun in accordance with the requirements for placing air-blown mortar except that no Portland cement need be added. The Contractor may add up to 60-kg of cement per cubic yard to improve placement stability at his option and expense. In either case, water sufficient to saturate the material and ensure proper packing and minimize rebound shall be added to the mixture. The nozzleperson shall operate in the immediate vicinity of the backfill face to ensure compaction and complete filling of voids.

At least 30 days prior to backfill operations, the Contractor shall submit to the Engineer for a proposed mix design and method of placing concrete, including placing equipment. No pressure concrete backfill shall be placed until mix design, placement method, and equipment have been approved. If the approved mix cannot be readily pumped or placed by the Contractor's placing equipment, additional water may be added, provided the water-cement ratio of the approved mix design is not exceeded.

The pressure concrete shall be placed by methods capable of forcing it into crevices and filling void spaces in the tunnel. The concrete backfill shall be placed under pressure by means of a "slick" line and pneumatic or positive displacement pumps.

The combined length of the slick line and delivery line shall not exceed the recommendation of the manufacturer of the concrete pump or, if no manufacturer's performance data is available, 45 m. The discharge end of the slick line shall be rigid conduit with a minimum length of 3 m. It shall be kept buried in at least 1.5 m of fresh concrete during concrete placement. Concrete shall be pumped continuously during withdrawal of the slick line to eliminate voids.

At portals, non-expansive soil or soil having a low expansion index must be used for backfill. Backfill should be compacted in accordance with applicable provisions of Section 19-5, "Earthwork" of the Standard Specifications. Backfill shall be placed in loose lifts not exceeding 200-mm in thickness, moisture-conditioned to near optimum moisture content and compacted to at least 95 percent relative compaction. The relative compaction shall be based on the maximum density determined by CTM 216.

**PRESSURE GROUTING OF VOIDS**

Where the Engineer has reasonable doubt that the tunnel void spaces are completely filled, the Contractor shall pressure grout such locations as ordered through grout pipes to be installed either from the ground surface or from within the conduit. At least two grout holes will be required at each location to permit escape of air. The location of surface grout pipes may be adjusted as may be required, dependent upon traffic requirements on overhead streets.

Grout for filling voids shall be low pressure grout (less than 70-kPa). Neat cement grout shall be used except that large voids shall be filled with pressure concrete or grout containing sand.

Grout shall be placed by means of pumps of positive displacement or pneumatic type and capable of placing grout at pressures up to 70-kPa unless otherwise approved by the Engineer. Grout shall be placed at pressures that are requisite for the conditions encountered, and will ordinarily be less than 70-kPa except in cases where large cave-ins or other adverse conditions may require higher pressures.

Regardless of the materials or methods of backfilling or filling voids used, the Engineer shall reserve the right to require filling of void spaces known to remain by additional grouting. Such work will be deemed to have resulted from the Contractor's operations and shall be done at the Contractor's expense.

Upon completion of the tunneling operations, voids around the outside face to the pipe shall be filled by pressure grouting through previously constructed grout holes or holes drilled through the pipe. The location of such holes shall be indicated on the Working Drawings.

**MEASUREMENT**

The 2100 mm reinforced concrete pipe shall be measured by the meter, for the actual length constructed, as shown on the plans and as directed by the Engineer.

**PAYMENT**

The contract price paid per meter for 2100 mm reinforced concrete pipe (Class V Special) shall include full compensation for furnishing, all labor, materials, tools, equipment and incidentals, and preparation of submittals, for doing the work involved in tunneling complete in place. This shall also include dewatering, furnishing, installing, backpacking, and maintaining tunnel supports, placing tunnel backfill, pressure grouting; providing access shafts and portals including excavation, backfill and replacement of surface or other improvements; furnishing and installing pipe and doing what is appurtenant to tunnel construction including probing, monitoring for heave and settlement and CPT pre- and post-testing within the limits shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

## 10-1.29 EROSION CONTROL (BLANKET)

Erosion control (blanket) shall conform to the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Erosion control (blanket) work shall consist of applying topsoil, seed and installing erosion control blanket to bio swale areas 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 have been tested for purity and germination not more than one year prior to application of seed.

Results from testing seed for purity and germination shall be furnished to the Engineer prior to applying seed.

Seed shall be delivered to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag will not be accepted.

A sample of approximately 30 g of seed will be taken from each seed container by the Engineer.

**Non-Legume Seed**

Non-legume seed shall consist of the following:

NON-LEGUME 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 |

**Erosion Control Blanket**

Erosion control blanket shall consist of wood excelsior mats secured in place with wire staples and shall conform to the following:

A. 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 a photo-degradable extruded plastic mesh. 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/m$^2$ ± 10 percent at the time of manufacture.

B. Staples for erosion control blankets shall be made of 8 -gage minimum steel wire and shall be U-shaped with 200-mm legs and 50-mm crown.

**Imported Topsoil**

Imported topsoil shall conform to the provisions in Section 20-2, "Materials," and Section 20-3, "Erosion Control," of the Standard Specifications.

**APPLICATION**

Erosion control (blanket) materials shall be placed in separate applications as follows:

A. The first application shall consist of applying imported topsoil, to areas designated on plans, to a depth of 152-mm. No compaction will be required.

B. The second application shall consist of applying seed at the following rates and in the following sequence:

1. Seed shall be applied at the rates indicated 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) |
|---|---|
| Non-Legume Seed | 40 |

C. The third application shall consist of installing the erosion control blanket over the seed application.

D. 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, imported topsoil, , 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.

## 10-1.291 EROSION CONTROL (TYPE D)

Erosion control (Type D) shall conform to the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions and shall consist of applying erosion control materials to embankment and excavation slopes and other areas disturbed by construction activities.

If the slope on which the erosion control is to be placed is finished during the rainy season as specified in "Water Pollution Control" of these special provisions, the erosion control shall be applied immediately to the slope.

Prior to installing erosion control materials, soil surface preparation shall conform to the provisions in Section 19-2.05, "Slopes," of the Standard Specifications, except that rills and gullies exceeding 50 mm in depth or width shall be leveled. Vegetative growth, temporary erosion control materials, and other debris shall be removed from areas to receive erosion control.

**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 shall be delivered to the project site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted.

A sample of approximately 30 g of seed will be taken from each seed container by the Engineer.

**Legume Seed**

Legume seed shall be pellet-inoculated or industrial-inoculated and shall conform to the following:

A. Inoculated seed shall be inoculated in conformance with the provisions in Section 20-2.10, "Seed," of the Standard Specifications.
B. Inoculated seed shall have a calcium carbonate coating.
C. Industrial-inoculated seed shall be inoculated with Rhizobia and coated using an industrial process by a manufacturer whose principal business is seed coating and seed inoculation.
D. Industrial-inoculated seed shall be sown within 180 calendar days after inoculation.
E. Legume seed shall consist of the following:

LEGUME SEED

| Botanical Name (Common Name) | Percent Germination (Minimum) | Kilograms Pure Live Seed Per Hectare (Slope Measurement) |
|---|---|---|
| Lotus scoparius (Deerweed) | 30 | 4.00 |
| Lupinus succulentus (Arroyo Lupine) | 40 | 4.00 |
| Lupinus bicolor Pigmy-Leaved Lupine | 40 | 2.00 |

**Non-Legume Seed**

Non-legume seed shall consist of the following:

NON-LEGUME SEED
Excluding Route 215-("3C Line") From Sta. 25+00 to 62+00

| Botanical Name (Common Name) | Percent Germination (Minimum) | Kilograms Pure Live Seed Per Hectare (Slope Measurement) |
|---|---|---|
| Lasthenia californica Dwarf Goldfields | 30 | 2.00 |
| Salvia columbariae Chia | 30 | 0.50 |
| Eriophyllum confertiflorum Golden Yarrow | 30 | 2.00 |
| Eschscholzia californica California Poppy | 40 | 2.00 |
| Croton setiger Doveweed | 20 | 0.50 |
| Helianthemum scoparium Common Rockrose | 30 | 2.00 |
| Vulpia Microstachys Small Fescue | 40 | 11.00 |

NON-LEGUME SEED
Route 215-("3C Line") From Sta. 25+00 to 62+00

| Botanical Name (Common Name) | Percent Germination (Minimum) | Kilograms Pure Live Seed Per Hectare (Slope Measurement) |
|---|---|---|
| Baccharis Glutinosa Mulefat | 20 | 4.00 |
| Eriogonum fasciculatum California Buckwheat | 65 | 2.00 |
| Eschscholzia californica California Poppy | 40 | 3.00 |
| Salvia apiana White sage | 50 | 3.00 |
| Salvia leucophylla Purple Sage | 70 | 2.00 |
| Salvia mellifera Black Sage | 50 | 3.00 |
| Sisyrinchium bellum Blue-eyed Grass | 75 | 3.00 |

**Straw**

Straw shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications and these special provisions.

Straw shall be derived from rice.

**Stabilizing Emulsion**

Stabilizing emulsion shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions.

Stabilizing emulsion shall be in a dry powder form, may be re-emulsifiable, and shall be a processed organic adhesive used as a soil tackifier.

**APPLICATION**

Erosion control materials shall be applied in separate applications in the following sequence:

A. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment within 60 minutes after the seed has been added to the mixture:

| Material | Kilograms Per Hectare (Slope Measurement) |
|---|---|
| Legume Seed | 10.00 |
| Non-Legume Seed | 20.00 |
| Fiber | 800 |
| Commercial Fertilizer | 300 |

B. Straw shall be applied at the rate of 4 tonnes per hectare based on slope measurements. Incorporation of straw will not be required. Straw shall be distributed evenly without clumping or piling.

C. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment:

| Material | Kilograms Per Hectare (Slope Measurement) |
|---|---|
| Fiber | 800 |
| Stabilizing Emulsion (Solids) | 200 |

The ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer.

Once straw work is started in an area, stabilizing emulsion applications shall be completed in that area on the same working day.

The proportions of erosion control materials may be changed by the Engineer to meet field conditions.

**10-1.292 ROCK BLANKET (TYPE 1)**

Rock blanket (Type 1) shall be placed as shown on the plans and in conformance with these special provisions.

**MATERIALS**

Rock for the rock blanket (Type 1) shall be clean, smooth multi colored rock, naturally colored reddish brown in overall appearance after placement except for the rock blanket to be placed along route 60 from STA 8+00 to 23+00 which shall be gray in color and shall be obtained from a single source.

Reddish brown colored rock for the rock blanket (Type 1) shall conform to the following grading:

| Screen Size (Millimeters) | Percentage Passing (By Mass) |
|---|---|
| 450x450 | 100 |
| 200x200 | 0 |

Grey Colored rock for the rock blanket (Type1) shall conform to the following grading:

| Screen Size (Millimeters) | Percentage Passing (By Mass) |
|---|---|
| 300x300 | 100 |
| 200x200 | 0 |

A sample of the rock shall be submitted to the Engineer for approval prior to delivery of the rock to the project site.

The rock blanket (Type 1) 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. The aggregate size shall be 10mm maximum.

Gaps between the rocks shall be filled with dry applied mortar. Mortar shall be colored reddish brown, similar in appearance to the overall rock color and 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.

**SITE PREPARATION**

Prior to beginning rock blanket (Type 1) work, areas to receive the rock blanket (Type 1) shall be cleared in conformance with the provisions in "Roadside Clearing" of these special provisions.

After clearing, the areas shall be excavated to the depth shown on the plans, graded to a smooth uniform surface and compacted to a minimum compaction of 90 percent on slopes of 1:3 or flatter and 85 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 unless otherwise directed by the Engineer and shall not be applied more than 300 mm beyond the rock blanket (Type 1) 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 secured in place with concrete wood headers and metal stake anchors -and imbedded in the concrete and securely set while the concrete is still plastic. Concrete found adhering to the exposed surfaces of the rock shall be removed. Rock found in a loose condition 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 (Type 1) borders the edge of pavement.

Finished rock blanket (Type 1) surfacing shall be uniform and even as well as maintain original flow lines, slope gradients and contours .

**MEASUREMENT AND PAYMENT**

Rock blanket (Type 1) will be measured by the square meter as determined from measurements made parallel to the ground slope.

The contract price paid per square meter for rock blanket (Type 1) 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 installing wood headers, metal stakes anchors 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.

## 10-1.293 IRRIGATION CROSSOVERS

Irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Conduits shall be placed in open trenches in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Conduits shall be corrugated steel pipe.

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.

When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

Conduits shall be installed under existing paving by jacking or drilling methods in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

## 10-1.294 EXTEND IRRIGATION CROSSOVERS

Extend existing irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Extend irrigation crossovers shall include conduit, water line crossover, and sprinkler control crossover extensions and appurtenances, locating existing irrigation crossovers and pressure testing existing and new water line crossovers. The sizes of conduit, water line crossover, and sprinkler control crossover extensions shall be as shown on the plans.

Before work is started in an area where an existing irrigation crossover conduit is to be extended, the existing conduit shall be located by the Contractor. When exploratory holes are used to locate the existing conduit, the exploratory holes shall be excavated in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

If debris is encountered in the ends of conduits to be extended, the debris shall be removed prior to extending conduits. Removal of debris within the first meter in the conduits shall be at the Contractor's expense. If debris is encountered in the conduit more than one meter from the ends of the conduits to be extended, the additional debris shall be removed as directed by the Engineer and will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Prior to installation of water line crossover extensions, the existing water lines shall be pressure tested for leakage in conformance with the provisions in Section 20-5.03H, "Pressure Testing," of the Standard Specifications. Repairs to the

existing water line crossover, when ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Conduit extensions shall be corrugated steel pipe. Water line crossover extensions shall be plastic pipe (PR 315) (supply line).

Sprinkler control crossover extensions shall be Type 3 electrical conduit.

Conductors shall be removed from existing sprinkler control crossovers to be extended.

After installation of the sprinkler control crossover extensions, new conductors shall be installed without splices in existing and extended sprinkler control crossovers. New conductors shall match the removed conductors in color and size and shall be spliced to the existing conductors in adjacent pull boxes. After the new conductors are installed, the conductors shall be tested in the same manner specified for traffic signal, sign illumination, and lighting circuits in conformance with the provisions in Section 86-2.14B, "Field Testing," of the Standard Specifications.

After water line crossover extensions have been installed, existing and extended water line crossovers shall be retested for leakage in conformance with the provisions in Section 20-5.03H, "Pressure Testing," of the Standard Specifications. Leaks that develop shall be repaired at the Contractor's expense and the water line crossovers shall be retested until a satisfactory pressure test is achieved.

## 10-1.30 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 Office of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

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 the OSD for final approval and use during construction.

### 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, a 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, a 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 non-conductive 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, rubber or synthetic rubber cover and tube, reinforced with a minimum of 2-ply synthetic yarn or steel wire and shall be equipped with steel flanges. 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 commercial quality concrete with a cement content not less than 350 kg of portland cement per cubic meter and commercial quality wire mesh. 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 95-1, "General," of the Standard Specifications and, at the option of the Contractor, shall conform to the provisions in Section 95-2.03, "Epoxy Resin Adhesive for Bonding New Concrete to Old Concrete," or in Section 95-2.04, "Rapid Set Epoxy Adhesive for Pavement Markers," or in Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers," of the Standard Specifications.

## INSTALLATION

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 portland cement 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 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 supply line (bridge) for each size listed in the Engineer's Estimate shall be made in the same manner as galvanized steel pipe and plastic pipe supply lines in Section 20-5.04, "Measurement," and Section 20-5.05, "Payment," of the Standard Specifications.

Full compensation for furnishing and installing air release valve assemblies, steel hangers, steel brackets and other fittings, casings and casing insulators, pipe end seals, concrete supports, pipe anchorages, concrete pipe stops, pipe wrapping tape, epoxy adhesives, 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 the sizes of water supply line (bridge) involved, and no additional compensation will be allowed therefor.

## 10-1.31 MAINTENANCE VEHICLE PULLOUT

Maintenance vehicle pullouts shall be constructed as shown on the plans and in conformance with these special provisions.

**EARTHWORK**

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

The grading plane shall not be more than 15 mm above the grade established by the Engineer.

A relative compaction of not less than 95 percent shall be obtained for a minimum depth of 150 mm below the grading plane.

Surplus excavated material shall become the property of the Contractor and 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.

**AGGREGATE BASE**

Aggregate for aggregate base shall conform to the provisions specified for 19-mm, Maximum, aggregate grading in Section 26-1.02A, "Class 2 Aggregate Base," of the Standard Specifications.

Aggregate base shall be a minimum of 150 mm thick. Aggregate base shall be spread and compacted in conformance with the provisions in Section 26-l.04, "Spreading," and Section 26-l.05, "Compacting," of the Standard Specifications.

**ASPHALT CONCRETE**

Asphalt concrete for maintenance vehicle pullouts shall be a minimum 80 mm thick in compacted thickness and shall conform to the provisions in "Asphalt Concrete" of these special provisions, except the aggregate shall conform to the 12.5 mm maximum grading.

**MEASUREMENT.**

The quantity of maintenance vehicle pullouts will be measured by the unit as determined from actual count in place.

**PAYMENT**

The contract unit price paid for maintenance vehicle pullout shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing maintenance vehicle pullouts, complete in place, including earthwork, soil treatment, aggregate base, and asphalt concrete, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.32 TRANSPLANT PALM TREES

Transplanting of existing palm trees shall conform to the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

Existing palm trees to be transplanted shall be removed and either stored or transplanted at the new locations prior to performing other work within the location of the existing palm trees.

When the palm trees are removed and the work within the areas to which the trees are to be transplanted is not completed to the stage at which the trees can be planted, the trees shall be stored and maintained until transplanting can be completed. In other cases, the palm trees shall be planted at the new locations the same day the palm trees are removed.

Transplanting palm trees shall be performed between March 15 and October 15 unless otherwise directed by the Engineer.

Before each palm tree is planted, dead fronds and frond stubs shall be removed from the trunk. In addition, green fronds shall be removed up to 2 rows of fronds away from the center growth. The 2 remaining rows of fronds shall be tied in an upright position with light hemp or manila rope. Other fronds and frond stubs shall be removed at the trunk in a manner that will not injure the tree trunk.

The roots of each palm tree or clump of palm trees shall be balled in a manner approved by the Engineer. Approval shall be obtained before removing any palm tree to be transplanted. The diameter and depth of each root ball shall be a minimum of 200 mm larger than the trunk diameter at the ground line. Exposed root balls shall be kept covered with wet burlap or canvas until the trees are planted.

Holes resulting from the removal of transplanted palm trees shall be backfilled the same day the trees are removed. Soil from the surrounding area may be used to backfill the holes. The backfill shall be mounded slightly above the surrounding ground level.

Palm trees shall not be dragged during transplanting operations and the trunks shall be protected from injury.

Each planting hole shall conform to the details shown on the plans.

Commercial fertilizer (packet) shall be slow or controlled release and shall be in a biodegradable packet form. The packet shall gradually release nutrients over a 12-month period. Each packet shall have a mass of 10 g ± 1 g and shall have the following guaranteed chemical analysis:

| Ingredient | Percentage |
|---|---|
| Nitrogen | 20 |
| Phosphoric Acid | 10 |
| Water Soluble Potash | 5 |

Backfill material for the palm tree planting holes shall be plaster sand.

After the planting holes have been backfilled, water shall be applied to the full depth of the backfill soil.

Watering basins for the transplanted palm trees shall be constructed as shown on the plans.

When the palm trees are planted, a root stimulant, approved by the Engineer, shall be applied to the roots of each palm tree in conformance with the printed instructions of the root stimulant manufacturer. A copy of the printed instructions shall be furnished to the Engineer before applying a stimulant. Root stimulant to be used shall be submitted to the Engineer not less than 2 weeks prior to the stimulant's intended use. Root stimulants not approved by the Engineer shall not be used.

Palm trees to be transplanted shall be maintained by the Contractor from the time the palm trees are removed to the time of acceptance of the contract, The palm trees shall be watered as necessary to maintain the trees in a healthy condition. Trash, debris and weeds within the basins, including the basin walls, 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. Weeds shall be removed before the weeds exceed 50 mm in length. Pesticides to be used for weed control shall be submitted to the Engineer not less than 2 weeks prior to the pesticide's intended use. Pesticides not approved by the Engineer shall not be used.

The provisions specified in Section 20-4.07, "Replacement," of the Standard Specifications for the replacement of unsuitable plants shall apply to transplanted palm trees. The replacement palm tree for each unsuitable transplanted palm tree shall be the same size and species as the palm tree being replaced. Each replacement palm tree shall be planted in the planting hole of the unsuitable palm tree which the new tree is replacing. The method for planting replacement palm trees shall be as specified in this section for transplanting palm trees. Removed unsuitable transplanted palm trees shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The quantity of transplant palm trees will be measured by the unit as determined from actual count in place.

The contract unit price paid for transplant palm tree shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in transplanting palm trees, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### 10-1.33 FINISHING ROADWAY

Finishing roadway shall conform to the provisions in Section 22, "Finishing Roadway," of the Standard Specifications.

### 10-1.34 AGGREGATE SUBBASE

Aggregate subbase shall be Class 1 and shall conform to the provisions in Section 25, "Aggregate Subbases," of the Standard Specifications and these special provisions.

The restriction that the amount of reclaimed material included in Class 1aggregate subbase not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 1, aggregate subbase may include reclaimed glass. Aggregate subbase incorporating reclaimed glass shall not be placed at locations where material will not be placed over the aggregate subbase.

Aggregate may include or consist of materials excavated from the existing outer shoulder and other paved roadways to be removed on the project. Concrete, reclaimed asphalt concrete, cement treated base, aggregate base and aggregate subbase, or a combination of any of these materials may be used to produce Class 1 aggregate subbase. Processing of these materials will be necessary to meet the aggregate grading and quality requirements of Section 25-1.02A, "Class 1, Class 2, and Class 3 Aggregate Subbases," of the Standard Specifications.

Full compensation for processing of such materials for use as Class 1aggregate subbase shall be considered as included in the contract price paid per cubic meter for Class 1 aggregate subbase and no additional compensation will be allowed therefor. Compensation for removal of such materials is specified elsewhere in these special provisions.

### 10-1.341 AGGREGATE BASE

Aggregate base shall be Class 2 and shall conform to the provisions in Section 26, "Aggregate Bases," of the Standard Specifications and these special provisions.

The restriction that the amount of reclaimed material included in Class 2 aggregate base not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 2 aggregate base may include reclaimed glass. Aggregate base incorporating reclaimed glass shall not be placed at locations where surfacing will not be placed over the aggregate base.

### 10-1.342 LEAN CONCRETE BASE

Lean concrete base shall conform to the provisions in Section 28, "Lean Concrete Base," of the Standard Specifications.

### 10-1.343 TREATED PERMEABLE BASE

Treated permeable base shall be asphalt treated and shall conform to the provisions in Section 29, "Treated Permeable Bases," of the Standard Specifications.

### 10-1.35 ASPHALT CONCRETE

Asphalt concrete shall be Type A and shall conform to the provisions in Section 11-1, "Quality Control / Quality Assurance" of these special provisions.

Open graded asphalt concrete shall conform to the provisions in "Open Graded Asphalt Concrete" of these special provisions.

Surfacing of miscellaneous areas with asphalt concrete shall conform to the provisions in "Asphalt Concrete (Miscellaneous Areas)" of these special provisions.

The Contractor may obtain a copy of the Department's "Manual for Quality Control and Quality Assurance for Asphalt Concrete" at www.dot.ca.gov/hq/construc/qcqa.html.

The aggregate for Type A asphalt concrete shall conform to the 19 mm maximum, medium grading specified in Section 39-2.02, "Aggregate," in Section 11-1, "Quality Control / Quality Assurance," of these special provisions.

In addition to the provisions in Section 39-9.01, "Spreading Equipment," in Section 11-1, "Quality Control / Quality Assurance," of these special provisions, asphalt paving equipment shall be equipped with automatic screed controls and a sensing device or devices.

When placing asphalt concrete to lines and grades established by the Engineer, the automatic controls shall control the longitudinal grade and transverse slope of the screed. Grade and slope references shall be furnished, installed, and maintained by the Contractor. Should the Contractor elect to use a ski device, the minimum length of the ski device shall be 9 m. The ski device shall be a rigid one piece unit and the entire length shall be utilized in activating the sensor.

When placing the initial mat of asphalt concrete on existing pavement, the end of the screed nearest the centerline shall be controlled by a sensor activated by a ski device not less than 9 m long. The end of the screed farthest from centerline shall be controlled by an automatic transverse slope device set to reproduce the cross slope designated by the Engineer.

When paving contiguously with previously placed mats, the end of the screed adjacent to the previously placed mat shall be controlled by a sensor that responds to the grade of the previously placed mat and will reproduce the grade in the new mat within a 3 mm tolerance. The end of the screed farthest from the previously placed mat shall be controlled in the same manner the screed was controlled when placing the initial mat.

If the methods and equipment furnished by the Contractor fail to produce a layer of asphalt concrete conforming to the provisions, including straightedge tolerance, in Section 39-10.04, "Compacting," in Section 11-1, "Quality Control / Quality Assurance," of these special provisions, the paving operations shall be discontinued and the Contractor shall modify the equipment or methods, or furnish substitute equipment.

If the automatic screed controls fail to operate properly during a day's work, the Contractor may use manual control of the spreading equipment for the remainder of that day. However, the equipment shall be corrected or replaced with alternative automatically controlled equipment conforming to the requirements in this section before starting another day's work.

In addition to the straightedge requirements in Section 39-10.04, "Compacting," in Section 11-1, "Quality Control / Quality Assurance," of these special provisions, asphalt concrete pavement shall conform to the surface tolerances specified herein.

The top surface of the uppermost layer of Type A asphalt concrete surfacing shall be profiled by the Contractor, in the presence of the Engineer. Two profiles shall be obtained in each lane. The profiles shall be approximately one meter from and parallel with the edge of the lane.

Profiles shall be performed using a California Profilograph or equivalent in conformance with the requirements in California Test 526 and as specified in these special provisions. Prior to beginning profiles, the profilograph shall be calibrated in the presence of the Engineer.

Asphalt concrete pavement shall conform to the following Profile Index requirements:

A. Pavement on tangent alignment and pavement on horizontal curves having a centerline curve radius of 600 m or more shall have a Profile Index of 8 mm or less for each 0.1-km section profiled.
B. Pavement on horizontal curves having a centerline curve radius of 300 m or more but less than 600 m, including the pavement within the superelevation transition of these curves, shall have a Profile Index of 16 mm or less for each 0.1-km section profiled.
C. Pavement containing high point areas with deviations indicated by the profilograph in excess of 7.5 mm in a length of 7.5 m or less shall be corrected by the Contractor regardless of the Profile Index of the each 0.1-km section profiled.

Profile Index requirements will not apply to the following areas of asphalt concrete pavement, but these areas shall conform to the straightedge requirements in Section 39-10.04, "Compacting," in Section 11-1, "Quality Control / Quality Assurance," of these special provisions:

A. Pavement on horizontal curves with a centerline curve radius of less than 300 m and pavement within the superelevation transition on those curves.
B. Pavement with a total thickness of 75 mm or less.
C. Pavement placed in a single lift when required by the special provisions.
D. Pavement with extensive grade or cross slope correction which does not receive advance leveling operations in conformance with the provisions in Section 39-10.03, "Spreading," in Section 11-1, "Quality Control / Quality Assurance," of these special provisions.
E. Pavement for ramps and connectors with steep grades and high rates of superelevation, as determined by the Engineer.
F. Pavement on city or county streets and roads.

G. Pavement on turn lanes and collector lanes that are less than 500 meters in length.
H. Shoulders and miscellaneous areas.
I. Pavement placed one meter from and parallel with the joint between asphalt concrete pavement and existing curbs, gutters or existing pavement.
J. Pavement within 15 m of a transverse joint that separates the pavement from an existing pavement, approach slab or structure surface not constructed under the contract.

The Contractor shall complete initial runs of the profilograph prior to opening new pavement to public traffic. Profilograph operations shall be in conformance with the lane closure requirement in "Maintaining Traffic" of these special provisions. In the event that initial profiles can not be made prior to opening the pavement to public traffic, they shall be made the next day that lane closures are permitted for the area to be profiled.

Areas of the top surface of the uppermost layer of Type A asphalt concrete pavement that do not meet the specified surface tolerances shall be brought within tolerance by abrasive grinding. Abrasive grinding shall conform to the provisions in the first paragraph and the last 4 paragraphs in Section 42-2.02, "Construction," of the Standard Specifications, except that the grinding residue shall be disposed of outside the highway right of way.

Abrasive grinding shall be performed to reduce individual deviations in excess of 7.5 mm, and to reduce the Profile Index of the pavement to be within the specified tolerance. Deviations in excess of 7.5 mm which cannot be brought into specified tolerances by abrasive grinding shall be corrected by either (1) removal and replacement or (2) placing an overlay of asphalt concrete. The corrective method for each area shall be selected by the Contractor and shall be approved by the Engineer prior to beginning the corrective work. Replacement or overlay pavement not meeting the specified tolerances shall be corrected by the methods specified above. Corrective work shall be at the Contractor's expense except that flagging costs will be paid for in conformance to the provisions in Section 12-2, "Flagging," of the Standard Specifications. . The Contractor shall profile the areas that have received abrasive grinding or corrective work until the final Profile Index of the area is within the specified tolerance.

When abrasive grinding is used to bring the top surface of the uppermost layer of asphalt concrete surfacing within the specified surface tolerances, additional abrasive grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from, and parallel with, the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline, within a ground area. Ground areas shall be neat rectangular areas of uniform surface appearance.

The original of the final profilograms that indicate the pavement surface is within the Profile Index specified shall become the property of the State and shall be delivered to the Engineer prior to acceptance of the contract.

Full compensation for performing profiles corrective work shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A) and no additional compensation will be allowed therefor.

The area to which paint binder has been applied shall be closed to public traffic. Care shall be taken to avoid tracking binder material onto existing pavement surfaces beyond the limits of construction.

The Contractor shall schedule his paving operations such that each layer of asphalt concrete is placed on contiguous lanes of a traveled way each work shift. At the end of each work shift, the distance between the ends of the layers of asphalt concrete on adjacent lanes shall not be greater than 3 m nor less than 1.5 m. Additional asphalt concrete shall be placed along the transverse edge at the end of each lane and along the exposed longitudinal edges between adjacent lanes, hand raked, and compacted to form temporary conforms. Kraft paper, or other approved bond breaker, may be placed under the conform tapers to facilitate the removal of the taper when paving operations resume.

Half-width surfacing operations shall be conducted in such manner that, at the end of each day's work, the distance between the ends of adjacent surfaced lanes shall not be greater than can be completed in the following day of normal surfacing operations.

Where the existing pavement is to be widened by constructing a new structural section adjacent to the existing pavement, the new structural section, on both sides of the existing pavement, shall be completed to match the elevation of the edge of the existing pavement at each location prior to spreading and compacting asphalt concrete over the adjacent existing pavement.

Shoulders or median borders adjacent to a lane being paved shall be surfaced prior to opening the lane to public traffic.

Asphalt concrete surfacing shall be placed on existing surfacing, including curve widening, chain control lanes, turnouts, left turn pockets, and public and private road connections shown on the plans, unless otherwise directed by the Engineer.

Additional asphalt concrete surfacing material shall be placed along the edge of the surfacing at road connections and private drives, hand raked, if necessary, and compacted to form smooth tapered conforms. Full compensation for furnishing all labor and tools and doing all the work necessary to hand rake said conforms shall be considered as included in the contract prices paid per tonne for the various contract items of asphalt concrete surfacing involved and no additional compensation will be allowed therefor.

The aggregate from each separate bin used for asphalt concrete, Type A, except for the bin containing the fine material, shall have a minimum Cleanness Value of 57, as determined by California Test 227 with modifications as follow:

A. Tests will be performed on the material retained on the 2.36 mm sieve from each bin and will not be a combined or averaged result.
B. Each test specimen will be prepared by hand shaking for 30 seconds, a single loading of the entire sample on a 305 mm diameter, 4.75 mm sieve, nested on top of a 305 mm diameter, 2.36 mm sieve.
C. Where a coarse aggregate bin contains material which will pass the maximum size specified and be retained on a 9.5 mm sieve, the test specimen mass and volume of wash water specified for 25 mm x 4.75 mm aggregate size will be used.
D. Samples will be obtained from the weigh box area during or immediately after discharge from each bin of the batching plant or immediately prior to mixing with asphalt in the case of continuous mixers.
E. The Cleanness Value of the test sample from each of the bins will be separately computed and reported.

At drier-drum and continuous plants with cold feed control, Cleanness Value test samples will be obtained from the discharge of each coarse aggregate storage. An aggregate sampling device shall be provided to obtain a 25 kg sample of each coarse aggregate.

### 10-1.351 OPEN GRADED ASPHALT CONCRETE

Open graded asphalt concrete shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions. Section 11-1, "Quality Control / Quality Assurance," of these special provisions shall not apply to open graded asphalt concrete.

### 10-1.352 ASPHALT CONCRETE (MISCELLANEOUS AREAS)

Surfacing of miscellaneous areas with asphalt concrete shall conform to the provisions for miscellaneous areas in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

Asphalt concrete placed in miscellaneous areas may be produced in conformance with the requirements for asphalt concrete placed on the traveled way in Section 11-1, "Quality Control / Quality Assurance," of these special provisions.

The amount of asphalt binder used in asphalt concrete placed in dikes, ditches, overside drains, and aprons at the ends of drainage structures shall be increased one percent by mass of the aggregate over the amount of asphalt binder determined for use in asphalt concrete placed on the traveled way.

Aggregate for asphalt concrete dikes shall conform to the 9.5-mm maximum grading specified in Section 39-2.02, "Aggregate," of the Standard Specifications.

In median areas adjacent to slotted median drains, each layer of asphalt concrete shall not exceed 9.5-mm, maximum compacted thickness.

The miscellaneous areas to be paid for at the contract price per square meter for place asphalt concrete (miscellaneous area) in addition to the prices paid for the materials involved shall be limited to the areas listed on the plans.

Asphalt concrete placed in miscellaneous areas will be paid for at the contract price per tonne for asphalt concrete in conformance with the provisions in Section 11-1, "Quality Control / Quality Assurance," of these special provisions. Section 39-11.02, "Statistical Evaluation and Determination of Pay Factor," in Section 11-1, "Quality Control / Quality Assurance," of these special provisions, shall not apply to asphalt concrete placed in miscellaneous areas. Payment for placing asphalt concrete in miscellaneous areas and dikes will be in conformance with the provisions in Section 39-8.02, "Payment," of the Standard Specifications.

### 10-1.353 ASPHALT CONCRETE (TYPE A, BOND BREAKER)

Asphalt concrete (Type A, Bond Breaker) shall conform to the provisions specified for Type A asphalt concrete in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions. Asphalt Concrete (Type A, Bond Breaker) shall be placed as shown on the plans.

The aggregate for asphalt concrete (Type A, Bond Breaker) shall conform to the 9.5-mm, maximum, grading specified in Section 39-2.02, "Aggregate," of the Standard Specifications.

The grade of asphalt binder to be mixed with aggregate for asphalt concrete (Type A, Bond Breaker) shall be Grade AR 4000 and shall conform to the provisions in Section 92, "Asphalt," of the Standard Specifications.

The amount of asphalt binder used in asphalt concrete (Type A, Bond Breaker) shall be increased by one percent by mass of the aggregate over the amount of asphalt binder determined for use in Type A asphalt concrete in conformance with the requirements in California Test 367. The asphalt content of the asphalt mixture will be determined in conformance with the requirements in California Test 379 or in conformance with the requirements in California Test 382.

The finished surface of the asphalt concrete (Type A, Bond Breaker) shall not extend above the grade established by the Engineer. Asphalt concrete (Type A, Bond Breaker) with a surface higher than the grade established by the Engineer shall be cold planed until the surface of asphalt concrete (Type A, Bond Breaker) conforms to the tolerances specified. Cold

planing equipment shall be power driven and specifically designed to produce a smooth surface that conforms to the straight edge requirements specified in Section 39-6.03, "Compacting" of the Standard Specifications. Asphalt concrete (Type A, Bond Breaker) with a surface lower than 15 mm below the grade established by the Engineer shall be removed and replaced with asphalt concrete (Type A, Bond Breaker) which complies with requirements of these specifications.

Paint binder (tack coat) shall be applied to existing surfaces to be surfaced with asphalt concrete (Type A, Bond Breaker), except when eliminated by the Engineer.

Paint binder (tack coat) shall be, at the option of the Contractor, either slow-setting type asphaltic emulsion, rapid setting asphaltic emulsion or paving asphalt. Slow-setting type asphaltic emulsion and rapid setting asphaltic emulsion shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 94, "Asphaltic Emulsions," of the Standard Specifications. When paving asphalt is used for paint binder, the grade will be determined by the Engineer. Paving asphalt shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 92, "Asphalts," of the Standard Specifications.

Paint binder (tack coat) shall be applied in the liter per square meter range limits specified for the surfaces to receive asphalt concrete in the tables below. The exact application rate within the range will be determined by the Engineer.

| Application Rates for Asphaltic Emulsion Paint Binder (Tack Coat) for Asphalt Concrete (Type A, Bond Breaker) on Lean Concrete Base | | |
|---|---|---|
| Type of surface to receive paint binder (tack coat) | Slow-Setting Asphaltic Emulsion $L/m^2$(Note A) | Rapid-Setting Asphaltic Emulsion $L/m^2$(Note B) |
| Lean Concrete Base | 0.20 – 0.35 | 0.10 – 0.20 |

Note A: Slow-setting asphaltic emulsion is asphaltic emulsion diluted with additional water. Water shall be added and mixed with the asphaltic emulsion (containing up to 43 percent water) so the resulting mixture contains one part asphaltic emulsion and not more than one part added water. The water shall be added by the emulsion producer or at a facility that has the capability to mix or agitate the combined blend.

Note B: Undiluted rapid-setting asphaltic emulsion.

| Application Rates for Paint Binder (Tack Coat) for Asphalt Concrete (except Open Graded) | |
|---|---|
| Type of surface to receive paint binder (tack coat) | Paving Asphalt $L/m^2$ |
| Lean Concrete Base | 0.05 – 0.10 |

When asphaltic emulsion is used as paint binder (tack coat), asphalt concrete (Type A, Bond Breaker) shall not be placed until the applied asphaltic emulsion has completely changed color from brown to black.

White pigmented curing compound shall be applied to the finished surface of the asphalt concrete (Type A, Bond Breaker) prior to placement of the portland cement concrete pavement. Pigmented curing compound shall conform to the requirements of ASTM Designation C 309, Type 2, Class A. Curing compound shall be applied in 2 separate applications to the area to be surfaced with portland cement concrete pavement. Each application of curing compound shall be applied at the approximate rate of one liter per 3.7 $m^2$.

Asphalt Concrete (Type A, Bond Breaker) will be measured and paid for in the same manner specified for Type A asphalt concrete in conformance with the requirements of Section 39-8, "Measurement and Payment," of the Standard Specifications.

Full compensation for the additional one percent of asphalt binder used in asphalt concrete (Type A, Bond Breaker) and for furnishing and applying white pigmented curing compound to the surface of the asphalt concrete (Type A, Bond Breaker) shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A, Bond Breaker).

### 10-1.354 ASPHALT CONCRETE(TYPE B)

Asphalt concrete to be used on highway bridge decks shall be Type B and shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

The aggregate for use in the asphalt concrete (Type B) shall conform to the provisions in Section 39 2.02, "Aggregate," of the Standard Specifications, and the following:

A. The grading of the aggregate shall be 12.5-mm, maximum, medium.
B. The grading of the aggregate in sections or tapers at bridge ends, less than 25 mm in total depth, may be 4.75-mm, maximum, subject to the approval of the Engineer.

The amount of asphalt binder to be mixed with the aggregate shall be between 4 percent and 7 percent by mass of the dry aggregate as determined by the Engineer.

Paint binder shall be SS1 type asphaltic emulsion.

Paint binder shall be applied at a rate of from 0.18- to 0.32-L/$m^2$ of surface covered. The exact rate of application will be determined by the Engineer.

Whenever concrete expansion dams are to be placed at bridge deck expansion joints, oil resistant construction paper shall be taped to the deck over the area to be covered by the dams prior to placing the paint binder and asphalt concrete across the joint.

At no time shall the difference in grade between adjacent lanes that are open to public traffic exceed 40 mm.

## 10-1.36 CONCRETE PAVEMENT

### GENERAL

Portland cement 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, Sundays 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 an initial test strip of concrete pavement from 200 meters to 300 meters 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 used to construct the test strip for the remainder of the paving operations, except as specified in this section. The Contractor shall not perform further paving until the test strip is 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 a test strip fails to conform to the specifications for concrete pavement as determined by the Engineer, in conformance with the evaluation of the test strip, as specified herein:

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, or
B. 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, or
C. Portion of the test strip fails to conform to profile requirements, or
D. The Contractor proposes different paving equipment, including a batch plant, paver, dowel inserter, tie bar inserter, tining, or curing equipment, or
E. The dowel bar tolerances are not met, or
F. The pavement thickness deficiency is greater than 15 mm after grinding, or
G. A change in concrete mix design has occurred.

The Contractor shall perform coring of the test strips, as directed by the Engineer, as part of the dowel and tie bar placement tolerance verification, and pavement thickness verification. The Engineer will select at random a minimum of six dowel bars and six randomly selected 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 inserters are used, the Contractor shall first 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.

Prior to 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. This procedure shall be submitted prior to the prepaving 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 three days, not including Saturdays, Sundays and legal holidays, 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 meters 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 prepaving 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 shall not exceed 400 kg/m$^3$.

**Tie Bars**

Tie bars shall be deformed reinforcing steel bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 300 or 420; ASTM Designation: A 616/A 616M, Grade 350 or 400; or ASTM Designation: 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 to 400 micrometers (7 and 16 mils). Fabrication, sampling and jobsite 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 the two samples shall be 750 mm long. Epoxy-coated tie bars shall not be bent.

**Epoxy (Drill and Bond)**

Epoxy for bonding tie 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 4.5°C, but not lower than recommended by the manufacturer. Class B shall be used when the internal temperature is from 4.5°C to 15.5°C. Class C shall be used when the internal temperature is above 15.5°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.

**Dowels**

Dowels shall be smooth, round, epoxy-coated steel conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 300 or 420, the details shown on the plans and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications. Epoxy coating of dowels shall conform to the provisions in ASTM Designation: A 884/A 884M, Class A, Type 1 or Type 2, except that the bend test shall not apply. Fabrication, sampling and jobsite 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 the two samples shall be 460 mm long.

Dowels shall be plain, smooth, round bars. Dowels shall be free from burrs or other deformations detrimental to free movement of the bars in the concrete.

**Bond Breaker**

Dowels 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 dowels 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 two 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 m$^2$.

**Load Transfer Assemblies (Dowel Basket)**

Load transfer assemblies shall be manufactured with a minimum welded wire gage number of 3/0 (9.2 mm). Assemblies shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Assemblies shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of assemblies shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the assembly. Assemblies 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 and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete fasteners shall be used for anchoring dowel bar assemblies to lean concrete base or asphalt concrete base. Concrete fasteners shall be driven fasteners (concrete nails), used specifically for fastening to hardened concrete, conforming to the requirements of ASTM Designation: F 1667. Shank diameter shall be a minimum of 4 mm with a minimum shank length of 64 mm. Clips shall be commercial quality manufactured for use with dowel assemblies.

The surface of concrete fasteners, and clips shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

**Tie Bar Assemblies and Chairs**

Tie bar assemblies and chairs shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of assemblies shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the assembly. Assemblies 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 and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

**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 639[a] | Shall not flow from channel |
| Extrusion Rate at 25° ± 1°C | ASTM C 603[b] | 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 132[c] | 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 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 ± 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.

**Backer Rods**

Backer rods shall have a diameter prior to placement at least 25 percent greater than the width of the sawcut and shall be expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. Hot pour sealant that will melt the backer rod shall not be used. The Contractor shall submit a manufacturer's data sheet verifying that the backer rod is compatible with the sealant to be used.

**Joint Filler Material**

Joint filler material shall be preformed 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, uniform rounded aggregate filler may be used to extend the grout. The extension of grout shall not exceed 60 percent of the mass or the maximum 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 |

## SUBMITTALS

If load transfer assemblies, or tie bar assemblies or chairs, are used, the Contractor shall submit working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall contain details and a materials list with name, address, and telephone number of the supplier of concrete nails, and clips. The Contractor shall submit the working drawings 14 days prior to constructing the initial test strip. The Engineer will have 14 days to approve the working drawings. Should the Engineer fail to complete the review of the working drawings 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 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.

## PAVEMENT CONCRETE MIX PROPORTIONS

The Contractor shall determine the mix proportions for pavement concrete. Section 40-1.015, "Cement Content," of the Standard Specifications shall not apply. 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 maximum water to cementitious materials ratio or minimum cementitious material content shall be that determined from the trial mixtures curve to produce a minimum flexural strength of 4.5 MPa at 42 days age.

At least 14 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 7, 14, 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 paving 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.

A concrete mix design 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 latter than 28 days. Beams shall be tested for modulus of rupture at a minimum of 7, 14, 28 and 42 days of age. Test specimens shall be fabricated and tested in conformance with the requirements in California Test 523.

The certified field qualification test data reports shall include the following:

A. Date of mixing,
B. Mixing equipment and procedures used,
C. Volume of batch in cubic meters and the mass or volume,
D. Type and source of ingredients used,
E. Penetration and slump of the concrete,
F. The air content of the concrete, and
G. The age at time of testing and strength of concrete specimens tested.

Field qualification test data reports shall be signed by a certified representatives 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.

**INSTALLING TIE BARS**

Tie bars shall be installed at longitudinal contact joints and longitudinal weakened plane joints as shown on the plans. Consecutive width of new portland cement concrete pavement tied together with tie bars shall not exceed 15 meters. Tie bars shall not be used at a joint where portland cement concrete and asphalt concrete pavements abut.

Tie bars shall be installed at longitudinal joints by one of the following methods:

A. 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 180º 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.
B. 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.
C. 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.
D. Using tie bar assemblies or chairs that conforms with the requirements of these special provisions.

**DOWEL PLACEMENT**

Dowels 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 the dowels, 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 dowels. The Contractor's procedure for dowel bar alignment, and concrete consolidation shall be verified by coring in conformance with the requirements in "Core Drilling for Dowel Placement Alignment Assurance Testing" in this section.

Dowels shall be placed at transverse weakened plane joints within shoulder areas.

Dowels shall be placed by using load transfer assemblies (dowel baskets) or by mechanical insertion. Dowels shall be oriented parallel with the pavement lane centerline and surface of the pavement at mid-slab depth. Dowel alignment shall be ±6 mm per 300 mm of dowel length in both horizontal and vertical planes.

When dowels 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 load transfer assemblies (dowel baskets) are used, they shall be securely anchored firmly 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 assembly (4 per lower runner wire). At least 10 concrete fasteners shall be used for assembly sections greater than 3.6 m and less than or equal to 4.9 m. Temporary spacer wires connecting load transfer assemblies shall be cut or removed after the assemblies are anchored into position prior to concrete placement. Paving shall be suspended when approved assemblies 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.

Approval of the initial placement of load transfer assemblies shall not constitute acceptance of the final position of the dowel bars.

## CORE DRILLING FOR DOWEL PLACEMENT ALIGNMENT ASSURANCE TESTING

Coring, to confirm dowel bar placement and position, 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 one test for every 1670 square meters of doweled pavement or fraction thereof. 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. If the cores indicate that dowel bars are not within the allowable tolerances or if air voids exist surrounding the dowel 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 $SO_4$, 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 alignment shall be within the specified tolerances. If dowels 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 positioning has been corrected.

Dowels 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 dowels 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 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. Dowels 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 dowels 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 dowels 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 alignment or improper concrete consolidation around dowels. The quantity of concrete pavement area used to determine the amount payment to the State will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect dowel alignment or improper concrete consolidation around dowels. 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 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 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 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.

At the Contractor's option, transverse weakened plane joints shall be either Type DSC or Type SSC as shown on the plans. Longitudinal weakened plane joints shall be Type SSC.

Seven days after the concrete pavement placement and not more than 4 hours before placing backer rods and 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. 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 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.

Backer rods shall be installed when the temperature of the portland cement concrete pavement is above the dew point of the air and when the air temperature is 4°C or above. Backer rod shall be installed when the joints to be sealed have been properly patched, cleaned and dried, as determined by the Engineer. Methods of placing backer rod that leave a residue or film on joint walls shall not be used.

Immediately after placement of the backer rod, 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.

**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 be 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 joint sealant and placed in conformance with the requirements for liquid joint sealant installation as specified above, except references to backer rods shall not apply.

**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:

A. 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.
B. 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.

Concrete shoulders shall be profiled. Two profiles shall be made within the shoulder, one meter from and parallel with each edge of the shoulder. Concrete shoulders profiled shall conform to the Profile Index requirements in this section.

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.

**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, furnishing and installing backer rod, 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 assemblies or chairs with fasteners and dowel assemblies 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 assemblies or chairs and dowel assemblies 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 back-filling 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 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 the dowels are out of alignment and the Engineer orders additional dowel 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 the dowels are within alignment tolerances and the Engineer orders more dowel coring than the one test for every 1670 square meters of doweled pavement, 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.

## 10-1.361 REPLACE CONCRETE PAVEMENT (RAPID STRENGTH CONCRETE)

Replace concrete pavement (Rapid Strength Concrete) shall consist of removing existing portland cement concrete pavement and underlying base materials and constructing rapid strength concrete (RSC) pavement as shown on the plans and in conformance with Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions.

### DEFINITIONS

The following definitions shall apply to this section:

A. EARLY AGE. – A time less than 10 times the final set time of the concrete.
B. FINAL SET TIME. – The elapsed time after initial contact of cement and water, or accelerator, if used, at which a specific penetration resistance of 27.6 MPa is achieved in conformance with the requirements in ASTM Designation: C 403.
C. OPENING AGE. – The age at which the concrete will achieve the specified strength for opening to public or Contractor traffic.

### PRE-OPERATION CONFERENCE

The Contractor and subcontractors involved in construction operations of RSC shall meet with the Engineer at a pre-operation conference, at a mutually agreed time, to discuss methods of accomplishing all phases of the construction operation, contingency planning, and standards of workmanship for the completed item of work.

The Contractor shall provide the facility for the pre-operation conference. The Contractor's superintendent, foremen, subcontractors, field staff, plant personnel including plant supervisors, manager, and operator involved with RSC shall attend the pre-operation conference. The Contractor shall submit a list of participants to the Engineer for approval. The complete listing shall identify each participant's name, employer, title and role in construction of RSC. The pre-operation conference shall be held for no less than 2 hours. Construction operations of RSC shall not begin until the specified personnel have completed the mandatory pre-operation conference.

### JUST-IN-TIME TRAINING

Just-In-Time Training (JITT) shall be mandatory, and consist of a formal joint training class on rapid strength concrete. Construction operations for rapid strength concrete 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 Pre-Operation Conference along with the Engineer's representatives shall attend JITT.

The JITT session will be conducted for not less than 4 hours on rapid strength concrete. The training class may be an extension of the Pre-Operation Conference and shall be conducted at the project field location convenient for both the Contractor's and the Engineer's project staffs. Scheduling and completion of the JITT session shall be completed at least 5 working days prior to the start of construction of rapid strength concrete. 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 rapid strength concrete. The instructor shall not be an employee of the Contractor or a member of the Engineer's field staff. A copy of the syllabus, handouts, and presentation material shall be submitted to the Engineer at least 7 days before the day of the training. Selection of the course instructor, the course content and training site shall be as mutually agreed to by the Contractor and the Engineer. The instructor shall issue a certificate of completion to the participants upon the completion of the class. The certificate shall include the course title, date and location of the class, the name of the participant, instructor's name, location and phone number.

The Contractor's or Engineer's personnel involved with rapid strength concrete operations will not be required to attend JITT if they have completed similar 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 session. The final determination for exclusion of any staff member's participation will be as determined by the Engineer. All attendees of the JITT shall complete, and submit to the Engineer, an evaluation of the training. The course evaluation form will be provided by the Engineer.

It is expressly understood that Just-In-Time Training 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.

## TRIAL SLAB

Prior to beginning work on replacement concrete pavement (RSC), the Contractor shall successfully complete one or more trial slabs for each RSC mix design to be used in constructing RSC pavement. Trial slabs shall be constructed, finished, cured and tested with the materials, tools, equipment, personnel and methods to be used in completing RSC pavement. Trial slabs shall demonstrate that the Contractor is capable of producing RSC pavement in conformance with the provisions in this section, within anticipated time periods including delivery, placement, finishing and curing times, and under similar atmospheric and temperature conditions expected during replacement operations. Multiple trial slabs for each RSC mix design may be required to envelop variable atmospheric and temperature conditions.

The minimum trial slab dimensions shall be 3 m by 6 m and shall be 225 mm thick where planned replacement pavement nominal thickness is less than 255 mm. The trial slab thickness shall be 260 mm where planned replacement pavement nominal thickness is 255 mm or greater. Where there are planned slab replacements with greater and less than 255 mm thickness then two trial slabs shall be required one at 225 mm thick and one at 260 mm thick. Trial slabs shall be placed near the project site at a location mutually acceptable to the Engineer and the Contractor except slabs shall not be placed on the roadway or within the project limits.

During trial slab construction and within 20 minutes of RSC delivery, beams shall be fabricated in conformance with the requirements in California Test 523. Beams shall be used to determine early age and 7-day modulus of rupture values. Beams fabricated for early age testing shall be cured so that the monitored temperature in the beams and the trial slab are within 3°C at all times. Internal temperatures of trial slab and early age beams shall be monitored and recorded at minimum time intervals of 5 minutes by installing thermocouples and or thermistors connected to strip-chart recorders or digital data loggers. Temperature recording devices shall be accurate to within ±1ºC. Internal temperature readings shall be measured at 25 mm from the top and 25 mm from the bottom, no closer than 75 mm from any edge of the concrete elements, until early age testing is completed. Beams fabricated for 7-day testing shall be cured in conformance with California Test 523 except they shall be placed into sand at between 5 and 10 times final set time or 24 hours, whichever is earlier. Trial slabs 225 mm thick shall have an early age modulus of rupture of not less than 2.8 MPa and a 7-day modulus of rupture of not less than 4.2 MPa. Trial slabs 260 mm thick shall have an early age modulus of rupture of not less than 2.3 MPa and a 7-day modulus of rupture of not less than 4.2 MPa. Beams failing early age or 7-day modulus of rupture requirements shall be cause for rejection of the trial slab.

The Contractor may request, in writing, the use of ASTM Designation: C 805 or C 900 to estimate the modulus of rupture of the pavement at early ages, subject to approval by the Engineer. The selected test method shall be used to determine modulus of rupture until 7 days after the Contractor notifies the Engineer of withdrawal of the proposal or 7 days after the Engineer notifies the Contractor of withdrawal of approval, in writing. During trial slab curing, correlation testing shall be performed to determine the relation between the modulus of rupture and ASTM Designation: C 805 or C 900 performed on the trial slab. The correlation shall be established by testing at 4 or more time intervals. At a minimum, tests shall be performed one hour before and one hour after the opening age and two others within 15 minutes of the opening age. Modulus of rupture estimates shall be calculated with either a linear, exponential or logarithmic, least squares best-fit equation, whichever provides the best correlation coefficient.

Materials resulting from construction of trial slabs and test specimens 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.

## REMOVING EXISTING PAVEMENT AND BASE MATERIALS

Exact limits of concrete pavement to be replaced will be determined by the Engineer.

Existing concrete pavement and underlying base material shall be removed and replaced with base material and RSC pavement within the same work period. In the event existing pavement or base materials are removed and the Contractor is unable to construct, finish, and cure RSC pavement prior to the specified traffic opening time, a temporary roadway structural section shall be constructed.

The outline of concrete pavement to be removed shall be sawed full depth with a power-driven saw except where the pavement is located adjacent to an asphalt concrete shoulder. Saw cuts within concrete pavement slabs shall be cut no more than 2 days prior to concrete pavement slab removal. Saw cuts made in work shifts prior to the actual removal work shift shall not be made parallel or diagonal to the traveled way and shall be cut so that traffic will not dislodge any pieces or segments.

Concrete pavement shall be removed by non-impacting methods. Each pavement panel shall be removed in one or more pieces without disturbance or damage to the underlying base.

Equipment used to remove concrete pavement within the sawed outline, shall not impact the surface of the concrete to be removed within 0.5-m of pavement to remain in place. Pavement and base removal shall be performed without damage to pavement or base to remain in place. Damage to pavement or base to remain in place, shall be repaired or removed and

replaced. Repair, or removal and replacement of the damaged pavement and base shall be at the Contractor's expense and will not be measured nor paid for.

Removed materials 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 material remaining in place, after removing pavement and base to the required depth, shall be graded to a uniform plane, moisture conditioned, and compacted by methods that will produce a firm and stable base. The finished surface of the remaining material shall not extend above the grade established by the Engineer. Areas that are low as a result of over excavation during base removal shall be filled, at the Contractor's expense, with base replacement material at the time and in the same operation that the base replacement layer is placed.

## TEMPORARY ROADWAY STRUCTURAL SECTION

Asphalt concrete and aggregate base, equal to the quantity of pavement removed during the work shift, shall be provided on site for construction of a temporary roadway structural section where existing pavement is to be replaced. The quantity and location of standby material shall be included in the Contractor's contingency plan in conformance with the requirements of these special provisions. Temporary roadway structural section shall be maintained and later removed as the first order of work when replace concrete pavement (Rapid Strength Concrete) operations resume. The temporary roadway structural section shall consist of 90-mm thick asphalt concrete over aggregate base. RSC not conforming to these special provisions for RSC may be used for temporary roadway structural section with the Engineer's approval.

Aggregate base for temporary roadway structural section shall be produced from commercial quality aggregates consisting of broken stone, crushed gravel, natural rough-surfaced gravel, reclaimed concrete and sand, or any combination thereof. Grading of aggregate base shall conform to the 19-mm maximum grading specified in Section 26-1.02A, "Class 2 Aggregate Base," of the Standard Specifications.

Asphalt concrete for temporary roadway structural section shall be produced from commercial quality aggregates and asphalt binder. Grading of aggregate shall conform to the 19-mm maximum, medium grading in Section 39-2.02, "Aggregate," of the Standard Specifications and asphalt binder shall conform to requirements for liquid asphalt SC-800 in Section 93, "Liquid Asphalts," of the Standard Specifications. Amount of asphalt binder to be mixed with the aggregate shall be approximately 0.3 percent less than the optimum bitumen content determined in conformance with the requirements in California Test 367.

Aggregate base and asphalt concrete for the temporary roadway structural section shall be spread and compacted by methods that will produce a well-compacted, uniform base, with a surface of uniform smoothness, texture and density. Surfaces shall be free from pockets of coarse or fine material. Aggregate base may be spread and compacted in one layer. Asphalt concrete may be spread and compacted in one layer. Finished surface of asphalt concrete shall not vary more than 15 mm from the lower edge of a 3.6-m ±0.06 m long straightedge placed parallel with the centerline and shall match the elevation of existing concrete pavement along the joints between the existing pavement and temporary surfacing.

Removed temporary roadway structural section materials 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, except that removed aggregate base may be stockpiled at the project site and reused for construction of temporary roadway structural sections. When no longer required, standby material or stockpiled material for construction of temporary roadway structural sections 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.

## RAPID STRENGTH CONCRETE

### General

Rapid Strength Concrete (RSC) shall be a concrete made with hydraulic cement that develops opening age and 7-day specified modulus of rupture strengths.

Requirements of Sections 40-1.015, "Cement Content," 40-1.05, "Proportioning," and 90-1.01, "Description," of the Standard Specifications shall not apply.

Combined aggregate grading used in RSC shall be either the 37.5-mm, maximum grading, or 25-mm, maximum grading, at the option of the Contractor.

Cement for RSC shall be hydraulic cement as defined in ASTM Designation: C 219 and shall conform to the following requirements:

| Test Description | Test Method | Requirement |
|---|---|---|
| Contraction in Air | California Test 527,W/C Ratio = 0.39 ± 0.010 | 0.053 %, max. |
| Mortar Expansion in Water | ASTM Designation: C 1038 | 0.04 %, max. |
| Soluble Chloride* | California Test 422 | 0.05 %, max. |
| Soluble Sulfates* | California Test 417 | 0.30 %, max. |
| Thermal Stability | California Test 553 | 60 %, min. |
| Compressive Strength @ 3 days | ASTM Designation: C 109 | 17 MPa |

*Test is to be done on a cube specimen, fabricated in conformance with the requirements in ASTM Designation: C 109, cured at least 14 days and then pulverized to 100% passing the 300-µm sieve

At least 45 days prior to intended use, the Contractor shall furnish a sample of cement from each lot proposed for use and all admixtures proposed for use in the quantities ordered by the Engineer.

The Contractor shall submit uniformity reports for cement used in RSC to the Engineer. Uniformity reports shall conform to the requirements in ASTM Designation: C 917, except that testing age and water content may be modified to suit the particular material. Uniformity reports shall be submitted at least every 30 days during RSC pavement operations.

Type C accelerating chemical admixtures conforming to the provisions in Section 90-4, "Admixtures," of the Standard Specifications may be used. In addition to the admixtures listed on the Department's current list of approved admixtures, citric acid or borax may be used if requested in writing by the cement manufacturer and a sample is submitted to the Engineer. Chemical admixtures, if used, shall be included in the testing for requirements listed in the table above.

At least 10 days prior to use in the trial slab, the Contractor shall submit a mix design for RSC that shall include the following:

A. Opening age
B. Proposed aggregate gradings
C. Mix proportions of hydraulic cement and aggregate
D. Types and amounts of chemical admixtures
E. Maximum time allowed between batching RSC and placing roadway pavement
F. Range of ambient temperatures over which the mix design is effective (10˚C maximum range)
G. Final set time of the concrete
H. Any special instructions or conditions, including but not limited to, water temperature requirements when appropriate

The Contractor shall submit more than one mix design to plan for ambient temperature variations anticipated during placement of the roadway pavement. Each mix shall be designed for a maximum ambient temperature range of 10°C. The Contractor shall develop and furnish modulus of rupture development data for each proposed mix design. Modulus of rupture development data for up to 7 days shall be provided to the Engineer prior to beginning paving operations. Modulus of rupture development data may be developed from laboratory prepared samples. The testing ages for modulus of rupture development data shall include one hour before opening age, opening age, one hour after opening age, 24 hours, 7 days and 28 days.

Concrete pavement penetration requirements in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications shall not apply to RSC.

RSC pavement shall develop a minimum modulus of rupture of as specified in "Pay Factor Adjustment for Low Modulus of Rupture" of these special provisions before opening to public or Contractor traffic. In addition, RSC pavement shall develop a minimum modulus of rupture of 4.2 MPa in 7 days after placement. RSC pavement that attains a modulus of rupture of less than specified may be accepted in conformance with "Pay Factor Adjustment for Low Modulus of Rupture" specified herein. Modulus of rupture shall be determined by averaging results from 3 beam specimens tested in conformance with the requirements in California Test 523. Beam specimens may be fabricated using an internal vibrator in conformance with the requirements in ASTM Designation: C 31. No single test shall represent more than the production of that day or 100 cubic meters, whichever is less.

Modulus of rupture at early age may be estimated using the correlation established during trial slab placement or by using results from beam specimens cured under atmospheric conditions and at a temperature within 3°C of the pavement. Modulus of rupture at other ages will be determined using beams cured and tested in conformance with California Test 523 except beams will be placed into sand between 5 and 10 times final set time or 24 hours, whichever is earlier. The Engineer will perform the testing to determine modulus of rupture values of the RSC pavement. The modulus of rupture, as determined above, will be the basis for accepting or rejecting the RSC pavement for modulus of rupture requirements.

**Pay Factor Adjustment for Low Modulus of Rupture**

Where planned replacement pavement nominal thickness is less than 255 mm, payment for replace concrete pavement (Rapid Strength Concrete) will be adjusted for low modulus of rupture tests as follows:

A. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of 2.8 MPa or greater before the lane is opened to the traffic and 7-day modulus of rupture of 4.2 MPa or greater will be paid for at the contract price per cubic meter for replace concrete pavement (Rapid Strength Concrete).
B. Replace concrete pavement (Rapid Strength Concrete) with a 7-day modulus of rupture of less than 3.4 MPa will not be paid for, and shall be removed and replaced, at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions.
C. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of 2.1 MPa or greater before the lane is opened to traffic and a 7-day modulus of rupture of equal to or greater than 3.4 MPa will be paid for at a percentage of the contract price per cubic meter for replace concrete pavement (Rapid Strength Concrete) in conformance with the percentages in the pay table below.
D. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of less than 2.1 MPa when the lane is opened to traffic will be rejected and shall be removed and replaced at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions.

Percentage Pay Table

| Modulus of Rupture (MPa) at opening to traffic | 7-Day Modulus of Rupture (MPa) | | |
|---|---|---|---|
| | Greater than or equal to 4.2 | Less than 4.2 and greater than or equal to 3.8 | Less than 3.8 and greater than or equal to 3.4 |
| Greater than or equal to 2.8 | 100% | 95% | 90% |
| Less than 2.8 and greater than or equal to 2.4 | 95% | 95% | 90% |
| Less than 2.4 and greater than or equal to 2.1 | 80%* | 80%* | 80%* |

*Any replacement panels that develops one or more transverse cracks within 21 days after placement shall be removed and replaced at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions. A transverse crack is defined as a crack running from one longitudinal edge of the panel to the other.

Where planned replacement pavement nominal thickness is 255 mm or greater, payment for replace concrete pavement (Rapid Strength Concrete) will be adjusted for low modulus of rupture tests as follows:

A. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of 2.3 MPa or greater before the lane is opened to the traffic and 7-day modulus of rupture of 4.2 MPa or greater will be paid for at the contract price per cubic meter for replace concrete pavement (Rapid Strength Concrete).
B. Replace concrete pavement (Rapid Strength Concrete) with a 7-day modulus of rupture of less than 3.4 MPa will not be paid for, and shall be removed and replaced, at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions.
C. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of 1.8 MPa or greater before the lane is opened to traffic and a 7-day modulus of rupture of equal to or greater than 3.4 MPa will be paid for at a percentage of the contract price per cubic meter for replace concrete pavement (Rapid Strength Concrete) in conformance with the percentages in the pay table below.
D. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of less than 1.8 MPa when the lane is opened to traffic will be rejected and shall be removed and replaced at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions.

Percentage Pay Table

| Modulus of Rupture (MPa) at opening to traffic | 7-Day Modulus of Rupture (MPa) | | |
|---|---|---|---|
| | Greater than or equal to 4.2 | Less than 4.2 and greater than or equal to 3.8 | Less than 3.8 and greater than or equal to 3.4 |
| Greater than or equal to 2.3 | 100% | 95% | 90% |
| Less than 2.3 and greater than or equal to 2.0 | 95% | 95% | 90% |
| Less than 2.0 and greater than or equal to 1.8 | 80%* | 80%* | 80%* |

*Any replacement panels that develops one or more transverse cracks within 21 days after placement shall be removed and replaced at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions. A transverse crack is defined as a crack running from one longitudinal edge of the panel to the other.

The Contractor shall pay to the State adjustments in payment for low modulus of rupture tests in conformance with the requirements specified in the tables in this section. The Department will deduct the amount of the adjustments from moneys due or that may become due, the Contractor under the contract.

**Proportioning**

Weighing, measuring and metering devices used for proportioning materials shall conform to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications and these special provisions.

Over and under dials, and other indicators for weighing and measuring systems used in proportioning materials shall be grouped so that the smallest increment for each indicator can be accurately read from the point at which the proportioning operation is controlled for ingredients batched at a central batch plant. In addition, indicators for weighing and measuring cement batched from a remote weighing system shall also be placed so that each indicator can be accurately read from the point at which the proportioning operation is controlled

Aggregates shall be handled and stored in conformance with the provisions in Section 90-5.01, "Storage of Aggregates," of the Standard Specifications. Liquid admixtures shall be proportioned in conformance with the provisions in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures," of the Standard Specifications. Mineral admixtures shall be protected from exposure to moisture until used. Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures to easily track the materials that are entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper.

Weighing equipment shall be insulated against vibration or movement of other operating equipment. When the plant is in operation, the mass of each draft of material shall not vary from the designated mass by more than the tolerances specified herein. Each scale graduation shall be 0.001 of the usable scale capacity.

Aggregate shall be weighed cumulatively and equipment for the weighing of aggregate shall have a zero tolerance of ±0.5 percent of the designated total batch mass of the aggregate. Equipment for the separate weighing of the cement or mineral admixture shall have a zero tolerance of ±0.5 percent of their designated individual batch drafts. Equipment for measuring water shall have a zero tolerance of ±0.5 percent of its designated mass or volume.

The mass indicated for any individual batch of material shall not vary from the preselected scale setting by more than the following:

| Material | Tolerance |
|---|---|
| Aggregate | ± 1.0 percent of designated batch mass |
| Cement | ± 0.5 percent of designated batch mass |
| Mineral Admixture | ± 1.0 percent of designated batch mass |
| Water | ± 1.5 percent of designated batch mass or volume |

Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cement, mineral admixture and water as provided in these special provisions. Dry ingredients shall be proportioned by mass. Liquid ingredients shall be proportioned by mass or volume.

At the time of batching, aggregates shall have been dried or drained sufficiently to result in stable moisture content, so that no visible separation of water from aggregate will take place during the proportioning process. 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.

If separate supplies of aggregate material of the same size group with different moisture content or specific gravity or surface characteristics affecting workability are available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another supply.

Cement shall be kept separate from the aggregates until released for discharge into the mixer. Cement shall be free of lumps and clods when discharged into the mixer. Fabric containers used for transportation or proportioning of cement shall be clean and free of residue before reuse.

Weigh systems for proportioning aggregate, cement, and mineral admixture 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 distinct material-weighing device.

For batches with a volume of one cubic meter or more, proportioning equipment shall conform to one of the following methods:

A. All ingredients shall be batched at a central batch plant and charged into a mixer truck for transportation to the pour site. Ingredient proportioning shall meet the requirements of Section 90-5, "Proportioning," of the Standard Specifications.
B. All ingredients except the cement shall be batched at a central batch plant and charged into a mixer truck for transportation to a remote located silo and weigh system for the proportioning of the cement. The remote system shall proportion cement for charging the mixer truck.
C. All ingredients except the cement shall be batched at a central batch plant and charged into a mixer truck for transportation to a remote location where pre-weighed, containerized cement shall be added to the mixer truck. The cement pre-weighing operation shall utilize a platform scale. The platform scale shall have a maximum capacity of 2.5 tonnes with a maximum graduation size of 0.5 kilograms. Cement shall be pre-weighed into a fabric container. The minimum amount of cement to be proportioned into any single container shall be one half of the total amount required for the load of RSC being produced.
D. Cement, water, and aggregate shall be proportioned volumetrically in conformance with these special provisions.

In order to check the accuracy of batch masses, the gross mass and tare mass of truck mixers shall be determined when ordered by the Engineer. The equipment shall be weighed at the Contractor's expense on scales designated by the Engineer.

The Contractor shall install and maintain in operating condition an electrically actuated moisture meter. The meter shall indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched. The meter shall have a sensitivity of 0.5 percent by mass of the fine aggregate.

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. Water added to the truck mixer at the job site shall be measured through a meter that conforms to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

Aggregate discharged from several bins shall be controlled by gates or by mechanical conveyors. The means of discharge from the bins and from the weigh hopper shall be interlocked so that no more than one bin can discharge at a time, and so that the weigh hopper can not be discharged until the required quantity from each of the bins has been deposited in the weigh hopper.

**Weighmaster Certificates**

Weighmaster certificates for RSC, regardless of the proportioning method used, shall include all information necessary to trace the manufacturer, and manufacturer's lot number for the cement being used. When proportioned into fabric containers the weighmaster certificates for the cement shall contain date of proportioning, location of proportioning and actual net draft mass of the cement. When proportioned at the pour site from a storage silo the weighmaster certificates shall contain date of proportioning, location of proportioning and the net draft mass of the cement used in the load.

**Volumetric Proportioning**

When RSC is proportioned by volume, the method shall conform to requirements specified herein.

Aggregates shall be handled and stored in conformance with the provisions in Section 90-5.01, "Storage of Aggregates," of the Standard Specifications. Liquid admixtures shall be proportioned in conformance with the provisions in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures," of the Standard Specifications. Mineral admixtures shall be protected from exposure to moisture until used. Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the batch-mixer storage hopper or in the feed line.

Batch-mixer trucks shall be equipped to proportion cement, water, aggregate and additives by volume. Aggregate feeders shall be connected directly to the drive on the cement vane feeder. The cement feed rate shall be tied directly to the feed rate for the aggregate and other ingredients. Any change in the ratio of cement to aggregate shall be accomplished by changing the gate opening for the aggregate feed. The drive shaft of the aggregate feeder shall be equipped with a revolution counter reading to the nearest full or partial revolution of the aggregate delivery belt.

Aggregate shall be proportioned using a belt feeder operated with an adjustable cutoff gate delineated to the nearest quarter increment. Height of the gate opening shall be readily determinable. Cement shall be proportioned by a method that conforms to the accuracy requirements of these special provisions. Water shall be proportioned by a meter conforming to the provisions in Section 9-1.01, "Measurement and Payment," of the Standard Specifications and these special provisions.

Delivery rate of aggregate and cement per revolution of the aggregate feeder shall be calibrated at appropriate gate settings for each batch-mixer truck used on the project and for each aggregate source. Batch-mixer trucks shall be calibrated at 3 different aggregate gate settings that are commensurate with production needs. Two or more calibration runs shall be required at each of the different aggregate gate openings. The actual mass of material delivered for aggregate proportioning device calibrations shall be determined by a platform scale as specified in these special provisions.

Aggregate belt feeder shall deliver aggregate to the mixer with volumetric consistency so that deviation for any individual aggregate delivery rate check-run shall not exceed 1.0 percent of the mathematical average of all runs for the same gate opening and aggregate type. Each test run shall be at least 500 kg. Fine aggregate used for calibration shall not be reused for device calibration.

At the time of batching, aggregates shall be dried or drained sufficiently to result in stable moisture content, so that no visible separation of water from aggregate takes place during the proportioning process. 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.

If separate supplies of aggregate material of the same size group with different moisture content or specific gravity or surface characteristics affecting workability are available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting another supply.

Rotating and reciprocating equipment on batch-mixer trucks shall be covered with metal guards.

The cement proportioning system shall deliver cement to the mixer with a volumetric consistency so that the deviation for any individual delivery rate check-run shall not exceed 1.0 percent of the mathematical average of 3 runs of at least 500 kg each. Cement used for calibration shall not be reused for device calibration.

Water meter accuracy shall be such that, when operating between 50 percent and 100 percent of production capacity, the difference between the indicated mass of water delivered and the actual mass delivered shall not exceed 1.5 percent of the actual mass for each of two individual runs of 1200 liters. The water meter shall be calibrated in conformance with the requirements of California Test 109 and shall be equipped with a resettable totalizer and display the operating rate.

Calibration tests for aggregate, cement and water proportioning devices shall be conducted with a platform scale located at the calibration site. Weighing of test run calibration material shall be performed on a platform scale having a maximum capacity not exceeding 2.5 tonnes with maximum graduations of 0.5-kg. The platform scale shall be error tested within 8 hours of calibration of batch-mixer truck proportioning devices. Error testing shall be performed with test masses conforming to California Test 109 and shall produce a witness scale that is within 2 graduations of the test mass load. The scale shall be available for use at the production site throughout the production period. Equipment needed for the calibration of proportioning systems shall remain available at the production site throughout the production period. A Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished with each delivery of aggregate, cement, and admixtures used for calibration tests and shall be submitted to the Engineer with a certified copies of the mass of each delivery. The Certificate of Compliance shall state that the source of materials used for the calibration tests is from the same source as to be used for the planned work. The Certificate of Compliance shall state that the material supplied conforms to the Standard Specifications and these Special Provisions and shall be signed by an authorized representative who shall have the authority to represent and act for the Contractor.

The batch-mixer truck shall be equipped so that an accuracy check can be made prior to the first operation for the project and at any other time as directed by the Engineer. Further calibration of proportioning devices shall be required every 30 days after production begins or when the source or type of any ingredient is changed. A spot calibration shall consist of calibration of the cement proportioning system only. A two run spot re-calibration of the cement proportioning system shall be performed each time 50 tonnes of cement has passed through the batch-mixer truck. Should the spot re-calibration of the cement proportioning system fall outside the limitations specified herein, a full calibration of the cement proportioning system shall be completed before the resumption of production.

Liquid admixtures shall be proportioned by a meter.

Cement storage shall be located immediately before the cement feeder and shall be equipped with a device that will automatically shut down the power to the cement feeder and aggregate belt feeder when the cement storage level is lowered to a point where less than 20 percent of the total volume is left in storage.

The Contractor shall furnish aggregate moisture determinations, made in conformance with the requirements of California Test 223, at least every 2 hours during proportioning and mixing operations. Moisture determinations shall be recorded and presented to the Engineer at the end of the production shift.

Each aggregate bin shall be equipped with a device that will automatically shut down the power to the cement feeder and the aggregate belt feeder when the aggregate discharge rate is less than 95 percent of the scheduled discharge rate of any bin.

Indicators specified herein shall be in working order prior to commencing proportioning and mixing operations and shall be visible when standing near the batch-mixer truck.

Identifying numbers of batch-mixer trucks shall be at least 75 mm in height, and be located on the front and rear of the vehicles.

Volumetric proportioned RSC shall be mixed in a mechanically operated mixer of adequate size and power for the type of RSC to be placed. Mixers may be of the auger type and shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers that have an accumulation of hard concrete or mortar shall be removed from service until cleaned. Other types of mixers may be used provided mixing quality will meet the requirements of these special provisions.

Charge or rate of feed to the mixer shall not exceed that which will permit complete mixing of the materials. Dead areas in the mixer, where material does not move or is not sufficiently agitated, shall be corrected by a reduction in the volume of material or by other adjustments. The mixer shall be designed to provide sufficient mixing action and movement to produce properly mixed RSC. Mixing shall continue until a homogeneous mixture is produced at discharge from the mixer. There shall be no lumps or evidence of non-dispersed cement at discharge from the mixer. No water shall be added to the RSC after discharge from the mixer.

Equipment having components made of aluminum or magnesium alloys, which may have contact with plastic concrete during mixing or transporting of RSC, shall not be used.

Uniformity of concrete mixtures will be determined by differences in penetration measurement made in conformance with the requirements in California Test 533. 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 15 mm. The Contractor shall furnish samples of freshly mixed concrete and provide facilities for obtaining the samples. Sampling facilities shall be safe, accessible, clean and produce a sample which is representative of production. Sample devices and sampling methods shall also conform to the requirements of California Test 125.

Ice shall not be used to cool RSC directly. When ice is used to cool water used in the mix, all of the ice shall be melted before entering the mixer.

Cement shall be proportioned and charged into the mixer by means that will result in no losses of cement due to wind, or due to accumulation on equipment, or other conditions which will vary the required quantity of cement.

Each mixer shall have a metal plate or plates, prominently attached, on which the following information is provided:

A. Uses for which the equipment is designed.
B. Manufacturer's guaranteed capacity of the mixer in terms of the volume of mixed concrete.
C. Speed of rotation of the mixer.

Consistency and workability of mixed concrete when discharged at the delivery point shall be suitable for placement and consolidation.

Information generated by volumetric devices will not be used for payment calculations.

The device that controls the proportioning of cement, aggregate and water shall produce a log of production data. The log of production data shall consist of a series of snapshots captured at 15-minute intervals throughout the period of daily production. Each snapshot of production data shall be a register of production activity at that time and not a summation of the data over the preceding 15 minutes. The amount of material represented by each snapshot shall be the amount produced in the period of time from 7.5 minutes before to 7.5 minutes after the capture time. The daily log shall be submitted to the Engineer, in electronic or printed media, at the end of each production shift or as requested by the Engineer, and shall include the following:

A. Mass of cement per revolution count.
B. Mass of each aggregate size per revolution count.
C. Gate openings for each aggregate size being used.
D. Mass of water added to the concrete per revolution count.
E. Moisture content of each aggregate size being used.
F. Individual volume of all other admixtures per revolution count.
G. Time of day.
H. Day of week.
I. Production start and stop times.
J. Batch-mixer truck identification.

K. Name of supplier.
L. Specific type, size, or designation of concrete being produced.
M. Source of the individual aggregate sizes being used.
N. Source, brand and type of cement being used.
O. Source, brand and type of individual admixtures being used.
P. Name and signature of operator.

Required report items may be input by hand into a pre-printed form or captured and printed by the proportioning device. Electronic media containing recorded production data shall be presented in a tab delimited format on a 90-mm diskette with a capacity of at least 1.4 megabytes. Each snapshot of the continuous production shall be followed by a line-feed carriage-return with allowances for sufficient fields to satisfy the amount of data required by these specifications. The reported data shall be in the above order and shall include data titles at least once per report.

**Replacement Base Layer**

Base materials removed shall be replaced with replacement base layer. Replacement base layer shall consist of rapid strength concrete and shall be placed in a separate and distinct operation from that of replacing concrete pavement.

Replacement base layer shall be finished to the grade of the original base layer. The surface shall not be textured and shall be finished to a smooth surface, free of mortar ridges and other projections. The finished surface shall be free from voids and porous areas.

**Bond Breaker**

Bond breaker shall be placed between replacement pavement and existing lean concrete base, cement treated base or new base replacement layer. Bond breaker shall be one of the following:

A. Curing paper conforming to the requirements in ASTM Designation: C 171, white.
B. Polyethylene film conforming to the requirements in ASTM Designation: C 171, except that the minimum thickness shall be 0.15 mm, white opaque.
C. Paving asphalt, Grade AR-4000, conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications.
D. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A, containing a minimum of 22 percent nonvolatile vehicles consisting of at least 50 percent paraffin wax.

When curing paper or polyethylene film is used, material shall be placed in a wrinkle free manner. Adjacent sheets shall be overlapped a minimum of 150 mm.

When curing compound or paving asphalt is used, all foreign and loose materials remaining from slab removal shall be removed prior to application.

When paving asphalt is used, no water shall be added before applying asphalt to the surface of the base. The paving asphalt shall be applied in one even application at a rate of 0.10 to 0.45-L/$m^2$ over the entire base surface area. Concrete pavement shall not be placed until the paving asphalt has cured.

When curing compound is used, the curing compound shall be applied in two separate applications. Each application shall be applied evenly at a rate of 0.3 to 0.5-L/$m^2$ over the entire base surface area.

**Spreading, Compacting and Shaping**

Metal or wood side forms may be used. Wood side forms shall not be less than 38-mm thick. Side forms shall be of sufficient rigidity, both in the form and in the connection with adjoining forms, that movement will not occur under the force from subgrading and paving equipment or from the pressure of concrete.

Side forms shall remain in place until the pavement edge no longer requires the protection of forms. Side forms shall be thoroughly cleaned and oiled prior to each use.

Consolidation of RSC shall be by means of high-frequency internal vibrators after the RSC is deposited on the subgrade. Vibrating shall be done in a manner to assure uniform consolidation adjacent to forms and across the full paving width. RSC shall be placed as nearly as possible in its final position and use of vibrators for extensive shifting of the mass of RSC will not be permitted.

RSC shall be spread and shaped by suitable powered finishing machines and supplemented by hand finishing as necessary. Methods of spreading, shaping and consolidating that result in segregation, voids or rock pockets shall be discontinued. The Contractor shall use methods that will produce dense homogeneous pavement conforming to the required cross section.

After the RSC has been mixed and placed, no additional water shall be added to the surface to facilitate finishing. Surface finishing additives, when used, shall be as recommended by the manufacturer of the cement and shall be approved by the Engineer prior to use.

**Joints**

Prior to placing concrete against existing concrete, a 6-mm thick commercial quality polyethylene flexible foam expansion joint filler shall be placed across the original transverse and longitudinal joint faces and extend the full depth of the excavation. The top of the joint filler shall be placed flush with the top of pavement. Joint filler shall be secured to the joint face of the existing pavement by a method that will hold the joint filler in place during the placement of concrete.

Transverse weakened plane joints in pavement widenings shall be constructed to match the spacing and skew of the weakened plane joints in the adjacent existing pavement. Where the existing transverse weakened plane joint spacing in an adjacent lane exceeds 4.6 m, an additional transverse weakened plane joint shall be constructed midway between the existing joints. The provisions in the second and third paragraphs in Section 40-1.08B, "Weakened Plane Joints," and the third paragraph in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications shall not apply. Sawing of weakened plane joints shall be completed within 2 hours of completion of final finishing. Minimum depth of cut for weakened plane joints shall be 120 mm.

**Final Finishing**

Tests to determine coefficient of friction of the final textured surface will be made only if the Engineer determines by visual inspection that the final texturing may not have produced a surface having the specified coefficient of friction. Any tests to determine the coefficient of friction will be made after the pavement is opened to public traffic, but not later than 5 days after concrete placement. Pavement areas having a coefficient of friction as determined in conformance with the requirements in California Test 342 of less than 0.30 shall be grooved in conformance with the provisions in Section 42-1.02, "Construction," of the Standard Specifications. Grooving shall be performed prior to the installation of any required edge drains adjacent to the areas to be grooved.

Transverse straightedge and longitudinal straightedge requirements will not apply to the pavement surface within 300 mm of the existing concrete pavement except as required in these special provisions. Longitudinal straightedge requirements in Section 40-1.10, "Final Finishing," of the Standard Specifications, shall be applied at transverse contact joints with existing concrete pavement where the straightedge is to be placed with the midpoint coincident with the joints. Pavement not meeting this straightedge requirement shall be corrected within 48 hours by grinding or other methods as approved by the Engineer.

Profiles of the completed pavement surface specified in Section 40-1.10, "Final Finishing," of the Standard Specifications will not be required. The Profile Index requirements in Section 40-1.10, "Final Finishing," of the Standard Specifications shall not apply.

**Curing Method**

The curing method for replacement pavement shall be as recommended by the manufacturer of the cement and as approved by the Engineer.

**REPLACE EXISTING PAVEMENT DELINEATION**

Whenever existing pavement delineation is removed, obliterated or damaged due to the work involved in replacing concrete pavement, the Contractor shall replace the delineation in conformance with the requirements of these special provisions.

**MEASUREMENT AND PAYMENT**

Replace concrete pavement (Rapid Strength Concrete) will be measured and paid for in the same manner specified for concrete pavement in Sections 40-1.13, "Measurement," and 40-1.14, "Payment," of the Standard Specifications, and these special provisions.

Replace concrete pavement (Rapid Strength Concrete) payments will be subject to the pay factor values listed in "Pay Factor Adjustment for Low Modulus of Rupture" of these special provisions.

Full compensation for the pre-operation conference, including furnishing the facility to hold the pre-operation conference in, shall be considered as included in the contract prices paid for the item involving RSC and no additional compensation will be made therefor.

Costs for providing JITT will be made 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.

The provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications shall not apply.

Full compensation for removing and disposing of existing concrete pavement and underlying base, constructing trial slabs, furnishing and placing bond breaker, furnishing and disposing of standby materials for temporary roadway structural section, and constructing, maintaining, removing and disposing of temporary roadway structural section, shall be considered as included in the contract price paid per cubic meter for replace concrete pavement (Rapid Strength Concrete), and no additional compensation will be allowed therefor.

If calibration of volumetric batch-trucks is performed more than 160 km from the project limits, additional inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for Replace Concrete Pavement (Rapid Setting Concrete) will be reduced $1000.

### 10-1.362 EXIT RAMP TERMINI

Portland cement concrete pavement at exit ramp termini shall be constructed as shown on the plans and as provided in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications.

### 10-1.363 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 ± 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 ± 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.

After grinding has been completed, the pavement surface shall be profiled in conformance with the requirements of Section 40-1.10, "Final Finishing," of the Standard Specifications. Two profiles shall be obtained in each lane approximately one meter from the lane lines. The average profile index shall be determined by averaging the two profiles in each lane. Additional grinding shall be performed, where necessary, to bring the ground pavement surface within the Profile Index requirements specified in Section 40-1.10, "Final Finishing," of the Standard Specifications.

Full compensation for profiling the ground pavement surface with a California profilograph or equivalent and any necessary additional grinding to bring the finished surface within the specified tolerances and for furnishing final profilograms to the Engineer shall be considered as included in the contract price paid per square meter for grind existing concrete pavement and no additional compensation will be allowed therefor.

### 10-1.37 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.

Foundation recommendations are included in the "Information Handout" available to the Contractor as provided for in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Attention is directed to "Welding" of these special provisions.

Attention is directed to "Bar Reinforcing Steel" of these special provisions for the column cage detail plan.

Difficult pile installation is anticipated at the Southeast Connector, Bridge No. 56-0802F due to the presence of rock that is mineralogically varied and also varies from weathered rock to fresh and from soft to very hard rock, caving soils, ground

water, abundant cobbles and sporadic boulders, clays restricted horizontal clearance, restricted working area, and traffic control.

Difficult pile installation is anticipated at the N215-W91 Connector, Bridge No. 56-0801G due to the presence of rock that is mineralogically varied and also varies from weathered rock to fresh and from soft to very hard rock, caving soils, ground water, abundant cobbles and sporadic boulders, clays, restricted horizontal clearance, restricted working area, and traffic control.

Difficult pile installation is anticipated at Chicago Avenue Overhead (Widen), Bridge No. 56-0403 due to the presence of caving soils.

Difficult pile installation is anticipated at 60/91/215/ Separation (Widen), Bridge No. 56-0402 due to the presence of caving conditions and fluctuating groundwater elevation.

Difficult pile installation is anticipated at Down Street Overhead (Widen), Bridge No. 56-0398, due to the presence of hard driving at Abutment 3; caving conditions for cast-in-drilled hole concrete piling, and railroad agreement requirements.

Difficult pile installation is anticipated at Riverside Canal (Lacadana Drive) Bridge , Bridge No. 56C-0499 due to the presence of caving soils; and fluctuating groundwater elevation.

Difficult pile installation is anticipated at Eastbound 60 Truck Connector (Bridge No. 56-0806G) due to the presence of weathered granitic bedrock, caving soils, fluctuating ground water, restricted horizontal clearance; restricted working area; and traffic control.

**Jetting**

Jetting 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 | Widen | Elevation of Bottom of Hole |
|---|---|---|---|
| Chicago Ave. OH, Br. No. 56-0403 | 1 | Left | 271.0 m |
| Chicago Ave. OH, Br. No. 56-0403 | 6 | Left | 272.5 m |
| Chicago Ave. OH, Br. No. 56-0403 | 1 | Right | 270.5 m |
| Chicago Ave. OH, Br. No. 56-0403 | 6 | Right | 269.5 m |

In addition to conforming to the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications, should obstructions to driving be encountered, the Contractor shall provide special driving tips or heavier pile sections, or shall subexcavate below the bottom of footing, or take other measures to prevent damage to the pile during driving. Full compensation for providing special tips, heavier sections, or for subexcavating or employing other measures to prevent damage to the piles shall be considered as included in the contract price paid per unit for drive steel pile of the size shown on the plans, and no additional compensation will be allowed therefor.

**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 midheight and near the bottom of the hole. Slurry shall be recirculated when tests show that the samples taken from midheight 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 midheight 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 midheight 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$^3$)<br><br>- before placement in the drilled hole<br>- during drilling<br><br>- prior to final cleaning<br>- immediately prior to placing concrete | 1030* to 1110*<br><br>1030* to 1200* | Mud Weight (Density)<br>API 13B-1<br>Section 1 |
| Viscosity (seconds/liter)<br><br>bentonite<br><br>attapulgite | 29 to 53<br><br>29 to 42 | Marsh Funnel and Cup<br>API 13B-1<br>Section 2.2 |
| pH | 8 to 10.5 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent)<br><br>- prior to final cleaning<br>- immediately prior to placing concrete | less than or equal to 4.0 | Sand<br>API 13B-1<br>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$^3$.<br>Slurry temperature shall be at least 4 degrees Celsius 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 EXL | KB Technologies Ltd.<br>3648 FM 1960 West<br>Suite 107<br>Houston, TX 77068<br>(800) 525-5237 |
| Super Mud | PDS Company<br>c/o Champion Equipment Company<br>8140 East Rosecrans Ave.<br>Paramount, CA 90723<br>(562) 634-8180 |
| Shore Pac GCV | CETCO Drilling Products Group<br>1350 West Shure Drive<br>Arlington Heights, IL 60004<br>(847) 392-5800 |

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 EXL synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| SLURRYPRO EXL<br>KB Technologies Ltd. | | |
|---|---|---|
| PROPERTY | REQUIREMENT | TEST |
| Density ($kg/m^3$)<br><br>- during drilling<br><br>- prior to final cleaning<br>- just prior to placing concrete | <br><br>less than or equal to 1075*<br><br>less than or equal to 1025* | Mud Weight (Density)<br>API 13B-1<br>Section 1 |
| Viscosity (seconds/liter)<br><br>- during drilling<br><br>-prior to final cleaning<br>- just prior to placing concrete | <br><br>53 to 127<br><br>less than or equal to 74 | Marsh Funnel and Cup<br>API 13B-1<br>Section 2.2 |
| pH | 6 to 11.5 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent)<br><br>- prior to final cleaning<br>- just prior to placing concrete | <br><br>less than or equal to 0.5 | Sand<br>API 13B-1<br>Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 $kg/m^3$.<br>Slurry temperature shall be at least 4 degrees Celsius when tested. | | |

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| SUPER MUD<br>PDS Company | | |
|---|---|---|
| PROPERTY | REQUIREMENT | TEST |
| Density ($kg/m^3$)<br><br>- prior to final cleaning<br>- just prior to placing concrete | less than or equal to 1025* | Mud Weight (Density)<br>API 13B-1<br>Section 1 |
| Viscosity (seconds/liter)<br><br>- during drilling<br><br>- prior to final cleaning<br>- just prior to placing concrete | 34 to 64<br><br>less than or equal to 64 | Marsh Funnel and Cup<br>API 13B-1<br>Section 2.2 |
| pH | 8 to 10.0 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent)<br><br>- prior to final cleaning<br>-just prior to placing concrete | less than or equal to 0.5 | Sand<br>API 13B-1<br>Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 $kg/m^3$.<br>Slurry temperature shall be at least 4 degrees Celsius when tested. | | |

Shore Pac GCV synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| Shore Pac GCV<br>CETCO Drilling Products Group | | |
|---|---|---|
| PROPERTY | REQUIREMENT | TEST |
| Density ($kg/m^3$)<br><br>- prior to final cleaning<br>- just prior to placing concrete | less than or equal to 1025* | Mud Weight (Density)<br>API 13B-1<br>Section 1 |
| Viscosity (seconds/liter)<br><br>- during drilling<br><br>- prior to final cleaning<br>- just prior to placing concrete | 35 to 78<br><br>less than or equal to 60 | Marsh Funnel and Cup<br>API 13B-1<br>Section 2.2 |
| pH | 8.0 to 11.0 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent)<br><br>- prior to final cleaning<br>-just prior to placing concrete | less than or equal to 0.5 | Sand<br>API 13B-1<br>Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 $kg/m^3$.<br>Slurry temperature shall be at least 4 degrees Celsius 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 ($kg/m^3$)<br><br>- prior to final cleaning<br>- just prior to placing concrete | 1017 * | Mud Weight (Density) API 13B-1 Section 1 |
| Sand Content (percent)<br><br>- prior to final cleaning<br>-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 and inspection pipes, if required.
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. 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.
2. 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.
3. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
4. Slurry testing equipment and procedures.
5. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
6. 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.

Material resulting from using slurry shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

**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 3 weeks for the Engineer to conduct these tests and make determination of acceptance if the 48.3-mm diameter cylinder passed all inspection pipes, and 4 weeks 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 3 weeks to review the mitigation plan after a complete submittal has been received.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-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 redrilling 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.

## 10-1.38 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.

## 10-1.39 TIEBACK ANCHORS

Anchors at the various tieback retaining walls at Canyon Crest Road Undercrossing (Widen), Bridge No. 56-0085, and Central Avenue Undercrossing (Widen), Bridge No. 56-0504, consisting of holes drilled in foundation material, grouted steel bars or strands, and anchorage assemblies, and testing of installed anchors, shall conform to the details shown on the plans, the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

Foundation recommendations are included in the "Information Handout" available to the Contractor in conformance with the provisions in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Difficult tieback installation is anticipated due to the presence of caving soils, low overhead clearance, and traffic control.

The Contractor shall determine the bond length necessary to meet acceptance criteria specified herein.

The submittal of reduced prints of corrected original tracings will not be required for tieback anchor installations.

In fabricating, handling, shipping, and placing tieback anchors, adequate care shall be taken to avoid damage to the sheathing. All damage to the sheathing caused by handling and fabrication prior to tieback anchor installation shall be repaired or replaced as determined by the Engineer. Repair procedure for the sheathing shall be included in the working drawings.

**MATERIALS**

Whenever "member" is referred to in Section 50, "Prestressing Concrete," of the Standard Specifications, it shall be considered to mean tieback anchor.

Structural steel for the tieback retaining wall shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions. Structural steel shall consist of the anchorage assembly and the anchorage enclosure. The anchorage assembly and the anchorage enclosure shall be galvanized as indicated on the plans. The provisions of "Welding Quality Control" of these special provisions shall not apply to the anchorage enclosure or to the weld between the steel tube and the bearing plate of the anchorage assembly for tiebacks. Those provisions shall apply to all other welds of structural steel for tieback retaining walls.

The permanent bearing plate of the tieback anchor shall effectively distribute the design force (T), to the concrete, such that the concrete bearing stress does not exceed 11 MPa and the bending stress does not exceed 0.55 $f_y$ for steel nor 0.36 $f_y$ for cast steel or cast iron.

Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. Fine aggregate may be added to the grout mixture of portland cement and water used outside of the grouted sheathing in drilled holes which are 200 mm or greater in diameter, but only to the extent that the cement content of the grout is not less than 500 kg per cubic meter of grout. Fine aggregate, if used, shall conform to the provisions in Section 90-2, "Materials," and Section 90-3, "Aggregate Gradings," of the Standard Specifications.

The plastic sheathing for tieback anchors shall conform to the following: polyvinyl chloride (PVC) sheathing, high density polyethylene (HDPE) sheathing, and polypropylene sheathing.

Corrugated plastic sheathing shall be PVC or HDPE. The width of corrugations, the distance between corrugations, and the height of corrugations of corrugated plastic sheathing shall be approximately the same.

PVC sheathing may be used for smooth sheathing for bar tendons and corrugated sheathing. PVC sheathing shall conform to ASTM Designation: D 1784, Class 13464-B. Corrugated PVC sheathing shall have a nominal wall thickness of 1.0 mm. HDPE sheathing may be used for smooth sheathing for bar tendons and corrugated sheathing. HDPE sheathing shall have a density between 940 kg/m$^3$ and 960 kg/m$^3$ as measured in accordance with ASTM Designation: D 792, A-2. Corrugated HDPE sheathing shall have a nominal wall thickness of 1.5 mm for sheathing with an outside diameter of 75 mm or greater, and a nominal thickness of 1.0 mm for sheathing with an outside diameter less than 75 mm, with a tolerance of minus 0.25-mm.

HDPE sheathing may be used for the smooth sheathing encapsulating individual strands of strand type tendons. Smooth HDPE sheathing for encapsulating strands shall have a minimum wall thickness of 1.0 mm. Polypropylene sheathing may be used for the smooth plastic sheathing encapsulating individual strands of strand type tendons. Polypropylene sheathing shall have a density between 900 kg/m$^3$ and 910 kg/m$^3$. Smooth polypropylene sheathing shall have a minimum wall thickness of 1.0 mm.

The smooth sheathing for the unbonded length of the individual strands shall have sufficient strength to prevent damage during construction operations, shall be watertight, chemically stable without embrittlement or softening, and nonreactive with concrete, steel or corrosion inhibiting grease. Smooth plastic sheathing, including joints, shall be watertight.

The corrugated sheathing, including joints, shall have sufficient strength to prevent damage during construction operations, shall be grout-tight and watertight, chemically stable without embrittlement or softening, and nonreactive with concrete, steel or corrosion inhibiting grease.

The transition between the corrugated plastic sheathing and the anchorage assembly shall be an approved detail that allows stressing to the design force without evidence of distress in the corrugated plastic sheathing.

Additional requirements for tiebacks with strand type tendons are as follows:

A. The strand anchorage assembly shall include an approved permanent type wedge retaining device. Where high strength bolts are a part of the device, the tensile capacity of the high strength bolts shall be 0.3 times the ultimate strength of the strands.
B. The individual strands of a tendon, except for the bonded length, shall be fully coated with corrosion inhibiting grease and then encapsulated by a smooth HDPE or polypropylene sheath. The corrosion inhibiting grease shall fill all space between strand wires and shall encapsulate the strand giving an encasement diameter at least 0.12-mm greater than the diameter of the bare strand. The sheath shall be hot melt extruded onto the strand or shall be shop

applied by an approved method that assures that all spaces between the sheath and the strand and between the strand wires are filled with corrosion inhibiting grease.

C. The corrosion inhibiting grease shall provide a continuous nonbrittle film of corrosion protection to the prestressing steel and lubrication between the strand and the sheathing, shall resist flow from the sheathing, shall be chemically stable and nonreactive with the prestressing steel, sheathing material and concrete, and shall be organic with appropriate polar, moisture displacing, and corrosion inhibiting additives.

D. The corrosion inhibiting grease shall have the physical properties listed in Table 3.2.1 of the Post Tensioning Manual, Fourth Edition, by the Post Tensioning Institute and as modified below. At least 40 days before use, a sample from the lot to be used and test results shall be provided for the corrosion inhibiting grease.

| Test | Requirements | ASTM Designation: |
|---|---|---|
| Water Soluble Ions:<br>Nitrates | 10 g/kg max. | D 3867 |
| Corrosion Test:<br>5% Salt Fog @ 38° C.<br>125 µm coating on<br>76 mm x 152 mm Q panel<br>Type S, 1000 hrs min. | Grade 7 or better | B 117, D 610 |
| Compatibility with sheathing:<br>Hardness change &<br>volume change of polymer after exposure to grease 40 days at 66° C. | 15% max.<br>10% max. | D 4289, Except use D 792 for density |

**CONSTRUCTION**

Tieback anchors shall be installed in accordance with the manufacturer's recommendations. In case of a conflict between the manufacturer's recommendations and these special provisions, these special provisions shall prevail.

Water and grout from tieback anchor construction operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into landscaping, gutters or other drainage facilities. Excessive amounts of water shall not be used in any of the drilling and the tieback anchor installation procedures.

Tieback anchor steel shall be protected prior to completion of all grouting against rust, corrosion and physical damage in conformance with the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications. In addition, there shall be no evidence of distress in the plastic sheathing or crushing of the cement grout within the pregrouted sheathing.

The tieback anchorage assembly shall be protected against rust, corrosion and physical damage, prior to completion of all grouting of enclosure or encasement in concrete.

The tieback anchor installation method selected by the Contractor shall be sufficient to achieve the loadings specified herein. Holes for tieback anchors shall be drilled in the foundation to a depth sufficient to provide the necessary bond length beyond the minimum unbonded length shown on the plans.

Tieback anchorage holes shall be drilled by either the rotary or rotary percussion drilling method.

The top level of tiebacks shall be installed in drilled holes advanced with drill casing. Drill casing shall be removed while filled with grout as the initial grout is being placed.

The diameter of the drilled hole shall be large enough to provide a minimum of 25 mm grout cover within the bonded length of the tendon. Centralizers shall be used within the bonded length of the tendon.

Pregrouting shall occur at least 48 hours before placing the tendon in the drilled hole.

Prior to installing each anchor assembly into the drilled hole, the anchor assembly shall be clean and free of oil, grease or other extraneous substances, and any damage to the sheathing shall be repaired or replaced.

Grout for all stages of tieback construction shall be injected at the low end of the void being filled and shall be expelled at the high end until there is no evidence of entrapped air, water or diluted grout. The grout shall be placed using grout tubes, unless another method is approved by the Engineer. The quantity of the grout and the grout pressures shall be recorded.

After placing initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

Additional requirements for tiebacks with strand type tendons are as follows:

A. The Contractor shall have the option of using Alternative A or Alternative B as shown on the plans for tieback tendons.
B. For Alternative A and Alternative B, strand tendons shall be sheathed with corrugated sheathing. The individual strands within the bonded length shall be separated by spaces so that the entire surface of each strand is bonded in the grout. The maximum spacing of strand spacers shall be 1.50 m. The strand spacers shall be plastic and of a construction and strength that will provide support for the individual strands during construction operations.
C. For Alternative A, the bonded length of the tendon is sheathed with corrugated sheathing and pregrouted full length of the corrugated sheathing before placing the tendon in the hole. The corrugated sheathing shall lap the smooth sheathing on the strands 600 mm. For this alternative, the initial grout in the drilled hole may be placed before or after insertion of the strand tendon.
D. For Alternative B, the tendon is sheathed full length with corrugated sheathing and pregrouted a minimum length of 600 mm before placing the tendon in the hole. After placing the tendon into the drilled hole and before placing initial grout in the drilled hole, the grout shall be injected at the low end of the corrugated sheathing and the grout shall be expelled at the high end until there is no evidence of entrapped air, water or diluted grout.
E. For Alternative A and Alternative B, anchors in holes of 150 mm diameter and smaller shall be initially grouted to within 150 mm of the end of the steel tube. Grout in the unbonded length shall not be placed under pressure. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.
F. For Alternative A and Alternative B, anchors in holes of greater than 150 mm diameter shall be initially grouted within the bond length. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

**Testing**

All tiebacks shall be load tested by either a performance test or a proof test. Load testing shall be performed against the permanent concrete waler. The permanent waler shall either attain a compressive strength of 22 MPa or cure for 7 days before loading. Bearing pads shall be kept a minimum of 300 mm away from the edges of the drilled hole. The magnitude of applied test loads shall be determined with a calibrated pressure gauge or a load cell. Movements of the end of the tieback, relative to an independent fixed reference point, shall be measured and recorded to the nearest 0.025 mm at each load increment during the load tests. The Contractor shall perform the measuring and recording and shall furnish the Engineer copies of the recorded movements.

A minimum of 3 tiebacks shall be performance tested. The Engineer shall determine the location of the tiebacks to be performance tested.

The performance test or proof test shall be conducted by measuring the test load applied to the tieback and the tieback end movement during incremental loading and unloading of the anchor in accordance with the loading schedule. The test load shall be held constant for 10 minutes. During the test load hold, the movement of the end of the tendon shall be measured at 1, 2, 3, 4, 5, 6, and 10 minutes. If the total movement between one minute and 10 minutes exceeds one mm, the test load shall be held for an additional 50 minutes. Total movement shall be measured at 15, 20, 25, 30, 45, and 60 minutes. If the test load is held for 60 minutes, a creep curve showing the creep movement between one minute and 60 minutes shall be plotted as a function of the logarithm of time.

| LOADING SCHEDULES | | |
|---|---|---|
| PERFORMANCE TEST | | PROOF TEST |
| | (CONT'D) | |
| AL | AL | AL |
| 0.25T | 0.25T | 0.25T |
| AL | 0.50T | 0.50T |
| 0.25T | 0.75T | 0.75T |
| 0.50T | 1.00T | 1.00T |
| AL | 1.25T | 1.25T |
| 0.25T | AL | 1.50T (TEST LOAD) |
| 0.50T | 0.25T | AL |
| 0.75T | 0.50T | |
| AL | 0.75T | |
| 0.25T | 1.00T | |
| 0.50T | 1.25T | |
| 0.75T | 1.50T (TEST LOAD) | |
| 1.00T (CONT'D) | AL | |
| T = Design force for the anchor shown on the plans | | |
| AL = Alignment load | | |

For performance and proof tests, each increment of load shall be applied in less than one minute and held for at least one minute but not more than 2 minutes or as specified above. The observation period for the load hold shall start when the pump begins to apply the last increment of load.

The jacking equipment, including the tendon movement measuring system, shall be stable during all phases of the tieback loading operations.

All tiebacks not performance tested shall be proof tested. If 1.5 times the design force cannot be obtained, the tieback shall be redesigned and replaced. Tieback anchors shall not be retested, unless the tieback bond length is post-grouted after the unacceptable test.

A performance tested tieback is acceptable if:

A. The measured elastic movement exceeds 0.80 of the theoretical elongation of the unbonded length plus the jacking length at the maximum test load; and
B. The creep movement between one and 10 minutes is less than 1.0 mm.

A proof tested tieback is acceptable if:

A. The pattern of movements is similar to that of adjacent performance tested tiebacks; and
B. The creep movement between one and 10 minutes is less than 1.0 mm.

Performance tested or proof tested tiebacks which fail to meet acceptance criterion B will be acceptable if the maximum load is held for 60 minutes and the creep curve plotted from the movement data indicates a creep rate of less than 2.0 mm for the last log cycle of time.

**Lock-off**

After successful testing of the tiebacks, the tiebacks shall be tensioned against the structure and locked off at a load equal to 0.75 T. The lock-off force is the load on the jacks which is maintained while the anchor head are permanently set. Immediately after lock-off, a lift-off test shall be performed to demonstrate that the specified lock-off force was obtained. Adjustments in the shim thickness shall be made if required to maintain the specified lock-off force.

For strand tendons, the permanent wedges shall be fully set in the anchor head while the tendon is stressed to the test load of 1.50 T , and then locked off at the lock-off force by removal of the shims or other appropriate means.

The permanent strand wedges shall bear uniformly against the wedge retainer device when torque is applied to the high-strength bolts.

Grouting to the level of secondary grouting to the dimensions shown on the plans shall be completed only after successful testing and lock-off has been completed. At least 24 hours after the secondary grout has set, the remaining void in the steel tube and bearing plate shall be filled with grout. Grout shall be injected at the low end and expelled at the high end

until there is no evidence of entrapped air or water. A minimum grout head of 600 mm shall be maintained until the grout has set.

**MEASUREMENT AND PAYMENT**

No payment will be made for tiebacks which do not pass the specified testing requirements.

Tieback anchors will be measured and paid for by the unit, and the number for payment will be determined by the requirements of the details shown on the plans.

The contract unit price paid for tieback anchor shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the tieback anchors, including special measures taken to contain grout in the drilled hole, testing, and furnishing and installing anchorage assemblies, complete in place, including repair or replacement of sheathing as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.40 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Attention is directed to the provisions in Section 7-1.09, "Public Safety." Before performing any column form handling or column form installation operation at any location that is closer than the length of the column form being handled or installed to the edge of any traveled way open to public use, the Contractor shall submit to the Engineer, as provided in Section 5-1.02, "Plans and Working Drawings," a detail plan of the measures that will be employed to provide for the safety of traffic and the public.

**GENERAL**

All bridge spread footing concrete at Blaine Street Overcrossing, Bridge No. 56-0395; Iowa Avenue Overcrossing, Bridge No. 56-0396; Linden Street Overcrossing, Bridge No. 56-0397; University Avenue Undercrossing (widen), Bridge No. 56-0408; Canyon Crest Road Undercrossing, Bridge No. 56-0085; Central Avenue Undercrossing (widen), Bridge No. 56-0504; Martin Luther King, Jr. Undercrossing, Bridge No. 56-0803L/R; EB 60 Truck Connector, Br. No. 56-0806G; and Box Springs Road Overcrossing, Bridge No. 56-0804, shall be placed neat against undisturbed material at the bottom of the footing excavation. If the material at the bottom of the footing excavation is disturbed, the material shall be recompacted to 95 percent relative compaction prior to the concrete placement.

Concrete for the Type 1 retaining wall used to support the reinforced concrete pipe within the Earth Retaining Structure, Location E–RW 215-51B, Bridge No. 56-0816M, as shown on the plans shall be measured and paid for as structural concrete, retaining wall.

The two 5-meter long Type 1 retaining walls located at Abutment 5 of Box Springs Road Overcrossing (Replace), Bridge No. 56-0804, as shown on the plans shall be measured and paid for as structural concrete, bridge.

Concrete used in the support of the overhead Post Type S signs at Box Springs Road Overcrossing (Replace), Bridge No. 56-0804, as shown on the plans shall be measured and paid for as structural concrete, bridge.

Concrete for the reinforced concrete barrier slab shall be measured and paid for as structural concrete, barrier slab and shall include bar reinforcing steel.

Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

When a roughened concrete surface is shown on the plans, the existing concrete surface shall be roughened to a full amplitude of approximately 6 mm by abrasive blasting, water blasting, or mechanical equipment.Neoprene strip shall be furnished and installed 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.

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.

**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.

Where falsework is supported on the deck of a structure, construction shall conform to the following:

A. Falsework shall bear directly on the girder stems or bent caps of the supporting structure or shall bear on falsework sills which are structurally adequate to transmit the load to the stems or cap without stress to the deck slab.
B. Additional falsework shall be in place beneath the supporting structure whenever construction loads are imposed upon the supporting structure. Such additional falsework shall be designed and constructed to support all construction loads imposed upon the supporting structure from the upper structure.

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 |
|---|---|
| N215-W91 Connector, -Br. No. 56-801G<br>Frame 4 | 9 |
| N215-W91 Connector, -Br. No. 56-801G<br>Frames 1, 2, 3, 5, or 6 | Each frame, 3 |
| SE Connector, Br. No. 56-0802F<br>Frame 4 | 9 |
| SE Connector, Br. No. 56-0802F<br>Frame 1, 2, 3 or 5 | Each frame, 3 |
| SE Connector (SB215/EB215), Br. No. 56-802G | 9 |
| Down St. OH, Br. No. 56-0398 (widen) | 9 |
| Chicago Ave OH, Br. No. 56-0403 | 9 |
| Box Springs OH, Br. No. 56-082R | 9 |
| Box Springs OH Truck Connector, Br. No. 56-805G | 9 |
| Martin Luther King, Jr. UC, Br. No. 56-803R/L | 5 |
| | |

Temporary crash cushion modules, as shown on the plans and conforming to the provisions in "Temporary Crash Cushion Module" of these special provisions, shall be installed at the approach end of temporary railings which are located less than 4.6 m from the edge of a traffic lane. For 2-way traffic openings, temporary crash cushion modules shall be installed at the departing end of temporary railings which are located less than 1.8 m from the edge of a traffic lane.

**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 be in writing, 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.

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.

## 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/m$^2$ (minimum) bond paper, 559 mm x 864 mm in size, of all CRIP plan sheets prepared by the Contractor for each CRIP shall be furnished to the Office of Structure Design, Documents Unit.

Each CRIP shall be submitted prior to completion of 25 percent of the contract working days and sufficiently in advance of the start of the work that is proposed to be revised by the CRIP to allow time for review by the Engineer and correction by the Contractor of the CRIP plans and calculations without delaying the work. The Contractor shall allow a minimum of 8 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.

**SLIDING JOINTS**

Sliding joints consisting of a neoprene strip lubricated with grease and covered with sheet metal shall conform to the following requirements:

A. Neoprene strip shall conform to the requirements for neoprene in Section 51-1.14, "Waterstops," of the Standard Specifications.
B. Grease shall conform to the requirements of Military Specification: MIL-S-8660. A uniform film of grease shall be applied to the upper surface of the neoprene strip prior to placing the sheet metal.
C. Sheet metal shall be commercial quality galvanized sheet steel. The sheet metal shall be smooth and free of kinks, bends, or burrs. Joints in the sheet metal shall be butt joints sealed with plastic duct sealing tape.
D. Construction methods and procedures shall prevent grout or concrete seepage into the sliding joint assembly.
E. The concrete surfaces on which the neoprene strips will be placed shall be floated to a level plane and finished with a steel trowel.

## 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 Military Specification: MIL-S-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.

## 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, prior to prestressing, and prior to the release of falsework. In any 50-$m^2$ 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-$m^2$ portion, measured from where that crack exceeds 0.5-mm in width, as determined by the Engineer.

Deck crack treatment shall consist of test sealing, and furnishing and applying methacrylate resin in conformance with the requirements of these special provisions. If grinding operation is required, deck treatment shall take place after grinding.

Prior to the start of deck treatment work, the Contractor shall submit for approval by the Engineer, a program for public safety associated with the use of methacrylate resin. The program shall identify materials, equipment, and methods to be used. The Contractor shall not perform deck treatment work, other than that specifically authorized in writing by the Engineer, until the program has been approved.

If the measures being taken by the Contractor are inadequate to provide for public safety associated with use of methacrylate resin, the Engineer will direct the Contractor to revise the operations and the public safety program. Directions for revisions will be in writing and will specify the items in which the Contractor's program is inadequate. No further deck treatment shall be performed until public safety measures are adequate, and a revised program for public safety has been approved.

The Engineer will notify the Contractor of the approval or rejection of any submitted or revised program for public safety associated with the use of methacrylate resin within 10 working days of receipt of the final submitted program.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised program for public safety associated with the use of methacrylate resin, nor for any delays to the work due to the Contractor's failure to submit an acceptable program for public safety associated with the use of methacrylate resin. If the Engineer does not review or approve the program submitted by the Contractor within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the program for public safety, 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.

### Materials

The material used for treating the deck shall be a low odor, high molecular weight methacrylate resin. Prior to 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 | TEST METHOD | REQUIREMENT |
|---|---|---|
| Viscosity mPa·s, maximum, (Brookfield RVT with UL adaptor, 50 RPM at 25°C) | ASTM D 2196 | 0.025 |
| Specific Gravity minimum, at 25°C | ASTM D 1475 | 0.90 |
| Flash Point °C, minimum | ASTM D 3278 | 82 |
| Vapor Pressure mm Hg, maximum, at 25°C | ASTM D 323 | 1.0 |
| Tack-free time minutes, maximum at 25°C | California Test 551 | 400 |
| PCC Saturated Surface-Dry Bond Strength MPa, minimum at 24 hours and 21±1°C | California Test 551 | 3.5 |
| * Test shall be performed prior to adding initiator. | | |

A Material Safety Data Sheet shall be furnished prior to use for each shipment of high molecular weight methacrylate resin.

The promoter and initiator, if supplied separately from the resin, shall not be mixed directly with each other. Containers of promoters and initiators shall not be stored together in a manner that will allow leakage or spillage from one to contact the containers or material of the other.

**Testing**

The Contractor shall allow 14 days for sampling and testing by the Engineer of the high molecular weight methacrylate resin prior to proposed use.

The Contractor shall treat a test area within the project limits of approximately 50 $m^2$ at a location approved by the Engineer. Conditions during the test treatment shall be similar to those expected on the deck. Equipment used in the test shall be similar to those used for the deck treating operations. If the test area is on the traveled way, traffic shall not be allowed on the treated test area until (1) the treated surface is tack free (non-oily), (2) the sand cover adheres sufficiently to resist brushing by hand, and (3) the coefficient of friction of the deck is at least 0.35 when tested in conformance with the requirements in California Test 342.

Should the above requirements for traffic use not be met, the Contractor shall suspend treating of bridge decks until another test area is treated and complies with the requirements.

**Construction**

Prior to 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 prior to placing the penetrating sealer, the deck surface shall be cleaned by abrasive blasting.

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.

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.

The relative humidity shall be less than 90 percent at time of treatment.

A compatible promoter/initiator system shall be capable of providing a resin gel time of not less than 40 minutes nor more than 1.5 hours at the temperature of application. Gel time shall be adjusted to compensate for the changes in temperature throughout treatment application.

The quantity of resin mixed with promoter and initiator shall be limited to 20 L at a time for manual application.

Machine application of the resin shall be performed by using a two-part resin system using 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. Hand held spray apparatus shall not be used.

The Contractor shall allow methacrylate resin to be applied only to the specified area. Concrete barrier, 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 prepared area shall be dry and the surface temperature shall be less than or equal to 38°C when the resin is applied. The rate of application of promoted/initiated resin shall be approximately 2.5 square meters per liter, ± 0.1 square meter per liter.

The deck surfaces to be treated shall be flooded with resin, allowing penetration into the concrete and filling of all cracks. The treatment 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.

After the resin has been applied, at least 20 minutes shall elapse before applying sand. The sand shall be commercial quality dry blast sand. Ninety-five percent of the sand shall pass the 2.36-mm sieve, and 95 percent shall be retained on the 850-µm sieve. The sand shall be applied at a rate of one kilogram per square meter, ± 0.1 kilogram per square meter.

Excess sand shall be removed from the deck surface by vacuuming or sweeping prior to opening to traffic.

Traffic shall not be allowed on the treated area until (1) the treated surface is tack free (non-oily), (2) the sand cover adheres sufficiently to resist brushing by hand, and (3) the coefficient of friction of the deck is at least 0.35 when tested in conformance with the requirements in California Test 342.

**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 roughening existing concrete surfaces to a full amplitude of approximately 6 mm, where shown on the plans, 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 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 furnishing and installing steel plates and for forming blockouts for joint seal assemblies 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.

The contract price paid per cubic meter for structural concrete, barrier slab shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the barrier slab, including structure excavation and structure backfill and for furnishing and placing all bar reinforcing steel necessary to construct barrier slabs, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for deck crack treatment, including a program for public safety 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.

At Blaine St. OC, Bridge No. 56-0395; Iowa Avenue OC, Bridge No. 56-0396; and Linden St. OC, Bridge No. 56-0397, concrete for Type 1 retaining walls at the abutments will be measured and paid for as structural concrete, bridge.

## 10-1.41 JACKING SUPERSTRUCTURE

Jacking superstructure shall consist of lowering the superstructures or superstructure widens of Blaine Street Overcrossing, Bridge No. 56-0395; Iowa Avenue Overcrossing, Bridge No. 56-0396; Linden Street Overcrossing, Bridge No. 56-0397; and Spruce Street Undercrossing (Widen), Bridge No. 56-0399, as shown on the plans and in accordance with the requirements in these special provisions.

The Contractor shall design, furnish, construct, monitor, maintain, and remove the temporary supports for the superstructure and determine the methods and equipment for lowering the superstructure in conformance with the requirements in these special provisions.

Construction sequence and application of temporary support jacking loads shall be as shown on the plans. Proposed changes to the construction sequence and application of temporary support jacking loads shall be subject to the Engineer's approval.

Temporary supports shall include jacking assemblies and appurtenant items necessary to jack and support the structures.

Attention is directed to the sections "Order of Work" and "Maintaining Traffic" of these special provisions regarding the construction sequences and the required openings in temporary supports for the use of public traffic.

Approval by the Engineer of the temporary support working drawings or temporary support inspection performed by the Engineer will in no way relieve the Contractor of full responsibility for the temporary supports.

**TEMPORARY SUPPORT DESIGN AND DRAWINGS**

The Contractor shall submit to the Engineer working drawings and design calculations for the temporary supports. Such drawings and design calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. The temporary support working drawings and design calculations shall conform to the requirements in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The number of sets of drawings and design calculations and times for review for temporary supports shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications.

Working drawings for any part of the temporary supports shall include stress sheets, anchor bolt layouts, shop details, and erection and removal plans.

The temporary support working drawings shall include descriptions and values of all loads, including construction equipment loads, descriptions of equipment to be used, complete details and calculations for jacking and supporting the structure, and descriptions of the displacement monitoring system. The displacement monitoring system shall include equipment to be used, location of control points, method and schedule of taking measurements.

Systems involving modifications to the bridge that impair the structural integrity, intended serviceability or design capacity of the bridge shall not be used.

A redundant system of supports shall be provided during the entire jacking operation for backup should any of the jacks fail. The redundant system shall include stacks of steel plates added as necessary to maintain the redundant supports at each jack location within 6 mm of the jacking sill or corbels.

For temporary supports over railroads, approval by the Engineer of the temporary support drawings will be contingent upon the drawings being satisfactory to the railroad company involved.

When footing type foundations are to be used, the Contractor shall determine the bearing value of the soil and shall show the values assumed in the design of the temporary supports on the temporary support drawings. Anticipated temporary support foundation settlement shall be shown on the temporary support drawings.

When pile type foundations are to be used, the temporary support drawings shall show the maximum horizontal distance that the top of a temporary support pile may be pulled in order to position it under its cap. The temporary support drawings shall also show the maximum allowed deviation of the top of the pile, in its final position, from a vertical line through the point of fixity of the pile.

The Contractor may use the permanent piles as part of the temporary support foundation. Permanent piles shall not be moved or adjusted from the locations shown on the plans. Any use of the permanent piles and the loads imposed on them shall be shown on the temporary support drawings. Should the Contractor propose to provide piles longer than required for the work in order to support the temporary supports above the elevation of the top of the footing and later cut off the piles at their final elevation, shear devices adequate to transfer all pile reactions into the footing will be required.

Temporary support footings shall be designed to carry the load imposed upon them without exceeding the estimated soil bearing values and anticipated settlements.

Where temporary supports are supported on the deck of an existing structure then temporary supports shall conform to the following:

A. Temporary supports shall bear directly on girder stems or bent caps or shall bear on support sills which are structurally adequate to transmit the load to the stems or cap without overstressing any member of the new or existing structure. Temporary supports shall not induce permanent forces into the completed structure or produce cracking.
B. Temporary supports shall be in place beneath the existing structure where temporary support loads are imposed upon the existing structure. Such temporary supports shall be designed and constructed to support all loads imposed upon the existing structure from the upper structure and any other loads imposed as a result of the proposed construction operations.

Bracing shall be provided, as necessary, to withstand all imposed loads during erection and removal of any temporary supports. The temporary support drawings shall show provisions for such temporary bracing or methods to be used to conform to these requirements during each phase of erection and removal. Wind loads shall be included in the design of such bracing or methods. Wind loads shall conform to the applicable provisions in Section 51-1.06A(1), "Design Loads," of the Standard Specifications.

The temporary support design calculations shall show a summary of computed stresses in the (1) temporary supports, (2) connections between temporary supports and the structure, and (3) permanent structural members. The computed stresses shall include the effect of the jacking sequence. The temporary support design calculations shall also include a lateral stiffness assessment of the temporary support system and conform to the design values shown on the plans.

The design of temporary supports will not be approved unless it is based on the use of loads and conditions which are no less severe than those described in "Temporary Support Design Criteria," of these special provisions and on the use of allowable stresses which are no greater than those described in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications.

If falsework loads are imposed on temporary supports, the temporary supports shall also satisfy the deflection criteria described in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications.

## TEMPORARY SUPPORT DESIGN CRITERIA

The temporary supports shall support the initial jacking loads and the minimum temporary support design loads and the minimum lateral design forces shown on the plans. The vertical design loads shall be adjusted for the weight of temporary supports and jacks, construction equipment loads and additional loads imposed by the Contractor's operations. The construction equipment loads shall be the actual weight of the construction equipment but in no case shall be less than 960 $N/m^2$ of deck surface area of the frame involved. A frame is defined as the portion of the bridge between expansion joints.

The temporary supports shall resist the specified lateral design forces shown on the plans. The lateral design forces to be resisted shall be increased to be compatible with the temporary support lateral stiffness if the stiffness exceeds the specified minimum. The temporary supports resisting transverse lateral loads shall be placed within a distance of not more than 0.5 of the span length from the bent. The temporary supports resisting longitudinal lateral loads shall be placed within the each frame.

The structure shall be mechanically connected to the temporary supports. The temporary supports shall be mechanically connected to their foundations. The mechanical connections shall be capable of resisting the lateral temporary support design forces. Friction forces developed between the existing structure and temporary supports shall not be used to reduce the lateral forces and shall not be considered as an effective mechanical connection. The mechanical connections shall be designed to tolerate adjustments to the temporary support frame throughout the use of the temporary supports.

If falsework loads are imposed on temporary supports, the temporary supports shall be designed to support the additional loads caused by the prestressing forces.

### Manufactured Assemblies

Manufactured assemblies shall conform to the provisions in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications and these special provisions.

Each jack shall be equipped with either a pressure gage or a load cell for determining the jacking force. Pressure gages shall have an accurately reading dial at least 150 mm in diameter. Each jack shall be calibrated by a private laboratory approved by the Transportation Laboratory within 6 months prior to use and after each repair. Each jack and its gage shall be calibrated as a unit with the cylinder extension in the approximate position that it will be at final jacking force and shall be accompanied by a certified calibration chart. Load cells shall be calibrated and provided with an indicator by which the jacking force is determined.

## SPECIAL LOCATIONS

Attention is directed to Section 51-1.06A(3), "Special Locations," of the Standard Specifications. All reference to falsework in this section shall also apply to temporary supports.

## TEMPORARY SUPPORT CONSTRUCTION

Attention is directed to section "Falsework" of these special provisions and to paragraphs 1 through 7 of Section 51-1.06B, "Falsework Construction," of the Standard Specifications. All reference to falsework in these paragraphs shall also apply to temporary supports.

Prior to proceeding with jacking operations, an engineer for the Contractor who is registered as a Civil Engineer in the State of California shall inspect the temporary supports, including jacking and displacement monitoring systems, for conformance with the working drawings. The Contractor's registered engineer shall certify in writing that the temporary supports, including jacking and displacement monitoring systems, conform to the working drawings, and that the material and workmanship are satisfactory for the purpose intended. A copy of this certification shall be available at the site of the work at all times.

The Contractor's registered engineer shall be present at the bridge site at all times when jacking operations or adjustments are in progress. The Contractor's registered engineer shall inspect the jacking 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, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure or proposed operation to correct or remedy the occurrence.

The Contractor shall perform an initial survey as part of the displacement monitoring system to record the location of the structure prior to the jacking operations. Two copies of the survey shall be signed by an engineer, who is registered as a Civil Engineer in the State of California, and submitted to the Engineer.

Vandal-resistant displacement monitoring equipment shall be provided and maintained. Vertical and horizontal displacements of the temporary supports and the structure shall be monitored continuously during jacking operations. As a minimum, elevations shall be taken prior to the start of jacking operations, immediately after jacking is complete, and before connecting the superstructure to the substructure, and after the temporary supports have been removed. As a minimum, structure shall be monitored at the bent and at mid span of both adjoining spans. Control points at each location shall be located near the center and at both edges of the superstructure. The records of vertical and horizontal displacement shall be signed by an engineer who is registered as a Civil Engineer in the State of California and available to the Engineer at the jobsite during normal working hours, and a copy of the record shall be delivered to the Engineer at the completion of reconstructing each bent.

A force equal to the initial jacking load or the dead load shown on the plans shall be applied to the structure by the temporary support system and held until all initial compression and settlement of the system is completed before falsework removal is begun.

**LOWERING OPERATIONS**

Jacking operations shall be carefully controlled and monitored to ensure that the jacking loads are applied simultaneously to prevent distortion and excessive stresses that would damage the structure. The superstructure shall be jacked as necessary to maintain the total vertical displacements at control points to less than 6 mm from the elevations recorded prior to jacking or as modified by the Engineer.

The superstructure shall be lowered to the position shown on the plans so that the load is distributed uniformly across each hinge, abutment, or bent. Galvanized shims shall be placed as approved by the Engineer, when required to provide uniform loading at bearing pads.

Should unanticipated displacements, cracking or other damage occur, the construction shall be discontinued until corrective measures satisfactory to the Engineer are performed. Damage to the structure as a result of the Contractor's operations shall be repaired by the Contractor in conformance with the provisions in Section 7-1.11, "Preservation of Property," of the Standard Specifications.

**REMOVING TEMPORARY SUPPORTS**

Attention is directed to Section 51-1.06C, "Removing Falsework," of the Standard Specifications. All references to falsework in this section shall also apply to temporary supports.

After lowering the superstructure, attachments to the structure for the jacking operations shall be removed and the concrete surfaces shall be finished

**PAYMENT**

The contract lump sum price paid for jacking superstructure shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in designing, constructing, maintaining, and removing the temporary supports, including jacking the structure and monitoring displacements, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.42 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 and these special provisions.

PTFE spherical bearings shall be of the following type:

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 Office 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 for other structures. 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.

The working drawings for PTFE spherical bearings shall include a description of the method of mechanical interlocking of the PTFE fabric to the metallic substrate for the PTFE bearing sole plate during concrete placement.

Working drawings shall be 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 6 weeks for other structures after complete drawings and all support data are submitted.

At the completion of each structure on the contract, one set of reduced prints on 75-g/m$^2$ (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all working drawings for each structure shall be furnished to the Engineer. Reduced prints of drawings which 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. Prior to welding, the manufacturer must submit a complete weld procedure to the Engineer for approval.

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 709, Grade 36 [250], 50 [345], or 50W [345W].

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 Sections 59-2, "Painting Structural Steel," and 91, "Paint" of the Standard Specifications, and "Clean and Paint Structural Steel" 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 PTFE spherical bearings.

Finish coats will not be required on the bearings.

PTFE spherical bearing assemblies shall be assembled at the factory. Each assembly shall have a minimum of 4 temporary steel straps which 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 can not 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 two 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 shall be as follows:

   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.

## 10-1.43 PRECAST CONCRETE GIRDERS

Precast reinforced concrete girders shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications.

### PRECAST PRESTRESSED CONCRETE BRIDGE MEMBERS

The top surface of the member shall be given a coarse texture by brooming with a stiff bristled broom or by other suitable devices that will result in uniform transverse scoring, in advance of curing operations. When I girders with concrete deck are shown on the plans, surfaces noted to be given a coarse broom finish shall be cleaned of surface laitance and curing compound before placing deck concrete. Exposure of clean aggregate will not be required.

The anticipated deflection and method of accommodation of deflection of precast prestressed concrete girders, prior to the time the deck concrete is placed, shall be shown on the working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The deflection shall include the following:

A. Anticipated upward deflection caused by the prestressing forces.

B. Downward deflection caused by the dead load of the girder.
C. Deflection caused by the creep and shrinkage of the concrete for the time interval between the stressing of the girders and the planned placement of the deck.

Such deflection shall be substantiated by calculations that consider the ages of the girder concrete at the time of stressing and the Contractor's planned placement of the deck. All deflection calculations shall be based on the concrete producer's estimate of the modulus of elasticity at the applicable concrete age.

Adjustments to accommodate girder deflections, which occur prior to the time the deck concrete is placed, may include revisions in bearing seat elevations, but any such adjustments shall be limited by the following conditions:

A. The minimum permanent vertical clearance under the structure as shown on the plans shall not be reduced.
B. The profile grade and cross slope of the deck shall not be changed.
C. A minimum of 25 mm of deck slab concrete between the top of the precast girders and the deck slab reinforcement shall be maintained.

Girders with unanticipated girder deflection and which cannot comply with conditions A, B, and C will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

Adjustments to accommodate girder deflections will not be considered a change in dimensions. Full compensation for increases in the cost of construction, including increases in the quantity of deck or bearing seat concrete, resulting from adjustments to accommodate girder deflections shall be considered as included in the contract price paid for the various items of work involved and no additional compensation will be allowed therefor.

Temporary lateral bracing shall be provided for girders located over the railroad property or the roadway at the Third Street Undercrossing, Bridge No. 56-0316; 60/90/215 Separation, Bridge No. 56-0402; Down Street Overhead, Bridge No. 56-0398; Chicago Avenue Overhead, Bridge No. 56-0403; University Avenue Undercrossing, Bridge No. 56-0408; Canyon Crest Road Undercrossing, Bridge No. 56-0085R/L; and Central Avenue Undercrossing, Bridge No. 56-0504. The bracing shall be installed at each end of each girder, except notched ends, prior to the release of the erection equipment from the girder and shall remain in place until 2 days after the concrete diaphragms have been placed. The bracing shall be adequate to prevent overturning of the girders prior to completion of the work and as a minimum shall be capable of resisting a lateral force of 720 Pa of girder side area applied laterally in either direction to the top of the girder. Girder erection shall not be started until the temporary lateral bracing proposed for use by the Contractor has been approved by the Engineer.

### 10-1.44 MASONRY BLOCK WALL

Masonry block wall, consisting of a reinforced concrete footing and either a reinforced concrete stem or a reinforced concrete masonry unit stem, shall conform to the provisions in Section 51, "Concrete Structures," and Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

Wall stems may be constructed of reinforced concrete or reinforced concrete masonry units.

Hollow load-bearing concrete masonry units shall conform to the requirements in ASTM Designation: C 90, Type II and shall be of uniform color and size.

Portland cement for grout and mortar shall conform to Section 90-2.01, "Portland Cement," of the Standard Specifications or shall conform to the requirements in ASTM Designation: C 150, Type II.

Hydrated lime shall conform to the requirements in ASTM Designation: C 207, Type S.

Mortar sand shall be commercial quality.

Caulking, for sealing expansion joints, shall be a non-sag polysulfide or polyurethane material conforming to the provisions in Federal Specification TT-S-230, Type II.

Mortar for laying masonry units shall consist, by volume, of one part portland cement, 0 to 0.5 parts 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 re-tempered more than one hour after mixing.

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 by mass shall be coarse aggregate. The Contractor shall determine the grading except that between 90 percent and 100 percent of the combined grading shall pass the 12.5-mm sieve.

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 it to flow and fill the voids without segregation. The maximum amount of free water shall not exceed 0.7 times the mass of the cement.

Grout proportioned by volume shall consist of at least one part portland cement and 4.5 parts aggregate. Aggregate volumes shall be based on a loose, air-dry condition.

Grout proportioned by mass shall contain at least 350 kg of portland cement per cubic meter.

Concrete masonry unit construction shall be true and plumb. Recesses in the units for horizontal reinforcement shall be provided.

Cleanout openings shall be provided at the bottoms of all cells where the height of wall is in excess of 1.25 m. The cleanouts shall be sealed before filling with grout, after inspection.

Mortar joints shall be approximately 10 mm wide. Units shall be laid with full mortar coverage of the face in both the vertical and horizontal joints, except where weep holes are specified. Vertical joints shall be shoved tight. Exposed joints shall be concave, tooled smooth.

All cells in the hollow unit masonry shall be filled solidly with grout. All grout shall be consolidated at the time of pouring by puddling or vibrating. The top lift of grout shall be placed approximately 25 mm below the top of the units, to provide for a cement mortar cap.

Splashing, staining or spotting on the exposed face of the wall stem shall be removed.

Pay quantities of the reinforced concrete masonry block wall will be determined by the square meter of completed wall, measured along the horizontal length and the vertical height from the top of footing to the top of the wall.

The contract price paid per square meter for masonry block wall shall include full compensation for furnishing all labor, materials, (including reinforcement), tools, equipment, and incidentals, and for doing all the work involved in constructing the masonry block wall, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Concrete for the footing and reinforcement for the footing and wall stem shall conform to the provisions in Section 51, "Concrete Structures," and Section 52, "Reinforcement," of the Standard Specifications.

Full compensation for concrete for the footing and reinforcement for the footing shall be considered as included in the contract price paid per square meter for masonry block wall and no separate payment will be allowed therefor.

## 10-1.45 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 produces the required flow rate and 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 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 nonconnecting 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 wrap-around 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.

**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 Slabs." 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, asphalt or cement, 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 follow 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.

Steel components of abutment ties including plates, nuts, washers, and rods shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Steel components of abutment ties including plates, nuts, washers, and rods shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications, and shall be epoxy-coated in conformance with the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement" of the Standard Specifications. Galvanizing will not be required.

The steel angle at the concrete barrier joint shall conform to the provision in Section 75-1.03, "Miscellaneous Metal," of the Standard Specifications.

Structure approach slabs shall be cured for not less than 5 days prior to opening to public traffic, unless, at the option of the Contractor, the structure approach slabs are constructed using concrete with a non-chloride Type C chemical admixture conforming to these special provisions.

Portland cement for use in concrete using a non-chloride Type C chemical admixture shall be Type II Modified, Type II Prestress, or Type III. Type II Modified and Type III cement shall conform to the provisions in Section 90-2.01, "Cement," of the Standard Specifications. Type II Prestress cement shall conform to the requirements of Type II Modified cement, except the mortar containing the portland cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not contract in air more than 0.053-percent.

The non-chloride Type C chemical admixture, approved by the Engineer, shall conform to the requirements in ASTM Designation: C 494 and Section 90-4, "Admixtures," of the Standard Specifications.

The concrete with non-chloride 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 ± 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. No more than 2 test cylinders shall have a strength of less than 5.5 MPa.

Building paper shall be commercial quality No. 30 asphalt felt.

Polyvinyl chloride (PVC) conduit used to encase the abutment tie rod shall be of commercial quality.

The top surface of approach slabs shall be finished in conformance with the provisions 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 non-chloride 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 truck load 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 non-chloride Type C chemical admixture, an insulating layer or blanket shall be used to cover the surface. The insulating layer or blanket shall have an R-value rating given in the table below. At the Contractor's option, a heating tent may be used in lieu of or in combination with the insulating layer or blanket.

| Temperature range during curing period | R-value, minimum |
|---|---|
| 13°C to 18°C | 1 |
| 7°C to 13°C | 2 |
| 4°C to 7°C | 3 |

**JOINTS**

Hardboard and expanded polystyrene shall conform to the provisions in Section 51-1.12D, "Sheet Packing, Preformed Pads and Board Fillers," of the Standard Specifications.

Type AL joint seals shall conform to the provisions in Section 51-1.12F, "Sealed Joints" of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods.

The pourable seal between the steel angle and concrete barrier shall conform to the requirements for Type A and AL seals in Section 51-1.12F(3), "Materials and Installation," of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods. Immediately prior to placing the seal, the joint shall be thoroughly cleaned, including abrasive blast cleaning of the concrete surfaces, so that all foreign material and concrete spillage are removed from all joint surfaces. Joint surfaces shall be dry at the time the seal is placed.

**MEASUREMENT AND PAYMENT**

Structural concrete, approach slab (Type N) will be measured and paid for in conformance with the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for the structure approach drainage system including geocomposite drain, plastic pipe, treated permeable base, filter fabric, miscellaneous metal, pourable seals, bar reinforcement, miscellaneous bridge 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.

## 10-1.451 STRUCTURE APPROACH SLABS (TYPE N MODIFIED)

Structure approach slabs (Type N Modified) shall consist of removing existing pavement and base to the bottom of the structural section shown on the plans for structure approach slab (Type N) including asphalt concrete surfacing, and constructing new reinforced concrete approach slabs at structure approaches as shown on the plans and in conformance with these special provisions.

### REMOVING EXISTING PAVEMENT AND BASE MATERIALS

The outlines of excavations in asphalt concrete shall be cut on a neat line to a minimum depth of 75 mm with a power-driven concrete saw or wheel-type rock cutting excavator before any asphalt concrete material is removed.

Materials removed 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 base material remaining in-place, after removing the existing pavement and base materials to the required depth, shall be graded uniformly, watered, and compacted. The finished surface of the base material at any point shall not extend above the grade approved by the Engineer.

Areas of the base material that are low as a result of over excavation shall be filled, at the Contractor's expense, with structure approach slab concrete at the time and in the same operation that the new concrete is placed.

### 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 produces the required flow rate and 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 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 nonconnecting 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 wrap-around 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.

### 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 Slabs." 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, asphalt or cement, 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 follow within one-half hour after the spreading operation and shall consist of 2 complete coverages of the treated material.

## STRUCTURE APPROACH SLAB

Reinforced concrete approach slabs shall conform to the provisions for approach slabs in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Concrete for use in approach slabs shall contain not less than 400 kg of cement per cubic meter.

The steel angles at the concrete barrier joint shall conform to the provision in Section 75-1.03, "Miscellaneous Metal," of the Standard Specifications.

Approach slab concrete that requires a minimum curing period of 6 hours shall be constructed using a non-chloride Type C chemical admixture. Mineral admixture will not be required in this concrete.

Portland cement for use in concrete using a non-chloride Type C chemical admixture shall be Type II Modified, Type II Prestress, or Type III. Type II Modified and Type III cement shall conform to the provisions in Section 90-2.01, "Cement," of the Standard Specifications. Type II Prestress cement shall conform to the requirements of Type II Modified cement, except the mortar containing the portland cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not contract in air more than 0.053-percent.

The non-chloride Type C chemical admixture shall be approved by the Engineer and shall conform to the requirements in ASTM Designation: C 494 and Section 90-4, "Admixtures," of the Standard Specifications.

The concrete with non-chloride 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 ± 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. No more than 2 test cylinders shall have a strength of less than 5.5 MPa.

Bar reinforcement in drilled holes shall be bonded in conformance with the provisions for drilling and bonding dowels in Section 83-2.02D(1), "General," of the Standard Specifications.

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.

The top surface of approach slabs shall be finished in conformance with the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications. The finished top surface shall not vary more than 6 mm from the lower edge of a 3.6-m straightedge placed parallel with the centerline. Edges of slabs shall be edger finished.

The surface of the approach slab will not be profiled and the Profile Index requirements shall not apply.

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. The minimum curing period as specified herein shall be considered to begin at the start of discharge of the last truck load of concrete to be used in the slab. Fogging of the surface with water after the curing compound has been applied will not be required. Should the film of curing compound be damaged from any cause before the approach slab is opened to public traffic, the damaged portion shall be repaired immediately with additional compound, at the Contractor's expense. Damage to the curing compound after the approach slab is opened to public traffic shall not be repaired.

If the ambient temperature is below 18°C during the curing period, an insulating layer or blanket shall cover the surface. The insulation 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 |

Tests to determine the coefficient of friction of the final textured surface will be made only if the Engineer determines by visual inspection that the final texturing may not have produced a surface having the specified coefficient of friction. Tests to determine the coefficient of friction will be made after the approach slab is opened to public traffic, but not later than 5 days after concrete placement. The coefficient of friction will be measured by California Test 342. Portions of completed concrete surfaces that are found to have a coefficient of friction less than 0.35 shall be ground or grooved parallel to the center line in conformance with the provisions for bridge decks in Section 42, "Groove and Grind Pavement," of the Standard Specifications.

**JOINTS**

Hardboard and expanded polystyrene shall conform to the provisions in Section 51-1.12D, "Sheet Packing, Preformed Pads and Board Fillers," of the Standard Specifications.

Type AL joint seals shall conform to the provisions in Section 51-1.12F, "Sealed Joints," of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods.

The pourable seal between the steel angle and concrete barrier shall conform to the requirements for Type A and AL seals in Section 51-1.12F(3), "Materials and Installation," of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods. Immediately prior to placing the seal, the joint shall be thoroughly cleaned, including abrasive blast cleaning of the concrete surfaces, so that all foreign material and concrete spillage are removed from all joint surfaces. Joint surfaces shall be dry at the time the seal is placed.

**MEASUREMENT AND PAYMENT**

Structural concrete, approach slab (Type N Modified) will be measured and paid for as structural concrete, approach slab (Type N) 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 removing and disposing of pavement materials,the structure approach drainage system including geocomposite drain, plastic pipe treated permeable base, filter fabric,miscellaneous metal, pourable seals, bar reinforcement and miscellaneous bridge metal, shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab (Type N) and no separate payment will be made therefor.

## 10-1.452 STRUCTURE APPROACH SLABS (TYPE R)

Structure approach slabs (Type R) shall consist of removing portions of existing structures, existing pavement and base including reinforced concrete approach slabs, asphalt concrete surfacing, portland cement concrete pavement, subsealing material, and cement treated base and constructing new reinforced concrete approach slabs at structure approaches as shown on the plans and in conformance with these special provisions.

### GENERAL

The thickness shown on the plans for structure approach slabs is the minimum thickness. The thickness will vary depending on the thickness of the pavement and base materials removed.

Where pavement subsealing has been performed under existing approach slabs, the subsealing material shall be removed for its full depth. Where removal of cement treated base is required to construct the approach slab, the entire thickness of the cement treated base shall be removed.

Voids between the new reinforced structure approach slab and the base material remaining in place that are caused by removal of subsealing material or cement treated base shall be filled, at the option of the Contractor, with aggregate base (approach slab) or structure approach slab concrete.

The Contractor shall establish a grade line for new approach slabs which shall provide a smooth profile grade. The profile grade will be subject to the approval of the Engineer.

The Contractor shall schedule his operations so that the pavement and base materials removed during a work period shall be replaced, in that same work period, with approach slab concrete that shall be cured for at least 6 hours prior to the time the lane is to be opened to public traffic as designated in "Maintaining Traffic" of these special provisions. In the event the existing pavement and base materials are removed and the Contractor is unable to construct, finish, and cure the new approach slab by the time the lane is to be opened to public traffic, the excavation shall be filled with a temporary roadway structural section as specified in this section, "Structure Approach Slabs (Type R)."

At locations where the removal of existing materials and approach slab construction is not required to be completed within the same work period, the requirements for "Temporary Roadway Structural Section" shall not apply. The Contractor shall have the option of:

A. Curing the approach slab concrete for not less than 5 days prior to opening to public traffic, or
B. Constructing the approach slab using concrete with a non-chloride Type C chemical admixture and curing the approach slab concrete at least 6 hours prior to opening to public traffic.

### TEMPORARY ROADWAY STRUCTURAL SECTION

A standby quantity of asphalt concrete and aggregate base, equal to the quantity of pavement removed during the work shift, shall be provided at the project site for construction of a temporary roadway structural section where existing approaches to structures are being replaced. The temporary structural section shall be maintained and later removed as a first order of work when the Contractor is able to construct and cure the approach slab within the prescribed time limit. The temporary structural section shall consist of 90-mm thick layer of asphalt concrete over aggregate base.

The aggregate base for the temporary structural section shall conform to the requirements specified under "Aggregate Base (Approach Slab)" of these special provisions.

The asphalt concrete for the temporary structural section shall be produced from commercial quality aggregates and asphalt binder. The grading of the aggregate shall conform to the 19-mm maximum medium grading in Section 39-2.02, "Aggregate," of the Standard Specifications and the asphalt binder shall conform to the requirements of liquid asphalt SC-800 in Section 93, "Liquid Asphalts," of the Standard Specifications. The amount of asphalt binder to be mixed with the aggregate shall be approximately 0.3-percent less than the optimum bitumen content as determined by California Test 367.

Aggregate base and asphalt concrete for the temporary structural section shall be spread and compacted by methods that will produce a well-compacted, uniform base, free from pockets of coarse or fine material and a surfacing of uniform smoothness, texture, and density. The aggregate base and the asphalt concrete may each be spread and compacted in one layer. The finished surface of the asphalt concrete shall not vary more than 15 mm from the lower edge of a 3.6-m straightedge placed parallel with the centerline and shall match the elevation of the existing concrete pavement and structure along the joints between the existing pavement and structure and the temporary surfacing.

The material from the removed temporary structural section shall be disposed of in conformance with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications except that removed aggregate

base may be stockpiled at the project site and reused for construction of another temporary structural section. When no longer required, standby material or stockpiled material for construction of temporary structural sections 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.

**REMOVING PORTIONS OF EXISTING STRUCTURES**

Attention is directed to "Existing Highway Facilities" of these special provisions.

**REMOVING EXISTING PAVEMENT AND BASE MATERIALS**

The outline of portland cement concrete to be removed shall be sawed full depth with a power-driven concrete saw.

The outlines of excavations in asphalt concrete shall be cut on a neat line to a minimum depth of 75 mm with a power-driven concrete saw or wheel-type rock cutting excavator before any asphalt concrete material is removed. These excavations shall be permanently or temporarily backfilled to conform to the grade of the adjacent pavement prior to opening the lane to public traffic. Surplus excavated material may be used as temporary backfill material.

Regardless of the type of equipment used to remove concrete within the sawed outline, the surface of the concrete to be removed shall not be impacted within 0.5-m of the pavement to remain in place. Removing existing pavement and base materials shall be performed without damage to the adjacent structure or pavement that is to remain in place. Damage to the structure or to the pavement that is to remain in place shall be repaired in conformance with the provisions in Section 7-1.11, "Preservation of Property," of the Standard Specifications.

Materials removed 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 base material remaining in-place, after removing the existing pavement and base materials to the required depth, shall be graded uniformly, watered, and compacted. The finished surface of the base material at any point shall not extend above the grade approved by the Engineer.

Areas of the base material that are low as a result of over excavation shall be filled, at the Contractor's expense, with structure approach slab concrete at the time and in the same operation that the new concrete is placed.

**AGGREGATE BASE (APPROACH SLAB)**

The aggregate base (approach slab) for filling voids below the reinforced structure approach slab concrete shall be produced from commercial quality aggregates consisting of broken stone, crushed gravel or natural rough-surfaced gravel, and sand, or any combination thereof. The grading of the aggregate base shall conform to the 19-mm maximum grading specified in Section 26-1.02A, "Class 2 Aggregate Base," of the Standard Specifications.

Aggregate base (approach slab) for filling voids below the reinforced structure approach slab concrete shall be spread and compacted by methods that will produce a well-compacted, uniform base, free from pockets of coarse or fine material. The aggregate base shall be watered and compacted to the grade approved by the Engineer. Where the required thickness of aggregate base is 200 mm or less, the base may be spread and compacted in one layer. Where the required thickness of aggregate base is more than 200 mm, the base shall be spread and compacted in 2 or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 200 mm. The finished surface of the base material at any point shall not extend above the grade approved by the Engineer. Areas of the base material that are lower than the grade approved by the Engineer, shall be filled with structure approach slab concrete at the time and in the same operation that the new concrete is placed.

**STRUCTURE APPROACH SLAB**

Reinforced concrete approach slabs shall conform to the provisions for approach slabs in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Concrete for use in approach slabs shall contain not less than 400 kg of cement per cubic meter.

Steel components of abutment ties including plates, nuts, washers, and rods shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

The steel angles at the concrete barrier joint shall conform to the provision in Section 75-1.03, "Miscellaneous Metal," of the Standard Specifications.

Approach slab concrete that requires a minimum curing period of 6 hours shall be constructed using a non-chloride Type C chemical admixture. Mineral admixture will not be required in this concrete.

Portland cement for use in concrete using a non-chloride Type C chemical admixture shall be Type II Modified, Type II Prestress, or Type III. Type II Modified and Type III cement shall conform to the provisions in Section 90-2.01, "Cement," of the Standard Specifications. Type II Prestress cement shall conform to the requirements of Type II Modified cement,

except the mortar containing the portland cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not contract in air more than 0.053-percent.

The non-chloride Type C chemical admixture shall be approved by the Engineer and shall conform to the requirements in ASTM Designation: C 494 and Section 90-4, "Admixtures," of the Standard Specifications.

The concrete with non-chloride 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 ± 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. No more than 2 test cylinders shall have a strength of less than 5.5 MPa.

Bar reinforcement in drilled holes shall be bonded in conformance with the provisions for drilling and bonding dowels in Section 83-2.02D(1), "General," of the Standard Specifications.

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.

The top surface of approach slabs shall be finished in conformance with the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications. The finished top surface shall not vary more than 6 mm from the lower edge of a 3.6-m straightedge placed parallel with the centerline. Edges of slabs shall be edger finished.

The surface of the approach slab will not be profiled and the Profile Index requirements shall not apply.

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. The minimum curing period as specified herein shall be considered to begin at the start of discharge of the last truck load of concrete to be used in the slab. Fogging of the surface with water after the curing compound has been applied will not be required. Should the film of curing compound be damaged from any cause before the approach slab is opened to public traffic, the damaged portion shall be repaired immediately with additional compound, at the Contractor's expense. Damage to the curing compound after the approach slab is opened to public traffic shall not be repaired.

If the ambient temperature is below 18°C during the curing period, an insulating layer or blanket shall cover the surface. The insulation 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 |

Tests to determine the coefficient of friction of the final textured surface will be made only if the Engineer determines by visual inspection that the final texturing may not have produced a surface having the specified coefficient of friction. Tests to determine the coefficient of friction will be made after the approach slab is opened to public traffic, but not later than 5 days after concrete placement. The coefficient of friction will be measured by California Test 342. Portions of completed concrete surfaces that are found to have a coefficient of friction less than 0.35 shall be ground or grooved parallel to the center line in conformance with the provisions for bridge decks in Section 42, "Groove and Grind Pavement," of the Standard Specifications.

**JOINTS**

Hardboard and expanded polystyrene shall conform to the provisions in Section 51-1.12D, "Sheet Packing, Preformed Pads and Board Fillers," of the Standard Specifications.

Type AL joint seals shall conform to the provisions in Section 51-1.12F, "Sealed Joints," of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods.

The pourable seal between the steel angle and concrete barrier shall conform to the requirements for Type A and AL seals in Section 51-1.12F(3), "Materials and Installation," of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods. Immediately prior to placing the seal, the joint shall be thoroughly cleaned, including abrasive blast cleaning of the concrete surfaces, so that all foreign material and concrete spillage are removed from all joint surfaces. Joint surfaces shall be dry at the time the seal is placed.

**MEASUREMENT AND PAYMENT**

Structural concrete, approach slab (Type R) 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 removing and disposing of portions of existing structures and pavement materials, and for furnishing and placing miscellaneous metal, and pourable seals shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab (Type R) and no separate payment will be made therefor.

The quantity of aggregate base (approach slab) to be paid for shall include the actual volume of aggregate base (approach slab) used to fill voids below the reinforced structure approach slab concrete, except for the volume of areas low as a result of over excavation. The volume to be paid for will be calculated on the basis of the constructed length, width, and thickness of the filled voids. Structure approach slab concrete used to fill voids lower than the approved grade of the base, except for the areas low as a result of over excavation by the Contractor, will be measured and paid for by the cubic meter as aggregate base (approach slab).

The contract price paid per cubic meter for aggregate base (approach slab) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing aggregate base (approach slab), complete in place, including excavation and removing and disposing of base and subsealing materials, 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, stockpiling, and disposing of standby material for construction of temporary structural sections; and for constructing, maintaining, removing, and disposing of temporary structural sections shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab (Type R) and no separate payment will be made therefor.

Full compensation for drilling and bonding of bar reinforcement shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab (Type R) and no separate payment will be made therefor.

## 10-1.46 MINOR CONCRETE (STAIRWAY)

Minor concrete (stairway) shall conform to the provisions in Section 52, "Reinforcement," Section 73, "Concrete Curbs and Sidewalks," and Section 90-10, "Minor Concrete," of the Standard Specifications and these special provisions.

Bar reinforcing steel, of the size and type shown on the plans, conforming to the provisions in Section 52 "Reinforcement, " of the Standard Specifications, shall be placed in the areas shown on the plans.

The contract price paid per cubic meter for minor concrete (stairway) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in minor concrete (stairway), complete in place, including reinforced concrete cap on masonry block wall, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.47 PAVING NOTCH EXTENSION

This work shall consist of extending existing paving notches in conformance with the details shown on the plans and these special provisions.

Concrete for paving notch extension shall be a high-strength material consisting of either magnesium phosphate concrete, modified high alumina based concrete, or portland cement based concrete. Magnesium phosphate concrete shall conform to the provisions for magnesium phosphate concrete in Section 83-2.02D(1), "General," of the Standard Specifications and these special provisions. Modified high alumina based concrete and portland cement based concrete shall be water activated and shall conform to the provisions for single component (water activated) magnesium phosphate concrete in Section 83-2.02D(1), "General," of the Standard Specifications and these special provisions.

At least one hour shall elapse between the time of placing concrete for the paving notch extension and placing concrete for the structure approach slab.

A clean uniform rounded aggregate filler may be used to extend the concrete. The moisture content of the aggregate shall not exceed 0.5-percent. Grading of the aggregate shall conform to the following:

| Sieve Sizes | Percentage Passing |
|---|---|
| 12.5-mm | 100 |
| 1.18-mm | 0-5 |

The amount of aggregate filler shall conform to the manufacturer's recommendation, but in no case shall the concrete strengths be less than that specified for magnesium phosphate concrete in Section 83-2.02D(1), "General," of the Standard Specifications.

The components of dual component (with a prepackaged liquid activator) magnesium phosphate shall be combined by mixing complete units supplied by the manufacturer. Portions of units shall not be used. Water shall not be added to dual component magnesium phosphate.

Magnesium phosphate concrete shall not be mixed in containers or worked with tools containing zinc, cadmium, aluminum or copper. Modified high alumina based concrete shall not be mixed in containers or worked with tools containing aluminum.

Concrete shall not be retempered. Finishing tools that are cleaned with water shall be thoroughly dried before working the concrete.

When placing concrete on slopes exceeding 5 percent, the Engineer may require the Contractor to provide a flow controlled modified material.

Modified high alumina based concrete and portland cement based concrete shall be cured in conformance with the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications. Magnesium phosphate concrete shall not be cured.

The surface temperature of the areas to receive the concrete shall be 5°C or above when the concrete is placed. The contact surface to receive the magnesium phosphate concrete shall be dry. The contact surfaces to receive the modified high alumina concrete or portland cement based concrete may be damp but not saturated.

The construction joint between the paving notch extension and the existing abutment shall conform to the provisions for horizontal construction joints in Section 51-1.13, "Bonding," of the Standard Specifications. Concrete shall be placed in the spalled portions of the existing paving notch concurrently with the concrete for the paving notch extension.

Attention is directed to "Reinforcement" of these special provisions.

Structure excavation and backfill shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications, except for payment.

Drilling of holes and bonding of reinforcing steel dowels shall conform to the provisions for drilling and bonding dowels in Section 83-2.02D(1), "General," of the Standard Specifications. 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.

The quantity of concrete for paving notch extension will be measured by the cubic meter as determined in conformance with the dimensions shown on the plans or other dimensions that may be ordered in writing by the Engineer.

The contract price paid per cubic meter for paving notch extension shall include full compensation for furnishing all labor, materials (including concrete for the paving notch spalled areas), tools, equipment, and incidentals, and for doing all the work involved in constructing the paving notch extension, complete in place, including structure excavation and backfill, reinforcement, and drilling and bonding dowels, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.48 SOUND WALL

### DESCRIPTION

This work shall consist of constructing sound walls of masonry block. Sound walls shall be supported on concrete barriers on retaining walls, retaining walls, and on concrete barriers on bridges 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 Sections 19, "Earthwork," 52, "Reinforcement," and 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

Sound wall masonry unit stems shall be constructed with joints of portland cement 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 masonry units shall be nominal size and texture and of uniform color. The colors of the masonry units shall be as shown on the plans, selected from the manufacturer's standards.

When high strength concrete masonry units with f'm=17.2 MPa are shown on the plans, the high strength masonry units shall have a minimum compressive strength of 26 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.

Expansion joint filler shall conform to the requirements in ASTM Designation: D 1751 or ASTM Designation: D 2000 2AA-805.

Portland cement mortar shall be colored to match the units. Coloring shall be chemically inert, fade resistant mineral oxide or synthetic type.

Portland cement for wall stems shall conform to the provisions in Section 90-2.01, "Portland Cement," 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 portland cement, 0 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 nor more than 0.25 percent soluble sulfates, as $SO_4$, when tested in conformance with California Test 417.

Prior to 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, 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.

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 cement for regular strength masonry. The maximum amount of free water shall not exceed 0.6 times the mass of the cement for high strength masonry.

Grout proportioned by volume for regular strength masonry shall consist of at least one part portland cement and 4.5 parts aggregate. Grout proportioned by volume for high strength masonry shall consist of at least one part portland cement 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 portland cement per cubic meter. Grout proportioned by mass for high strength masonry shall contain not less than 400 kilograms of portland cement per cubic meter.

Reinforced concrete masonry unit wall stems shall be constructed with portland cement 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 10 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 prior to 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 prior to 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 (masonry block) and sound walls (barrier)(masonry block) will be measured by the square meter of wall projected on a vertical plane between the elevation lines shown on the plans or for walls supported on barriers from the top of the barrier to the upper elevation line and length of wall .

The contract prices paid per square meter for sound wall (masonry block) and sound wall (barrier)(masonry block) 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 excavation, backfill, and reinforcement , as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. Retaining walls and concrete barrier supporting sound walls (masonry block) and sound walls (barrier)(masonry block) will be measured and paid for as separate items of work.

## 10-1.49 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, dowels to be bonded into drilled holes will be paid for as bar reinforcing steel (bridge).

Unless otherwise provided, drilling and bonding dowels will be measured and paid for by the meter determined by the number and the required depth of holes as shown on the plans or as ordered by the Engineer.

The contract price paid per meter for drill and bond dowel shall include full compensation for furnishing all labor, materials (except reinforcing steel dowels), tools, equipment, and incidentals, and for doing all the work involved in drilling the holes, including coring through reinforcement when approved by the Engineer, and bonding the dowels, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.50 CLEAN EXPANSION JOINTS

All deck joints shown on the plans to be cleaned, shall be cleaned as specified herein.

Cleaning shall include removal of all existing seal material, dirt, debris, damaged waterstop, and joint filler, and shall be accomplished by methods which do not damage existing sound concrete surfaces.

Joint size shall be verified after the joint has been cleaned.

The Contractor shall take necessary precautions to ensure that material removed from expansion joints does not fall onto public traffic or private property beneath the bridges. The Contractor shall submit for the Engineer's approval, details for preventing material, equipment, or debris from falling onto traffic or railroad property.

Joints with undamaged waterstops shall be cleaned only to the top of the waterstop, provided the waterstop does not have to be removed for placement of the seal.

Joints without waterstops and joints with waterstops with existing damage or damage caused by the Contractor, shall be cleaned down to the hinge seat or bearing seat, unless otherwise directed by the Engineer.

All joint damage shall be repaired as directed by the Engineer.

Cleaning joints below existing damaged waterstops and repairing existing joint damage will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. The cost of repairing damage caused by the Contractor's operations shall be borne by the Contractor.

Materials removed from the expansion joint, except for surface dust, shall be recovered and disposed of away from the site in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Cleaning expansion joints will be measured by the meter for the length of the deck joint as shown on the plans.

The contract price paid per meter for clean expansion joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in cleaning expansion joints, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**10-1.51 SEALING JOINTS**

Joints in concrete bridge decks and joints between concrete structures and concrete approach slabs shall 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.

Where polyurethane seals are shown on the plans, a silicone sealant conforming to the provisions in Section 51–1.12F, "Sealed Joints," of the Standard Specifications may be used.

When ordered by the Engineer, a joint seal larger than called for by the Movement Rating shown on the plans shall 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.

**10-1.52 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 Structural Steel" 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 $g/m^2$ (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 | 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) |

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 depths and widths of the recesses at abutments shall be as follows in the following table:

| Bridge Name and Bridge Number | Portion of the Structure MR | Maximum Depth of Recess | Maximum Width of Recess on Each Side of the Expansion Joint |
|---|---|---|---|
| SE Connector Br. No. 56-0802F | Abutment 1 MR 70 mm | 255 mm | 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.

**10-1.521 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 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 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 or 559 mm x 864 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 4 weeks to review the drawings after a complete set has been received.

Within 3 weeks after final working drawing approval, one set of the corrected good quality prints on 75-g/m$^2$ (minimum) bond paper (559 mm x 864 mm in size) of all working drawings prepared by the Contractor for each joint seal assembly shall be furnished to OSD.

Each shipment of joint seal assembly materials shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-l.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 requirements of ASTM Designation: A 325 or A 325M. 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 Sections 59-2, "Painting Structural Steel," and 91, "Paint," of the Standard Specifications, and "Clean and Paint Structural Steel" 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.

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 assembly shall have cast-in-place anchorage components forming a mechanical connection between the joint components and the concrete deck.

The bridge deck surface shall conform to the provisions in Section 51-1.17 "Finishing Bridge Deck," of the Standard Specifications 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 depths and widths of the recesses at abutments and at hinges shall be as follows in the following table.

| Bridge Name and Bridge Number | Portion of the Structure MR | Maximum Depth of Recess | Maximum Width of Recess on Each Side of the Expansion Joint |
|---|---|---|---|
| SE Connector Br. No. 56-0802F | Abutment 18 MR 150 mm | 360 mm | 450 mm |
| EB 60 Truck Connector Br. No. 56-0806G | Abutment 1 and Abutment6 MR 150 mm | 360 mm | 450 mm |
| SE Connector Br. No. 56-0802F | Hinge 3 MR 225 mm | 385 mm | 600 mm |
| SE Connector Br. No. 56-0802F | Hinge 7, 10, & 14 MR 300 mm | 410 mm | 750 mm |
| N215-W91 Connector Br. No. 56-0801G | Abutment 1 and Abutment 28 MR 150 mm | 400 mm | 500 mm |
| N215-W91 Connector Br. No. 56-0801G | All Hinges MR 400 mm | 410 mm | 765 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 barrier.

Full compensation for any additional materials or work required because of the 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.

**10-1.53 REFINISHING BRIDGE DECKS**

Surfaces of bridge decks that are exposed when existing railings, curbs, or sidewalks are removed shall be prepared and refinished flush with the adjoining deck surface with portland cement concrete or rapid setting concrete, at the option of the Contractor, in conformance with these special provisions.

The exact area to be refinished will be designated by the Engineer.

Attention is directed to "Public Safety" of these special provisions.

When work is being performed within 3 m of a traffic lane or performed over traffic, dust and residue from deck preparation and cleaning shall be removed or controlled by vacuum, water spray, or shield methods approved by the Engineer.

Concrete shall be removed without damage to concrete that is to remain in place. Damage to concrete which is to remain in place shall be repaired to a condition satisfactory to the Engineer.

The concrete in deck areas to be refinished shall be removed to a depth of approximately 20 mm below the adjoining deck surface. A 20 mm deep saw cut shall be made along the perimeter of areas prior to removing the concrete.

Existing areas of the deck more than 20 mm below the adjoining deck surface shall be prepared by removing not less than 6 mm of surface material to expose sound aggregates.

Concrete removal may be done by abrasive blast cutting, abrasive sawing, impact tool cutting, machine rotary abrading, or by other methods, all to be approved by the Engineer. Cut areas shall be cleaned free of dust and all other loose and deleterious materials by brooming, abrasive blast cleaning, and high pressure air jets. Equipment shall be fitted with suitable traps, filters, drip pans or other devices to prevent oil or other deleterious matter from being deposited on the deck.

Existing reinforcement, exposed during the removal of concrete, that is to remain in place shall be protected from damage.

Steel dowels shall be cut off flush with the existing concrete or cut off at the bottom of concrete removal, whichever is lower. Patching around or over dowels in sound concrete will not be required. Existing voids around dowels, where refinishing is not required, shall be chipped back to sound concrete, the dowels removed 25 mm below the finished surface, and the hole filled with rapid setting concrete.

Refinishing isolated high areas in the existing deck may be accomplished by cutting the concrete down to be flush with the plane of the adjoining deck surface by abrasive sawing, grinding, impact tool cutting, or by other methods to be approved

by the Engineer. When grinding is performed to bring the deck concrete flush with the adjoining deck surface, the resulting surface shall have a coefficient of friction of not less than 0.35 as determined by California Test 342.

**PORTLAND CEMENT CONCRETE**

An epoxy adhesive shall be applied to the surfaces to be refinished before placing the portland cement concrete. Immediately prior to applying the adhesive, the area to receive the adhesive shall be cleaned by abrasive blasting and blown clean by compressed air to remove dust and any other loose material. The area to be covered shall be surface dry and the ambient temperature shall be 10°C or above when the adhesive is applied.

The epoxy adhesive shall be furnished and applied in conformance with the provisions in Section 95-1, "General," and Section 95-2.03, "Epoxy Resin Adhesive for Bonding New Concrete to Old Concrete," of the Standard Specifications. Whenever the ambient temperature is below 18°C, Type II epoxy shall be used. The exact rate of applying epoxy adhesive will be as determined by the Engineer. The adhesive shall be worked onto the surface with stiff brushes or equal.

Portland cement concrete used to fill the prepared areas shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and the following:

A. The concrete shall contain a minimum of 400 kilograms of portland cement per cubic meter.
B. The amount of free water used in concrete shall not exceed 166 kg/m$^3$.
C. The aggregate shall contain between 50 and 55 percent fine aggregate and the remainder shall be pea gravel. The grading of pea gravel shall be such that 100 percent passes the 12.5 mm screen and not more than 5 percent passes the 1.18 mm sieve, unless a larger size is ordered by the Engineer.
D. Admixtures shall be furnished and used if directed by the Engineer.
E. Immediately after depositing on the newly placed adhesive, the portland cement concrete shall be thoroughly consolidated until all voids are filled and free mortar appears on the surface and then struck off to the required grade.
F. Concrete shall be cured as provided in Section 90-7.03, "Curing Structures," of the Standard Specifications.
G. No loads of any kind shall be applied to the portland cement concrete for at least 7 days after placing, unless otherwise permitted by the Engineer.

**RAPID SETTING CONCRETE**

The concrete used to fill the prepared areas shall be a high-strength material consisting of either magnesium phosphate concrete, modified high alumina based concrete, or portland cement based concrete. Magnesium phosphate concrete shall conform to the requirements for magnesium phosphate concrete in Section 83-2.02D(1), "General," of the Standard Specifications and these special provisions. Modified high alumina based concrete and portland cement based concrete shall be water activated and shall conform to the requirements for single component (water activated) magnesium phosphate concrete in Section 83-2.02D(1), "General," of the Standard Specifications and the following:

A. A clean uniform rounded aggregate filler may be used to extend the concrete. The moisture content of the aggregate shall not exceed 0.5 percent. Grading of the aggregate shall conform to the following:

| Sieve Size | Percentage Passing |
|---|---|
| 12.5 mm | 100 |
| 1.18 mm | 0-5 |

B. The amount of aggregate filler shall conform to the manufacturer's recommendation, but in no case shall the concrete strengths be less than that specified for magnesium phosphate concrete in Section 83-2.02D(1), "General," of the Standard Specifications.
C. Mixing of components of dual component (with a prepackaged liquid activator) magnesium phosphate shall be by complete units, supplied by the manufacturer. Portions of units shall not be used. Water shall not be added to dual component magnesium phosphate.
D. Immediately prior to applying the rapid setting concrete, the surface shall be dry and blown clean by compressed air to remove accumulated dust and any other loose material. If the surface becomes contaminated at any time prior to placing the concrete, the surface shall be cleaned by abrasive blasting. The surface temperature of the areas to be covered shall be 4°C or above when the concrete is applied. Methods proposed to heat said surfaces are subject to approval by the Engineer. The surface for the magnesium phosphate concrete shall be dry. The surfaces for modified high alumina based concrete or portland cement based concrete may be damp but not saturated.

E. Magnesium phosphate concrete shall not be mixed in containers or worked with tools containing zinc, cadmium, aluminum or copper. Modified high alumina based concrete shall not be mixed in containers or worked with tools containing aluminum.
F. Concrete shall not be retempered. Finishing tools that are cleaned with water shall be thoroughly dried before working the concrete.
G. When placing concrete on slopes exceeding 5 percent, the Engineer may require the Contractor to provide a flow controlled modified material.
H. Modified high alumina based concrete and portland cement based concrete shall be cured in conformance with the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications. Magnesium phosphate concrete shall not be cured.
I. Unless otherwise permitted in writing by the Engineer, public traffic shall not be permitted on the new concrete until at least 24 hours after final set.

**FINISHING REQUIREMENTS**

In advance of the curing operations, the surface of the concrete shall be textured by brooming with a stiff bristled broom or by other suitable devices which will result in uniform scoring. Brooming shall be performed transversely. The operation shall be performed at a time and in a manner that to produces a hardened surface having a uniform texture and a coefficient of friction of not less than 0.35 as determined by California Test 342.

Refinished surfaces that are found to have a coefficient of friction less than 0.35 shall be ground or grooved by the Contractor at his expense in conformance with the applicable provisions in Section 42, "Groove and Grind Pavement," of the Standard Specifications.

In the longitudinal direction, refinished surfaces shall not vary more than 6 mm from the lower edge of a 3.6 m straightedge. The refinished surface shall be flush with the existing adjoining surface.

**MEASUREMENT AND PAYMENT**

No adjustment of compensation will be made for any increase or decrease in the quantity of refinish bridge deck, 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 contract item of refinish bridge deck.

The quantity in square meters of refinish bridge deck to be paid for will be determined from the lengths and widths of the refinished areas, measured horizontally, plus 0.02-$m^2$ for patching around each dowel.

The contract price paid per square meter for refinish bridge deck shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in refinishing areas of the existing bridge deck (including cutting steel dowels), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.54 POLYESTER CONCRETE OVERLAY

**GENERAL**

This work shall consist of constructing a polyester concrete overlay, including application of a prime coat, in conformance with the details shown on the plans and these special provisions.

Before starting deck overlay work on the project, the Contractor shall submit for approval by the Engineer, a program for public safety associated with the use of methacrylate resin and polyester concrete during the construction of the project. This program shall identify materials, equipment, and methods to be used. The Contractor shall not perform any deck overlay work on the project, other than that specifically authorized in writing by the Engineer, until the program has been approved.

If the measures being taken by the Contractor are inadequate to provide for public safety associated with the use of methacrylate resin and polyester concrete, the Engineer will direct the Contractor to revise the operations and public safety program. These directions will be in writing and will specify the items of work for which the Contractor's program for public safety associated with the use of methacrylate resin and polyester concrete is inadequate. No further work shall be performed on these items until the public safety measures are adequate, and if required, a revised program for public safety associated with the use of methacrylate resin and polyester concrete has been approved.

The Engineer will notify the Contractor in writing of the approval or rejection of any submitted or revised program for public safety associated with the use of methacrylate resin and polyester concrete in not more than 10 working days following submittal.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised program for public safety associated with the use of methacrylate resin and polyester concrete, nor for any delays to

the work due to the Contractor's failure to submit an acceptable program for public safety associated with the use of methacrylate resin and polyester concrete.

A certified industrial hygienist shall furnish an airborne emissions monitoring plan. The emissions shall be monitored at a minimum of 4 points including the point of mixing, application, and the point of nearest public contact, as determined by the Engineer. At the completion of work, a report by the certified industrial hygienist with results of the airborne emissions monitoring plan shall be furnished to the Engineer. The airborne emissions monitoring work, including planning, monitoring, and reporting, performed by the certified industrial hygienist will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

Surface preparation shall be as specified in "Prepare Concrete Bridge Deck Surface" of these special provisions.

When determined by the Engineer, the smoothness of existing concrete surfaces which are to be covered with polyester concrete overlay will be tested by the Engineer with a bridge profilograph in conformance with the provisions in Section 51-l.17, "Finish Bridge Decks," of the Standard Specifications. Conforming to the bridge profilograph test requirements on existing bridge decks will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

**MATERIALS**

Polyester concrete shall consist of polyester resin binder and dry aggregate. The resin shall be an unsaturated isophthalic polyester-styrene co-polymer conforming to the following:

| POLYESTER RESIN BINDER | | |
|---|---|---|
| PROPERTY | REQUIREMENT | TEST METHOD |
| * Viscosity | 0.075 to 0.200 Pa·s (RVT, No. 1 Spindle, 20 RPM at 25°C) | ASTM D 2196 |
| * Specific Gravity | 1.05 to 1.10 at 25°C | ASTM D 1475 |
| Elongation | 35 percent, minimum Type I at 11.5 mm/min. Thickness= 6.5±1 mm | ASTM D 638 |
| | Sample Conditioning: 18/25/50 + 5/70 | ASTM D 618 |
| Tensile Strength | 17.5 MPa, minimum Type I at11.5 mm/min. Thickness= 6.5±1 mm | ASTM D 638 |
| | Sample Conditioning: 18/25/50 + 5/70 | ASTM D 618 |

| | | |
|---|---|---|
| * Styrene Content | 40 percent to 50 percent (by weight) | ASTM D 2369 |
| Silane Coupler | 1.0 percent, minimum (by mass of polyester styrene resin) | |
| PCC Saturated Surface-Dry Bond Strength | 3.5 MPa, minimum at 24 hours and 21±1°C | California Test 551 |
| * Static Volatile Emission | 60 gram per square meter, loss, maximum | South Coast Air Quality Management District, Standard Method |
| * Test shall be performed prior to adding initiator. | | |

The silane coupler shall be an organosilane ester, gammamethacryloxypropyltrimethoxysilane. The promoter shall be compatible with suitable methyl ethyl ketone peroxide (MEKP) and cumene hydroperoxide (CHP) initiators.

Aggregate for polyester concrete shall conform to the provisions in Section 90-2.02, "Aggregates," of the Standard Specifications and either of the following combined aggregate gradings:

| COMBINED AGGREGATE | | |
|---|---|---|
| Sieve Size | Percentage Passing | |
| | 9.5-mm Max. | 4.75-mm Max. |
| 12.5-mm | 100 | 100 |
| 9.5-mm | 83 - 100 | 100 |
| 4.75-mm | 65 - 82 | 62 - 85 |
| 2.36-mm | 45 - 64 | 45 - 67 |
| 1.18-mm | 27 - 48 | 29 - 50 |
| 600-µm | 12 - 30 | 16 - 36 |
| 300-µm | 6 - 17 | 5 - 20 |
| 150-µm | 0 - 7 | 0 - 7 |
| 75-µm | 0 - 3 | 0 - 3 |

Aggregate retained on the 2.36-mm sieve shall have a maximum of 45 percent crushed particles when tested in conformance with California Test 205. Fine aggregate shall consist of natural sand.

The polyester resin binder in the concrete shall be approximately 12 percent by mass of the dry aggregate; the exact percentage will be determined by the Engineer.

The average of coarse and fine aggregate absorption shall not exceed one percent as determined by California Tests 206 and 207.

At the time of mixing with the resin, the moisture content of the aggregate, as determined by California Test 226, shall not exceed one half of the aggregate absorption.

The prepared surface shall receive a wax-free, low odor, high molecular weight methacrylate prime coat. The prime coat shall be a resin, and prior to 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:

| High Molecular Weight Methacrylate (HMWM) Resin | | |
|---|---|---|
| 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 | 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 prior to adding initiator. | | |

The promoter/initiator system for the methacrylate resin shall consist of a metal drier and peroxide. If supplied separately from the resin, at no time shall the metal drier be mixed with the peroxide directly. The containers shall not be stored in a manner that will allow leakage or spillage from one material to contact the containers or material of the other.

A Material Safety Data Sheet shall be furnished prior to use for each shipment of polyester resin binder and high molecular weight methacrylate resin.

The Contractor shall allow 14 days for sampling and testing of the polyester resin binder and high molecular weight methacrylate resin prior to proposed use.

If bulk resin is to be used, the Contractor shall notify the Engineer in writing 10 days prior to the delivery of the bulk resin to the jobsite. Bulk resin is any resin that is stored in containers in excess of 209 liters.

When magnesium phosphate concrete is placed prior to the deck overlay, the magnesium phosphate concrete shall be placed at least 72 hours prior to placing the prime coat.

When modified high alumina based concrete is placed prior to the deck overlay, the prime coat shall not be placed on the concrete until at least 30 minutes after final set.

Expansion joints shall be adequately isolated prior to overlaying or may be sawed within 4 hours after overlay placement, as approved by the Engineer. The exact time of sawing will be determined by the Engineer.Prior to applying the prime coat, the area to receive the prime coat shall be dry and blown clean by compressed air to remove accumulated dust and any other loose material. The surface temperature shall be at least 10°C and the relative humidity less than 85 percent when the prime coat is applied.

The prime coat shall be uniformly applied to completely cover the surface to receive the polyester concrete. The rate of spread shall be approximately 1.5 square meters per liter.

The prime coat shall be allowed to cure a minimum of 15 minutes before placing polyester concrete. If the primed surface becomes contaminated, the contaminated area shall be cleaned by abrasive blasting and reprimed at the Contractor's expense.

Polyester concrete shall be placed within 120 minutes after the prime coat has been applied.

Polyester concrete shall be mixed in mechanically operated mixers. Mixer size shall be limited to a 0.25-cubic meter capacity, unless approved by the Engineer.

A continuous mixer, employing an auger screw/chute device, may be approved for use by the Engineer upon demonstrating its ability to produce a satisfactory product. The continuous mixer shall 1) be equipped with a metering device that automatically measures and records the aggregate volumes and the corresponding resin volumes, and 2) have a readout gage, visible to the Engineer at all times, that displays the volumes being recorded. The volumes shall be recorded at no greater than 5 minute intervals along with the time and date of each recording. A printout of the recordings shall be furnished to the Engineer at the end of each workshift.

The amount of initiator used in polyester concrete shall be sufficient to produce an initial set time between 30 and 120 minutes during placement. The initial set time will be determined by using an initial-setting time Gillmore needle in conformance with the requirements in ASTM Designation: C 266. Accelerators or inhibitors may be required to achieve proper set times and shall be used as recommended by the resin supplier.

The resin binder shall be initiated and thoroughly blended just prior to mixing with aggregate. The polyester concrete shall be mixed a minimum of 2 minutes prior to placing.

Polyester concrete shall be placed prior to gelling and within 15 minutes following addition of initiator, whichever occurs first. Polyester concrete that is not placed within this time shall be discarded.

The surface temperature of the area to receive polyester concrete shall be the same as specified above for the prime coat.The finishing equipment used shall strike off the polyester concrete to the established grade and cross section. Finishing equipment shall be fitted with vibrators or other means of consolidating the polyester concrete to the required compaction.

The polyester concrete shall be consolidated to a relative compaction of not less than 97 percent in conformance with California Test 552.

The finished surface of the polyester concrete overlay shall conform to the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications and these special provisions.

Polyester concrete surfaces shall receive an abrasive sand finish. The sand shall be commercial quality blast sand conforming to the quality and dryness requirements for polyester concrete aggregate as specified in these special provisions. Ninety-five percent of the sand shall pass the 2.36-mm sieve, and 95 percent shall be retained on the 850-µm sieve.

The sand finish shall be uniformly applied immediately after overlay strike-off and before gelling occurs to provide a minimum uniform coverage of 0.4-kilogram per square meter.

The surface texture of polyester concrete overlay surfaces shall be uniform and shall have a coefficient of friction of not less than 0.35 as measured by California Test 342. Portions of surfaces that do not meet the above provision shall be ground or grooved parallel to the centerline in conformance with the provisions of Section 42, "Groove and Grind Pavement," of the Standard Specifications until the above tolerance is met.

Traffic and equipment shall not be permitted on the overlay for a minimum of 4 hours following final finishing. Overlays shall be protected from moisture for a minimum of 4 hours after finishing.

**MEASUREMENT AND PAYMENT**

Furnishing polyester concrete overlay will be measured by the cubic meter. The volume to be paid for will be determined from calculations based on the quantity of resin binder used and the yield of the specified mix design. The Contractor shall furnish suitable measuring devices to assure correct proportioning of materials and accurate measurements for calculating pay quantities. The pay quantity shall be the calculated quantity of polyester concrete overlay used in the work, exclusive of any wasted or unused material.

Placing polyester concrete overlay will be measured by the square meter. The area to be paid for will be based on the dimensions shown on the plans.

The contract price paid per cubic meter for furnish polyester concrete overlay shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing polyester concrete, including polyester resin binder, promoter/initiator, and aggregate, 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 square meter for place polyester concrete overlay shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the polyester concrete overlay, complete in place, including application of prime coat, but excluding the airborne emissions monitoring work done by the certified industrial hygienist, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for compliance with the requirements for a program for public safety associated with use of methacrylate resin and polyester concrete shall be considered as included in the contract prices paid for the items of work involving polyester concrete overlay and no additional compensation will be allowed therefor.

## 10-1.55 ARCHITECTURAL SURFACE (TEXTURED CONCRETE)

Architectural texture 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 treatment shall conform to the provisions in "Architectural Surface (Textured Concrete)" of these special provisions

Architectural textures listed below are required at concrete surfaces shown on the plans:

A. Fractured rib texture
B. Heavy blast texture
C. Splitface running bond texture
D. Fieldstone texture
E. Fractured rib split slate texture

F. Fractured rib bell texture
G. Bear 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 fractured rib bell texture shall be an architectural texture of fractured rib texture with relief patterns simulating the shape of a bell as shown on the plans.

The heavy abrasive blast texture shall be an architectural texture accomplished by abrasive blasting the surface of the concrete to produce a generally uniform color and sandy texture with air and water bubbles in the concrete partially exposed.

The splitface running bond texture shall be a concrete surface texture simulating the pattern and texture of a split face concrete masonry unit wall in a running bond pattern. The running bond of the simulated concrete masonry wall shall be continuous between forms. The running bond pattern shall consist of full courses. A partial course may occur only when needed as the bottom course. Simulated mortar joints shall be tooled concave. Vertical mortar joints shall be aligned plumb with horizontal joints running perpendicular to vertical joints. The split face texture shall be random and not have secondary patterns imparted by shadows or repetitive split face surfaces. The concrete surface texture shall not exceed 19-mm relief. The concrete surface texture areas shall be sharp and crisp with out easing or rounding.

The split slate texture shall be a concrete surface texture simulating the pattern and texture of split slate rock. The concrete surface shall have a relief depth as shown on the plans.

The fractured rib split slate texture shall be an architectural texture of fractured rib texture and split slate texture with relief patterns simulating the appearance of a bell and an arch as shown on the plans.

The bear relief texture shall simulate a formed relief with various concrete texture surfaces, treatments, and finishes constructed to the dimensions and shapes shown on the plans. Tile used for the bear relief texture shall conform to the provisions in "Ceramic Tile" of these special provisions. Corners at the intersection of plane surfaces of concrete shall be sharp and crisp without easing or rounding. A Class 1 surface finish shall be applied to the architectural texture as shown on the plans.

**REFEREE SAMPLES**

The fractured rib and splitface running bondarchitectural textures shall match the respective textures and color of the respective referee sample. The referee sample for fractured rib texture is located in Riverside, on Route 91 at Jackson St. Overcrossing, Retaining Wall 261 and is available for inspection. The referee sample for splitface running bond texture is in Victorville, on Southbound Route 15, near Mojave Drive Overcrossing, Retaining Wall 31and is available for inspection.

**TEST PANEL**

Test panels at least 4.0 m x 4.0 m in size shall be successfully completed at locations approved by the Engineer before beginning work on architectural textures. The area of architectural texture and portion of relief pattern to be depicted on the test panels shall be as shown on the plans and as directed by the Engineer. Test panels shall be constructed and finished with the materials, tools, equipment and methods to be used, including placement of expansion joints, weakened planes, and joints between formliner units, in constructing the architectural textures, including areas representative of the fractured rib, splitface running bond block,split slate, and bear relief. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer 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 fractured rib, splitface running bond, and split slate textured concrete surfaces and shall be installed in conformance with the manufacturer's recommendations, unless other methods of forming textured concrete surfaces are approved by the Engineer. Form liners shall be manufactured from an elastomeric material or a semi-elastomeric polyurethane material by a manufacturer of commercially available concrete form liners. No substitution of other types of formliner material will be allowed. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Textured concrete surfaces with such recurring textural configurations shall be reworked to remove such patterns as approved by the Engineer or the concrete shall be replaced.

Form liners shall have the following properties:

| Description | ASTM Designation: | Range |
|---|---|---|
| Elastomeric material | | |
| Shore A hardness | D 2240 | 20 to 65 |
| Tensile strength (MPa) | D 412 | 0.9 to 6.2 |
| Semi-elastomeric polyurethane | | |
| Shore D hardness | D 2240 | 55 to 65 |
| Tensile strength (MPa) | D 2370 | 18 minimum |

Cuts and tears in form liners shall be sealed and repaired in conformance with the manufacturer's recommendations. Form liners that are delaminated from the form shall not be used. Form liners with deformations to the manufactured surface caused by improper storage practices or any other reason shall not be used.

Form liners shall extend the full length of texturing with transverse joints at 2.5 m minimum spacing. Small pieces of form liners shall not be used. Grooves shall be aligned straight and true. Grooves shall match at joints between form liners. Joints in the direction of grooves in grooved patterns shall be located only in the depressed portion of the textured concrete. Adjoining liners shall be butted together without distortion, open cracks or offsets at the joints. Joints between liners shall be cleaned before each use to remove any mortar in the joint.

Adhesives shall be compatible with the form liner material and with concrete. Adhesives shall be approved by the liner manufacturer. Adhesives shall not cause swelling of the liner material.

**RELEASING FORM LINERS**

Products and application procedures for form release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the liner material or delamination from the forms. Release agents shall not stain the concrete or react with the liner material. For reliefs simulating fractured concrete or wood grain surfaces the application method shall include the scrubbing method using a natural bristle scrub brush in the direction of grooves or grain The release agent shall coat the liner with a thin film. Following application of form release agent, the liner surfaces shall be cleaned of excess amounts of agent using compressed air. Buildup of form release agent caused by the reuse of a liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of liner material on the concrete and without pulling or breaking concrete from the textured surface. The concrete surfaces exposed by removing forms shall be protected from damage.

**CURING**

Concrete surfaces with architectural texture shall be cured only by the forms-in-place or water methods. Seals and curing compounds shall not be used.

**MEASUREMENT AND PAYMENT**

Architectural texture 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, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for architectural texture on concrete barriers shall be considered as included in the contract price paid per meter for the various types of concrete barrier involved and no separate payment will be made therefor.

Full compensation for architectural texture on precast concrete panels for mechanically stabilized embankment shall be considered as included in the contract price paid per square meter for earth retaining structure involved and no separate payment will be allowed therefor.

## 10-1.56 CERAMIC TILE

### PART 1.- GENERAL

This work shall consist of furnishing and installing ceramic tile in accordance with the details shown on the plans and these special provisions.

Ceramic tile shall include glazed wall tile, patterned porcelain tile, matte porcelain tile, textured porcelain tile, polished porcelain tile, trim tile, setting materials, grouts and such other materials as maybe required for a complete installation.

**SUBMITTALS.--**

**Product data.--**Manufacturer's descriptive data, a list of materials to be used, and installation instructions for all materials required for the work shall be submitted for approval.

Manufacturer's descriptive data shall be submitted for each type of tile, mortar bed materials, bond coat materials and additives, and grout materials and additives.

Materials list and installation instructions shall include all products and materials to be incorporated into the work.

Friction reports shall be submitted for tile products to be used on floors and other pedestrian surfaces.

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

**QUALITY ASSURANCE.--**

**Single source responsibility.--**Each type and color of tile, grout and setting materials shall be obtained from a single source.

**Master Grade Certificates.--**Each shipment of tile to the project site shall be accompanied by a Master Grade Certificate issued by the tile manufacturer.

**Certificates of Compliance.--**Certificates of compliance shall be furnished for bond coat materials, setting bed materials and grout in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

**DELIVERY, STORAGE AND HANDLING.--**

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

**Storage and handling.--**Materials shall be stored and handled in such a manner as to prevent damage or contamination by water, freezing or foreign matter.

**PROJECT CONDITIONS.--**

**Protection.--**Tile work shall be protected and environmental conditions maintained during and after installation to comply with the reference standards and manufacturer's printed instructions.

**Temperatures.--**Unless otherwise specified in the manufacturer's installation instructions, the ambient temperature shall be maintained at not less than 10°C nor more than 38°C in tiled areas during installation and for 7 days after completion. Exterior work areas shall be shaded from direct sunlight during installation.

Tile shall not be installed when the temperature of the substrate is greater than 32°C or is frost covered.

## PART 2.- PRODUCTS

**MANUFACTURERS.--**

**Available manufacture's.--**Subject to compliance with the specifications, tile shall be American Olean Tile Co., Inc.; Summitville Tiles, Inc.; United States Ceramic Tile Co.; or equal.

**GENERAL.--**

**Ceramic tile.--**Ceramic tile shall conform to the requirements in ANSI Standard: A137.1, "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.

Ceramic tile shall conform to the "Standard Grade" requirements.

**Tile installation materials.--**Tile installation materials shall conform to the requirements in ANSI standard referenced with products and materials indicated for setting and grouting.

**Tile color and size.--**Tile color shall be as shown on the plans; tile size shall be as indicated in the plans.

**TILE PRODUCTS.--**

**Glazed wall tile.--**

Glazed wall tile shall be machine made, dust pressed white body clay, and shall have a glossy glaze finish, plain face, and cushion edges. Tile shall be 8 mm nominal thickness.

Ceramic tile trim shall match material, size and finish of field tile. Free edges of tiled areas of walls shall have bullnose type trim. Outside corners shall have bullnose type runner trim (not beads). Reentrant corners shall have cove type trim.

**Patterned porcelain tile.--**

Patterned porcelain tile shall be machine made, unpolished, dust pressed natural porcelain clay. Tiles shall have less than 0.5 percent water absorption and be suitable for exterior use. Tiles shall be 10 mm nominal thickness. Patterned porcelain shall be slip resistant.

Tile shall have truncated domes, 23 mm diameter, 5 mm nominal height, and center to center spacing of 60 mm. Arrangement of the domes shall be such that there is no break in pattern or spacing when tiles are arranged side by side.

**Matte porcelain tile.--**

Matte porcelain tile shall be machine made, unpolished, dust pressed natural porcelain clay and shall have a plain face. Tile shall have a nominal thickness of 8 mm. Matte porcelain tile shall be slip resistant.

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

**Textured porcelain tile.--**

Textured porcelain tile shall be machine made, unpolished, dust pressed natural porcelain clay. Tile shall have less than 0.5 percent water retention and be suitable for exterior use. Tiles shall have a nominal thickness of 8 mm. Textured porcelain tile shall be slip resistant.

**Polished porcelain tile.--**

Polished porcelain tile shall be machine made, dust pressed natural porcelain clay. Tile shall have less than 0.5 percent water absorption and be suitable for exterior use. Tile shall have a glossy polished finish and plain face. Tiles shall have a nominal thickness of not less than 8 mm.

**SETTING MATERIALS.--**

**Portland cement mortar installation materials.--**

Materials for portland cement mortar installation shall conform to the requirements in ANSI Standard: A108.1 as required for installation method designated, unless otherwise indicated.

**Membrane.--**Membrane shall be asphalt impregnated felt conforming to ASTM Designation: D 226, Type I, or polyethylene film conforming to ASTM Designation: C 171, Type 1.1.2. Polyethylene film shall not be less than 0.1 mm thick.

**Reinforcement.--**Reinforcement shall be galvanized welded wire fabric with 50 mm x 50 mm - 1.6 mm x 1.6 mm conforming to ASTM Designations: A 82 and A 185 except for minimum wire size. Reinforcement shall be provided in flat sheets.

**Metal lath.--**Metal lath shall be self furring, galvanized, conforming to ASTM Designation: C 847, flat expanded type weighing not less than 1.4 $kg/m^2$. Factory assembled metal lath and paper backing may be used where reinforcement over paper is shown on the plans.

**Tile bond coat.--**

Tile bond coat shall be latex-portland cement bond coat.
Latex-portland cement mortar bond coat shall be a prepackaged mortar mix, conforming to ANSI Standard: A118.4, incorporating a dry acrylic resin, and to which only water is added at the job site. Mortar shall be suitable for exterior use and be labeled for the type of tile to be installed.

**Epoxy bond coat.--**

Epoxy bond coat shall be a 2 part prepackaged epoxy mortar conforming to ANSI Standard: A118.3, suitable for exterior use. Mortar shall be labeled for the type of tile to be installed.

**GROUTING MATERIALS.--**

**Tile grout.--**

Tile grout shall be latex-portland cement grout.

Latex-portland cement grout shall be a prepackaged grout mix, conforming to ANSI Standard: A118.6, incorporating a dry acrylic resin, and to which only water is added at the jobsite. Grout shall be suitable for exterior use and labeled for the type of tile to be installed.

**Epoxy grout.--**

Epoxy grout shall be a 2 part prepackaged epoxy grout conforming to ANSI Standard: A118.3 and suitable for exterior use. Grout shall be labeled for the type of tile to be used.

**Grout pigment.--**

Grout pigment shall be chemically inert, fade resistant mineral oxide or synthetic type. Color shall be as shown on the plans.

**SEALANTS.--**

**Sealant.--**

Sealant for vertical expansion joints shall be a medium modulus silicone or polyurethane. Sealant for horizontal joints shall be a 2-part polyurethane type material with a Shore Hardness of 35 to 45.

Color of exposed sealants shall match color of grout in tile adjoining sealed joints.

**MORTAR BEDS.--**

**Cement mortar bed.--**

Cement mortar bed for walls shall be proportioned of one part cement, 1/2 part hydrated lime, 6 parts damp sand by volume and only enough water to provide the necessary workability. Ingredients shall be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed shall be not less than 20 mm in thickness.

Cement mortar bed for floors shall be proportioned of one part cement, 1/10 parts hydrated lime, 5 parts damp sand by volume and only enough water added to provide the necessary workability. Ingredients shall be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed shall be not less than 32 mm in thickness.

**MISCELLANEOUS MATERIALS.--**

**Sand.--**

Sand shall be a natural or manufactured sand conforming to ASTM Designation: C 144, except that no more than 10 percent shall pass the No. 150 µm sieve.

**Sealers.--**

Sealer for grout shall be a penetrating proprietary compound designed for sealing grout. Silicone sealers shall not be used.

**Cement.--**

Cement shall conform to ASTM Designation: C 150, Type I.

**Hydrated lime.--**

Hydrated lime shall conform to ASTM Designation: C 206, Type S, or ASTM Designation: C 207, Type S.

**Water.--**

Water shall be clean and potable.

**Metal edge strips.--**

Metal edge strips shall be stainless steel terrazzo strips, 3 mm wide at top edge with integral provision for anchorage to mortar bed or substrate.

**Cementitious tile backer board.--**

Cementitious backer board shall be a backing and underlayment panel composed of a concrete core with glass mesh reinforcing on both faces and conforming to the requirements of ANSI Standard: A118.9.

**MIXING MORTAR AND GROUT.--**

**Mixing.--**Mortar and grout shall be mixed to comply with the requirements of referenced standards and manufacturers for accurately proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures need to produce mortars and grout of uniform quality with optimum performance characteristics for application intended.

## PART 3.- EXECUTION

**PREPARATION.--**

**General.--**Concrete, mortar, or masonry substrate surfaces which are to receive a mortar bed shall not vary more than 5 mm in 2.4 m from the required plane and shall be true, plumb at vertical surfaces, and square at intersection edges.

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

The cleaned surfaces which are to receive a mortar bed shall be saturated with water just prior to placing mortar or the cleaned surfaces shall be coated with fresh neat cement slurry. If the surface is saturated with water, excess water shall be

removed and the wetted surfaces uniformly dusted with portland cement. The slurry or wetted cement dust shall be broomed to completely coat the surface with a thin and uniform coating just prior to placing the mortar.

Substrates shall be inspected to insure that grounds, anchors, plugs, recessed frames, bucks, drains, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of the tiles.

**INSTALLATION.--**

**General.--**Tile installation shall conform to applicable parts of ANSI 108 Series of the tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" and Tile Council of American, "Handbook for Ceramic Tile Installation."

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

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

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

Tile work shall extend into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as shown on the plans. Work shall be terminated neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

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

**Mortar bed placement.--**The mortar bed, with or without reinforcement as shown on the plans, shall be placed, consolidated, and finished to the required thickness.

The surface of the mortar bed shall be true and pitched as shown on the plans, without high or low spots. The mortar bed surface shall not vary more than 3 mm in 2.4 m from a plane parallel to the finished tile surface when tile is installed on a cured mortar bed.

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

Cement mortar beds to receive a tile bond coat shall be damp cured under cover for a minimum of 48 hours at a temperature of not less than 21°C.

Cement mortar beds to receive an epoxy bond coat shall be damp cured under cover for a minimum of 96 hours at a temperature of not less than 21°C and allowed to dry thoroughly prior to setting tile.

**Cementitious backer board.--**Cementitious backer board shall be installed in accordance with the provisions of ANSI Standard: A118.11.

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

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

**Installing tiles.--**Tile shall be installed in accordance with the manufacturer's instructions and shall be set solid and shall be well bonded to the substrate.

Tile set on a tile bond coat shall be installed in accordance with ANSI Standard: A108.5, and tile set on an epoxy mortar shall be installed in accordance with ANSI Standard: A108.6.

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

Tile shall completely cover wall areas behind mirrors and fixtures.

Tile shall be installed so that the finished tile surface does not vary more than 3 mm in 2.4 m from the finished tile surface shown on the plans. In no case shall there be offsets in adjoining tiles, low spots on finished tile surfaces that can pond water, or finished tile surfaces that are not plumb or true in the completed tile work.

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

If tile is face mounted, the paper and glue shall be removed within one hour after tile is installed and all tiles that do not meet the requirements for joints and surface tolerance shall be adjusted or replaced.

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

**Joints.--**Joints between tile shall be continuous both vertically and horizontally. Joints shall be straight and of uniform and equal width. Where tiles on adjoining surface are the same size, the joints shall align, one with the other. Joint width shall be as recommended by the tile manufacturer.

**Grouting tile.--**Grout shall be mixed, applied and cured in accordance with the manufacturer's recommendations and ANSI Standard: A108.10 for cement grout and ANSI Standard: A108.9 for epoxy grout.

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

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

A maximum amount of grout shall be forced into the joints between tiles in accordance with the manufacturer's recommendations. The grout shall be finished to the depth of the cushion for cushion edge tile and finished flush with the surface for square edge tile. All gaps and skips in the grout spaces shall be filled.

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

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

Expansion joints shall be kept free of grout or mortar.

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

**Expansion joints.--**Expansion joints shall be installed at the perimeter of all tile floors and at all substrate control joints and changes in the substrate material. Exterior expansion joint spacing shall not exceed 5 m in any direction.

All expansion joints shall be made with sealant over backer rods. The thickness of sealant at the center of expansion joints shall not exceed the width of the joint. Joint edges shall be primed as recommended by the sealant manufacturer.

**Edge strips.--**Edge strips shall be installed at openings where the threshold has not been shown on the plans, but where tile floor abuts other flooring materials at the same level. Edge strips shall be installed centered under the closed door, or where there is no door, centered in the opening.

**Sounding tile.--**Tiled surfaces shall be sounded with a metal bar or chain for improperly bonded tile or setting bed. Tile or setting bed that emits a hollow sound shall be replaced.

**Replacement.--**Cracked, chipped, broken, or otherwise defective tiles shall be removed and replaced. All tiles which differ more than 2 mm in elevation from adjacent tile edges shall be removed and replaced.

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

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

**CLEANING AND PROTECTION.--**

**Cleaning tile surfaces.--**All exposed tile surfaces shall be cleaned of all grout haze upon completion of grouting. Acids and chemicals used to clean tile shall conform to the tile manufacturer's recommendations. Cleaners shall not be harmful to materials on surfaces of abutting floors, walls, and ceilings. Tile work shall be rinsed thoroughly with clean water before and after using acid or chemical cleaners. After cleaning and rinsing, tile surfaces shall be polished using a soft cloth.

Tile work shall be cleaned and polished again immediately prior to completion of the contract. All dirt, grime, stains, paints, grease, and other discoloring agents or foreign materials shall be removed.

**Protection.--**After grouting, all tiled surfaces shall be kept free from impact, vibration or shock, for at least 72 hours after.

Tile surfaces damaged by construction operations shall be retiled.

**SCHEDULES.--**

**Wall tile.--**

Wall tile shall be nominal 102 mm x 102 mm glazed wall tile.

Installation on concrete and masonry shall be on a mortar bed using tile bond coat and grout, and shall conform to the requirements of Method W 211, "Handbook for Ceramic Tile Installation.

## 10-1.57 PLASTER FINISH

**GENERAL.--**This work shall consist of installing lath and applying portland cement plaster in accordance with the details shown on the plans and these special provisions.

Plaster shall be 3 coat work. The total thickness of plaster shall be 19 mm unless otherwise shown on the plans. The color and the surface finish shall be as shown on the plans.

**PRODUCTS.--**

**Sand.--**

Sand shall be lean commercial quality plaster sand.

**Cement.--**

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

**Lime.--**

Lime shall conform to ASTM Designation: C 206.

**Color for plaster.--**

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

**Premixed portland cement plaster.--**

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

**Metal lath.--**

Metal lath shall be self-furring expanded metal diamond mesh with rust inhibitive coating and waterproof vapor barrier backing. Mesh shall weigh not less than 1.8 $kg/m^2$.

**Metal lath fasteners.--**

Metal lath fasteners shall be galvanized or corrosion resistant nails, screws or staples.

**Beads, screeds, control joints and accessories.--**

Beads, screeds, control joints and accessories shall be galvanized steel, not less than 0.50 mm thickness.

**Vent screen.--**

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

**Water.--**

Water shall be potable.

**EXECUTION.--**

**METAL LATH INSTALLATION.--**Metal lath, beads, screeds, control joints, vent screens and other metal accessories shall be installed rigidly and securely in place in accordance with the manufacturer's recommendations.

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

**PLASTER PROPORTIONING AND MIXING.--**Materials shall be accurately proportioned and measured for each batch. All batches for a given coat shall be proportioned the same. Plaster shall be proportioned one part cement to between 3 and 5 parts sand by volume, only sufficient water to obtain a workable mix, and a lime plasticizing agent. Not more than 9 kg of dry hydrated lime or lime putty per sack of cement shall be used in the first and second plaster coat. Plaster for finish coat shall contain not more than 42 kg of dry hydrated lime or lime putty per sack of cement. Lime shall not be used if mineral admixture or blended hydraulic cement is used.

Frozen materials shall not be used in the mix.

All plaster mixing ingredients shall be mixed in a mechanical mixer. After all ingredients are in the mixer, the plaster shall be mixed for a minimum of 2 minutes. The mixture shall be uniform in color after mixing. Hand mixing of plaster will be allowed only with the written approval of the Engineer.

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

**PLASTER APPLICATION.--**Plaster shall not be applied if the ambient temperature is 4°C or less. Plaster shall not be applied to frost covered or frozen surfaces. Surfaces to receive plaster shall be clean.

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

The first coat shall be applied with sufficient material and pressure to form full keys and good bond and to cover surfaces. Before setting, the first coat shall be cross-scratched to receive the second coat. The first coat shall be moisture cured, without soaking, for not less than 48 hours after application or until covered by the second coat.

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

The third coat of plaster shall not be placed until at least 7 days after the second coat of plaster has been placed. Troweling of the third coat of plaster shall leave the surface smooth and free from rough areas, trowel marks, checks, or other blemishes. The finished surface shall be true and even and shall not vary more than 3 millimeters in 1.5 meters from the required plane. Plaster with cracks, blisters, pits, stains, efflorescence, shadowing, dryouts, or checks will not be accepted. Surfaces shall be clean and sound.

The third coat shall have the type of finish shown on the plans.

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

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

## 10-1.58 INTERLOCKING PAVERS

Interlocking paver work shall consist of furnishing and installing interlocking pavers, including earthwork, sub-base, bedding sand, concrete curb, and edging as shown on the plans and in conformance with these special provisions, and as directed by the Engineer.

### MATERIALS

#### Interlocking Pavers

Interlocking pavers shall meet the following requirements set forth in ASTM C 936, standard specification for interlocking concrete paving units:

A. Average compressive strength of 8,000 psi (55 MPa) with no individual unit under 50 MPa.
B. Average absorption of 5% with no unit greater than 7% when tested in accordance with ASTM C 140.
C. Resistance to 50 freeze-thaw cycles when tested in accordance with ASTM C 67.

Paver thickness shall be 80 mm.

Paver height shall not vary by more than 3.2mm from specified height.

Pave length and width shall be shall be 200- mm x 100-mm. Paver length and width shall not vary by more than 1.6mm.

Interlocking pavers shall be a red-brown blend

Interlocking pavers units shall have spacer bars to ensure a minimum joint width between units in which the sand is placed. These spacer bars shall not be flush with the unit surface or chamfered edge.

**Aggregate Base**

Aggregate for aggregate base shall conform to the provisions specified for 19-mm, maximum, aggregate grading in Section 26-1.02A, "Class 2 Aggregate Base," of the Standard Specifications.

Aggregate base shall be a minimum depth as shown on the plans. Aggregate base shall be spread and compacted in conformance with the provisions in Section 26-l.04, "Spreading," and Section 26-l.05, "Compacting," of the Standard Specifications.

**Filter Fabric**

Filter fabric shall conform to Section 88-1.03, 'Filter Fabric', of the Standard Specifications and these special provisions.

A woven barrier fabric shall be placed over the compacted aggregate base. The fabric shall be installed as recommended by the manufacturer and shall be a woven needle-punched polyproplyene material with a minimum thickness of 26-mils. Water permeability through the fabric shall not be less than 560 liters per minute per square meter.

**Bedding Sand**

Sand for sand bedding and joints shall be a well-graded, clean washed sand, free from clay or organic material.

Grading of sand samples for the bedding course and joints shall be done according to ASTM C 136. Bedding sand shall conform to grading requirements of ASTM C 33 as described below:

| Sieve Size | Percentage Passing |
|---|---|
| 9.5 mm | 100 |
| 4.75 mm | 95 to 100 |
| 2.36 mm | 85 to 100 |
| 1.18 mm | 50 to 85 |
| 600 µm | 25 to 60 |
| 300 µm | 10 to 30 |
| 150 µm | 2 to 10 |

**Joint Sand**

Joint sand shall conform to the grading requirements of ASTM C 144 as described below:

| Sieve Size | Natural Sand Percentage Passing | Manufactured Sand Percentage Passing |
|---|---|---|
| 4.75 mm | 100 | 100 |
| 2.36 mm | 95 to 100 | 95 to 100 |
| 1.18 mm | 70 to 100 | 70 to 100 |
| 600 µm | 40 to 75 | 40 to 75 |
| 300 µm | 10 to 35 | 20 to 40 |
| 150 µm | 2 to 15 | 10 to 25 |
| 75 µm | 0 | 0 to 10 |

**Concrete Curb**

Concrete for concrete curb shall conform to the provisions in Section 90-10, “Minor Concrete” of the Standard Specifications and these special provisions.

The work to construct concrete curb shall conform to the provisions in Section 73: “Concrete Curbs and Sidewalks” of the Standard Specifications.

**EARTHWORK AND PLACEMENT**

**Earthwork**

Areas to receive interlocking pavers shall be cleared and excavated and compacted, to the depth as shown on the plans, and in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

The grading plane shall not be more than 15 mm above the grade established by the Engineer.

A relative compaction of not less than 95 percent shall be obtained for a minimum depth of 150 mm below the grading plane.

Surplus excavated material shall become the property of the Contractor and 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.

**Placement**

Interlocking pavers shall not be placed on the project without written approval by the Engineer.

Interlocking pavers shall be placed in a 45-degree herringbone pattern over aggregate base and sand bedding course as shown on the plans.

Interlocking pavers shall be cut as required to fill gaps at edges using approved methods as recommended by the manufacturer. Units cut no smaller than one-third of a whole paver are recommended where subject to vehicular traffic.

Interlocking pavers shall be compacted into bedding sand per the manufacturer’s recommendation. After compaction, the pavers shall meet the required grade and shall not deviate more than 10 mm under a 3 m long straightedge.

Interlocking pavers shall be swept clean of sand and debris and sealed with a water based sealer as recommended by the paver manufacturer.

Sand joints shall be 3-mm with a tolerance of one millimeter.

**MEASUREMENT AND PAYMENT**

Interlocking pavers will be measured by the square meter in place in the field.

The contract price paid per square meter for interlocking pavers shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing interlocking pavers, complete in place, including earthwork, aggregate base and concrete curbing as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.59 PREPARE AND PAINT CONCRETE BARRIER SURFACES

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

All exposed surfaces of concrete barriers except for barriers directly adjacent to retaining walls that are not to be painted shall be prepared and painted in accordance with the provisions in Sections 59, "Painting," and 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 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 595BA No. 30227.

Prior to painting the concrete 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 barrier (including test panels) shall be considered as included in the contract price paid per meter for the types of concrete barriers designated in the Engineers estimate and no separate payment will be made therefore.

## 10-1.60 REINFORCEMENT

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

Attention is directed to the provisions in Section 7-1.09, "Public Safety." Before performing any bar reinforcing steel cage handling or bar reinforcing steel cage installation operation at any location that is closer than the length of the bar reinforcing steel cage being handled or installed to the edge of any traveled way open to public use, the Contractor shall submit to the Engineer, as provided in Section 5-1.02, "Plans and Working Drawings," a detail plan of the measures that will be employed to provide for the safety of traffic and the public.

All bar reinforcement in the internal key column cage at Day Street Undercrossing (Widen), Bridge No. 56-0477R including #16 spiral and the #25 bar reinforcing steel shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Bar reinforcing steel for the Type 1 retaining wall used to support the reinforced concrete pipe within the Earth Retaining Structure, Location E (RW 215-51B) will be measured and paid for as bar reinforcing steel (retaining wall).

Individual hoops, made continuous with butt welded splices, which are substituted for spiral reinforcement, shall conform to the requirements for "Ultimate Butt Splices" of these special provisions.

**ULTIMATE BUTT SPLICES**

Ultimate butt splices shall be either welded or mechanical splices, shall be used at the locations shown on the plans, and shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

**General Requirements**

The Contractor shall designate in writing an ultimate butt splicing Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for 1) the quality of all 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 ultimate butt 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.

The length of any type of ultimate mechanical butt splice shall not exceed 10 times the bar diameter of the larger bar to be spliced.

All ultimate prejob, production, and job control sample splices shall be 1) a minimum length of 1.5 meters for reinforcing bars No. 25 or smaller and 2 meters for reinforcing bars No. 29 or larger, with the splice located at mid-point, and 2) suitably identified prior to shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. Any splice that shows signs of tampering will be rejected.

A minimum of one control bar shall be removed from the same bar as, and adjacent to, all ultimate prejob, production, and job control sample splices. Control bars shall be 1) a minimum length of one meter for reinforcing bars No. 25 or smaller and 1.5 meters for reinforcing bars No. 29 or larger, and 2) suitably identified prior to shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. The portion of adjacent bar remaining in the work shall also be identified with weatherproof markings that correspond to its adjacent control bar.

Shorter length sample splice and control bars may be furnished if approved in writing by the Engineer.

Each sample splice and its associated control bar shall be identified and marked as a set. Each set shall be identified as representing a prejob, production, or job control 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 "Prejob Test Requirements for Ultimate Butt Splices" specified herein, or the bars shall be replaced in kind. These bars shall be repaired or replaced such that no splices are located in the "No Splice Zone" shown on the plans.

Section 52-1.08E, "Job Control Tests," of the Standard Specifications shall not apply.

The provisions for total slip shall not apply to any ultimate splices that are welded or that are used on hoops.

The independent qualified testing laboratory used to perform the testing of all ultimate butt sample splices and control bars 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 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/A 370M 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.

**Ultimate Butt Splice Test Criteria**

Ultimate prejob, production, and job control sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370/A 370M and California Test 670.

Ultimate prejob and production 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 has achieved at least 95 percent of the ultimate tensile strength of the control bar associated with the sample. In addition, necking of the bar shall be visibly evident 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 of each control bar shall be determined by tensile testing the bar to rupture and shall be determined for all control bars, 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.

Testing to determine the minimum tensile strength, in conformance with the provisions in the ninth paragraph of Section 52-1.08, "Splicing," of the Standard Specifications, will not be required.

**Prejob Test Requirements for Ultimate Butt Splices**

Prior to use in the work, all ultimate butt splices shall conform to the following prejob test requirements:

A. Eight prejob sample splices for each bar size of each splice type including ultimate mechanical butt splices, ultimate complete joint penetration butt welded splices, and ultimate resistance butt welded splices, that will be used in the work, shall be fabricated by the Contractor. For deformation-dependent types of couplers, 8 sample prejob splices shall also be fabricated for each reinforcing bar size and deformation pattern that will be used in the work.
B. The sample splices shall be fabricated using the same splice materials, position, operators, location, and equipment, and following the same procedures as will be used to make the splices in the work.
C. At the option of the Contractor, operator qualification tests may be performed simultaneously with the preparation of prejob sample splices.
D. If different diameters of hoops are shown on the plans, prejob sample splices, as described above, will only be required for the smallest hoop diameter. In addition, these splices shall be fabricated using the same radius as shown on the plans for these hoops.
E. Unless otherwise directed in writing by the Engineer, 4 prejob sample splices and control bar sets shall be shipped to the Transportation Laboratory and the remaining 4 sets shall be tested by the Contractor's independent qualified testing laboratory.
F. Each group of 4 sets from a prejob test shall be securely bundled together and identified by location and contract number with weatherproof markings prior to shipment. Bundles containing fewer than 4 sets will not be tested by the Transportation Laboratory, nor shall they be tested by the independent laboratory.
G. All 8 sample splices from each prejob test shall conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein.
H. Prior to performing any tensile tests on prejob test sample splices, one of the 4 samples shall be tested for, and shall conform to, the provisions for total slip. Should this sample not meet these requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. All 3 of these remaining samples tested shall conform to the aforementioned slip requirements.
I. For each bundle of 4 sets, a Prejob Test Report shall be prepared by the independent testing laboratory performing the testing. The report shall 1) be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California; 2) include, as a minimum, the following information for each set: contract number, bridge number, bar size, type of splice, length of mechanical splice, physical condition of test sample splice and control bar, any notable defects, limits of affected zone, total measured slip, location of visible necking area, ultimate strength of each splice, ultimate strength and 95 percent of this ultimate strength for each control bar, and a comparison between 95 percent of the ultimate strength of each control bar and the ultimate strength of its associated splice; and 3) be submitted to the QCM for review and approval, and then to the Engineer.
J. Test results for each bundle of 4 sets will be reported in writing to the Contractor within 10 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.

K. Should the Engineer fail to provide the test results 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 providing the test results, 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.

**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 4 sets of sample splices and control bars removed from each lot of completed splices, except when quality assurance tests are performed.

A lot of ultimate butt splices is defined as 1) 150, or fraction thereof, of the same type of ultimate mechanical butt splices used for each bar size and each bar deformation pattern that is used in the work or 2) 150, or fraction thereof, of ultimate complete joint penetration butt welded splices, or ultimate 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.

After all splices in a lot have been completed, the QCM shall notify the Engineer in writing that all couplers in this lot conform to the specifications and are ready for testing. The sample splices will either be selected by the Engineer at the job site or a fabrication facility, provided the facility is located within an 80-km radius of the jobsite.

At the option of the Contractor, sample splices for spiral reinforcement may be either 1) removed from the completed lot, or 2) prepared in the same manner as specified herein for ultimate prejob sample splices and control bars.

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 or QCM 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, in the presence of either the Engineer or the Engineer's authorized representative.

The Engineer or the Engineer's authorized representative will be at the independent qualified testing laboratory within a maximum of 5 working days after receiving written notification that the samples are at the laboratory and ready for testing. Should the Engineer or the Engineer's authorized representative fail to be at the laboratory 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 this action, 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.

A sample splice or control bar from any set will be rejected if any tamper-proof marking or seal is disturbed prior to testing.

The 4 sets from each production test shall be securely bundled together and identified with a completed sample identification card prior to 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.

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 set: contract number, bridge number, lot number and location, bar size, type of splice, length of mechanical splice, physical condition of test sample splice and control bar, any notable defects, limits of affected zone, total measured slip, location of visible necking area, ultimate strength of each splice, ultimate strength and 95 percent of this ultimate strength for each control bar, and a comparison between 95 percent of the ultimate strength of each control bar and the ultimate strength of its associated splice.

The QCM must review, approve, and forward each Production Test Report to the Engineer for review before any splices represented by the report are encased in concrete. The Engineer shall 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 prior to receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase any splices pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification 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 notification, 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.

Prior to performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the provisions for total slip. Should this sample not meet these 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 these requirements, all splices in the lot represented by this production test will be rejected.

If 3 or more sample splices from any production test conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, all splices in the lot represented by this production test will be considered acceptable.

Should only 2 sample splices from any production test conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, 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 any production test conforms to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, all splices in the lot represented by this production test will be rejected.

If a production test for any lot fails, the Contractor will be required to repair or replace all reinforcing bars from which sample splices were removed, complete in place, before the Engineer selects any additional splices from this lot for further testing.

Whenever any lot of ultimate butt splices is rejected, additional ultimate butt 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 correcting these 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. Should the Engineer not provide notification 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 this action, 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.

Production tests will not be required on any repaired splice from a lot, regardless of the type of prequalified ultimate mechanical butt splice used to make the repair.

Should an additional production test be required, the Engineer may select any repaired splice for use in the additional production test.

### 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 additional production tests, or portion thereof, performed thereafter, the Contractor shall concurrently prepare 4 additional ultimate job control sample splices along with associated control bars. These ultimate job control samples shall be prepared in the same manner as specified herein for ultimate prejob sample splices and control bars.

Each time 4 additional ultimate job control sample splices are prepared, 2 of these job control 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 "Production Test Requirements for Ultimate Butt Splices" specified herein.

The 2 remaining job control sample splice and associated control bar sets, along with the 2 remaining production sample splice and associated control bar sets shall be shipped, unless otherwise directed in writing by the Engineer, 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 prior to 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 "Production Test Requirements for Ultimate Butt Splices" specified herein.

Test results for each bundle of 4 sets will be reported in writing to the Contractor within 3 working days after receipt of the bundle by 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 any splices prior to receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase any splices pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification 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 notification, 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.

## SERVICE BUTT SPLICES

Service butt splices shall be used at the locations shown on the plans, and shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions. Service butt splices shall be either welded or

mechanical splices. Unless otherwise specified, mechanical lap splices shall be treated as service butt splices as specified herein.

**General Requirements**

The Contractor shall designate in writing a service butt splicing Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for 1) the quality of all service 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 butt 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.

All service prejob and production sample splices shall be 1) a minimum length of 1.5 meters for reinforcing bars No. 25 or smaller, and 2 meters for reinforcing bars No. 29 or larger, with the splice located at mid-point; and 2) suitably identified prior to shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. Any splice that shows signs of tampering will be rejected.

Shorter length sample splice bars may be furnished if approved in writing by the Engineer.

Each set shall be identified as representing either a prejob or production test sample splice.

Section 52-1.08E, "Job Control Tests," of the Standard Specifications shall not apply.

When joining new reinforcing bars to existing reinforcement, the prejob sample splices shall be made using only the deformation pattern of the new reinforcement to be joined.

The provisions for total slip shall not apply to any service splices that are welded.

The independent qualified testing laboratory used to perform the testing of all service butt sample splices 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 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/A 370M 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.

**Service Butt Splice Test Criteria**

Service prejob sample splices and production sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370/A 370M and California Test 670.

Service prejob sample splices and production sample splices shall develop a minimum tensile strength of not less than 550 Mpa.

**Prejob Test Requirements for Service Butt Splices**

Prior to use in the work, all service butt splices shall conform to the following prejob test requirements:

A. Four prejob sample splices for each bar size of each splice type including service mechanical butt splices, service complete joint penetration butt welded splices, and service resistance butt welded splices, that will be used in the work, shall be fabricated by the Contractor. For deformation-dependent types of couplers, 4 sample prejob splices shall also be fabricated for each reinforcing bar size and deformation pattern that will be used in the work.
B. The sample splices shall be fabricated using the same splice materials, position, operators, location, and equipment, and following the same procedures as will be used to make the splices in the work.
C. At the option of the Contractor, operator qualification tests may be performed simultaneously with the preparation of prejob sample splices.
D. Unless otherwise directed in writing by the Engineer, the 4 sample splices shall be tested by the Contractor's independent qualified testing laboratory.

E. Each group of 4 samples from a prejob test shall be securely bundled together and identified by location and contract number with weatherproof markings prior to shipment. Bundles containing fewer than 4 samples shall not be tested by the independent laboratory.
F. All 4 sample splices from each prejob test shall conform to the provisions in "Service Butt Splice Test Criteria" specified herein.
G. Prior to performing any tensile tests on prejob test sample splices, one of the 4 samples shall be tested for, and shall conform to, the provisions for total slip. Should this sample not meet these requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. All 3 of these remaining samples tested shall conform to the aforementioned slip requirements.
H. For each bundle of 4 samples, a Prejob Test Report shall be prepared by the independent testing laboratory performing the testing. The report shall 1) be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California; 2) include, as a minimum, the following information for each sample: contract number, bridge number, bar size, type of splice, length of mechanical splice, physical condition of test sample splice, any notable defects, total measured slip, and ultimate strength of each splice; and 3) be submitted to the QCM for review and approval, and then to the Engineer.

**Production Test Requirements for Service Butt Splices**

Production tests shall be performed by the Contractor's independent laboratory for all service butt splices used in the work. Unless otherwise specified, a production test shall consist of 4 sample splices prepared for each lot of completed splices. The samples shall be prepared by the Contractor in the same manner as specified herein for service prejob sample splices, and then tested by the independent laboratory in the presence of either the Engineer or the Engineer's authorized representative.

A lot of service butt splices is defined as 1) 150, or fraction thereof, of the same type of service mechanical butt splices used for each bar size and each bar deformation pattern that is used in the work or 2) 150, or fraction thereof, of service complete joint penetration butt welded splices, or service resistance butt welded splices for each bar size used in the work.

The Engineer or the Engineer's authorized representative will be at the independent qualified testing laboratory within a maximum of 5 working days after receiving written notification that the samples are at the laboratory and ready for testing. Should the Engineer or the Engineer's authorized representative fail to be at the laboratory 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 this action, 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 4 samples from each production test shall be securely bundled together and identified with a completed sample identification card prior to 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.

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 sample: contract number, bridge number, lot number and location, bar size, type of splice, length of mechanical splice, physical condition of test sample splice, any notable defects, total measured slip, ultimate strength of each splice.

The QCM must review, approve, and forward each Production Test Report to the Engineer for review before any splices represented by the report are encased in concrete. The Engineer shall 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 prior to receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase any splices pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification 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 notification, 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.

Prior to performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the provisions for total slip. Should this sample not meet the 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 slip requirements, all splices in the lot represented by this production test will be rejected.

If 3 or more sample splices from any production test conform to the provisions in "Service Butt Splice Test Criteria" specified herein, all splices in the lot represented by this production test will be considered acceptable, provided all 4 samples develop a minimum tensile strength of not less than 420 Mpa.

Should only 2 sample splices from any production test conform to the provisions in "Service Butt Splice Test Criteria" specified herein, one additional production test shall be performed on the same lot of splices. This additional production test shall consist of testing 4 samples splices that have been randomly selected by the Engineer and removed by the Contractor from the actual completed lot of splices. Should any of the 4 splices from this additional test fail to conform to these provisions or to develop a minimum tensile strength of not less than 550 Mpa, all splices in the lot represented by these production tests will be rejected.

If only one sample splice from any production test conforms to the provisions in "Service Butt Splice Test Criteria" specified herein, all splices in the lot represented by this production test will be rejected.

If a production test for any lot fails, the Contractor will be required to repair or replace all reinforcing bars from which sample splices were removed, complete in place, before the Engineer selects any additional splices from this lot for further testing.

Whenever any lot of service butt splices is rejected, additional service butt 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 correcting these 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. Should the Engineer not provide notification 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 this action, 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.

**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 conforming to the provisions of "Ultimate Butt Splices," of these special provisions 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.

Full compensation for conforming to the provisions of "Service Butt Splices," of these special provisions 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.

Full compensation for galvanizing spiral and bar reinforcing steel as specified shall be considered as included in the contract price paid per kilogram for the bar reinforcing steel (bridge) and no additional compensation will be allowed therefor.

Reinforcing steel for the structural concrete, barrier slab shall be paid for as specified in "Concrete Structures" of these special provisions.

## 10-1.61 SHOTCRETE

Shotcrete shall conform to the provisions in Section 51, "Concrete Structures," and Section 53, "Shotcrete," of the Standard Specifications and these special provisions.

Shotcrete operations shall completely encase all reinforcement and other obstructions shown on the plans. Exceptional care shall be taken to properly encase the reinforcement and other obstructions with shotcrete.

Attention is directed to the section, "Order of Work," in these special provisions regarding furnishing preconstruction shotcrete test panels.

Except for finish coats, shotcrete shall be applied by the wet-mix process only.

Finish coats, applied by the dry-mix process, may be used only when approved by the Engineer.

Shotcrete shall have a minimum compressive strength of 22.5 MPa at 28 days or as shown on the plans, whichever is greater. No shotcrete work shall be performed prior to verification by the Engineer of the required compressive strength.

Splicing of reinforcing bars No. 22 or larger in shotcrete shall be by butt splicing only.

The Contractor shall be responsible for obtaining and testing all required preconstruction and production test cores. All coring and testing shall be at the Contractor's expense and performed in the presence of the Engineer, unless otherwise directed. The Engineer shall be notified a minimum of 24 hours prior to the Contractor performing any coring or testing operations.

All cores shall be obtained and tested for compressive strength in conformance with the requirements in ASTM Designation: C 42. Cores used for determining compressive strength shall not contain any bar reinforcement or other obstructions. The testing shall be performed at an independent testing facility approved by the Engineer. A copy of the test results shall be furnished to the Engineer within 5 days following completion of testing.

All test panels 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.

**PRECONSTRUCTION REQUIREMENTS**

Prior to performing shotcrete work, the Contractor shall construct at least 2 preconstruction shotcrete test panels for each mixture being considered unless otherwise specified.

The nozzleperson shall have a minimum of 3000 hours experience as a nozzleperson on projects with a similar application.

At least 10 working days prior to constructing any shotcrete test panels, the Contractor shall submit to the Engineer for approval, a Quality Control Plan (QCP) for the proposed method of shotcrete placement. The plan shall include the following:

A. The number and qualifications of nozzlepersons available to place shotcrete, the number of nozzlepersons on-site at any time during the shotcrete placement, description of their work schedule, and the procedures for avoiding fatigue of any nozzleperson.
B. The proposed method of placing shotcrete, including, but not limited to, application rates, details of any proposed construction joints and their locations, and methods for achieving the required thickness and surface finish.
C. The procedure for curing shotcrete surfaces.
D. The description of a debris containment system, to be used during the cleaning of bar reinforcing steel and concrete and placing of shotcrete, as required to provide for public safety.

The Engineer shall have 10 working days to review and approve the QCP submittal after a complete plan has been received. No construction of shotcrete test panels shall be performed until the QCP 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 QCP, 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.

Preconstruction shotcrete test panels shall be constructed by the nozzlepersons and application crew scheduled to do the work, using equipment, materials, mixing proportions, ambient temperatures and procedures proposed for the work. The preconstruction shotcrete test panels shall conform to the following:

A. One shotcrete test panel, of the size determined by the Contractor, shall be unreinforced and shall have 3 cores taken from it and tested for compressive strength. The compressive strength shall be the average strength of the 3 cores, except that, if any core should show evidence of improper coring, the core shall be discarded and the compressive strength shall be the average strength of the remaining cores. The test panel shall be identified and submitted to the Engineer with the test results including a description of the mixture, proportions, and ambient temperature.
B. One shotcrete test panel shall have the same (1) thickness, (2) bar size and amount of bar reinforcement or other obstructions and (3) positioning of bar reinforcement or obstructions as the most heavily reinforced section of shotcrete to be placed. The test panel shall be square with the length of the sides equal to at least 3 times the thickness of the most heavily reinforced section of shotcrete to be placed, but not less than 750 mm. After a minimum 7 days of cure, the test panel shall be broken by the Contractor, in the presence of the Engineer, into pieces no larger than 250 mm in greatest dimension. The surfaces of the broken pieces shall be dense and free of laminations and sand pockets, and shall verify that the bar reinforcement or other obstructions are completely encased.
C. Both test panels shall be cured under conditions similar to the actual work.
D. At the option of the Contractor, cores to be used for determining the compressive strength may be taken from the reinforced test panel described above in lieu of making a separate unreinforced test panel as described above. The compressive strength shall be the average strength of the 3 cores, except that, if any core should show evidence of improper coring or contains bar reinforcement or other obstructions, the core shall be discarded and the compressive strength shall be the average strength of the remaining cores. If cores are taken from the reinforced test panel, the panel shall not be broken into pieces, as described above, until it has cured for a minimum of 14 days.

**PLACING**

An air blowpipe shall be used during shotcrete placement to remove rebound, overspray and other debris from the areas to receive shotcrete.

Construction joints shall be tapered, and shall conform to the provisions in Sections 51-1.13, "Bonding," of the Standard Specifications.

All overspray and rebound shall be removed prior to final set and before placement of shotcrete on adjacent surfaces.

Rebound or any other material which has already exited the nozzle shall not be reused.

Shotcrete shall be cured in conformance with the provisions of Section 90-7.03, "Curing Structures," of the Standard Specifications.

When a finish coat is to be used, all loose, uneven or excess material, glaze, and rebound shall be removed by brooming, scraping, or other means and the surface left scarified. Any surface deposits which take a final set shall be removed by abrasive blasting. Prior to placing the finish coat, the receiving surface shall be washed down with an air-water blast.

Shotcrete extending into the space shown on the plans for cast-in-place concrete shall be removed.

**TESTING AND ACCEPTANCE**

At least 3 production shotcrete test cores shall be taken from each 30 square meters or portion thereof of shotcrete placed each day. The cores shall be 76 mm in diameter. The location where cores are to be taken will be designated by the Engineer. Test cores shall be identified by the Contractor and a description of the core location and mixture, including proportions, shall be submitted to the Engineer with the test cores, immediately after coring. Cored holes shall be filled with mortar in conformance with the provisions in Section 51-1.135, "Mortar," of the Standard Specifications.

Upon receipt of the cores, the Engineer will perform a visual examination to determine acceptance, as described below. Within 48 hours after receipt, the Engineer will return the cores to the Contractor for compressive strength testing.

The compressive strength test shall be performed using the shotcrete production test cores described above. The compressive strength shall be the average strength of the 3 cores, except that, if any core should show evidence of improper coring, the core shall be discarded and the compressive strength shall be the average strength of the remaining cores.

The basis of acceptance for production shotcrete test cores shall be (1) that the core is dense and free of laminations and sand pockets, and shows that the reinforcement or other obstructions are completely encased and (2) the same as specified for test cylinders in the fourth and fifth paragraphs of Section 90-9.01, "General," of the Standard Specifications.

If any production test core shows signs of defective shotcrete as described in (1) above, the shotcrete represented by such test core 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 shotcrete placed in the work are acceptable.

The surface finish of the shotcrete shall conform to the provisions of Section 51-1.18, "Surface Finishes," of the Standard Specifications.

**MEASUREMENT AND PAYMENT**

Full compensation for the Quality Control Plan, constructing and breaking test panels, furnishing and testing cores and patching cored holes shall be considered as included in the contract price paid per cubic meter for shotcrete and no additional compensation will be allowed therefor.

## 10-1.62 WATERPROOFING

Waterproofing shall conform to the provisions in Section 54, "Waterproofing," of the Standard Specifications and these special provisions.

Membrane waterproofing shall be applied to isolation casings in the same manner provided for waterproofing concrete surfaces.

The exposed surfaces of the membrane waterproofing applied to isolation casings shall be of uniform height above ground without unsightly bulges, depressions or other imperfections.

At the option of the Contractor, a preformed membrane waterproofing system may be furnished and applied in lieu of the asphalt membrane waterproofing specified above. Preformed membrane waterproofing shall conform to these special provisions.

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 preformed membrane sheet. The Certificate of Compliance shall include the following information: (1) type of preformed membrane sheet, and (2) the conditioner or primer application rates.

The preformed membrane waterproofing system shall consist of an adhesive, conditioner or primer applied to a prepared surface; a preformed membrane sheet of rubberized asphalt or polymer modified bitumen; mastic or tape for sealing the edges of the sheet; and a protective covering over the sheet held by an adhesive.

The preformed membrane sheet shall be either permanently applied to a polyethylene film or reinforced with a polypropylene mesh fabric, polyester/polypropylene fabric or a fiberglass mesh fabric. The membrane sheet shall conform to the following requirements:

| Property | Test | Requirement | |
|---|---|---|---|
| | | Polyethylene Film | Fabric Reinforced |
| Tensile Strength (Minimum)(1) | ASTM D 882 (2) | 3.5N/mm (3) | 3.5N/mm (3) |
| Percent Elongation at break (Minimum) (4) | ASTM D 882 (2) | 150 percent (3) | 25 percent (3) |
| Pliability | ASTM D 146 (5) | No cracks | No cracks |
| Thickness (Minimum) (6) | ------ | 1.5 mm | 1.5 mm |
| Rubberized Asphalt Softening Point (Minimum) | AASHTO T 53 | 74°C | 74°C |
| Polymer Modified Bitumen Softening Point (Minimum) | AASHTO T 53 | 99°C | 99°C |

Notes:
(1) Breaking factor in machine direction.
(2) Method A, average 5 samples.
(3) At 23°C ± 2°C
(4) Machine direction.
(5) 180-degree bend over a 25-mm mandrel at -120°C
(6) Total thickness of preformed membrane sheet and polyethylene film or fabric reinforcement.

Adhesives, conditioners, primers, mastics and sealing tapes shall be manufactured for use with the respective preformed membrane sheet materials and shall be applied according to the manufacturer's recommendations.

The protective covering shall be 3-mm minimum thickness hardboard or other material that furnishes equivalent protection. Backfill material and equipment shall not cut, scratch, depress or cause any other damage to the preformed membrane.

Surfaces designated to receive preformed membrane waterproofing shall be thoroughly cleaned of dirt, dust, loose or unsound concrete, and other extraneous material and shall be free from fins, sharp edges, and protrusions that would, in the opinion of the Engineer, puncture or otherwise damage the membrane. Sharp corners to be covered shall be rounded (outside) or chamfered (inside).

Surfaces shall be dry when components of the preformed membrane waterproofing system are applied.

Preformed membrane waterproofing shall not be applied to any surface until the Contractor is prepared to follow its application with the placing of the protective covering and backfill within a sufficiently short time that the membrane will not be damaged by workers or equipment, exposure to weathering, or from any other cause. Damaged membrane or protective covering shall be repaired or replaced by the Contractor at the Contractor's expense.

All projecting pipe, conduits, sleeves or other facilities passing through the preformed membrane waterproofing shall be flashed with prefabricated or field-fabricated boots, fitted coverings or other devices as necessary to provide watertight construction.

All conditioner or primers shall be thoroughly mixed and continuously agitated during application. Conditioner, primers or adhesive shall be allowed to dry to a tack free condition prior to placing membrane sheets.

The surfaces shall be recoated if membrane sheets are not placed over primer, conditioner or adhesive within the time recommended by the manufacturer.

The preformed membrane sheet shall not be applied in wet or foggy weather, nor when the ambient temperature is below 4°C.

Preformed membrane material shall be placed starting at the bottom and lapped by a minimum of 150 mm at splices and at repairs to holes or tears.

Exposed edges of membrane sheets shall have a trowelled bead of manufacturer's recommended mastic or sealing tape applied after the membrane is placed.

The surface of the preformed membrane shall be cleaned free of dirt and other deleterious material before the protective covering is placed.

The protective covering shall be placed on a coating of adhesive of a type recommended by the manufacturer. The adhesive shall be applied at a rate sufficient to hold the protective covering in position until the backfill is placed.

Preformed membrane waterproofing will be measured and paid for by the square meter as asphalt membrane waterproofing.

### 10-1.63 TREAT BRIDGE DECKS

Treating bridge decks shall consist of test sealing, and furnishing and applying a penetrating sealer as shown on the plans and as specified in these special provisions.

The existing decks of the following bridges shall be treated:

Down Street Overhead, Bridge No. 56-0398
Spruce Street Undercrossing, Bridge No. 56-0399
Route 60/91/215 Separation, Bridge No. 56-0402
Chicago Avenue Overhead, Bridge No. 56-0403

Prior to the start of deck treatment work, the Contractor shall submit for approval by the Engineer, a program for public safety associated with the use of methacrylate resin. The program shall identify materials, equipment, and methods to be used. The Contractor shall not perform deck treatment work, other than that specifically authorized in writing by the Engineer, until the program has been approved.

If the measures being taken by the Contractor are inadequate to provide for public safety associated with the use of methacrylate resin, the Engineer will direct the Contractor to revise the operations and the public safety program. Directions for revisions will be in writing and will specify the items in which the Contractor's program is inadequate. No further deck treatment shall be performed until public safety measures are adequate, and a revised program for public safety has been approved.

The Engineer will notify the Contractor of the approval or rejection of any submitted or revised program for public safety associated with the use of methacrylate resin within 10 working days of receipt of the program.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised program for public safety associated with the use of methacrylate resin, nor for any delays to the work due to the Contractor's failure to submit an acceptable program for public safety associated with the use of methacrylate resin. 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.

**Materials**

The material used for treating the concrete shall be a low odor, high molecular weight methacrylate resin. Prior to 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 | TEST METHOD | REQUIREMENT |
|---|---|---|
| * Viscosity Pa·s, maximum, (Brookfield RVT with UL adaptor, 50 RPM at 25°C) | ASTM D 2196 | 0.025 |
| * Specific Gravity minimum, at 25°C | ASTM D 1475 | 0.90 |
| * Flash Point °C, minimum | ASTM D 3278 | 82 |
| * Vapor Pressure mm Hg, maximum, at 25°C | ASTM D 323 | 1.0 |
| Tack-free Time minutes, maximum at 25°C | California Test 551 | 400 |
| PCC Saturated Surface-Dry Bond Strength MPa, minimum at 24 hours and 21±1°C | California Test 551 | 3.5 |
| * Test shall be performed prior to adding initiator. | | |

A Material Safety Data Sheet shall be furnished prior to use for each shipment of high molecular weight methacrylate resin.

The promoter and initiator, if supplied separately from the resin, shall not be mixed directly with each other. Containers of promoters and initiators shall not be stored together in a manner that will allow leakage or spillage from one to contact the containers or material of the other.

**Testing**

The Contractor shall allow 14 working days for sampling and testing by the Engineer of the high molecular weight methacrylate resin prior to proposed use.

The Contractor shall treat a test area within the project limits of approximately 50 $m^2$ at a location approved by the Engineer. Conditions during the test treatment shall be similar to those expected on the deck. Equipment used in the test shall be similar to those used for the deck treating operations. If the test area is on the traveled way, traffic shall not be allowed on the treated test area until (1) the treated surface is tack free (non-oily), (2) the sand cover adheres sufficiently to resist brushing by hand, and (3) the coefficient of friction of the deck is at least 0.35 when tested in conformance with the requirements in California Test 342.

Should the above requirements for traffic use not be met, the Contractor shall suspend treating of bridge decks until another test area is treated and complies with the requirements.

**Construction**

Prior to treating bridge decks, the deck surface shall be cleaned as specified in "Clean Bridge Deck" of these special provisions.

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.

The relative humidity shall be less than 90 percent at time of treatment.

A compatible promoter/initiator system shall be capable of providing a resin gel time of not less than 40 minutes nor more than 1.5 hours at the temperature of application. Gel time shall be adjusted to compensate for the changes in temperature throughout treatment application.

The quantity of resin mixed with promoter and initiator shall be limited to 20 L at a time for manual application.

Machine application of the resin shall be performed by using a two-part resin system using 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. Hand held spray apparatus shall not be used.

The Contractor shall apply methacrylate resin only to the specified area. Concrete barriers, 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 prepared area shall be dry and the surface temperature shall not exceed 38°C when the resin is applied. The rate of application of promoted/initiated resin shall be approximately 2.5 square meter per liter; the exact rate shall be determined by the Engineer.

The deck surfaces to be treated shall be flooded with resin, allowing penetration into the concrete and filling of all cracks. The treatment 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.

After the resin has been applied, at least 20 minutes shall elapse before applying sand. The sand shall be commercial quality dry blast sand. Ninety-five percent of the sand shall pass the 2.36-mm sieve, and 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.

Excess sand shall be removed from the deck surface by vacuuming or sweeping prior to opening to traffic.

Traffic shall not be allowed on the treated area until (1) the treated surface is tack free (non-oily), (2) the sand cover adheres sufficiently to resist brushing by hand, and (3) the coefficient of friction of the deck is at least 0.35 when tested in conformance with the requirements in California Test 342.

**Measurement and Payment**

Treating bridge deck surfaces will be measured by the square meter based on plan dimensions and will be paid for as treat bridge deck. Furnishing the high molecular weight methacrylate resin will be measured by the liter of mixed material actually placed and will be paid for as furnish bridge deck treatment material. No payment will be made for material wasted or not used in the work.

The contract price paid per square meter for treat bridge deck shall include full compensation for furnishing all labor, materials, (including sand, but excluding treatment material), tools, equipment, and incidentals, and for doing all the work

involved in test sealing, applying treatment material and removing excess sand, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per liter for furnish bridge deck treatment material (low odor) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals necessary to furnish the bridge deck treatment material to the site of the work, ready for application, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

Full compensation for compliance with the requirements for the program for public safety associated with use of methacrylate resin, shall be considered as included in the contract prices paid for the items of work involving treating bridge decks, and no additional compensation will be allowed therefor.

## 10-1.64 STEEL STRUCTURES

Construction of steel structures shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

### GENERAL

Attention is directed to "Welding" in Section 8, "Materials," of these special provisions.

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 or mm x thread pitch)) | ASTM Designation: A 325 (Nominal bolt diameter (inch)) |
| 13 or 12.70, M12, M12 x 1.75 | 1/2 |
| 16 or 15.88, M16, M16 x 2 | 5/8 |
| 19 or 19.05, M20, M20 x 2.5 | 3/4 |
| 22 or 22.22, M22, M22 x 2.5 | 7/8 |
| 24, 25, or 25.40, M24, M24 x 3 | 1 |
| 29 or 28.58, M27, M24 x 3 | 1 1/8 |
| 32 or 31.75, M30, M30 x 3.5 | 1 1/4 |
| 38 or 38.10, M36, M36 x 4 | 1 1/2 |

### MATERIALS

### 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.

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 |

(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance shall be plus or minus 45 degrees.
(b) Applicable only to connections in which all material within grip of the bolt is steel.
(c) When bolt length exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.

6. Turn the nut to achieve the applicable minimum bolt tension value listed in Table C. After reaching this tension, record the moving torque, in foot-pounds, required to turn the nut, and also record the corresponding bolt tension value in pounds. Torque shall be measured with the nut in motion. Calculate the value, T (in ft-lbs), where T=[(the measured tension in pounds) x (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 |

7. Turn the nut further to increase bolt tension until the rotation listed in Table B is reached. The rotation is measured from the heavy reference line made on the face plate after the bolt was snug-tight. Record this bolt tension.
8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Long Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque (Step 6) shall be less than or equal to the calculated value, T (Step 6), 2) the bolt tension measured in Step 7 shall be

greater than or equal to the applicable turn test tension value listed in Table D, 3) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 4) the bolt does not shear from torsion or fail during the test, and 5) the assembly does not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head is expected and will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

Table D

| Turn Test Tension Values | |
|---|---|
| Bolt Diameter (inches) | Turn Test Tension (kips) |
| 1/2 | 14 |
| 5/8 | 22 |
| 3/4 | 32 |
| 7/8 | 45 |
| 1 | 59 |
| 1 1/8 | 64 |
| 1 1/4 | 82 |
| 1 3/8 | 98 |
| 1 1/2 | 118 |

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of short bolts. Fasteners are considered to be short bolts when full nut thread engagement cannot be achieved when installed in a bolt tension measuring device:

A. Short Bolt Test Equipment:

1. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Short Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
2. Spud wrench or equivalent.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: 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.<br>(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.

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.

**WELDING**

Table 2.2 of ANSI/ AASHTO/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.

**10-1.65 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 and these special provisions.

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 and in the special provisions.

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 contract number, sign structure type and reference as shown on the contract plans, District-County-Route-Kilometer Post, and contract number.

The Engineer shall have 20 working 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.

One top nut, one leveling nut, and 2 washers shall be provided for the upper threaded portion of each anchor bolt.

Surfaces of base plates which are to come in contact with concrete, grout, or washers and leveling nuts shall be flat to within 3 mm tolerance in 305 mm, and to within 5 mm tolerance overall. Faying surfaces of plates in high-strength bolted connections including flange surfaces of field splices, chord joints, and frame junctures, and contact surfaces of plates used for breakaway slip base assemblies shall be flat to within 2 mm tolerance in 305 mm, and within 3 mm tolerance overall.

Thermally cut holes made in tubular members of sign supports, other than holes in base and flange plates, shall initially be made a minimum of 2 mm undersized, and then be mechanically enlarged by reaming or grinding to the final required size and shape. All edges shall have a surface roughness of not greater than 6.35 µm. Round holes may be drilled to the exact final diameter. No holes shall be made in members unless the holes are shown on the plans or are approved in writing by the Engineer.

Steel members used for overhead sign structures shall receive nondestructive testing (NDT) in conformance with AWS D1.1 and the following:

A.

| Weld Location | Weld Type | Minimum Required NDT |
|---|---|---|
| Welds for butt joint welds in tubular sections, nontubular sections, and posts | CJP groove weld with backing ring | 100% UT or RT |
| Longitudinal seam welds* | PJP groove weld | 25% MT |
| | CJP groove weld | 100% UT or RT |
| Welds for base plate, flange plate, or end cap to post or mast arm | CJP groove weld | 25% UT or RT |
| | Fillet weld | 25% MT |
| * Longitudinal seam welds shall have 60% minimum penetration, except that within 150 mm of any circumferential weld, longitudinal seam welds shall be CJP groove welds. | | |

B. A written procedure approved by the engineer shall be used when performing UT on material less than 8 mm thick. Contoured shoes shall be used when performing UT on round tubular sections under 1270 mm in diameter.

C. When less than 100 percent of a weld is specified for NDT, and if defects are found during this inspection, additional NDT shall be performed. This additional NDT shall be performed on 25 percent of the total weld for all similar welds, as determined by the Engineer, produced for sign structures in the project. If any portion of the additional weld inspected is found defective, 100 percent of all similar welds produced for sign structures in the project, as determined by the Engineer, shall be tested.

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.

### 10-1.66 ROADSIDE SIGNS

Roadside signs shall be 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.

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 with creosote, creosote coal tar solution, creosote petroleum solution (50-50), pentachlorophenol in hydrocarbon solvent, copper naphthenate, ammoniacal copper arsenate, or ammoniacal copper zinc arsenate. In addition to the preservatives listed above, Southern yellow pine may also be pressure treated with chromated copper arsenate. When other than one of the creosote processes is used, blocks shall have a minimum retention of 6.4 $kg/m^3$, and need not be incised.

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.

**10-1.67 INSTALL SIGN PANEL ON EXISTING FRAME**

Sign panels shall be installed on existing frames at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-1.06, "Sign Panels and Fastening Hardware," of the Standard Specifications and these special provisions.

Existing sign panels, as shown on the plans, shall be removed and disposed of as provided in Section 15, "Existing Highway Facilities," of the Standard Specifications.

Installing sign panels on existing frames will be measured by the square meter and the quantity to be paid for will be the total area, in square meters, of sign panels installed in place.

The contract price paid per square meter for install sign panel on existing frame shall include full compensation for furnishing all labor, materials (except State-furnished sign panels and mounting bolts), tools, equipment, and incidentals, and for doing all the work involved in installing sign panels on existing frames, complete in place (including removing and disposing of existing sign panels), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**10-1.68 CLEAN AND PAINT STRUCTURAL STEEL**

Exposed new metal surfaces, except where galvanized, shall be cleaned and painted in conformance with the provisions in Section 59-2, "Painting Structural Steel," 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 "SSPC: The Society for Protective Coatings" specifications or qualification procedures which are applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
C. Proposed methods and equipment to be used for any paint application.
D. Proof of each of any required certifications, SSPC-QP 1, SSPC-QP 2, 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.

The Engineer shall have 2 weeks 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 reviewed 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.

**CLEANING**

Exposed new metal surfaces shall be dry blast cleaned in conformance with the requirements in Surface Preparation Specification No. 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 shall conform to the requirements in Abrasive Specification No. 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings" and shall not contain hazardous material. Mineral and slag abrasives shall comply with the requirements for Class A, Grade 2 to 3 as defined therein.

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.

**PAINTING**

Blast cleaned surfaces shall receive a single undercoat, and a final coat where specified, consisting of a waterborne inorganic zinc coating conforming to the requirements in AASHTO Designation M 300, Type II, except that: 1) the first 3 sentences of Section 4.7, "Primer Field Performance Requirements," and the entire Section 4.7.1 shall not apply, and 2) zinc dust shall be Type II in conformance with the requirements in ASTM Designation: D 520. The inorganic zinc coating shall be listed on 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.

Inorganic zinc coating shall not be applied when the atmospheric or surface temperature is less than 7°C or more than 29°C, nor when the relative humidity exceeds 85 percent.

The single undercoat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 4 hours after blast cleaning.

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.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted 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 inorganic zinc coating shall be tested for adhesion and cure. The locations of the tests will be determined by the Engineer. The sequence of the testing operations shall be determined by the Contractor. The testing for adhesion and cure 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 and to test the inorganic zinc coating cure. The inorganic zinc coating shall pass the following tests:

**Adhesion**

The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured at no more than 6 locations per bearing and 6 locations perjoint seal assembly using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Contractor, at the Contractor's expense, shall: (1) verify compliance with the adhesion requirements, (2) furnish test results to the Engineer, and (3) repair the coating after testing.

**Cure**

The inorganic zinc coating, when properly cured, 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.

The final coat of inorganic zinc coating shall be applied after testing for adhesion, testing for cure, and completion of all operations that may damage or discolor the steel surface, including correction of runs, sags, thin and excessively thick areas in the paint film, skips and holidays, dry spray, or areas of non-uniform appearance.

The area to receive the final coat of inorganic zinc coating shall be lightly roughened by abrasive blasting using an abrasive no larger than 600 µm. Abrasive blasting shall remove no more than 15 µm of inorganic zinc. The surface to be lightly roughened shall be free from moisture, dust, grease or deleterious material. The undercoated areas of the under surfaces of bottom flanges shall be protected from abrasive blast cleaning operations.

The final coat of inorganic zinc coating shall be applied to the required dry film thickness in one uniform application within 24 hours after light roughening. The dry film thickness of the final coat shall be not less than 25 µm nor more than 75 µm.

Except at bolted connections, the total dry film thickness of all applications of the single undercoat and final coat of inorganic zinc coating shall be not less than 125 µm nor more than 275 µm.

Finish coats will not be required.

## 10-1.681 PREPARE AND PAINT CONCRETE SURFACES

This work shall consist of preparing and painting concrete surfaces, where shown on the plans, and in conformance with these special provisions.

### Materials

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 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 paint shall be formulated and applied so that the color of the coated concrete matches Federal Standard 595B No. 30227.

### Test Panel

A test panel at least 2.0 m x 2.0 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural texture or painting concrete. The test panel shall be representative of paint concrete surfaces and the architechtural surface texture, as shown on the plans. The test panel shall be constructed, finished, and painted with the materials, tools, equipment, personnel, and methods to be used in constructing, finishing, and painting the concrete surfaces. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture, and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard for comparison in determining acceptability of split face running bond architectural texture and painting for concrete surfaces.

The Contractor shall submit to the Engineer, not less than one week prior to initial application of the concrete coating to the test panel, a copy of the manufacturer's recommendations and written application instructions.

### Surface Preparation

New concrete surfaces to be painted shall be cured in conformance with the provisions in Section 90-7.03, "Curing Structures," of the Standard Specifications.

Concrete surfaces to be painted shall be prepared in conformance with the requirements of SSPC-SP 13, "Surface Preparation of Concrete," of the Structural Steel Painting Council. After concrete surface preparation is complete, the Contractor shall clean all concrete surfaces to be painted by water rinsing as defined in Section 59-1.03, "Application," of the Standard Specifications.

### Painting Concrete

The coating shall be applied per the manufacturer's recommendations and in conformance with the requirements of SSPC-SP 11,"Guide for Coating Concrete," of the Structural Steel Painting Council.

Any damaged areas shall be repaired in the same manner as the original surface preparation and paint application.

### Measurement and Payment

Concrete surfaces to be prepared and painted will be measured by the square meter. Measurement will be determined along the surface of the actual areas painted.

The contract price paid per square meter for prepare and paint concrete surfaces shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing of and applying paint to concrete surfaces, complete in place, including construction of test panels and repairing damaged areas, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.682 PREPARING AND PAINTING CONCRETE BARRIER SURFACES

All exposed surfaces of median concrete barriers, including median barriers on bridge decks, shall be prepared and painted in conformance 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.

Prior to painting the concrete 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 barrier, including up to 5 test panels, shall be considered as included in the contract price paid per meter for the types of concrete barriers designated in the Engineers estimate and no separate payment will be made therefore.

**10-1.69 ALTERNATIVE PIPE**

Alternative pipe culverts shall conform to the provisions in Section 62, "Alternative Culverts," of the Standard Specifications and these special provisions.

Attention is directed to "Reinforced Concrete Pipe," and "Corrugated Steel Pipe" elsewhere in these special provisions.

**10-1.691 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.

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 m or one half of the outside diameter of the pipe.

Joints for culvert pipes shall conform to the plans or specifications for standard joints.

When reinforced concrete pipe is installed in conformance with the details shown on Revised 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, 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 excavation and backfill below the planned elevation of the bottom of the bedding will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

The Outer Bedding shown on Revised Standard Plan A62DA shall not be compacted prior to placement of the pipe.

**10-1.692 CORRUGATED STEELPIPE**

Corrugated steel pipe culverts shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications and these special provisions.

Asphaltic mastic coating or polymeric sheet coating substituted for bituminous coating shall be placed on the outside and inside surfaces of the pipe.

Corrugated steel pipe shall be fabricated from zinc-coated steel sheet.

**10-1.70 EDGE DRAIN**

Edge drains shall conform to the provisions in Section 68-3, "Edge Drains," of the Standard Specifications and these special provisions.

Outlet and vent covers will not be required.

**10-1.701 OVERSIDE DRAIN**

Steel entrance tapers, slip joints, metal pipe downdrain anchor assemblies, and corrugated steel pipe downdrains shall conform to the provisions in Section 69, "Overside Drains," of the Standard Specifications and these special provisions.

Steel entrance tapers and pipe downdrains shall be fabricated from zinc-coated steel sheet.

### 10-1.702 CABLE ANCHORAGE SYSTEM

Cable anchorage systems for pipe downdrains shall be installed as shown on the plans and in conformance with the provisions in Section 69-1.02C, "Anchor Assemblies," of the Standard Specifications and these special provisions.

Cables, welded steel eyes, steel rods, turnbuckles, thimbles, cable clamps, and anchor plates shall conform to the provisions for similar materials in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications.

Steel pipes shall conform to the provisions for similar materials in Section 56–1.02E, "Pipe Posts," of the Standard Specifications.

### 10-1.703 OVERSIDE DRAINS

Overside drains consisting of corrugated steel pipe, steel tapers, steel conduits, and drainage inlets shall conform to the provisions in Section 69, "Overside Drains," of the Standard Specifications and these special provisions.

Drainage inlets, steel grates, and incidental metal parts shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

Alternative concrete box drainage inlets with steel grates may be used, subject to the following requirements:

A. Precast concrete boxes shall conform to the provisions in Section 70-1.02H, "Precast Concrete Structures," of the Standard Specifications.
B. The concrete compressive strength requirements shall not apply. When reinforcement is used for construction purposes, the amount shall be determined by the Contractor.

Downdrains, in connection with concrete slope paving at bridges, consisting of corrugated steel pipe, including tapers, conduit, connecting bands, and accessories will be measured by the meter for the actual length placed. The downdrains will be measured from the beginning of the corrugated steel pipe to the end of the downdrain, which may consist of corrugated steel pipe or steel conduit.

Downdrains in connection with concrete slope paving at bridges will be paid for at the contract price per meter for 200 mm corrugated steel pipe downdrain (1.63-mm thick).

Drainage inlets (slope paving) including grates, complete in place, will be measured and paid for as units in the same manner as provided for tapered inlets in Section 69 of the Standard Specifications.

### 10-1.71 MISCELLANEOUS FACILITIES

Grated line drain, corrugated steel pipe risers and alternatuve flared end sections shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

Miscellaneous drainage facilities are listed on the plans for the various types of drainage work involved. This work includes the installation of welded steel pipe, debris rack cage, precast concrete pipe inlet, and precast concrete pipe manhole. Drainage details for this work are shown on the plans.

### 10-1.72 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 vinylester 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 withstand load testing conforming to the requirements in Federal Specification RR-F-621E for "Frames, Covers, Gratings, Steps, Manhole Sump and Catch Basin." 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.

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, except that minor concrete shall contain not less than 300 kg of cement 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, prior to 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.

## 10-1.73 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

### Concrete pipe supports

Concrete pipe supports shall consist of either a precast or cast-in-place concrete pipe cradle, galvanized steel pipe clamp, 2 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 commercial quality concrete not less than 325 kg of portland cement per cubic meter, commercial quality wire mesh and reinforcement. The concrete pipe supports and pipe stops shall be moist cured for not less than 3 days.

### Epoxy adhesive

Epoxy adhesive shall conform to the provisions in Section 95-1, "General," of the Standard Specifications and at the option of the Contractor, shall conform to the provisions in Section 95-2.03, "Epoxy Resin Adhesive for Bonding New Concrete to Old Concrete," or in Section 95-2.04, "Rapid Set Epoxy Adhesive for Pavement Markers," or in Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers," of the Standard Specifications.

## 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 other fittings, casing, concrete supports, 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.

## 10-1.731 WELDED STEEL PIPE CASING (BRIDGE)(NATURAL GAS)

Welded steel pipe casings for natural gas pipelines through bridges and under approach slabs shall be furnished and installed of the size shown, and shall conform to the details shown on the plans, the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

Attention is directed to "Welding" of these special provisions.

The Contractor shall furnish and install the welded steel pipe casings for natural gas pipelines at the locations and of the sizes shown in the following table:

| Bridge Name (Bridge Number) | Contractor Furnished and Installed Welded Steel Pipe Casing (Bridge)(Natural Gas) Outside Diameter x Minimum Thickness |
|---|---|
| Blaine Street Overcrossing (Replace) (Bridge No. 56-0395) | 508 mm x 9.525 mm |
| Box Springs Road Overcrossing (Replace) (Bridge No. 56-0804) | 406 mm x 7.93 mm |

Unless otherwise shown on the plans, casings shall be extended 1.5 m beyond the approach slab or 1.5 m beyond the abutment where no approach slab occurs.

The Gas Company (gas utility) shall furnish, install and test the natural gas pipeline carrier lines, including neoprene slip seals and vents for the welded steel pipe casings (bridge)(natural gas), at the following locations and of the sizes shown in the following table:

| Bridge Name (Bridge Number) | Gas Utility Furnished, Installed and Tested Natural Gas Carrier Pipe Outside Diameter x Minimum Thickness |
|---|---|
| Blaine Street Overcrossing (Replace) (Bridge No. 56-0395) | 273 mm x 6.350 mm |
| Box Springs Road Overcrossing (Replace) (Bridge No. 56-0804) | 219 mm x 5.563mm |

Installation and testing of the following gas utility facilities will require coordination with the Contractor's operations. The Contractor shall make necessary arrangements with the gas utility company, through the Engineer, and shall submit a schedule of work, verified by a representative of the gas utility company, to the Engineer. The schedule of work shall provide not less than the-following number of working calendar days, as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications for the gas utility company to complete their work.

| Utility | Location | Calendar Days |
|---|---|---|
| The Gas Company Install and test 273mm natural gas carrier pipeline | Blaine Street Overcrossing (Replace) (Bridge No. 56-0395) | 21 days |
| The Gas Company Install and test 219 mm natural gas carrier pipeline | Box Springs Road Overcrossing (Replace) (Bridge No. 56-0804) | 14 days |

**WORKING DRAWINGS**

Working drawings for temporary support of casing pipe at the abutments shall be submitted for approval to the Office of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

Approval by the Engineer of the working drawings for temporary support of casing pipe will be contingent upon the drawings being satisfactory to the gas utility company involved.

## MATERIALS

### General

Wherever reference is made to the following American Petroleum Institute (API) specifications in the Standard Specifications, on the project plans, or in these special provisions, the year of adoption for these specifications shall be as follows:

| API Code | Year of Adoption |
|---|---|
| API 5L | 2000 |

All requirements of the code listed above shall apply unless specified otherwise in the Standard Specifications, on the plans, or in these special provisions.

### Casing pipe

Pipe for natural gas pipeline casings shall conform to the requirements in API Specification 5L: Grade B, Grade X42, or Grade X52 of manufactured steel pipe. Natural gas pipeline casing shall be bare steel pipe.

### Manufactured Steel Pipe

All manufactured steel pipe shall conform to the requirements in API Specification 5L. Manufactured steel pipe is defined as pipe produced at a permanent facility where an automatic welding process, electric resistance welder, or seamless pipe operation is used; where this steel pipe can be produced in lengths at least 8 m long without a circumferential splice; and where this manufacturing can be done on a daily basis. Manufactured steel pipe is not a specifically engineered product. (i.e. Manufactured steel pipe is an off-the-shelf item.)

### Pipe Wrapping Tape

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.

### Concrete Supports

Each concrete support shall consist of pre-cast or cast-in-place concrete, bar reinforcing steel or wire fabric, and where shown on the plans, stainless steel pipe protective structures.

Concrete supports shall conform to the dimensions shown on the plans, and shall be constructed of commercial quality concrete with a minimum compressive strength not less than 27.6 MPa., and commercial quality wire fabric. The concrete shall be moist cured for not less than 3 days.

All natural gas pipeline casing support components and hardware including nuts and bolts shall be galvanized or stainless steel.

J-type steel anchor bolts, bent steel straps with slotted holes, steel pipe straps with slotted holes, pipe clamps, nuts, washers, pipe protective structures, protection pads and other fittings shall be suitable for the type and size of the natural gas pipeline casing shown on the plans, and shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Protection pads shall be neoprene pads. Neoprene pads shall be furnished and bonded to the concrete supports and shall conform to the provisions of Section 51-1.14, "Waterstops," of the Standard Specifications.

### Epoxy Adhesive

Epoxy adhesive shall conform to the provisions in Section 95-1, "General," of the Standard Specifications and, at the option of the Contractor, shall conform to the provisions in Section 95-2.03, "Epoxy Resin Adhesive for Bonding New Concrete to Old Concrete," or in Section 95-2.04, "Rapid Set Epoxy Adhesive for Pavement Markers," or in Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers," of the Standard Specifications.

## INSTALLATION

The Contractor shall notify the Engineer in writing, at least 30 calendar days in advance of the proposed dates that the work will be ready for installation of accessories or natural gas pipeline casing. The Engineer will, in turn, notify the gas utility.

The Engineer will arrange for a gas company engineer or gas company designated representative to be on site prior to and during placement of the natural gas pipeline casing through the bridges and under approach slabs.

Natural gas line casings 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 Portland Cement 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 the casings through abutments shall not be filled until the prestressing has been completed.

Openings for casings through bridge superstructure concrete shall either be formed or shall consist of pipe sleeves.

#### Cleaning and Closing of Pipe

The interior of the natural gas pipeline casing shall be cleaned of any debris or obstructions before and after installation. Openings shall be capped or plugged as soon as the pipe casing 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.

#### Field Welding

Field welding of steel casing is defined as welding performed after the certificate of compliance has been furnished by the manufacturer and shall conform to the requirements in AWS D1.1.

### MEASUREMENT AND PAYMENT

Measurement and payment for welded steel pipe casing (natural gas) for each size listed in the Engineer's 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 concrete supports, anchor bolts, straps, pipe clamps, protection pads, pipe protective structures, if required, and other fittings, mortar and building paper, epoxy adhesives, and casings shall be considered as included in the contract prices paid per meter for the sizes of welded steel pipe casing (natural gas) involved and no additional compensation will be allowed therefor.

## 10-1.74 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 type fabric, Type B.

## 10-1.741 SLOPE PAVING

Slopes under the ends of bridges at Box Springs Overhead Truck Connector, Bridge No. 56-0805G; Box Springs Overhead Right Bridge (Replace), Bridge No. 56-0082R; Day Street Undercrossing (Widen), Bridge No. 56-0477R; and Eastbound 60 Truck Connector, Bridge No. 56-0-806G, 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.

## 10-1.742 SLOPE PAVING (ROCK BLANKET)

Slopes under the bridge ends at Box Springs Road Overcrossing (Replace), Bridge No. 56-0804, shall be paved in conformance with the details shown on the plans, the provisions in Section 72-6, "Slope Paving," of the Standard Specifications and these special provisions.

#### Test Panels

Four weeks prior to placing the permanent slope paving, the Contractor shall construct a test panel at least 1.2 meters by 1.8 meters 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 at the same slope, 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.

#### Materials

Rocks for the slope paving (rock blanket) shall measure between 125 mm and 175 mm in the largest dimension and conform to the requirements in "Rock Blanket (Type 1)" of these special provisions.

The Contractor shall submit a sample of rocks for approval by the Engineer a minimum of 30 working days prior to placing the rock blanket surface for slope paving.

Slope paving (rock blanket) shall be colored by mixing a fine ground, synthetic mineral oxide, specifically manufactured for coloring concrete, into the concrete and mortar mix. The coloring agent shall be uniformly and homogeneously mixed with the concrete and mortar. The color of the completed slope paving (rock blanket) concrete and mortar bed after curing and when air dry shall be reddish brown conforming closely to Color No. 30227 of the Federal Standard No. 595B.

The rocks shall be placed on a mortar bed. The cement mortar bedding shall conform to the following:

Portland cement shall conform to the provisions in Section 90-2.01, "Portland Cement," of the Standard Specifications.

Hydrated lime shall conform to the requirements in 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 the rocksshall consist, by volume, of one part portland cement, 0 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. 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 premixed mortar or grout 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.

**Installation**

Rocks shall be washed clean before use.

The top surface of theconcrete base to receive mortar bed shall be prepared in conformance with the provisions for horizontal construction joints in Section 51-1.13, "Bonding," of the Standard Specifications.

The concrete base shall be cured by the water method for at least 2 days.

Rocks shall be laid and embedded in a mortar bed approximately 75 mm thick and fully sealed. Rocks shall be shoved tight so that the mortar is flushed into the joints. Excess mortar shall be trimmed mid depth of the rocks and removed.

Each rock shall be positioned to expose the rounded, smooth, aesthetically best-appearing side of the rock. The overall appearance of the slope paving (rock blanket) shall be uniform and aesthetically pleasing.

After completion of mortaring rocks on any 3-meter strip, no person or load shall be permitted on the surface for a period of at least 24 hours and longer if so ordered by the Engineer.

The slope paving (rock blanket) concrete and mortar shall be cured in conformance with the provision in Section 90-7.01A, "Water Method," of the Standard Specifications.

Surfaces of completed rock blanket, concrete, and other such materials exposed to view shall be protected from spillage, splatters and other deposits of cementitious materials from rock blanket construction. All such deposits shall be removed without damage to the materials or exposed surfaces.

Exposed surfaces of rock shall be cleaned and free of cement, mortar and efflorescence.

**Measurement and Payment**

Slope paving (rock blanket) will be measured by the square meter. The area to be paid for will be calculated from the lengths and widths of the completed slope paving surface areas of rock blanket and smooth concrete surfaces as shown on the plans.

The contract price paid per square meter for slope paving (rock blanket) shall include full compensation for furnishing all labor, materials (including concrete, rocks, mortar, bar reinforcing steel, reinforcing steel anchors, and welded wire fabric), tools, equipment, and incidentals and for doing all the work involved in constructing slope paving (rock blanket), complete in place, (including excavation, backfill, installing scalloped border, constructing smooth concrete slope paving surfaces, preparing and cleaning exposed surfaces, and protecting completed work), 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 applying a coloring agent to the concrete and mortar mix shall be considered as included in the contract price paid per square meter for slope paving (rock blanket) and no additional compensation will be allowed therefor.

Full compensation for constructing, breaking and the disposal of test panels and the removal of cementitious materials from rocks to be reused shall be considered as included in the contract price paid per square meter for slope paving (rock blanket) and no additional compensation will be allowed therefor.

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 stiff broom finish by any means which will result in a surface conforming to the details shown on the plans.

Prior to placing the permanent slope paving, 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.

### 10-1.743 MISCELLANEOUS CONCRETE CONSTRUCTION

Minor concrete (miscellaneous construction, curb, curb and gutter, island paving, driveway, sidewalk, gutter behind retaining walls and curb ramp) 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 (miscellaneous construction, curb, curb and gutter, island paving, driveway sidewalk, gutter behind retaining walls and curb ramp) and no separate payment will be made therefor.

### 10-1.75 PUMPING PLANT EQUIPMENT

#### DESCRIPTION

The work shall consist of furnishing and installing pumping plant equipment in accordance with these special provisions, the details shown on the plans and the provisions in Section 74, "Pumping Plant Equipment," of the Standard Specifications. In addition, the Contractor’s attention is directed to Order of Work, of these Special Provisions, regarding responsibility for maintaining drainage pumping capacity of the drainage area and Section 74-1.055, of the Standard Specifications, regarding use of the pumping equipment prior to acceptance of work.

Earthwork, foundations, sheet metal, electrical, and all other work incidental and necessary to the proper installation and operation of the mechanical work shall conform to the requirements for similar type work elsewhere in these special provisions.

All electrical components of mechanical work and their installation shall conform to the National Electrical Code; the California Administrative Codes, Title 24, Part 3, "Basic Electrical Regulations," and Title 8, Chapter 4, "Electrical Safety Orders".

#### PAINTING

All field supplied paint shall be as specified in Section 74-1.06, "Painting," of the Standard Specifications.

#### CERTIFICATION

Certification required for drainage pumps shall be delivered to the Engineer in triplicate before pump installation.

#### SUBMITTALS

Submittals shall be as specified in Section 74 of the Standard Specifications. In addition, submittals shall include the following information:

1. Descriptive Data.--Five (5) bound identified copies of the complete description and performance data covering materials and equipment specified herein shall be submitted for approval. Submittals shall be approved prior to installation and shall include, but not necessarily be limited to, the following:

   Drainage pump, including motor and pump base
   Flexible expansion coupling
   Wall louver
   Flap valve
   Pressure gage
   Control house door
   Latching door stop
   Pressure rated manhole

2. Manuals.--Before completion of project, 3 bound identified copies of operation and maintenance instructions and parts lists for equipment furnished shall be delivered to the Engineer at the jobsite. Manuals that are inadequate or incomplete will be returned and the Contractor shall resubmit adequate and complete manuals. Manuals shall be included for the following equipment:

   Drainage pump

3. Warranties and Guarantees.--Manufacturer's warranties and guarantees furnished for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

**TESTING**

Testing of the completed drainage pumping equipment shall be in accordance with Section 74-1.07 "Tests," of the Standard Specifications, and as described elsewhere in these special provisions.

## 10-1.751 DRAINAGE PUMPING EQUIPMENT

**DRAINAGE PUMP**

Drainage pump shall be a submersible type, close coupled, submersible motor waste water pump. Pump casing, bracket, and volute shall be gray cast iron construction. All external nuts and bolts shall be non-magnetic stainless steel. The impeller shall be bronze or ductile iron, dual-vane, non-clogging type and shall be capable of passing 76mm solids, sludge and fibrous materials. The impeller shall be dynamically balanced and factory certified in accordance with ISO Grade 6.3 for rotors in rigid frames at the RPM of the motor supplied. Balance certificate shall be submitted as part of the certified pump curve performance submittal. Balancing of impeller shall not weaken or deform the impeller. The drainage pump shall include replaceable bronze impeller wear rings and casing wear rings, the pump shaft shall be supported by roller bearings.

The pump motor shall be a 3-phase NEMA Design B, oil filled or continuous duty in air, induction motor. Motor shall be housed in a cast iron casing and shall have moisture resistant NEMA Class F insulation. Motor shall have built-in thermal overload protection. Horsepower, voltage, and rpm shall be as shown on the plans. The pump motor shall be a standard efficiency motor and sized NEMA Code G or smaller.

The pump motor shall be protected from contamination by the liquid being pumped, by a tandem, double-mechanical seal running in an oil reservoir. The oil reservoir of the pump shall be equipped with a seal failure alarm system. Seals shall be tungsten carbide or silicone carbide.

The pump motor shall be have portable Type SO cord, or cords, approved for extra hard service, of sufficient length to reach from the pump to the junction box, as shown on the plans, motor starter enclosure without splicing. Cords shall have suitable cable connectors for terminating in a junction box and contain a equipment grounding conductor with green or green with yellow stripe insulation. Cords shall be sealed into the motor with epoxy by the pump manufacturer, and provided with strain relief features at the junction box.

The drainage pump shall be foot mounted, with the discharge pipe bolted directly to the pump discharge flange. The foot mounted base shall be specifically designed by the pump manufacturer to allow proper operation of the pump at the pumping conditions specified and shall be designed to support the assembled weight of the pump and motor.

Two submittals shall be submitted for approval. The first submittal shall be the pump manufacturer’s standard or representative performance data for the pump being proposed. It shall show that the pump meets the specified performance points and does not develop more the 95% of the motor nameplate power, anywhere on the pumping curve.

The second submittal shall be the pump manufacturer's factory certified test data for each approved pump. Each pump supplied shall be factory tested as an assembled pumping unit, and certified capable of pumping water under test according to the flow rates at the total heads indicated on the plans. Testing shall be done in accordance with the Hydraulics Institute, Centrifugal Pump Test Standard. The certified test shall show that the pump does not develop more than 100% nor less than 97% of the motor nameplate power, at the point the pump requires the maximum power. The pumping unit shall be defined as the actual driver, and actual pump and impeller combination supplied.

Documentation of the factory certified test shall include:

a record of the actual test points used to generate the pump curve.
a pump performance curve showing flow rate verses total dynamic head.
the points specified in the contract documents plotted on the submitted curve.
the power and efficiency curves from cutoff head down to 3.9 meters.
the rpm of the actual driver.
the actual impeller diameter.

The pump and motor shall be shipped in a condition capable of being in storage before final installation. If the Contractor elects to store the drainage pumping equipment before final installation, the Contractor shall maintain the pump in accordance with the manufacturer's recommended storage and warrantee requirements.

The complete pump and motor assembly shall be factory coated with an approved manufacturer recommended coating system compatible with the intended application of the drainage pumping equipment.

**FLAP VALVE**

The flap valve shall: be the size shown on the plans, be flange mounted, have iron body and cover with bronze seat faces, have a bronze hinge pin. The flap valve shall have an inclined seating plane and positive stop to limit opening to no greater than 45 degrees past horizontal. Cast iron components shall be painted with the manufacturer's standard finish.

**FASTENERS**

All fasteners, including expansion anchors, nuts, bolts and washers, shall be stainless steel unless otherwise noted.

**CONTROL HOUSE DOOR**

The control house door shall be flush type, vertically stiffened, hollow metal door, and metal frame. The door size shall be as shown on the plans. The door shall be formed of 1.5 mm nominal thickness, galvanized face sheets, turned over and fully covering all vertical edges. Seams shall be continuously welded. The door shall have 1.5 mm nominal thickness, or thicker, steel stiffener channels along hinge and lock edges. End channels (top and bottom) shall be fully flush and continuously closed. The door shall have continuous one piece, full length, vertical steel rib stiffeners spaced not to exceed 150 mm apart, with insulation between. The door shall also be reinforced around the hinges and lockset. The bottom end shall have moisture vents to drain condensation. The door and frame shall be factory prepared and reinforced to receive hardware. All parts of the door shall be securely welded together. Exterior welds shall be ground flush.

The door frame shall be formed of 2.0 mm nominal thickness, pressed sheet steel 140 mm x 50 mm in section with mitered, full welded corners and at least 3 standard casting anchors on each side supplied by manufacturer. The frame shall have adequate metal housing closures at hinges and latch to prevent intrusion of concrete or grout. Exterior welds shall be ground flush. The threshold shall be the rectangular or half saddle, bumper type for out swing doors, and securely anchored to the floor.

Control house door hardware shall consist of the following: hinges shall be 1 1/2 pair, non-removable pins, full mortise butt hinges. Hinges shall be industrial, heavy weight quality, stainless steel or brass, 5 knuckle, concealed ball bearing. Latch shall be non-locking, knob type passage latch, brass or stainless steel, heavy duty, corrosion resistant, and designed in accordance with ANSI A !56.2, Grade 1. The door lock cover shall be fabricated and installed as shown on the plans and as directed by the Engineer. The pad lock will be furnished by others after acceptance of pumping plant. In addition, install a latching door stop that can hold the door in the open position. Latching door stop shall be suitable for exterior locations. Latching door stop shall have replaceable non-marring bumper, standard dull finish, and suitable mounting hardware. Coordinate latching door stop type with door undercut and mounting location.

The door frame shall be set true and plumb and shall be adequately braced to prevent distortion when the concrete is placed. All doors shall fit correctly in their frames, shall swing freely and shall close properly.

The hollow metal door and frame shall be factory painted with an approved coating suitable for exterior applications.

If the Contractor desires to lock the control house during construction, he shall furnish his own lock for the door until acceptance of the pumping plant.

**WALL LOUVER**

Wall louver shall be rain proof, have V shaped blades and shall be constructed of 1.3 mm electro-galvanized steel. Wall louver shall be set in a continuous channel frame, in accordance with manufacturer's recommendations, with a insect and bird-screen in a removable frame from the inside face. Surfaces shall be finish painted in the field, after installation, or shall be factory finish painted. Wall louver shall be Anemostat; K.N. Croder Inc.; Leslie Locke, or equal.

**PRESSURE GAGE**

Pressure gage shall be ANSI Standard: Grade A, 114 millimeter dial, liquid filled with cover, stainless steel case, reset screw, 6 millimeter MPT bottom inlet. Gage shall be dual scale KPa and PSIG, from 0 KPa to 140 KPa. Gage cock shall be 6 millimeter NPT ball valve. Pressure gage shall be Marsh, Ashcroft, or equal.

**DIMENSIONS AND LOCATIONS**

Dimensions and locations of pumping equipment shown on the plans are approximate. Contractor shall submit detailed drawings showing installation details of pumps and associated hardware. If pumps selected by the Contractor require revisions to pump plant metal work or other construction details, the Contractor shall submit detailed drawings of these revisions for approval. No additional compensation shall be made for revisions resulting from Contractor's pump selection.

**IDENTIFICATION**

The discharge pipe of each pump shall have the number of the pump which it is connected to painted on the discharge pipe. The number shall be 50mm high, white in color, and located approximately 2m above landing 1 so that it is visible from landing 1.

**10-1.752 PUMPING PLANT ELECTRICAL EQUIPMENT**

**SCOPE.**--Work covered by this section shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system in accordance with the details shown on the plans, the provisions of Section 74, "Pumping Plant Equipment" of the Standard Specifications and as specified in this section, and the work of installing and wiring motors and controls as specified under “Pumping Plant Equipment" of these special provisions.

**RELATED WORK.**--Earthwork, foundations, sheet metal, painting, mechanical and such other work incidental to and necessary for the proper installation and operation of the electrical work shall be done in accordance with the requirements specified for similar work elsewhere in these special provisions or in the Standard Specifications.

**SUBMITTALS.**--Submittals shall be as specified in section 74-1.04 “Data to be Furnished” of the Standard Specifications. All dimensions illustrated on submittal drawings and all units of measurement shall be shown in the International System of Units (metric system).

**OPERATION AND MAINTENANCE MANUALS.**--Prior to the completion of the contract, three (3) identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material will be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Manuals shall be submitted for the following equipment:

Motor Control Center complete with all the equipment inside the control center

**TRAINING.**--Training of State personnel in programming, connection, operation, trouble shooting, and maintenance of the pump controller shall be provided. The training shall be conducted for not more than 6 personnel at the job site or at a site mutually agreed upon by the Contractor and the Engineer for a minimum of 4 hours. The trainer shall be an authorized representative of the pump controller manufacturer.

All trainees shall be supplied with books, manuals, and such other training material, guides and equipment, not mentioned, but required for a complete and thorough training course. Training shall include hands-on experience in programming techniques and operation.

**MANUFACTURER'S TECHNICAL SUPPORT.**--The manufacturer of the pump controller shall provide technical assistance and guidance in the operation, maintenance and trouble shooting of operational problems of the pump controller

for one year following the acceptance of the Contract. The technical support shall be provided at no additional cost to the State.

Technical support shall be provided at the facility site by an authorized representative of the Pump Controller manufacturer and by a toll free telephone service to the manufacturer.

**TESTING.--**After the electrical system installation work has been completed, the electrical system shall be tested in the presence of the Engineer to demonstrate that the electrical system functions properly. The testing shall include all the functions of the pump controller. The Contractor shall make all necessary repairs, replacements, adjustments and retests at his expense.

**WARRANTIES, GUARANTIES AND INSTRUCTION SHEETS.--**Manufacturer's warranties and guaranties furnished for materials used in the work and instruction sheets and parts lists supplied with materials shall be delivered to the Engineer prior to acceptance of the Contract.

**DESCRIPTION OF OPERATION.--**Automatic operation of the drainage pumps shall be controlled by the trapped air level monitoring system and the pump controller. The monitoring system shall measure the water pressure and convert it to a 4 to 20 ma signal, which shall then be scaled to provide the depth of the water in the sump relative to the bottom of the sump. The pump controller shall display the current water level and shall determine which pump to turn on.

Either pump no. 1 or pump no. 2 shall start when the water level rises to the "Start lead pump" elevation and continue to run until the water level falls to the "Stop lead pump" elevation as shown on the plans. The remaining pump shall start when the water level rises to the "Start lag pump" elevation and continue to run until the water level falls to the "Stop lag pump" elevation as shown on the plans. When both pumps are running and the water level continues to rise, one of the two pumps shall be de-energized when the water level rises to the "High level alarm" elevation. The pump shall start when the water level drops to the "High level alarm" elevation as shown on the plans. Pump no. 1 and pump no. 2 shall alternate with each lead pump call. Should the Pump Controller call for both pumps to start at the same time for any reason (such as when power is restored after an interruption and the water level is above the "Start lag pump" elevation or when it is in the "Test" mode), there shall be a time delay of ten seconds between the starting of each pump.

Pilot light PL3 and indicating light IL1 shall be energized whenever control power is present. When motor current is sensed by a current switch, the corresponding pilot light and time meter of the pump and indicating light IL2 shall be energized.

Seal failure indicating lights on seal failure relays shall be treated as alarm indication only and in no way affect the control operation of a pump.

The phase failure relay shall provide sensing for phase loss, phase unbalance and phase reversal. Whenever an abnormal condition occurs for more than five seconds, the control power shall be de-energized until the condition returns to normal.

**EXCAVATING AND BACKFILLING.--**Excavating and backfilling shall conform to Section 86-2.01 "Excavating and Backfilling" in the Standard Specifications.

**FOUNDATIONS.--**Foundations shall conform to Section 86-2.03 "Foundations" in the Standard Specifications.

**CORE CONCRETE.--**Holes shall be cored by methods that will not shatter or damage the concrete adjacent to the holes.

The diameter of the cored holes shall be as shown on the plans or as required.

Water for the core drilling operations shall be from the domestic water supply and shall not contain more than 1,000 parts per million of chlorides as Cl, nor more than 1,300 parts per million of sulfates as SO4, nor shall it contain any impurities in a sufficient amount to cause discoloration or etching of the surface.

Water from the core drilling operations shall not be permitted to flow into sewers or other drainage facilities.

## PRODUCTS.--

**Conduit.--**

Unless otherwise shown, all conduit shall be Type 1 conduit with threaded steel or malleable iron fittings.

**Conductors.--**

Conductors shall be stranded copper. Unless otherwise shown, conductor types shall be as follows: (1) conductors across hinges of control panel enclosures shall be MTW, (2) all other conductors shall be THHN in dry locations and XHHW-2 in wet locations.

**Splices.--**

All splices in underground pull boxes shall be made watertight.

**Service Pedestal.--**

Service pedestal shall consist of a panelboard section, a service and distribution section, and power transfer switch section for a 208 V, 400 A, 3-phase, 4-wire service. Enclosures of the three sections shall be NEMA 3R enclosures. Exterior shall be 2.66 mm (12-gage). Sheet steel and interior shall be 1.90 mm (14-gage) sheet steel. All screws, latches, hinge pins and similar hardware shall be stainless steel. Exterior doors shall be lockable with a padlocks. Enclosures finish shall be baked enamel or baked thermosetting polyester finish.

**Service Disconnect Switch (SD).--**

Service disconnect switch shall be a 3-pole, 600 V, 400 A frame, 400 A trip, molded case circuit breaker with adjustable AC magnetic trip set at 2,000 amperes mounted as shown on the plans. The interrupting capacity of the breaker shall be 65,000 A (RMS symmetrical) at 240 V, (ac).

**Panlboard A .--**

Panelboard A shall be indoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 208/120 V, ac panelboard at least 508 mm wide with 225 A main lugs, insulated neutral, hinged door and molded case branch circuit breakers as shown on the plans.

**Panlboard A Disconnect Switch .--**

Panelboard A disconnect switch shall be a 3-pole, 600 V, ac, 250 A frame, 200 A trip, molded case circuit breaker with adjustable AC magnetic trip set at 1,000 amperes mounted as shown on the plans. The interrupting capacity of the breaker shall be 65,000 A (RMS symmetrical) at 240 V, (ac).

**Pumphouse Disconnect Switch (PHD1).--**

Pumphouse disconnect switch shall be a 3-pole, 600 V, ac, 100 A frame, 100 A trip, molded case circuit breaker with adjustable AC magnetic trip set at 500 amperes mounted as shown on the plans. The interrupting capacity of the breaker shall be 65,000 A (RMS symmetrical) at 240 V, (ac).

**Existing Kiosk Disconnect Switch .--**

Existing kiosk disconnect switch shall be a 3-pole, 600 V, ac, 150 A frame, 40 A trip, molded case circuit breaker with adjustable AC magnetic trip set at 200 amperes mounted as shown on the plans. The interrupting capacity of the breaker shall be 65,000 A (RMS symmetrical) at 240 V, (ac).

**Power Transfer Switch (PTS).--**

Power transfer switch shall be a 3-pole, double-throw, 600 V, ac, 125 A, rotary type switch without an off position. Switch shall have a handle and escutcheon plate with a legend “UTILITY” AND “STANDBY”. Switch shall be rated 40 horsepower at 480 V, (ac).

**Motor Control Center (MCC).--**

Motor control center shall consist of enclosed vertical sections joined together to form a rigid, free standing assembly. The construction of the MCC shall meet the requirements set forth by Underwriters’ Laboratories UL 845 and NEMA ICS-2-322 and be UL listed. The MCC shall be in accordance with NEMA standards for Type 1 gasketed enclosure.

The MCC shall be suitable for operation with 208 V, 3-phase 4-wire plus ground, 60 Hz service. MCC shall have a minimum fault interrupting capacity of 65,000 amperes (symmetrical) at 240 V, (ac).

Vertical sectionNo. 1shall be designed to accommodate plug-on units in front-of-board construction. Vertical section No. 1 housing plug-on units shall be 508 mm wide and shall be 508 mm deep. Vertical section No. 2 shall be 762 mm wide and shall be 508 mm deep section without busbars. Removable blank plates shall cover all unused unit mounting spaces. Blank plates shall be flanged on all four sides and shall be mounted with captive screws.
Vertical sections shall be mounted with both horizontal and vertical wireways as shown on the plans. Sufficient clearances shall be provided in the horizontal wireway so that no restriction is encountered in running wires from the vertical to horizontal wireway.
Horizontal wireways shall be provided in the top and bottom of each vertical section and shall be arranged to provide full length of continuity throughout the entire assembly. Covers for all wireways shall be equipped with captive screws.
A vertical wire trough shall be located on the right hand side of vertical section No. 1 and shall extend from the top horizontal wireway to the bottom of the available unit mounting space. A separately hinged door having captive type screws shall cover the vertical wire trough to provide easy access to control wiring without disturbing control units.
Reusable wire ties shall be furnished in each vertical wire trough for the purpose of grouping and securely holding wires in place. All wireways shall be isolated from the bus bars.
Vertical section No. 1 shall have a three-phase vertical bus. The rating of the vertical buses shall be minimum 600 A continuous current rating and shall be in accordance with UL, ANSI, and NEMA standards.
Each unit shall have a door securely mounted with concealed type hinges which shall allow the door to swing open a minimum of 112 degrees. Doors shall be fastened to the structure so that they may remain in place when a unit is withdrawn and may be closed to cover the unit space when the unit has been temporarily removed. Doors shall be held closed with captive screws which engage self-aligning cage nuts. Each starter unit door shall house an external low-profile overload reset button for resetting the overload relay.
Each plug-on unit shall be supported and guided by tilt and lift-out removable pan.
An external operator handle shall be supplied for each switch or circuit breaker. The operator handle shall be color coded to display red in the “ON” position and black in the “OFF” position. The operator handle shall have a conventional up-down motion and shall be designed so that the down position will indicated the unit is “OFF”. For safety it shall be possible to lock this handle in the “OFF” position with up to three padlocks. The operator handle shall be interlocked with the unit door to prevent switching to the “ON” position while the unit door is open. A defeater mechanism shall be provided for the purpose of defeating this interlock.
A schematic diagram of the control system under transparent protective cover shall be provided with the MCC.
The MCC wiring shall be NEMA Class II, Type B wiring.

**Pumphouse Disconnect (PHD2).--**

Pumphouse disconnect switch shall be a 3-pole, 600 V, 150 A frame, 70 A trip, molded case circuit breaker with adjustable AC magnetic trip set at 350 amperes mounted in the MCC as shown on the plans. The interrupting capacity of the breaker shall be 65,000 A (RMS symmetrical) at 240 V, (ac).

**Phase Failure Relay Disconnect (PFRD).--**

Phase failure rely disconnect shall be a 3-pole, 600 V, (ac), 150 A frame, 15 A trip, molded case circuit breaker mounted in MCC as shown on the plans. The interrupting capacity of the breaker shall be 65,000 A (symmetrical) at 240 V, (ac).

**Phase Failure Relay (PFR).--**

Phase failure relay shall be 208 V, (ac), socket mounted, adjustable, automatic reset, voltage sensing phase failure relay with single-pole, double-throw, 5 A, 120 V contacts. Relay shall be capable of sensing phase loss, phase unbalance and phase reversal and shall have a LED indicating the relay is energized.

**Motor Starters (ST1 and ST2).--**

Motor starters shall be NEMA Size 1, NEMA rated, 3-pole, line-voltage combination starter and motor circuit protector mounted in the MCC as shown on the plans. Starter shall have 120 V coil, double-break silver contacts, and 3 manual-reset, non-adjustable thermal overloads set to trip between 115 and 125 percent of full load motor

current, as quoted on the nameplate by the motor manufacturer. Overload reset shall be externally operable. Starter shall have one normally-close and one normally-open auxiliary contacts.

**Light Disconnect (LD).--**

Light disconnect shall be 3-pole, 600 V, (ac), 150 A frame, 15 A trip, molded case circuit breaker. The interrupting capacity of the breaker shall be 65,000 A (symmetrical) at 240 volts, (ac).

**Panelboard LP.--**

Panelboard shall be single-phase, 3-wire, 120/208 V, (ac) panelboard with 100 A main lugs, insulated neutral, and molded case circuit breakers as shown on the plans.

**Trapped Air Level Monitoring System.--**

Trapped air level monitoring system shall consist of an air compressor, three-way solenoid valve, pressure transducer, polyethylene sensing air tube and a compression bell. The system shall operate based on the output of the pressure transducer which is connected to a trapped air column. The air column pressure changes in accordance with the water level. The compression bell, which is submerged in the water, shall provide sufficient air volume to maintain the desired accuracy. The system shall operate over a range of 0 to 10 meters of water with an accuracy of ±10 mm for an ambient condition ranging from 0 to 93°C. The pressure transducer shall provide a 4 to 20 mA output signal to the Pump Controller to determine the water level. The air compressor shall operate at 120 V, (ac) and be constructed of an aluminum piston with Teflon-sleeved cylinder for long service life. Compressor motor shall be approximately a 37 W, shaded pole motor with integral overload protection. Compressor shall have a capacity 0.0184 $m^3$/min at 345 kPa and capable of initializing against a 1724 kPa head. The direct acting, three-way, plastic bodied solenoid valve operating at 120 V, (ac) with compression connections for air shall isolate the pressure transducer during the purge cycle of the air column. Polyethylene sensing tube shall have ASTM Designation: D1248, Class A with 1 mm (minimum) wall thickness.

**Pump Liquid Level Controller.--**

The pump liquid level controller shall be a 12 V, (dc) solid state, industrial grade programmable controller with a minimum of six programmable levels. The levels shall be programmable from 0 to 12 meters and include high alarm and de-energize and re-energize one pump, low alarm, lead pump on, lead pump off, lag pump on and lag pump off. Programming shall be accomplished using faceplate mounted, gold contact switches. No programming software shall be required. Lead and lag pumps shall alternate with each lead pump call unless programmed for manual sequence. The pump controller shall measure the storage liquid level by monitoring the 4 to 20 ma output signal from the pressure transducer of the trapped air level monitoring system specified in these special provisions. The storage liquid level shall be displayed with an LED digital display a minimum of 10 millimeter high letters accurate to one decimal place. The pump controller shall have a minimum of six output relays with 10 A rated contacts at 120 V, (ac), LED indicators and be mounted on plug-in bases. The pump controller shall have a test pushbutton and potentiometer to enable testing of the system by bypassing the pressure transducer input and allowing manual adjustment of the input signal. The purge interval for the trapped air level monitoring system shall be programmable from the pump controller for a minimum of 1 to 8 hours and the compressor run time per interval shall be programmable from 5 to 30 seconds. The pump controller shall have a pushbutton for manual purge which allows the combination compressor and solenoid valve to run at the same set time. The pump controller shall have an available analog output signal proportional to the storage liquid level.

**DC Power Supply.--**

DC power supply shall be rated for 115 V, (ac) input and DC voltage and current outputs as required by the equipment installed. The power supply shall be panel or channel mounted, convection cooled, completely protected and short circuit proof with an adjustment range of ±5 percent (minimum) and shall be operable at temperatures between 0° to 50°C.

**Ground Fault Circuit Interrupter (GFCI) Switch.--**

Ground fault circuit interrupter (GFCI) switch shall be 3-wire, 20 A, 125 V, ac switch with ground fault interrupter. Switch shall detect and trip at current leakage of 5 ma.

**Remote Pump Test Station Control Panel.--**

Remote pump test station control panel enclosure shall be a single hinged door, 407 mm x 304 mm x 152 mm, NEMA Type 4X enclosure containing an interior electrical mounting panel and door clamps. Selector switches, SS3 and SS4; sump light switch, LS3: and duplex receptacle, DP; shall be mounted in cast metal boxes with threaded hubs inside the control panel enclosure as shown on the plans.

**Seal Failure Relays (SFR1 and SFR2).--**

Seal failure relay shall be as shown on the plans and as recommended by the pump manufacturer. The seal failure relay, complete with pump leak indicating light, sensor probe continuity test push-button, and test indicating light, shall be a factory assembled unit mounted inside the MCC as shown on the plans. Relay shall include one normally-open and one normally-closed contact rated for 120 V, (ac).

**Current Switches (CS1 and CS2).--**

Current switch shall be self-powered, solid state, alternating current sensing switch mounted in each motor starter as shown on the plans. Switch shall have a single-pole, normally-open contact rated one-ampere at 240 V, (ac). Current sensing level shall be chosen between a low range of one to 15 amperes and a high range of 15 to 300 A. Switch shall have a thru-hole of 14 mm minimum diameter for sensing the alternating current.

**Time Meters (TM1 and TM2).--**

Time meter shall be 120 V, 60 Hz, non-resettable running time meter with 0 to 99 999.9 hours range.

**Selector Switches (SS1 thru SS4).--**

Selector switches, SS1 and SS2, shall be 10 A, 120 V, 30.5 mm, NEMA Type 4, single-pole, 2-position maintained, rotary switch mounted on the MCC door as shown on the plans. Switch contacts shall have an inductive pilot duty rating of 60 A (make), 6 A (break) and 10 A (continuous) at 120 V and 35 percent power factor. Selector switches, SS3 and SS4, shall be 20 A, 120/277 V, (ac) specification grade toggle switch suitable for wiring with stranded conductors.

**Pilot Lights (PL1 thru PL3).--**

Pilot light shall be 120 V, (ac), 30.5 mm, NEMA Type 4, panel mounted, high visibility light emitting diode (LED) type lamp with colored plastic lens and screw cap.The color of the lens shall be as shown on the plans.

**Control Relays (CR1 and CR2).--**

Control relay shall be 120 V, (ac), general-purpose relay with 3-pole, double-throw, 10 A contacts. Relay shall be enclosed in a clear plastic with 11-pin plug base. Socket for the relay shall be barrier type, 11-contacts relay socket with 10 A contacts and screw terminals.

**Terminal Blocks (TB).--**

Terminal block shall be 30 A, 600 V, NEMA rated, molded plastic with two or more terminals and two or more mounting holes in each cast block or channel mounted type (DIN rail). The molded plastic shall have a high resistance to heat, moisture, mechanical shock and electric potential and shall have a smooth even finish. Terminal blocks shall have tubular, high-pressure clamp connectors.

Each terminal block or row of blocks shall have a molded marking strip attached with screws or a computer printed plastic label securely fastened to the blocks. The identifying numbers of the terminating conductors, as shown on the plans or on the approved submittal drawings, shall be engraved in the marking strip or permanently printed on the plastic label. The marking strip shall be laminated phenolic plastic with white core and black front and back.

**Coils.--**

All coils of relays, starters and other operating equipment shall have magnet coils wound for an operating range having a mean equal to the actual voltage to be applied.

**Room Light (F1).--**

Room light shall be surface mounted fluorescent fixture with two, F96T12HO lamps and 800 ma, -20°C ballast. Fixture shall have high impact resistance, reinforced polyester housing; and acrylic diffuser secured to fully-gasketed housing by captive, cam-action latches.. Fixture shall be suitable for wet locations.

**Sump Light (SL).--**

Sump light shall be wall-mounted, explosionproof, rated for class 1 division 2 locations, heavy cast aluminum with gray epoxy powder coat finish, glazed porcelain socket with 300 W incandescent lamp, impact and heat resistant clear prismatic globe with die cast guard.

**Area Light (H1).--**

Area light shall be 3658 mm high, 152 mm x 152 mm square, dark bronze, steel pole with hand hole and hand hole gasketed cover. Luminaire shall be 150 W, 120 V, high pressure sodium rectangular fixture with integral ballast and photoelectric cell. Pole shall be mounted on concrete foundation as shown on the plans.

**Control House Exterior Light (H2).--**

Contro house exterior light shall be outdoor, wall-mounted, 100 W, 120 V high pressure sodium luminaire with integral ballast and photoelectric cell. Luminaire shall have prismatic glass refractor and die cast bronze aluminum housing.

**Indicating Lights (IL1 and IL2).--**

Indicating light shall be cast-metal, vapor-tight, fluorescent lighting fixture with colored, shatterproof, polycarbonate plastic globe and twin tube 18-watt, 120-volt compact fluorescent lamp with integral ballast. Color of globe shall be as shown on the plans. Fixture shall be suitable for wet location.

**Light Switches (LS1 thru LS3).--**

Light switch shall be 20 A, 120/277 V, (ac) specification grade switch suitable for wiring with stranded conductors in a cast metal box.

**Duplex Plug Receptacles (DP).--**

Duplex plug receptacle shall be 20 A, 3-wire, 125 V, grounding type, specification grade duplex receptacle outlet suitable for wiring with stranded conductors in a cast metal box. Outlet shall be combination of a twist lock outlet and parallel blade outlet.

**Junction and Outlet Boxes.--**

All boxes shall be cast ferrous metal box with hubs and gasketed covers

**Underground Pull Boxes.--**

Underground pull boxes shall be concrete type and shall be as shown on sheet ES-8 of the Standard Plans.

**Nameplates.--**

Nameplates shall be laminated phenolic plastic with white core and black front and back. Nameplate inscription shall be in capital letters etched through the outer layer of the nameplate material.

**Warning Plates.--**

Warning plates shall be laminated phenolic plastic with white core and red front and back. Warning plate inscription shall be in 6 mm high capital letters etched through the outer layer of the warning plate material.

**Supporting devices.—**

Supporting devices shall be corrosion resistant.

**Ground rod.—**

Ground rod shall be 19 mm (minimum) galvanized or copper clad steel rod, 3048 mm long.

**EXECUTION.--**In addition to the requirements of Section 74, "Pumping Plant Equipment" of the Standard Specifications, the execution of the work shall conform to the following requirements:

**Conduits.--**Do not install any conduits behind ladders or within 380 mm of the center line of the ladder.

**Motor control center.--**MCC shall be mounted on channel and anchored to the concrete slab with expansion anchors and bolts. The MCC shall be shimmed as required to make each section level. The Contractor shall provide the Engineer with an installation procedure of the MCC.

The MCC shall be placed through either a doorway or roof across opening. Any disassembly, assembly or modification to the MCC and any other work needed to accomplish installation shall be at Contractor's expense. Any modification must be approved by the manufacturer and said modification shall not alter the performance in anyway.

**Conductors.--**Feeder and branch circuit ungrounded conductors shall be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding shall be as follows:

| SYSTEM | COLOR CODE |
|---|---|
| 120/208V-Three phase | Black, red, blue |

**Panelboards .--**Where "Space" is indicated on the plans, branch connectors, mounting brackets, and other hardware shall be furnished and installed for future breaker.

A typewritten directory under transparent protective cover shall be provided and set in metal frame inside the cabinet door. Directory panel designation for each circuit breaker shall include complete information concerning equipment controlled including area designated on the plans.

**Component mounting.--**Components in the MCC shall be mounted as shown on the plans.

**Current Switches CS1 and CS2.--** Current switches CS1 and CS2 shall be mounted in the starter compartment of the MCC as shown on the plans. Conductors shall be looped around the sensing coil multiple times as necessary to sense current.

**Nameplates.--** Inscriptions on nameplates shall be as shown on the plans. Nameplates shall be mounted with self-tapping cadmium plated screws or nickel plated bolts except the nameplates mounted on the back of an enclosure cover shall be attached with a strong adhesive..

**Supporting devices.—**Hangers, brackets, supports and electrical equipment shall be secured to surfaces by means of expansion shields and machine screws or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood screws on wood construction.

**PAYMENT.--**Full compensation for excavation, backfilling, foundation, and core drilling shall be considered as included in the contract lump sum price paid for pumping plant electrical equipment and no separate payment will be allowed therefor.

Full compensation for the training and manufacturer's technical support shall be considered as included in the contract lump sum price paid for pumping plant electrical equipment and no separate payment will be allowed therefor.

## 10-1.76 MISCELLANEOUS IRON AND STEEL

Miscellaneous iron and steel shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

## 10-1.77 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.

Miscellaneous metal (bridge) shall consist of the miscellaneous bridge metal items listed in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications, and the following:

A. 64 mm anchor bolts for Post Type S overhead sign
B. Pipe hangers for bridge deck drains
C. Weld linked eye rods

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 (UV) exposure at 60°C, and then 4 hour 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.

## 10-1.78 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 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.

## 10-1.79 PUMPING PLANT METAL WORK

Pumping plant metal work shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

## 10-1.80 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.

## 10-1.801 MISCELLANEOUS METAL (RESTRAINER-PIPE TYPE)

Miscellaneous metal (restrainer-pipe type) shall consist of bridge joint pipe restrainers with double extra strong steel pipe and associated hardware as shown on the plans and in conformance with the provisions in Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications and in these special provisions.

The Contractor shall submit working drawings with the method of grouting the pipe restrainers in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

Double extra strong steel pipe shall conform to the requirements of ASTM Designation: A53, Grade B.

Pipe restrainers shall be bonded to the existing concrete by completely filling the entire void between the pipe restrainer and the cored hole with grout within the limits shown on the plans. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. Filler material and seals shall be provided along the sides of the pipe to be grouted, to prevent grout from entering the bridge hinge joints. The filler material and seals shall not restrict joint movement.

Miscellaneous metal (restrainer-pipe 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.

Full compensation for bonding pipe restrainers to existing concrete shall be considered as included in the contract price paid per kilogram for miscellaneous metal (restrainer-pipe type) and no additional compensation will be allowed therefor.

## 10-1.81 CHAIN LINK FENCE

Chain link fence shall be Type CL-0.9 and Type CL-1.8 and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications.

## 10-1.811 CHAIN LINK WALK GATE

3.0m and 4.9m chain link walk gates shall be Type CL-1.8 conforming to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

Gates shall be installed at the locations shown on the plans. Gate installations shall be complete with gate post, latch post, concrete footings, braces, truss rods, and hardware. Gate and latch posts shall be braced to the next post as shown on the plans.

Gate mounting and latching hardware shall not contain open-end slots for the fastening bolts.

Chain link fabric for gates shall be of the same mesh size as the existing fence in which the gates are installed.

Full compensation for new posts, footings, hardware, braces, and truss rods shall be considered as included in the contract unit price paid for 3.0-m and 4.9-m chain link gate (Type CL-1.8) and no additional compensation will be allowed therefor.

**10-1.82 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.

**10-1.83 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.

**10-1.84 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 and blocks shall be wood.

**TERMINAL SYSTEM (TYPE ET)**

Terminal system (Type ET) shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Terminal system (Type ET) shall be an ET-2000 PLUS (4-tube system) extruder terminal as manufactured by Trinity Industries, Inc., and shall include all the items detailed for terminal system (Type ET) shown on the plans.

Arrangements have been made to insure that any successful bidder can obtain the ET-2000 PLUS (4-tube system) extruder 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 ET-2000 PLUS (4-tube system) extruder terminal, FOB Centerville, Utah is $1,305.00, not including sales tax.

The above price will be firm for orders placed on or before July 31, 2003, 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 systems (Type ET) 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.

The terminal system (Type ET) 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. 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.

Surplus excavated material remaining after the terminal system (Type ET) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

**TERMINAL SYSTEM (TYPE SRT)**

Terminal system (Type SRT) shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Terminal system (Type SRT) shall be a SRT-350 Slotted Rail Terminal (8 post system) as manufactured by Trinity Industries, Inc., and shall include all the items detailed for terminal system (Type SRT) shown on the plans.

The 5 mm x 44 mm x 75 mm plate washer shown on the elevation view and in Section D-D at Wood Post No. 1 shall be omitted.

Arrangements have been made to insure that any successful bidder can obtain the SRT-350 Slotted Rail Terminal (8 post system) 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 SRT-350 Slotted Rail Terminal (8 post system), FOB Centerville, Utah is $805.00, not including sales tax.

The above price will be firm for orders placed on or before July 31, 2003, 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 terminal systems (Type SRT) 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.

The terminal system (Type SRT) 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 terminal 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 terminal 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 SRT) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

**10-1.841 TRANSITION RAILING (TYPE WB)**

Transition railing (Type WB) shall be furnished and installed as shown on the plans and in conformance with these special provisions.

The rail elements specified in the plans as 10-gage shall conform to Class B, Type 1 railing as shown in AASHTO Designation: M 180. All other rail elements, backup plates, terminal, end and return sections shall conform to Class A, Type 1 railing as shown In AASHTO Designation: M 180.

Transition railing (Type WB) shall include all the items detailed for transition railing (Type WB). shown on the plans.

Surplus excavated material remaining after the transition railing (Type WB) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

Attention is directed to “Material Containing Aerially Deposited Lead” and “Water Pollution Control” elsewhere in these special provisions.

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 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.

**10-1.842 CHAIN LINK RAILING**

Chain link railing shall conform to the provisions in Section 83-l, "Railings," of the Standard Specifications.

The chain link fabric shall be 9-gage (3.76 mm), Type IV, Class B, bonded vinyl coated fabric, conforming to the requirements in AASHTO Designation: M 181.

The strength of the bond between the coating material and steel of the bonded vinyl coated chain link fabric shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

### 10-1.843 METAL BRIDGE RAILING

Metal railing, steel bridge railing, steel bridge picket railing, metal tube bridge railing, handrailing, pipe handrailing, and tubular handrailing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

### 10-1.844 CABLE RAILING

Cable railing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

### 10-1.85 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Architectural treatment on concrete barrier shall conform to the provisions in "Architectural Surface (Textured Concrete)" of these special provisions.

Plastic pipe as shown on the plans shall be polyvinyl chloride (PVC) plastic pipe, Schedule 80, and shall conform to the provisions for edge drain pipe and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications. The plastic pipe shall be rigidly supported in place during concrete placing operations.

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.

Concrete barrier (Type 26A) will be measured and paid for as concrete barrier (Type 26).

Full compensation for plastic pipe shall be considered as included in the contract price paid per meter for concrete barrier of the type or types listed in the Engineer's Estimate and no separate payment will be made therefor.

### 10-1.86 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 insure 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 $2,850.00, not including sales tax.

The above price will be firm for orders placed on or before July 31,2003, 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.

### 10-1.87 CRASH CUSHION (ADIEM)

Crash cushion shall be furnished and installed as shown on the plans and in conformance with the provisions in the Standard Specifications and these special provisions.

Crash cushion shall be an ADIEM II-350 as manufactured by Trinity Industries, Inc., and shall include the items detailed for crash cushion shown on the plans.

The successful bidder can obtain the crash cushion from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, Utah 84014, telephone 1-800-772-7976.

The price quoted by the manufacturer for ADIEM II-350, FOB Centerville, Utah is $12,000.00, not including sales tax.

The above price will be firm for orders placed on or before July 31, 2003, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall furnish the Engineer one copy of the manufacturer's plan and parts list.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the crash cushion conforms to the contract plans and specifications, conforms to the prequalified design and material requirements, and was manufactured in conformance with the approved quality control program.

Crash cushion shall be installed in conformance with the manufacturer's installation instructions.

Surplus excavated material remaining after the crash cushion has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

Crash cushion (ADIEM) will be measured by the unit as determined from actual count in place in the completed work.

The contract unit price paid for crash cushion (ADIEM) shall include full compensation for furnishing all labor, materials (including anchor bolts, nuts, washers, and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the ADIEM type crash cushion, complete in place, including structure excavation, structure backfill, and disposing of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### 10-1.88 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 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 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow thermoplastic pavement markings shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

Thermoplastic pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

### 10-1.89 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 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow sprayable thermoplastic traffic stripes shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of 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.

### 10-1.90 PAINT TRAFFIC STRIPE AND PAVEMENT MARKING

Painted traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Traffic stripe and pavement marking paint shall conform to the requirements in State Specification No. PTWB-01.

The color of the painted traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6628-01.

Retroreflectivity of the paint traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White painted traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow painted traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of painted traffic stripes and pavement markings. Permanent tape, if used, shall be placed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of painted traffic stripes and pavement markings, the tape will be measured and paid for by the meter as paint traffic stripe and by the square meter as paint pavement marking of the number of coats designated in the Engineer's Estimate.

### 10-1.91 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.

Retroreflective pavement markers placed in pavement recesses will be measured and paid for as pavement marker (retroreflective-recessed).

## 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.

The Contractor shall notify the Engineer not less than 72 hours prior to requiring initial access to the existing irrigation controllers. When the Engineer determines that access to the controllers is required at other times, arrangements will be made to provide this access.

**PROGRESS INSPECTIONS**

Progress inspections will be performed by the Engineer for completed highway planting and irrigation system work at designated stages during the life of the contract.

Progress inspections will not relieve the Contractor of responsibility for installation in conformance with the special provisions, plans and Standard Specifications. Work within an area shall not progress beyond each stage until the inspection has been completed, corrective work has been performed, and the work is approved, unless otherwise permitted by the Engineer.

The requirements for progress inspections will not preclude additional inspections of work by the Engineer at other times during the life of the contract.

The Contractor shall notify the Engineer, in writing, at least 4 working days prior to completion of the work for each stage of an area and shall allow a minimum of 3 working days for the inspection.

Progress inspections will be performed at the following stages of work:

A. During pressure testing of the pipelines on the supply side of control valves.
B. During testing of low voltage conductors.
C. Before planting begins and after completion of the work specified for planting in Section 20-4.03, "Preparing Planting Areas," of the Standard Specifications.
D. Before plant establishment work begins and after completion of the work specified for planting in Section 20-4.05, "Planting," of the Standard Specifications.
E. At intervals of one month during the plant establishment period.

**COST BREAK-DOWN**

The Contractor shall furnish the Engineer a cost break-down for the contract lump sum items of highway planting and irrigation system. Cost break-down tables shall be submitted to the Engineer for approval within 60 working days after the contract has been approved. Cost break-down tables shall be approved, in writing, by the Engineer before any partial payment will be made for the applicable items of highway planting and irrigation system involved.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Cost break-downs shall be completed and furnished in the format shown in the samples of the cost break-downs included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the unit descriptions shown in the samples. The line items and quantities given in the samples are to show the manner of preparing the cost break-downs to be furnished by the Contractor.

The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break-downs submitted to the Engineer for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-downs submitted for approval.

The sum of the amounts for the line items of work listed in each cost break-down table for highway planting and for irrigation system work shall be equal to the contract lump sum price bid for Highway Planting and Irrigation System, respectively. Overhead and profit, except for time-related overhead, shall be included in each individual line item of work listed in a cost break-down table.

No adjustment in compensation will be made in the contract lump sum prices paid for highway planting and irrigation system due to differences between the quantities shown in the cost break-downs furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

Individual line item values in the approved cost break-down tables will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the contract lump sum items of highway planting and irrigation system due to changes in line items of work ordered by the Engineer. When the total of ordered changes to line items of work increases or decreases the lump sum price bid for either Highway Planting or Irrigation System by more than 25 percent, the adjustment in compensation for the applicable lump sum item will be determined in the same manner specified for increases and decreases in the total pay quantity of an item of work in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

**HIGHWAY PLANTING COST BREAK-DOWN**
**NB**
**Contract No. 08-334844**

| UNIT DESCRIPTION | UNIT | APPROXIMATE QUANTITY | VALUE | AMOUNT |
|---|---|---|---|---|
| Roadside Clearing | LS | Lump Sum | | |
| Plant (Group A) | EA | 6189 | | |
| Plant (Group B) | EA | 1648 | | |
| Plant (Group U) | EA | 210 | | |
| Plant (Group F) | EA | 22600 | | |
| Plant (Group H) | EA | 5380 | | |
| Cultivate (Soil Amendment) | M2 | 6900 | | |
| Plant (Group K-1) | EA | 70 | | |
| Plant (Group K-2) | EA | 12 | | |
| Plant (Group Z) | EA | 22 | | |
| Plant (Group T) | M2 | 1000 | | |
| Mulch | KG | 5,760 | | |
| Commercial Fertilizer (granular) | EA | 8,151 | | |
| | | | | |
| | | | | |
| | | | | |

**TOTAL** _____

**IRRIGATION SYSTEM COST BREAK-DOWN**

**Contract No. 08-334844**

| UNIT DESCRIPTION | UNIT | APPROXIMATE QUANTITY | VALUE | AMOUNT |
|---|---|---|---|---|
| Check, Test and Remove Irrigation Facilities | LS | Lump Sum | | |
| Control & Neutral Conductors | LS | Lump Sum | | |
| 25 mm Electric Remote Control Valve | EA | 7 | | |
| 40 mm Electric Remote Control Valve | EA | 38 | | |
| 50 mm Electric Remote Control Valve | EA | 8 | | |
| 20 mm Plastic Pipe (Schedule 40) (Supply Line) | M | 2490 | | |
| 25 mm Plastic Pipe (Schedule 40) (Supply Line) | M | 1910 | | |
| 32 mm Plastic Pipe (Schedule 40) (Supply Line) | M | 695 | | |
| 40 mm Plastic Pipe (Schedule 40) (Supply Line) | M | 1020 | | |
| 50 mm Plastic Pipe (Schedule 40) (Supply Line) | M | 2655 | | |
| Sprinkler (TypeA-5) | EA | 30 | | |
| Sprinkler (TypeA-6) | EA | 41 | | |
| Sprinkler (Type B-1) | EA | 241 | | |
| Sprinkler (Type B-2) | EA | 956 | | |
| Sprinkler (Type B-4) | EA | 126 | | |
| Sprinkler (Type C-2) | EA | 350 | | |
| 25 mm Gate Valve | EA | 6 | | |
| 40 mm Gate Valve | EA | 11 | | |
| 50 mm Gate Valve | EA | 6 | | |
| 6-Station Solar Automatic Irrigation Controller | EA | 1 | | |
| 40 mm Backflow Preventer Assembly | EA | 1 | | |
| 50 mm Backflow Preventer Assembly | EA | 3 | | |
| Backflow Preventer Assembly Enclosure | EA | 4 | | |
| 24-Station Field Unit | EA | 2 | | |

**TOTAL** _____

## 10-2.02 EXISTING HIGHWAY PLANTING

In addition to the provisions in Section 20, "Erosion Control and Highway Planting," of the Standard Specifications, work performed in connection with existing highway planting shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Replacement planting shall conform to the provisions in "Preservation of Property" of these special provisions.

### MAINTAIN EXISTING PLANTED AREAS

Existing planted areas shall be maintained as directed by the Engineer. Maintaining existing planted areas will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Attention is directed to "Preservation of Property" of these special provisions.

## 10-2.03 EXISTING HIGHWAY IRRIGATION FACILITIES

The work performed in connection with the various existing highway irrigation system facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Water shall be maintained in conformance with the provisions in Section 20-5.025, "Maintain Existing Water Supply," of the Standard Specifications.

### LOCATE EXISTING CROSSOVERS AND CONDUITS

Existing crossovers and conduits shown on the plans to be incorporated in the new work shall be located in conformance with the provisions for locating conduits in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Unless otherwise directed by the Engineer, existing crossovers and conduits shown on the plans to be incorporated in the new work shall be located prior to performing work on irrigation systems.

If debris is encountered in the ends of conduits, the debris shall be removed prior to performing other work in the conduits. Removal of debris within the first one meter in these conduits shall be at the Contractor's expense. If debris is encountered in the conduits more than one meter from the ends of the conduits, the additional debris shall be removed as directed by the Engineer and the removal work will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

### CHECK AND TEST EXISTING IRRIGATION FACILITIES

Existing irrigation facilities that are to remain or to be relocated, and that are within those areas where clearing and grubbing or earthwork operations are to be performed, shall be checked for missing or damaged components and proper operation prior to performing clearing and grubbing or earthwork operations. Existing irrigation facilities outside of work areas that are affected by the construction work shall also be checked for proper operation.

A written list of existing irrigation system deficiencies shall be submitted to the Engineer within 5 working days after checking the existing facilities.

Deficiencies found during checking of the existing facilities shall be corrected as directed by the Engineer. Corrective work ordered by the Engineer will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Existing backflow preventers shall be tested in conformance with the provisions in "Irrigation Systems" of these special provisions.

Length of watering cycles for use of potable water from water meters for checking or testing existing irrigation facilities shall be as determined by the Engineer.

Repairs to the existing irrigation facilities ordered by the Engineer after checking and testing the facilities, and further repairs required thereafter as ordered by the Engineer, except as otherwise provided under "Existing Highway Irrigation Facilities" of these special provisions, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

### REMOVE EXISTING IRRIGATION FACILITIES

Existing irrigation facilities within excavation and embankment slopelines to be removed, shall be removed. Facilities that are more than 150 mm below finished grade, may be abandoned in place.

Immediately after disconnecting an existing irrigation facility to be removed or abandoned from an existing facility to remain, the remaining facility shall be capped or plugged, or shall be connected to a new or existing irrigation facility.

A list of salvaged facilities, including the quantity and size of each item salvaged, shall be included with each delivery. Nozzle lines shall not be listed.

Facilities to be removed, 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.

## 10-2.04 HIGHWAY PLANTING

The work performed in connection with highway planting shall conform to the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

### HIGHWAY PLANTING MATERIALS

#### Mulch

Mulch shall be colored wood chips and shall be 75mm or less in size, made from chipped recycled fir wood, and shall be colored red with a long lasting, non-toxic mineral dye.

#### Commercial Fertilizer (Granular)

Commercial fertilizer (granular) used during planting shall be a pelleted or granular form and shall fall within 20 percent of the following guaranteed chemical analysis:

| Ingredient | Percentage |
|---|---|
| Nitrogen | 6 |
| Phosphoric Acid | 20 |
| Water Soluble Potash | 20 |

#### Commercial Fertilizer (Granular)

Commercial fertilizer (granular) used during plant establishment shall be a pelleted or granular form, and shall fall within the following guaranteed chemical analysis range:

| Ingredient | Percentage |
|---|---|
| Nitrogen | 9 |
| Phosphoric Acid | 9 |
| Water Soluble Potash | 9 |

### ROADSIDE CLEARING

Within 30 days prior to preparing rock blanket (Type 1) areas, erosion control (Type D) areas, turf (Sod) areas, maintenance vehicle pullout areas, planting areas, and mulch areas trash and debris shall be removed from within the limits of those areas, excluding paved areas, medians and existing planted areas where existing plants are to remain.

In addition to removing trash and debris, the project area shall be cleared as specified herein:

A. Weeds shall be killed and removed within planting areas where plants are to be planted in groups or rows -and from within an area extending 2 m beyond the outer limits of the groups or rows of plants.

After the initial roadside clearing is complete, additional roadside clearing work shall be performed as necessary to maintain the areas, as specified above, in a neat appearance until the start of the plant establishment period. This work shall include the following:

A. Trash and debris shall be removed.
B. Weed growth shall be killed before the weeds reach the seed stage of growth or exceed 75 mm in length.

#### Weed Control

Weed control shall also conform to the following:

A. Stolon type weeds shall be killed with glyphosate.
B. Tumbleweeds shall be removed by hand pulling before the tumbleweeds reach a height of 75 mm.
C. Removed weeds 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.

Roadside clearing work shall not include work required to be performed as clearing and grubbing as specified in Section 16, "Clearing and Grubbing," of the Standard Specifications.

**PESTICIDES**

Pesticides used to control weeds shall conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specifications. Except as otherwise provided in these special provisions, pesticide use shall be limited to the following materials:

Cacodylic Acid
Diquat
Fluazifop-butyl
Glyphosate
Isoxaben (Preemergent)
Sethoxydim
Oxadiazon - 50 percent WP (Preemergent)
Oryzalin (Preemergent)
Pendimethalin (Preemergent)
Prodiamine (Preemergent)
Trifluralin (Preemergent)
Ammonium Sulfate
Magnesium Chloride
Melfluidide (Growth regulator)
Napropamide (Preemergent)

Granular preemergents may be used when applied to areas that will be covered with mulch, excluding plant basins. Granular preemergents shall be limited to the following materials:

Dichlobenil (Preemergent)
Oxadiazon (Preemergent)

Granular preemergents shall be applied prior to the application of mulch. Mulch applications shall be completed in these areas on the same working day. Photosensitive dye will not be required.

Glyphosate shall be used to kill stolon type weeds.

Oxadiazon shall be of the emulsifiable concentration or wettable powder type, except when Oxadiazon is used under mulch in conformance with these special provisions.

A minimum of 100 days shall elapse between applications of preemergents.

Ammonium sulfate and magnesium chloride shall be used only in areas planted to Carpobrotus or Delosperma. Ammonium sulfate and magnesium chloride shall not be applied in a manner that allows the pesticides to come in contact with trees or shrubs.

If the Contractor elects to request the use of other pesticides on this project, the request shall be submitted, in writing, to the Engineer not less than 15 days prior to the intended use of the other pesticides. Except for the pesticides listed in these special provisions, no pesticides shall be used or applied without prior written approval of the Engineer.

Except for ground cover plants pesticides shall not be applied in a manner that allows the pesticides to come in contact with the foliage and woody parts of the plants.

**CULTIVATE**

Areas to be planted with Plant Group "F," Plant Group "H," and turf (sod) shall be cultivated.

Immediately prior to cultivation, soil amendment and commercial fertilizer shall be added to the areas to be cultivated. Soil amendment shall be added at the rate shown on the plans and commercial fertilizer shall be applied at the rate of 7.5 kilograms per 100 square meters. Soil amendment and fertilizer shall be thoroughly mixed with the soil.

After cultivation is complete and the irrigation systems have been installed and the plant holes have been excavated and backfilled, no further planting work shall be done in the cultivated areas for a period of 10 days, except the soil shall be kept sufficiently moist to germinate weeds. Weeds that germinate shall be killed.

**PLANTING**

Backfill material for plant holes shall be a mixture of soil and soil amendment. The quantity of soil amendment shall be as shown on the Plant List. Soil amendment shall conform to the provisions in Section 20-2.03, "Soil Amendment," of the

Standard Specifications. Backfill material shall be thoroughly mixed and uniformly distributed throughout the entire depth of the plant hole without clods and lumps.

Commercial fertilizer and granularshall be applied or placed at the time of planting and at the rates shown on the Plant List and in conformance with the provisions in Section 20-4.05, "Planting," of the Standard Specifications and these special provisions.

A granular preemergent shall be applied to areas to be covered with mulch outside of plant basins in conformance with the provisions in "Pesticides" of these special provisions.

Mulch placed in areas outside of plant basins shall be spread to a uniform depth of 100 mm.

Mulch shall not be placed within areas to be planted with Carpobrotus edulis or Pelargonium peltatum "Balcan," one meter of the centerline of earthen drainage ditches, within one meter of the edge of paved ditches, and within one meter of the centerline of drainage flow lines.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions regarding functional tests of the irrigation systems. Planting shall not be performed in an area until the functional test has been completed for the irrigation system serving that area. Carpobrotus edulis shall not be planted within 1 meter of other groundcover, trees and shrubs.

Before each palm tree is planted, dead fronds and frond stubs shall be removed from the trunk. The palm head including the aptical bulb shall be saturated with a fungicide approved for use by Engineer. Green fronds shall be removed up to 2 rows of fronds away from the center growth. The 2 remaining rows of fronds shall be tied in an upright position with light hemp or manila rope. Palm trees shall not be dragged during planting operations and the trunks shall be protected from injury. Planting hole shall conform to the details shown on the plans. Backfill material shall be plaster sand.

When the palm trees are planted, a root stimulant, approved by the Engineer, shall be applied to the roots of each palm tree in conformance with the printed instructions of the root stimulant manufacturer. A copy of the printed instructions shall be furnished to the Engineer before applying a stimulant. Root stimulant to be used shall be submitted to the Engineer not less than 2 weeks prior to the stimulant's intended use. Root stimulants not approved by the Engineer shall not be used.

**TURF (SOD)**

Turf (sod) shall be placed on the areas shown on the plans as "Turf."

Sod shall be a fescue matching the adjacent existing fescue and shall be healthy field grown sod containing not more than 12 mm thick thatch. The age of the sod shall be not less than 8 months or more than 16 months.

Sod shall be grown in conformance with California agricultural codes. The sod shall be free from disease, weeds, insects, and nondesirable types of grasses and clovers. Soil upon which the sod has been grown shall contain less than 50 percent silt and clay.

Sod shall be machine cut at a uniform soil thickness of 16 mm ± 6 mm, not including top growth and thatch.

A Certificate of Compliance for the sod shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Sod shall be protected with tarps or other protective covers during delivery and shall not be allowed to dry out during delivery or prior to placement.

Areas to be planted to sod shall be cultivated in conformance with the provisions in "Cultivate" of these special provisions.

Weeds and debris shall be removed before cultivation and 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.

Soil amendment and commercial fertilizer shall be applied at the rates shown on the plans and in conformance with the provisions in "Cultivate" of these special provisions.

After cultivation, installation of irrigation systems, and excavation and backfilling of plant holes are completed, areas to be planted to sod shall be fine graded and rolled. Areas to be planted to sod shall be graded to drain and shall be smooth and uniform prior to placing sod. Areas to be planted to sod adjacent to sidewalks, header boards, and other paved borders and surfaced areas shall be 40 mm ± 6 mm below the top grade of the facilities, after fine grading, rolling, and settlement of the soil.

Sod shall be placed so that the ends of adjacent strips of sod are staggered a minimum of 0.6-m. Edges and ends of sod shall be placed firmly against adjacent sod and against sidewalks, concrete headers, and other paved borders and surfaced areas.

After placement of the sod, the entire sodded area shall be lightly rolled to eliminate air pockets and to ensure close contact with the soil. After rolling, the sodded areas shall be watered so that the soil is moistened to a minimum depth of 100 mm. Sod shall not be allowed to dry out.

If irregular or uneven areas appear before or during the plant establishment period, these areas shall be restored to a smooth and even appearance.

When the turf (sod) has reached a height of 75 mm the turf shall be mowed to a height of 32 mm. Turf (sod) edges, including edges adjacent to sidewalks, concrete headers, and other paved borders and surfaced areas, shall be trimmed to a uniform edge not extending beyond the edge of turf or the facilities. Mowed and trimmed growth shall be removed and 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. Trimming shall be repeated whenever the edge of turf exceeds 25 mm.

Mowing and trimming turf (sod) and disposing of mowed material, during the plant establishment period, will be paid for in conformance with the provisions in "Plant Establishment Work" of these special provisions.

**PLANT ESTABLISHMENT WORK**

The plant establishment period shall be Type 2 and shall not be less than 125 working days.

Attention is directed to "Relief From Maintenance and Responsibility" in these special provisions regarding relief from maintenance and protection.

Two applications of commercial fertilizer (granular) shall be applied to trees, shrubs, vines turf (sod) and ground cover areas when directed by the Engineer. Commercial fertilizer shall be applied at the rates shown on the plans and shall be spread with a mechanical spreader wherever possible.

The center to center spacing of replacement plants for unsuitable ground cover plants shall be the original spacing:

Weeds within mulched and ground cover areas and outside of plant basins shall be controlled by killing.

Vines shall be trained onto fences and walls or through cored holes in walls.

At the option of the Contractor, plants of a larger container size than those originally specified may be used for replacement plants during the first 125 working days of the plant establishment period. The use of plants of a larger container size than those originally specified for replacement plants shall be at the Contractor's expense.

When ordered by the Engineer, one application of a preemergent pesticide conforming to the provisions in "Pesticides" of these special provisions, shall be applied between 40 and 50 working days prior to completion of the plant establishment period. This work will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

The final inspection shall be performed in conformance with the provisions in Section 5-1.13, "Final Inspection," of the Standard Specifications and shall be completed a minimum of 20 working days before the estimated completion of the contract.

Turf areas shall be mowed in conformance with the provisions in "Turf (Sod)" of these special provisions.

Full compensation for mowing and trimming turf (sod) and disposing of mowed and trimmed material during the plant establishment period shall be considered as included in the contract lump sum price paid for plant establishment work and no additional compensation will be allowed therefor.

**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.

Only pipeline trenches and excavation pits for supply lines being supplied from one water service point shall be open at one time. After pressure testing is complete, trenches and pits excavated for pipe supply lines, being supplied from one water service point, shall be backfilled prior to commencing excavations for pipe supply lines being supplied from another water service point.

**VALVE BOXES**

Valve boxes shall conform to the provisions in Section 20-2.24, "Valve Boxes," of the Standard Specifications, except as otherwise provided herein.

Valve boxes shall be precast portland cement concrete.

Covers for concrete valve boxes shall be cast iron or steel. Cast iron and steel covers shall be hinged with brass hinge pins for valve boxes containing valves smaller than 50 mm.

Valve boxes shall be identified on the top surface of the covers by labels containing the appropriate abbreviation for the irrigation facility contained in the valve box as shown on the plans. Valve boxes that contain remote control valves shall be identified by the appropriate letters and numbers (controller and station numbers). Labels for valve boxes shall conform to the provisions in Section 20-5.03F, "Valves and Valve Boxes," of the Standard Specifications.

Label material shall be plate plastic.

## GATE VALVES

Gate valves shall be as shown on the plans and in conformance with the provisions in Section 20-2.28, "Gate Valves," of the Standard Specifications and these special provisions.

Gate valves, 50 mm in size, shall be manufactured of ductile iron or cast iron with non rising stainless steel stems .

## ELECTRIC AUTOMATIC IRRIGATION COMPONENTS

### Irrigation Controllers

Irrigation controllers shall be single, solid-state independent controllers conforming to the following:

The solar automatic irrigation controllers shall conform to the following:

A. Solar Irrigation controllers, shall operate on a photovoltaic power system computer with a lockable waterproof vandal resistant case, and shall be manufactured as one complete unit.
B. Power shall be available for continuous 24-hour operation.
C. The computer liquid-crystal display shall be powered by a 9-volt battery key mechanism.
D. The solar irrigation controller shall have an output digital control pulse at 3.5-volts which will operate a valve solenoid.
E. The solar irrigation controller shall be fully automatic and capable of operating a complete one day to 90 day cycle, scheduling of up to 32 totally independent programs, with each having its own start time, day cycle, assigned stations, duration, and program time. Each station shall be capable of 1 minute to 24 hour operation in one minute increments and shall have separate settings for hours and minutes.
F. The solar irrigation controller shall have an emergency program backup system with a user-defined fail-safe program and system parameters which are stored in a non-erasable memory.
G. The solar irrigation controller shall be installed as shown on the plans in accordance with the manufacturer's specifications.

The watering time of each station shall be displayed on the face of the control panel.

### Electric Remote Control Valves

Electric remote control valves shall conform to the provisions in Section 20-2.23, "Control Valves," of the Standard Specifications and the following:

A. Valve shall be cast iron construction.
B. Valves shall be straight pattern (side inlet) as shown on the plans.
D. Valve solenoids, adjacent to route 91 from station 123+00 to station 124+20, for solar controllers shall be DC latching and operate on 3.5 V.
E. Valves shall operate within a pressure range of 0-2068 kPa.
F. Valve shall operate at a minimum flow rate of .04 liters per minute.
G. Valves shall be equipped with an internal manual bleed.

### Pull Boxes

Pull box installations shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduits and Pull Boxes," of the Standard Specifications.

### Conductors

Low voltage, as used in this section "Conductors," shall mean 36 V or less, and shall be a minimum number 14 size wire.

Low voltage control and neutral conductors in pull boxes and valve boxes, at irrigation controller terminals, and at splices shall be marked as follows:

A. Conductor terminations and splices shall be marked with adhesive backed paper markers or adhesive cloth wrap-around markers, with clear, heat-shrinkable sleeves sealed over the markers.

Markers for the control conductors shall be identified with the appropriate number or letter designations of irrigation controllers and station numbers. Markers for neutral conductors shall be identified with the appropriate number or letter designations of the irrigation controllers.

The color of low voltage neutral and control conductor insulation, shall be homogeneous throughout the entire thickness of the insulation.

Insulation for conductors may be UL listed polyethylene conforming to UL44 test standards with a minimum insulation thickness of 1.05 mm for wire sizes 10AWG and smaller.

Type "C", Type "S" or Type "T" splices shall be used. Splices for low voltage control and neutral conductors shall conform to provisions in Section 86-2.09C, "Connectors and Terminals," 86-2.09D, "Splicing," and 86-2.09E, "Splice Insulation," of the Standard Specifications, except Type "S" splices shall be soldered.

**REMOTE IRRIGATION CONTROL SYSTEM**

The Remote Irrigation Control System (RICS) shall consist of communication connections to existing base station, field units, connections to existing communications conductors, and manufacturer supplier support.

**BASE STATION**

The existing base station is located at the University of California Riverside Campus, 900 University Avenue, Riverside CA 92521. The telephone number for base station accessibility is (909) 787-4220.

**BASE STATION EQUIPMENT**

**Communication Equipment**

The communication equipment for the base station shall have a 2-way data communications link with the field units by the following method:

A. Hard wire.

**Field Units**

Field unit shall consist of a field switching terminal (irrigation controller), communication conductors and remote control valve actuator system installed in an irrigation controller enclosure cabinet. The irrigation controller enclosure cabinet shall conform to the provisions in "Irrigation Controller Enclosure Cabinet" of these special provisions. Communication conductors shall conform to the requirements as specified in "Conductors" of these Special Provisions.

Arrangements have been made to insure that any successful bidder can obtain the specified field switching terminal (irrigation controller) listed below from Solar Wind Systems, 925 Lakeville St., Suite 320, Petaluma, California, 94952., Telephone number (415) 883-0404. The Remote Control Valve Actuator System supplier is Hydroscape Products, 610 Batavia, Orange, California, 92868, Telephone Number (714) 639-9886.

Price quotes are guaranteed for one year from date of quote submitted on 10/15/2002. Quoted prices do not include sales tax.

**FIELD UNIT EQUIPMENT NEEDED**

| Description | Model # | Quantity | Quoted Price | Extended Price |
|---|---|---|---|---|
| **I – FIELD SWITCHING TERMINAL** | | | | |
| (Irrigation Controller) | FST-24C | 2 | $2,500.00 | $5,000.00 |
| **II – REMOTE CONTROL VALVE ACTUATOR SYSTEM** | | | | |
| EICON 30 Station Permanent Mount Receiver | HSOMT30RX | 2 | $510.00 | $1020.00 |
| EICON PANCAK Antenna | HSVRA | 2 | $190.00 | $380.00 |
| UHF Handheld Transceiver EICON | TRX-5U | 2 | $1,499.00 | $2,998.00 |
| | | | TOTAL | $9,398.00 |

If at the time of installation, this quoted price has changed, the State will take credit for any reduction in the price, or will pay the difference for any increase in price. The credit or payment will be taken on the first monthly progress payment

made after the field unit is installed. The contractor shall furnish the Engineer with a copy of the invoice for the fully assembled field unit.

**Communication Equipment**

The communication equipment for the field units shall have a 2-way data communication link with the base station by the method described under base station communications in this special provision.

**ARMOR-CLAD CONDUCTORS**

Armor-clad conductors shall be used in direct burial applications from pull boxes adjacent to irrigation controller to remote control valves and other irrigation facilities in conformance with the details shown on the plans and these special provisions.

Armor-clad conductors shall conform to the following:

A. Conductors shall be the proper size for the application, and shall be solid, uncoated copper with a conductor size not less than 90 percent of the AWG diameter required.
B. At the Contractor's option, conductor insulation coverings shall be either of the following:

    1. Polyvinyl chloride (PVC) conforming to UL style, Type UF 60°C, 600 V. Average thickness of insulation shall be not less than 1.52 mm, with a minimum thickness of 1.37 mm, or
    2. UL listed polyethylene conforming to UL44 test standards with a minimum insulation thickness of 1.05 mm for wire sizes 10AWG and smaller.

C. Armor shall be a minimum 0.13-mm thick by 12.7 mm wide Type 304 stainless steel tape that is helically wrapped over each conductor with a 33 percent minimum overlap.
D. Outer jacket for conductors shall be sunlight resistant PVC and shall conform to the Insulated Power Cable Engineer's Association (ICEA) S-61-402, NEMA Standard WC5, and UL Listing 1263. Nominal thickness of the outer jacket shall be 0.76-mm with a minimum thickness of 0.61-mm.

At the option of the Contractor, conductors conforming to the provisions in Section 20-2.31D, "Conductors," of the Standard Specifications may- be used when the conductors are installed in an electrical conduit.

**IRRIGATION SYSTEMS FUNCTIONAL TEST**

Functional tests for the solar irrigation controllers and associated automatic irrigation systems shall conform to the provisions in Section 20-5.027J, "Testing," of the Standard Specifications and these special provisions.

Tests shall demonstrate to the Engineer, through one complete cycle of the solar irrigation controllers in the automatic mode, that the associated automatic components of the irrigation systems operate properly. If automatic components of the irrigation systems fail a functional test, these components shall be repaired at the Contractor's expense and the testing repeated until satisfactory operation is obtained.

Associated automatic components shall include, but not be limited to, remote control valves.

Upon completion of work on an irrigation system, including correction of deficiencies and satisfactory functional tests for the systems involved, the plants to be planted in the area watered by the irrigation system may be planted provided the planting areas have been prepared as specified in these special provisions.

**IRRIGATION SYSTEMS FUNCTIONAL TEST**

Functional tests for the remote irrigation controller system (RICS) and associated automatic irrigation systems shall conform to the provisions in Section 20-5.027J, "Testing," of the Standard Specifications and these special provisions.

Two functional tests shall be performed, one without and one with connection to the existing remote irrigation controller system base station. Both tests shall consist of demonstrating to the Engineer, through one complete cycle of the irrigation controllers in the automatic mode, that the associated automatic components of the irrigation systems operate properly.

The Contractor shall notify the Engineer not less than 2 weeks prior to starting the functional tests for the remote irrigation control system.

Associated automatic components for both tests shall include, but not limited to, new and existing remote control valve actuator systems, irrigation controllers, remote control valves and conductors. Associated automatic components for the second test shall include, but not be limited to, existing irrigation software programs. The first test shall be performed prior to planting the plants and shall consist of testing the irrigation controllers and associated automatic irrigation systems without connection to the existing remote irrigation controller system base station. Upon completion of a satisfactory functional test,

and correction of the deficiencies, the plants to be planted in the areas watered by the irrigation system may be planted, provided the planting areas have been prepared as specified in these special provisions.

The second test shall be performed prior to the start of plant establishment and shall consist of testing the irrigation controllers (field units) and associated automatic irrigation systems with connection to the existing remote irrigation controller system base station. As part of the second test, a remote irrigation controller system watering schedule shall be submitted for each irrigation controller (field unit) to the Engineer. The Engineer will submit the watering schedule to University of California Riverside staff for imput into the irrigation software program, and a computer printout will be made available to the Contractor for verification. If the Engineer determines the submitted watering schedule is unacceptable, a revised watering schedule shall be submitted to the Engineer for approval within 5 working days. Upon completion of a satisfactory test, including correction of deficiencies, the plant establishment period may begin, provided planting work as specified in these special provisions has been completed except for plant establishment work.

Repair or replacement of existing irrigation facilities due to unsatisfactory performance shall conform to the provisions in Section 20-5.025, "Maintain Existing Water Supply," of the Standard Specifications and "Existing Highway Irrigation Facilities" of these special provisions.

**PIPE**

**Steel Pipe**

Galvanized steel pipe supply lines installed between water meters and backflow preventer assemblies shall be installed not less than 450 mm below finished grade, measured to the top of the pipe.

**Plastic Pipe**

Plastic pipe supply lines shall be polyvinyl chloride (PVC) 1120 or 1220 pressure rated pipe.

Plastic pipe supply lines that are 50 mm or smaller in diameter shall be schedule 40 pipe and shall conform to the requirements of ASTM designation: 1785.

Plastic pipe supply lines shall have solvent cemented type joints. Primers shall be used on the solvent cemented type joints.

Fittings for plastic pipe supply lines with a pressure rating (PR) of 315 shall be Schedule 80.

**WATER METER**

Water meters for the irrigation systems will be furnished and installed by the serving utility at the locations shown on the plans.

Upon receipt of a written request from the Contractor, the Engineer will make arrangements with the serving utility to install the water meters. The State will pay the costs and fees charged by the serving utility for the installations.

**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.

Pressure loss through the backflow preventers shall not exceed the following:

| BACKFLOW PREVENTER SIZE (millimeters) | FLOW RATE (Liters per minute) | PRESSURE LOSS (kPa) |
|---|---|---|
| 50 | 300 | 80 |

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.

**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.

Enclosure door handles shall have provisions for padlocking in the latched position. Padlocks will be State-furnished. Attention is directed to "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 the provisions in Section 20-2.26, "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 concrete pad shall extend a minimum of 50 mm beyond the outer limits of the backflow preventer assembly enclosure, unless otherwise shown on the plans or specified in these special provisions.

### TESTING BACKFLOW PREVENTERS

New backflow preventers installed by the Contractor and existing backflow preventers to remain in place 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 of the backflow preventer assembly and before operation of the irrigation systems. Existing backflow preventers shall be tested, and repaired if required, when existing irrigation facilities are checked.

Repair of existing backflow preventers will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications when ordered by the Engineer, except damage caused by the Contractor's operations.

Retesting of backflow preventers after satisfactory completion of the first tests will not be required.

Testing existing backflow preventers will be paid for in conformance with the provisions in "Checking and Testing Existing Irrigation Facilities" of these special provisions.

### SPRINKLERS

Sprinklers shall conform to the type, pattern, material, and operating characteristics listed in the "Sprinkler Schedule" shown on the plans.

### FINAL IRRIGATION SYSTEM CHECK

A final check of existing and new irrigation facilities shall be performed not more than 20 working days prior to acceptance of the contract.

The length of watering cycles using potable water measured by water meters for the final check of irrigation facilities will be determined by the Engineer.

Remote control valves connected to existing and new irrigation controllers shall be checked for automatic performance when the controllers are in automatic mode.

Unsatisfactory performance of irrigation facilities installed or modified by the Contractor shall be repaired and rechecked at the Contractor's expense until satisfactory performance is obtained, as determined by the Engineer.

Repair or replacement of existing irrigation facilities due to unsatisfactory performance shall conform to the provisions in "Existing Highway Irrigation Facilities" of these special provisions.

Nothing in this section "Final Irrigation System Check" shall relieve the Contractor of full responsibility for making good or repairing defective work or materials found before the formal written acceptance of the entire contract by the Director.

Full compensation for checking the irrigation systems prior to the acceptance of the contract shall be considered as included in the contract lump sum price paid for plant establishment work and no additional compensation will be allowed therefor.

## SECTION 10-3. ELECTRICAL SYSTEMS

**10-3.01 DESCRIPTION**

Modifying traffic signals and lighting, Traffic Signals and Lighting, irrigation controller enclosure cabinet, modifying highway and sign illumination ramp metering systems, modifying ramp metering system, traffic monitoring stations (count), traffic monitoring station (incident), modify fiber optic system, closed circuit television system, Microwave Vehicle detection sensor system shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions. Locations of Traffic monitoring station (count), Traffic monitoring station (incident) installations are shown on the fiber optic system plans.

Electric conduit is included in the following structures:

University Avenue Undercrossing, Bridge No. 56-0314
Mission Inn Avenue Undercrossing, Bridge.No. 56-0315
Third Street Undercrossing, Bridge No. 56-0316
Spruce Street Overcrossing.Bridge No. 56-0800
Spruce Street Undercrossing, Bridge.No 56-0399
Chicago Avenue Overhead, Bridge No 56-0403
Blaine Street Overcrossing, Bridge No. 56-0395
Iowa Avenue Overcrossing, BridgeNo. 56-0396
Linden Ave Overcrossing, Bridge No. 56-0397
Canyon Crest Drive Undercrossing, Bridge No. 56-0085R/L
Martin Luther King Boulevard, Bridge. No. 56-0803
Central Avenue Undercrossing, Bridge No. 56-0504
Box Springs Road Overcrossing, Bridge No. 56-0804
Day Street Undercrossing, Bridge No. 56-0447R

Fiber optic conduit is included in the following structures:

University Ave Undercrossing, Bridge No. 56-0314.
Mission Inn Avenue Undercrossing, Bridge.No. 56-0315
Third Street Undercrossing Br No 56-0316
Spruce Street Overcrossing Bridge No.56-0800
Spruce Street Undercrossing Bridge No 56-0399
Chicago Street Undercrossing. Bridge. No. 56-0403
Blaine Street Overcrossing. Bridge. No. 56-0395
University Avenue Undercrossing Bridge No.56-0409
Central Avenue Undercrossing Bridge No 56-0504
Box Springs Road Overcrossing Bridge. No. 56-0804
Day Street Undercrossing Bridge. No 56-0447R

Sprinkler control conduit is included in the following structures:

A. Canyon Crest Rd. Undercrossing (widen), Bridge No. 56-0085R/L
B. Martin Luther King Boulevard. Undercrossing, Bridge No. 56-0803
C. Blaine Street Overcrossing, Bridge No. 56-0395
D. Iowa Avenue Overcrossing, Bridge No. 56-0396
E. Linden Avenue Overcrossing, Bridge No. 56-0397

Traffic signal work shall be performed at the following locations:

A. 91 WB off at Mission Inn Avenue
B. 91 EB on at University Avenue
C. 91 at WB on Spruce Street
D. 91 at EB off Spruce Street
E. 91 at La Cadena Avenue and Spruce Street
F. Iowa Ave at Linden Street
G. 215 at SB at Blaine St
H. 215 at NB at Blaine Street
I. 215 SB at University Avenue

J. 215 NB at University Avenue
K. Canyon Crest at Martin Luther King Boulevard
L. 215 SB Martin Luther King Boulevard
M. 215 NB off Central Avenue
N. 215 SB on Central Avenue
O. Central at Sycamore Canyon
P. 215 NB at Box Springs
Q. Fair Isle at Sycamore Canyon
R. 215 at Sycamore Canyon
S. 60 at Day Street

**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 30 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. Fiber optic conduit.
B. Fiber optic inner duct
C. Fiber Optic Splice Vault
D. Type A Cable
E. Type B cable
F. Type C cable
G. Type D cable
H. Close circuit Television system elements (Camera Pole, Closed Circuit Camera Assembly, Type 334-CCTV Cabinet Assembly, Camera Tranceiver (TCVR)).
I. Microwave vehicle Detection sensor system
J. Video Multiplexer
K. Video Demultiplexer

For lump sum bid items at more than one location the cost breakdown shall include subtotals by location.

**10-3.03 EQUIPMENT LIST AND DRAWINGS**

Each field cabinet which is connected to the communication system under this contract shall be supplied with the following documentation stored in a water resistant folder, mounted on the inside of the cabinet door:

A. The wiring diagram for the communication elements at that site.
B. The system schematic diagrams.
C. The data node circuit assignment tables.
D. The fiber assignment tables (data nodes and hub).

Additional information may be supplied by the Engineer to be used to produce the documentation listed above by adding the related information that applies to this project.

Full compensation for field cabinet documentation shall be included in the contract lump sum price paid for system testing and documentation and no additional payment will be allowed therefor.

**10-3.04 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS**

Traffic signal system shutdowns shall be limited to periods between the hours of 9 a.m. and 3 p.m.

**10-3.05 ORDER OF WORK**

CCTV locations 2,3,4,5 shall be installed and placed in operation prior to the removal of either High Mast CCTV.

**10-3.06 FOUNDATIONS**

Reinforced cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards shall conform to the provisions in "Piling" of these special provisions.

**10-3.07 STANDARDS, STEEL PEDESTALS AND POSTS**

Standards, steel pedestals and posts for traffic signal and lighting standards shall conform to the provisions in "Steel Structures" of these special provisions.

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.

**10-3.08 SLIP BASE INSERTS**

Slip base inserts, for installation between the lighting standards and the foundations, shall conform to the details shown on the plans.

The bottom slip base plate shall be welded to the bottom anchor plate before installation. The top slip base plate shall be drilled and tapped to accept the threaded studs as shown on the plans. The studs shall not be welded to the top slip base plate. The pitch diameter of the threaded holes shall conform to the requirements in ANSI Standard: B1.1, having a Class 2B tolerance. Threaded studs installed in the top slip base plate shall match the holes in the base of the lighting standard.

The optional cast steel plate shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

The combined bottom anchor plate and bottom slip base plate shall be bolted to the foundation. The top slip base plate, without the lighting standard attached, shall be bolted to the bottom slip base plate. Each high-strength bolt shall be torqued to 200 ± 10 N·m. After assembly of the insert, the lighting standard shall be erected and installed on the top slip base plate. During installation the lighting standard shall be properly supported to maintain proper alignment of the insert.

High strength bolts, nuts and flat washers used to connect slip base inserts shall conform to the requirements in ASTM Designation: A 325.

**10-3.09 CONDUIT**

Conduit to be installed underground shall be Type 1 schedule 40 unless otherwise specified. Detector termination conduits shall be Type 3.

All conduits in or on bridge structures shall be type 1.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

| Size Designation for Metallic Type Conduit | Equivalent Size for Rigid Non-metallic Conduit |
|---|---|
| 21 | 20 |
| 27 | 25 |
| 41 | 40 |
| 53 | 50 |
| 63 | 65 |
| 78 | 75 |
| 103 | 100 |

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. Conduits shall not be installed by trenching across freeways or ramps.

Pull ropes for use when installing cables in Type 3 conduit shall consist of a flat, woven, lubricated, soft-fiber polyester tape with a minimum tensile strength of 8000 N and shall have printed sequential measurement markings at least every meter.

## 10-3.10 FIBER OPTIC CONDUIT

Fiber optic conduit is defined as conduit that will contain inner-duct and/or fiber optic cable, as shown on the plans. Furnishing and installing fiber optic conduit shall conform to the provisions for other conduits, and the following.

All fiber optic conduit shall be either Type 1 or Type 3

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 30 mm of asphalt shall be placed within 3 calendar days.

Type 1 conduit shall be used for conduit attached to the exterior of a bridge or for conduit between a bridge and an adjacent splice vault and for conduit installed under freeway entrance-and exit ramps or fiber optic pull box.

Direct coupling of Type 1 rigid steel to Type 3 rigid non-metallic fiber optic conduit will be permitted at underground locations by means of an industry standard rigid non-metallic conduit coupling. The coupling shall be the type for joining threaded conduit to solvent welded conduit.

Type 1 conduit shall be used for fiber optic conduit bends, except when using conduit with integral innerduct. Minimum conduit bend radius shall be 10 times trade diameter.

When fiber optic conduit is placed in a trench, that is not in a pavement area, the trench shall be backfilled with commercial quality colored concrete, as described elsewhere in these special provisions, containing not less than 250 kg of portland cement per cubic meter, to the dimensions shown on the plans. The trench shall be wide enough for a minimum of 25 mm of concrete between the wall of the trench and the side of the conduit.

Concrete used to backfill trenches shall have a 24-hour curing period. The trenches shall have barricades with "Open Trench" signs posted at the beginning of the trench and every 60 m.

Conduit shown on the plans to be installed either by trench in pavement or jacking will be paid for as trench in pavement regardless of which method is used.

All jacked conduit shall be Type 1. No trenching shall be allowed across freeways and ramps.

Immediately prior to installing innerduct, conduit shall be blown out with compressed air until all foreign material is removed.

After innerduct has been installed, the ends of conduits and innerduct shall be sealed with an approved type of conduit sealing

### WARNING TAPE

Warning tape shall be provided and placed in the trench over conduits containing F/O cable as shown on the plans. The warning tape shall be 100 mm wide with bold printed black letters of approximately 19 mm on bright orange color background, and contain the printed warning "CAUTION BURIED FIBER OPTIC CABLE - CALTRANS, " repeated at approximately 910 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 warning tape shall not delaminate nor shall the message smear when wet. The tape and the printed message shall be resistant to insects and shall not degrade when exposed to alkalis, acids and other corrosive elements commonly found in soil. It shall have a minimum of 356 N tensile strength and a minimum of 700 percent elongation before breakage.

Full compensation for furnishing and installing the warning tape shall be considered as included in the contract lump sum price paid for Modify Fiber optic communication system and no separate payment will be made therefor.

### TRACER WIRE

Tracer wire shall be provided and placed in conduits containing fiber optic cable as shown on 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 splice vault from each direction.

Tracer wire may be spliced at intervals of not less than 150 m. Splices shall conform to Section 86-2.09, "Wiring," of the Standard Specifications.

### COLORED CONCRETE BACKFILL

The concrete backfill for the installation of conduits that will contain F/O cable shall be a medium to dark, red color to clearly distinguish the concrete backfill from other concrete and soil. The concrete shall be pigmented by the addition of commercial quality cement pigment to the concrete mix. The red concrete pigment shall be LM Scofield Company; Orange Chromix Colorant; Davis Colors; or equal. The concrete shall conform to the provisions in Section 90-10, "Minor Concrete."

For trenches in pavement areas, only the top 100 mm of concrete backfill will be required to be pigmented concrete. At the option of the Contractor, the full depth may have the pigment.

Full compensation for furnishing and incorporating the cement pigment to achieve the color required shall be considered as included in the contract lump sum price paid for Modify fiber optic communication system and no separate payment will be made therefor.

**CONDUIT MARKERS**

Conduit markers shall be provided at 30 m spacing in places where fiber optic conduit is placed in non-paved areas. These markers shall conform to the standard plan A73C, class1, type F, flexible post delineator, except that the marker shall be non-reflective. The following text shall be written on each marker: "CAUTION BURRIED FIBER OPTIC CABLES".

### 10-3.11 INNERDUCT

Four innerducts shall be installed in each size 103 conduit. Each fiber optic cable shall be installed in its own innerduct.

Innerduct consists of an extruded flexible annealed polyethylene tubing that is installed inside electrical conduit, and which in turn the fiber optic cable is installed. Innerduct within a conduit run shall be continuous without splices or joints.

Unless otherwise shown on the plans, innerduct shall be nominal 32 mm inside diameter, with wall thickness of 2300 µm ± 76 µm, and shall meet the following requirements:

Polyethylene for innerduct shall have a density of 0.955 ±0.005 g/cm$^3$ (ASTM Standard D-1505), and shall conform to the applicable portions of ASTM Designations: D 3485, D 3035, D 2239, and D 2447, and the applicable portions of NEMA TC7 and TC2. Tensile yield strength shall be 22 753 kPa minimum (ASTM D-638).

Walls shall be smooth, corrugated or ribbed.

The polyethylene forming each innerduct shall be color coded according to the cable type that it contains as follows:

| |
|---|
| Type A - black |
| Type B - orange |
| Type C - yellow |
| Type D - blue |

The exterior of the duct shall be marked with sequential measurement markings every meter.

The innerducts shall be shipped on reels marked with the manufacturer, the contract number, and the size and length of the innerduct. The product on reels shall be covered with aluminized material to protect colors from UV deterioration during shipment and storage.

Installation procedures shall conform to the procedures specified by the innerduct manufacturer.

Full compensation for innerduct installed into conduit shall be considered as included in the contract lump sum price paid for Modify fiber optic communication system and no separate payment will be made therefor.

### 10-3.12 MULTIDUCT CONDUIT

Where Size 103 conduit with innerduct is to be installed by trenching, a factory assembled conduit system with four innerducts will be allowed.

The conduit shall be Schedule 40 PVC. Each innerduct shall be 32 mm (I.D. nominal), manufactured from polyethylene or PVC. Each innerduct shall be a different color and shall be consistent for the project. UL listing is not required.

Polyethylene innerduct shall conform to the provisions described under "INNERDUCTS", longitudinally ribbed, with minimum wall thickness of 2 mm.

PVC innerduct shall have a wall thickness of 2.3 mm minimum.

Straight segments of multiduct conduit shall be nominal 6 m lengths with a minimum 125 mm slip joint. Joints shall be keyed to mate the enclosed innerducts and shall lock together or be provided with a seating mark to verify proper assembly. The joint shall be solvent welded or sealed with a gasket as recommended by the manufacturer. Factory manufactured end sections shall be provided.

Bends shall be rigid factory assembled sections or shall be formed from factory assembled flexible sections, designed to fit the system.

Prior to joining the last sections of the conduit run, the innerduct colors at the ends shall be verified to be consistent.

## 10-3.13 CONDUIT AND INNERDUCT SEALING PLUGS

Except as otherwise noted, all conduits and empty 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, communication pull box and 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 Size 103 fiber optic conduit and innerducts shall seal the conduit and all innerducts simultaneously with one self contained assembly having an adjustable resilient filler of neoprene or silicone rubber clamped between backing ends and compressed with stainless steel hardware.

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 neoprene or silicone adapting sleeves, used singularly or in multiples, shall be inserted within the body of the plugs.

Sealing plugs used to seal Size 103 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 lump sum price paid for Modify fiber optic communication system and no separate payment will be made therefor.

## 10-3.14 ROUND TRAFFIC FIBER OPTIC SPLICE VAULTS

Fiber optic splice vaults shall conform to the Western Underground Committee Guide No. 3.6, "Nonconcrete Enclosures," except where differences are noted here or detailed on the plans. Dimensions of round traffic fiber optic splice vaults shall be as shown on the plans.

Fiber optic splice vault covers shall be rated for AASHTO HS 20-44 loading and shall be installed at the locations and in the manner shown on the plans. Concrete place around and under traffic splice vaults shall be minor concrete and shall contain not less than 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 of the vault allowing the slack fiber optic cable to be neatly coiled in a circular configuration.

Pulling eyes shall be installed as necessary to accommodate pulling of cables.

Tops of fiber optic vaults shall be installed at grade in paved areas and 25 mm above grade in unpaved areas.

## 10-3.15 CONDUCTORS AND WIRING

Splices shall be insulated by "Method B" or, at the Contractor's option, splices of conductors shall be insulated with heat-shrink tubing of the appropriate size after thoroughly painting the spliced conductors with electrical insulating coating.

The minimum insulation thickness, at any point, for Type USE, RHH or RHW wire shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive, and 1.3 mm for No. 8 to No. 2, inclusive. The minimum insulation thickness, at any point, for Type THW and TW wires shall be 0.69 mm for conductor sizes No. 14 to No. 10, inclusive, 1.02 mm for No. 8, and 1.37 mm for No. 6 to No. 2, inclusive.

Splices for fiber optic cables shall be as specified elsewhere in these special provisions.

### SIGNAL INTERCONNECT CABLE.

Signal Interconnect Cable (SIC) shall be the 6-pair type.

### 15 KV POWER CABLE

For this portion of the special provision, the term “cable(s)” shall refer to 15 kV shielded power cables run separately, grouped.

All cables shall be of the same gauge and manufacturer, and installed per the plans. The cables shall run continuously, and without splices except where shown on the plans.

**Cable.**--If the ambient temperature of where the cables are stored drops below –12˚C. The cables shall remain in an ambient temperature of least 16˚C for 24 hours prior to installation.

The components of the cable shall have the following characteristics:

1. Cables.--Cables shall be shielded, and rated 15 kV by the manufacturer. Cables shall be UL listed Type MV-90 or MV-105. The cable shall have a performance record demonstration a minimum of 20 years successful operation experience in utility and industrial power cable applications.
2. Conductors.--Conductors shall be Class "B" Copper Stranding sized per the plans. Conductors shall be encased with a material which reduces conductor-insulation stress.
3. Insulation and shield.--The insulation shall be a corona immune material. The insulation shall be ethylene-propylene rubber (EPR) base, rated at 133%. The insulation compound shall not contain polyethylene. The discharge of the insulation shall be demonstrated by withstanding 21 kV for 250 hours without failure when tested in accordance with the method described in ASTM D2275-89. The insulation shall be compounded by the cable manufacturer in its own facility. The insulation shall be encased with and insulation or semi-conduction shield. The shield shall be covered with a 0.005 inch copper tape shield with 20% overlap.
4. Jacket.--The jacket shall be PVC or Polyethylene, of at least 0.080 inches thickness. The jacket surface shall be printed as required by UL 1072.

The Contractor shall submit to the Engineer for approval the manufacturer and manufacturer's specifications of all power cables.

**Cable pulling.**--The Contractor shall submit in writing to the Engineer for approval, a schedule of pulls prior to cable installation. The Contractor shall certify in writing that the cable installation meets the requirements of the cable manufacturer and these special provisions concerning pulling tensions, allowable sidewall pressures, and installed radius limitations.

All conduits and ducts to be used, new and existing shall be swabbed or brushed prior to installing any cable. All conduits or ducts over 200 feet in length shall be pre-lubricated prior to installing any cable.

The Contractor shall schedule with the Engineer a time in which the pulling process can be monitored by the Engineer. The Contractor shall not be compensated for the installation of any power cables which are installed in the Engineer's absence.

The cables and armored cable shall be installed using the pulling eve method. The pulling eye(s) shall be a system manufactured specifically for attaching a pull eye directly on to the conductors of shielded power cables. The single or multiple type may be employed. If not factory installed, the appropriate installation tools and kits shall be used. The eye(s) shall be sized to specifically to fit the shielded power cable being installed.

All quadrant blocks and radius cable sheaves shall have a minimum radius of 24 inches and at least five equally spaced sheaves or a minimum radius of 36 inches and at least three equally spaced sheaves. All sheaves shall be at least 2.7 inches in width.

The maximum pulling force that may be exerted on the combined cables is 1,650 lbf. The maximum pulling force that may be exerted on the armored cable is 2,500 lbf.

All pulls totaling more than 200 feet or incorporation bends totaling more than 80 degrees must incorporate the use of dynamometer, force gauge, tension measuring or limiting device. The dynamometer or force gauge shall be adjustable to limit or stop the pulling force of the machine, or the display shall be marked prominently enough that the force can be read from a distance of 10 feet by the Engineer.

The pulling compound to be used shall be of the non-petroleum type. It may be factory prepared, or field mixed according to the manufacturer's specifications. The pulling compound shall be one of the ready-to-use types listed below, or the manufacturer's equivalent for field mixing:

American Cable Colloid Co. – Sli X-300
Cable Associates, Inc. – Gel-Lube 7/5
Generam Machine Products Co. – No. 7437-pc
Ideal Industries, Inc. – Aqua-Gel II or CW
Mac Products, Inc. – MacLube No. CA-51
Minerallac Electric Co. – Minerallac H-2B
Plymouth Rubber Co. – No. 45 Cable Pulling Lubricant
Polywater Corp. – "A", "G", "J", or "WJ"

**Terminating**.--All terminations and splices shall be done by personnel certified in Medium Voltage Cable Splicing. Certification shall be by a company that manufactures high or medium voltage cables splices, or union certification. The Contractor shall submit to Engineer for approval the qualification of any and all personnel that will be involved in termination or splicing the medium voltage cables.

The cables shall be terminated in the substation using equipment and devices specifically designed for use with shielded power cable. The cables shall be installed onto the existing terminal lugs of the switchgear after removing the existing cables from the terminal lugs. All bolts, washers, and torque values shall be submitted to the Engineer for approval.

The cables shall be spliced onto the armored cable inside the new 15 kV junction box at the San Francisco Anchorage. The cables shall be spliced to the armored cable using equipment and devices specifically designed for use on the cables being installed.

All terminations and splices shall employ the no-stress cone hand-applied taped method.

All proposed termination and splice methods and equipment shall be submitted to the Engineer for approval 15 working days before work may begin. Do not order or fabricate any materials or devices unless approved by the Engineer.

C**onduct of work**.--The Engineer will make all arrangements with the Utilities and State forces for de-energizing or all switching operations on State equipment on which the Contractor may need to work. The Contractor shall submit a schedule of working days before any of these services are required.

All work shall be performed during the hours specified elsewhere in these special provisions. All State electrical facilities shall be fully operational prior to 1400 each work day. The Contractor shall be financially responsible for any accident that may occur because of the Contractor's failure to restore a facility to full operation prior to 1400 of any day.

The Contractor shall be responsible for any and all damage to equipment or material due to improper handling, testing, or servicing procedures. The Contractor shall replace or restore to its original condition any equipment or material so damaged during the course of work at Contractor's expense.

The new medium voltage system shall be installed, tested, and fully operational before the existing medium voltage system is to be removed, abandoned, or modified. The Contractor is responsible for coordination this work with all other Contractors so that no part of the construction is delayed for the installation of the new medium voltage system. The Contractor shall be financially liable for any and all delays that are a result of failure to install the new medium voltage system.

**Safety.**--In general, all work, testing, servicing, and cleaning should be performed on apparatus de-energized and disconnected from the power source. Power circuits shall have conductors shorted to ground by a hot line grounding device. All safety equipment deemed necessary to prevent potential injury to personnel or damage to equipment shall be provided by the Contractor.

## 10-3.16 FIBER OPTIC CABLE PLANT

### FIBER OPTICS GLOSSARY

**Breakout. --** The cable "breakout" is produced by (1) removing the jacket just beyond the last tie-wrap point, (2) exposing 1 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 align and join two fibers together to provide a means for attaching to and decoupling from a transmitter, receiver, or another fiber (patch panel).

**Connectorized.--**A term that describes the termination point of a fiber after connectors have been affixed.

**Connector Module Housing (CMH).--**A patch panel used in the FDF to terminate singlemode fibers with most common connector types. It may include a jumper storage shelf and a hinged door.

**Couplers.--**Couplers are devices which mate two fiber optic connectors to facilitate the transition of optical light signals from one connector into another. Couplers may also be referred to as: adapters, feed-thrus, and barrels. They are normally located within FDFs mounted in panels. They may also be used unmounted, to join two simplex fiber runs.

**Fiber Distribution Unit (FDU).--**A combination of the Connector Module Housing (CMH) and the Splice Module Housing (SMH) in the same enclosure.

**F/O.--**Fiber optic

**FOIP.--**Fiber optic inside plant cable

**FOP.--**Fiber optic outside plant cable

**FOTP.--**Fiber optic test procedure(s) as defined by EIA/TIA standards.

**Jumper.--**A short fiber optic cable that has connectors installed on both ends, and is used for connection within a FDU.

**Light Source.--**A transportable piece of fiber optic test equipment that, when coupled with a power meter, is used to perform end-to-end attenuation testing. It contains a stabilized light source operating at the designed wavelength of the system under test. It also couples light from the source into the fiber to be received at the far end by the receiver.

**Link.--**A passive section of the system, the ends of which are to be connected to active components. A link may include splices and couplers. For example, a video link may be from a F/O transmitter to a video multiplexer (MUX).

**Optical Time Domain Reflectometer (ODTR).--**A piece of fiber optic test equipment similar in appearance to an oscilloscope that is used to measure the total amount of power loss between two points. It provides a visual and printed display of the relative location of system components such as fiber sections, splices and connectors as well as the losses that are attributed to each component.

**Patchcord.--**A short jumper.

**Pigtail.--**Relatively short length of fiber optic cable that is connectorized on only one end.

**Power Meter.--**A transportable piece of fiber optic test equipment that, when coupled with a light source, is used to perform end-to-end attenuation testing. It contains a detector that is sensitive to light at the designed wavelength of the system under test. Its display indicates the amount of power injected by the light source that arrives at the receiving end of the link.

**Riser Cable. --** NEC approved cable installed in a riser (a vertical shaft in a building connecting one floor to another).

**Segment.--**A section of F/O cable that is not connected to any active device and may or may not have splices per the design.

**Splice.--**The permanent joining of fiber ends to identical or similar fibers.

**Splice Closure.--**A container used to organize and protect splice trays. The container allows splitting or routing of fiber cables from multiple locations. The container is environmentally sealed to protect the fibers.

**Splice Module Housing (SMH).--**The SMH stores splice trays as well as pigtails and short cable lengths.

**Splice Tray.--**A container used to organize and protect spliced fibers.

**Storage Cabinet.--**Designed for holding excess cable slack for protection. The storage cabinet allows the user flexibility in equipment location and the ability to pull cable back for resplicing.

## 10-3.17 FIBER OPTIC OUTSIDE PLANT CABLE

### GENERAL

Each fiber optic cable Fiber optic outside plant Cable for this project shall be all dielectric, gel filled, duct type, with loose buffer tube construction with a maximum outside diameter of 14 mm and shall conform to these special provisions. Cables shall contain singlemode (SM) dual-window (1310 nm and 1550 nm) fibers with the numbers described below and as shown on the plans:

| | |
|---|---|
| Type A cable | 144 SM fibers |
| Type B cable | 60 SM fibers |
| Type C cable | 48 SM fibers |
| Type D cable | 12 SM fibers |

The optical fibers shall be contained within loose buffer tubes. The loose buffer tubes shall be stranded around an all dielectric central member. Aramid yarn shall be used as a primary strength member, and a polyethylene outside jacket shall provide for overall protection.

All F/O cable of each specific type shall be from the same manufacturer, who is regularly engaged in the production of this material.

The cable shall be qualified as compliant with Chapter XVII, Title 7, Part 1755-900 of the Code of Federal Regulations, "REA specification for filled fiber optic cables" (which replaced the United States Department of Agriculture Rural Electrification Administration specifications REA-PE-90).

**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 inclusions to meet the optical, mechanical, and environmental requirements of these specifications. The required fiber grade shall reflect the maximum individual fiber attenuation, to guarantee the required performance of each and every fiber in the cable.

The coating shall be a dual layered, UV cured acrylate. The coating shall be mechanically 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 attenuation shall be measured 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 | Characteristic |
|---|---|
| Type | Step Index |
| Core diameter | 8.3 µm (nominal) |
| Cladding diameter | 125 µm ±1.0 µm |
| Core to Cladding Offset | ≤1.0 µm |
| Coating Diameter | 250 µm ±15 µm |
| Cladding Non-circularity<br>defined as: [1-(min. cladding dia ÷max. cladding dia.)]x100 | ≤2.0% |
| Proof/Tensile Test | 345 MPa, Min |
| Attenuation:<br>@1310 nm (SM)<br>@1550 nm | <br>≤0.4 dB/km<br>≤0.4 dB/km |
| Attenuation at the Water Peak | ≤2.1 dB/km @ 1383 ± 3 nm |
| Chromatic Dispersion:<br>Zero Dispersion Wavelength<br>Zero Dispersion Slope<br>Maximum Dispersion: | <br>1301.5 to 1321.5 nm<br>≤0.092 ps/(nm$^2$∗km)<br>≤3.3 ps/(nm∗km) for 1285 to 1330 nm<br><18 ps/(nm∗km) for 1550 nm |
| Cut-Off Wavelength | <1250 nm |
| Mode Field Diameter (Petermann II) | 9.3 ±0.5 µm at 1310 nm<br>10.5 ± 1.0 µm at 1550 nm |

**COLOR CODING**

In buffer tubes containing multiple fibers, each fiber shall be distinguishable from others in the same tube by means of color coding according to the following:

| | |
|---|---|
| 1. Blue (BL) | 7. Red (RD) |
| 2. Orange (OR) | 8. Black (BK) |
| 3. Green (GR) | 9. Yellow (YL) |
| 4. Brown (BR) | 10. Violet (VL) |
| 5. Slate (SL) | 11. Rose (RS) |
| 6. White (WT) | 12. Aqua (AQ) |

The colors shall be targeted in accordance with the Munsell color shades and shall meet EIA/TIA-598 "Color Coding of Fiber Optic Cables."

The color formulation shall be compatible with the fiber coating and the buffer tube filling compound, and be heat stable. It shall not fade or smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

**CABLE CONSTRUCTION**

**General.--**The fiber optic cable shall consist of but not be limited to the following components:

A. Buffer tubes
B. Central member
C. Filler rods
D. Stranding
E. Core and cable flooding
F. Tensile strength member
G. Ripcord
H. Outer jacket

**Buffer tubes.--**Clearance shall be provided in the loose buffer tubes between the fibers and the inside of the tube to allow for expansion without constraining the fiber. The fibers shall be loose or suspended within the tubes. The fibers shall not adhere to the inside of the buffer tube. Each buffer tube shall contain 1, 6 or a maximum of or 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.

Buffer tubes shall be stranded around a central member by a method that will prevent stress on the fibers when the cable jacket is placed under strain, such as the reverse oscillation stranding process.

Each buffer tube shall be distinguishable from other buffer tubes in the cable by the color coding specified for the fibers.

**Central Member.--**The central member which functions as an anti-buckling element shall be a glass reinforced plastic rod with similar expansion and contraction characteristics as the optical fibers and buffer tubes. A linear overcoat of Low Density Polyethylene shall be applied to the central member to achieve the optimum diameter to provide the proper spacing between buffer tubes during stranding.

**Filler rods.--**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.

**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.

**Core and Cable Flooding.--**The cable core shall contain a water-blocking material or the cable core interstices shall be filled with a polyolefin based compound to prevent water ingress and migration. The water-blocking material or the flooding compound shall be homogeneous, non-hygroscopic, electrically non-conductive, and non-nutritive to fungus. The core shall be free from dirt and foreign matter and shall be readily removable with conventional nontoxic solvents. The compound shall also be nontoxic, dermatologically safe and compatible with all other cable components.

**Tensile Strength Member.--**Tensile strength shall be provided by high tensile strength aramid yarns and fiberglass which shall be helically stranded evenly around the cable core and shall not adhere to other cable components.

**Ripcord.--**The cable shall contain at least one ripcord under the jacket for easy sheath removal.

**Outer jacket.--**The jacket shall be free of holes, splits, and blisters and shall be medium or high density polyethylene (PE), or medium density cross-linked polyethylene with minimum nominal jacket thickness of 1000 µm ±76 µm. Jacketing material shall be applied directly over the tensile strength members and flooding compound and shall not adhere to the aramid strength material. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The jacket or sheath shall be marked with the manufacturer's name, the words "Optical Cable", the number of fibers, "SM", year of manufacture, and sequential measurement markings every meter. The actual length of the cable shall be within -0/+1 percent of the length marking. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be approximately 2.5 mm.

The fiber optic cable samples (5 foot length) shall be submitted to Resident Engineer, as well as its 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-455-81A, "Compound Flow (Drip) Test for Filled Fiber Optic Cable". The test sample shall be prepared in accordance with Method A. The cable shall exhibit no flow (drip or leak) at 80°C as defined in the test method.

Crush resistance of the finished F/O cables shall be 220 N/cm 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 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 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).

Impact testing shall be conducted in accordance with EIA-455-25 (FOTP-25) "Impact Testing of Fiber Optic Cables and Cable Assemblies." The cable shall withstand 20 impact cycles. The average increase in attenuation for the fibers shall be ≤0.20 dB at 1550 nm. The cable jacket shall not exhibit evidence of cracking or splitting.

The finished cable shall withstand a tensile load of 2670 N without exhibiting an average increase in attenuation of greater than 0.20 dB. 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 Resident Engineer the fiber optic cable test compliance, the fiber optic manufacture catalogue, and its samples.

**PACKAGING AND SHIPPING REQUIREMENTS**

Documentation of manufacturer’s compliance to the required optical fiber specifications shall be provided to the Engineer prior to ordering the material.

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. Two meters of cable length on each end of the cable shall be accessible for testing.

Each cable reel shall have a durable weatherproof label or tag showing the manufacturer's name, the cable type, the actual length of cable on the reel, the Contractor's name, the contract number, and the reel number. A shipping record shall 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 minimum hub diameter of the reel shall be at least thirty times the diameter of the cable. The F/O cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable.

Installation procedures and technical support information shall be furnished at the time of delivery.

**FIBER OPTIC LABELING**

**Abbreviation:**

| | |
|---|---|
| HUB | HUB.X |
| VAULT | VXX.X |
| CAMERA | CXX.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 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, ramp meter, vehicle detection station and TOS assemblies.

Example labeling: C-HUB.A-HUB.E
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.

Full compensation for fiber optic cable labeling shall be considered as included in the contract lump sum price paid for modify fiber optic communication system and no additional compensation will be allowed therefor.

**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 provide two copies of the installation procedures to be used by the Contractor from the manufacturer two weeks prior to planned installation of cables.

F/O cable shall be installed using a cable pulling lubricant recommended by the F/O cable and/or the innerduct manufacture and a non-abrasive pull tape conforming to the provisions described under "Conduit" elsewhere in these special provisions.

Splices shall be limited to CCTV camera system locations, video nodes, data nodes, as shown on the plans and as directed by the Engineer.

During cable installation, the bend radius shall be maintained at not less than twenty times the outside diameter of the cable.

F/O cable shall be installed without splices except where specifically allowed on the plans or described in these special provisions. A minimum of 15 m of slack shall be provided at each splice vault without a cable splice. At fiber optic splice closures, a minimum of 9 m of each cable exiting the closure shall be stored in the splice vault.

Unless shown or provided otherwise, only one F/O cable shall be installed in each innerduct.

**SPLICING**

Field 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 cabinets shall be done in splice trays housed in ITUs. All splices done in communication hubs shall be done in splice trays housed in FDUs.

Unless otherwise allowed, the F/O cable 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.

When splicing selected fiber of two cables, a “mid-span access” method shall be used. 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 discernible tensile force on the optical fiber. All splices shall be protected with a metal reinforced thermal shrink sleeve.

**SPLICE CLOSURES AND SPLICE TRAYS**

The F/O field splices shall be enclosed in splice closures which shall be complete with splice organizer trays, brackets, plugs, clips, cable ties, seals and sealants, as needed. The splice closure shall be suitable for a direct burial or pull box application. the 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:

- non filled thermoplastic case
- pressurizable, rodent proof, water proof, re-enterable and moisture proof
- expandable from 2 cables per end to 8 cables per end by using adapter plates
- cable entry ports shall accommodate 10 mm to 25 mm diameter cables
- multiple grounding straps
- accommodate up to 8 splice trays
- suitable for "butt" or "through" cable entry configurations
- place no stress on finished splices within the splice trays

Splice closures shall be bolted to the side wall of the splice vault.

Splice trays in the splice closures shall conform to the following:

- accommodate up to 24 fusion splices
- place no stress on completed splices within the tray

- accommodate "butt" or "through" splicing applications
- accommodate up to 8 buffer tubes, holding up to 48 fibers
- stackable with a snap-on hinge cover
- buffer tubes securable with channel straps
- contain fiber retention strips that accommodates either fusion or mechanical splices
- must be labeled per these special provisions

Full compensation for fiber optic splice closure shall be considered as included in the contract lump sum price paid for modify fiber optic communication system and no separate payment will be made therefor.

**PASSIVE CABLE ASSEMBLIES AND COMPONENTS**

The F/O 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 first class, 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.

**FIBER OPTIC CABLE TERMINATIONS**

**DISTRIBUTION BREAKOUT**

The jacketed cable shall be lashed with tie wraps to the rack prior to entering the FDU. The cable shall also be tie-wrapped to the inside of the FDU near the point of entry. The glass fibers shall not be damaged during cutting and removal of the buffer tubes.

The jacketed area and bare fibers shall be cleaned to remove the moisture blocking gel. The transition from the buffer tube to the bundle of jacketed fibers shall be treated by an accepted procedure for sleeve tubing, shrink 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 protects 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 and/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 m 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°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°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.

## 10-3.18 FIBER OPTIC CABLE TESTING

### GENERAL

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, and (3) during final system testing. 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. The Contractors attention is directed to "As-Builts" elsewhere in these special provisions, regarding the requirements for recording test results.

A minimum of 20 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 approval. The procedures shall include the tests involved and how the tests are to be conducted. Included in the test procedures shall be 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. After cabling, 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 7 years, (2) attached to the cable reel in a waterproof pouch, and (3) submitted to the Contractor and to the Engineer.

**AFTER CABLE INSTALLATION**

After the fiber optic cable has been pulled but before breakout and termination, 100 percent of all the fibers shall be tested with an OTDR for attenuation. Test results shall be recorded, dated, compared and filed with the previous copies of these tests. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the 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 DOS based 89 mm 3.5 inch disk recording capability that has associated software to do comparisons and reproductions on 216 mm x 279 mm 8.5 inch x 11 inch paper, via a personal computer.

**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. 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.

**10-3.19 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 and/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.

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.

**FIBER OPTIC SYSTEM DESIGN CRITERIA**

The design system gain margin shall be at least 6 dB for each and every link. If the design system gain margin is less than 6 dB, the Engineer shall be notified and informed of the Contractor's plan to meet the design requirement. The Design System Gain Margin shall be calculated by subtracting the Total System Loss of each link (from Cable Verification Worksheet elsewhere in these special provisions) from the Total System Gain (measured during equipment testing).

**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.

**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 splice loss and attenuation. Testing of fiber links shall be completed in such a way, to show the loss of each connector, in the OTDR trace. 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 cable shall be replaced at the Contractor's expense. The new cable 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 between Hub B and Hub H (60/91/215 to 215/60) 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 fiber links 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 link loss budgets, and filed with the other recordings of the same links.

**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

Contract No. _____
Contractor: _____

Operator: _____
Date:_____

Link Number: _____
Fiber Number:_____
Test Wavelength (Circle one): 1310 1550

Location of Fiber Ends:
End 1:_____ End 2:_____

1. OTDR Test Results:
   A. Forward Loss _____ dB
   B. Reverse Loss:_____ dB
   C. Average Loss [2A + 2B)/2]:_____ dB

2. Power Meter and Light Source Test Results:
   A. Forward Loss _____ dB
   B. Reverse Loss: _____ dB
   C. Average Loss [2A + 2B)/2]: _____ dB

3. Calculated Fiber Loss:
   A. Number of Splices in the Link: _____ dB
   B. Allowed Link Loss per Splice: _____ dB

Total Allowed Loss due to Splices (4A * 4B): _____ dB

4. Calculated Splice Loss:
   A. Number of Splices in the Link: _____ dB
   B. Allowed Link Loss per Splice: _____ dB
   C. Total Allowed Loss due to Splices (4A * 4B): _____ dB

5. Calculated Link Loss:
   A. Allowed Connector Loss (for 2 connectors): _____ dB
   B. Total Link Loss (5A + 3C + 4C): _____ dB

6. Cable Verification:
   A. Compare Power Meter Average Loss to Calculated Link Loss (2C - 5B):

If the value on line 6A is greater than zero, the link has failed the Test. See Test Failures elsewhere in these special provisions.

To Be Completed By Caltrans:

Resident Engineer's Signature: _____
Cable Link Accepted By: _____

**10-3.20 FIBER DISTRIBUTION UNIT (FDU)**

The fiber distribution unit (FDU) racks shall be EIA standard mount type as shown on the plans.

The connector panel shall be located internal to the unit so as not expose fiber optic connections. Cable accesses shall have grommets.

FDUs shall be sized to contain sufficient connector module housings (CMHs) to handle the associated cables and their respective breakouts. In cables with smaller fiber counts, more than one cable may be assigned to an FDU but fibers from the same cable shall not be split between two FDUs. In all cases, FDUs shall be capable of housing and securing required splice trays in splice module housings (SMH).

All FDUs shall house the splice trays needed to store the "breakout to pigtail" splices.

Connector module housings (CMH), splice module housings (SMH) shall be mounted with adjustable mounting brackets for horizontal positioning. The front covers shall be Lexan with a rear cover of metal of the same gauge and color as the remainder of the FDU rack. Panels shall have at least six coupler capacity and all panel positions shall be filled with couplers. Where panels have spare SC positions, the couplers shall have dust covers on both sides.

Coupler capacities shall usually range from 12 to 72 fibers or couplers, as indicated on the plans. Couplers shall be mounted in panels housed within the FDU. Spare panel positions within the FDU shall have blanks or panels ready for future expansion. The front and back covers of the FDU shall be retractable or removable to facilitate internal installation.

Full compensation for the fiber distribution unit and terminating fiber optic cable shall be considered as included in the contract lump sum price paid for equipment at location involved, and no additional compensation will be made therefor.

**10-3.21 INTERCONNECT AND TERMINATION UNIT (ITU)**

The Contractor shall furnish and install all related equipment to interface the rack mount interconnect and termination unit 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.

The ITU shall meet the following physical requirements:

482.6 mm rack mountable
305 mm(D) x 45 mm(H)

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.

The Contractor shall furnish and install all related equipment to interface the rack mount interconnect and termination unit to the incoming fiber optic communications cable and the patchcord fiber optic cable.

### 10-3.22 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 conduits, except when the conduits contain combinations of loop lead-in cable, fiber optic cable, or signal interconnect cable. A No. 8 minimum, bare copper wire shall run continuously in circuits, except for series lighting circuits, where No. 6 bare copper wire shall run continuously. 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.

### 10-3.23 SERVICE

Continuous welding of exterior seams in service equipment enclosures is not required.

The contractor shall pay all connection fees

#### ELECTRIC SERVICE (IRRIGATION)

Electric service (irrigation) shall be from the service points to the irrigation controllers (IC) and to the spaces provided in the irrigation controller enclosure cabinets (CEC) for irrigation controllers as shown on the plans.

Irrigation Controller (IC) at various locations : A single-pole, 15-A circuit breaker shall be installed in the service equipment enclosure. The circuit breaker shall be of the same manufacturer and model and interrupting capacity as the existing circuit breakers.

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 irrigation controllers, complete in place, including conductors, conduit and pull boxes to the pull box adjacent to irrigation controller enclosure cabinets and irrigation controllers, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

### 10-3.24 STATE-FURNISHED CONTROLLER ASSEMBLIES

The Model 170 controller assemblies, including controller unit, completely wired controller cabinet and inductive loop detector sensor units, but without 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 332 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.

## 10-3.25 IRRIGATION CONTROLLER ENCLOSURE CABINET

Irrigation controller enclosure cabinets for new field units shall be constructed and the equipment within the cabinets shall be installed in conformance with the details shown on standard plan ES-3H, the provisions in the Standard Specifications, and these special provisions. Dimensions of cabinet shall be 1500 mm in height, 500 mm wide and 300 mm in depth including a hooded vent.

Irrigation controller enclosure cabinets shall be fabricated in conformance with the provisions in Section 86-3.04A, "Cabinet Construction," of the Standard Specifications.

Irrigation controller enclosure cabinets shall be fabricated of stainless steel.

Irrigation controller enclosure cabinet door handles shall be provided with vandal resistant covers over locking device and shall have provisions for padlocking in the latched position. Padlocks will be State-furnished as provided under "Materials" of these special provisions.

The plywood mounting panel shall be 19-mm exterior AC grade veneer plywood. The panel shall be painted with one application of an exterior, latex based, wood primer and 2 applications of an exterior, vinyl acrylic enamel, white in color. The plywood panel shall be painted on all sides and edges prior to installation of the panel in the cabinet and equipment on the panel.

Inside of the doors shall have provisions for storage of the irrigation plans.

Duplex convenience receptacles shall have ground-fault circuit interruption as defined by the Code. Circuit interruption shall occur on 6 mA of ground-fault current and shall not occur on less than 4 mA. Receptacles shall be installed in a weatherproof housing with rainproof lift covers.

Solid-state automatic shut-off rain sensor units shall be installed for the irrigation controller enclosure cabinets in vandal resistant enclosures. Rain sensor units shall automatically interrupt the master remote control valves when approximately 3 mm of rain has fallen. The irrigation system shall automatically be enabled again when the accumulated rainfall evaporates from the rain sensor unit collection cup. Rain sensor units shall be rated 24 V (ac) to 30 V (ac). Static charge protection shall be included to protect against lightning damage.

Equipment, except for field wiring, shall be installed in the cabinet in a shop prior to field installation.

Equipment, except for field wiring, shall be installed in the cabinet in a shop by the equipment manufacturer's representative or distributor prior to field installation.

Irrigation controller enclosure cabinets will be measured by the unit as determined from actual count in place.

The contract unit price paid for irrigation controller enclosure cabinet shall include full compensation for furnishing all labor, materials, tools, equipment (including rain sensor units), and incidentals, and for doing all the work involved in fabricating and installing irrigation controller enclosure cabinets, complete in place, including constructing foundations, pads and conduits to pull box adjacent to cabinets, and installing equipment within the cabinets, except controllers, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-3.26 VEHICLE SIGNAL FACES AND SIGNAL HEADS

Light Emitting Diode (LED) signal modules for vehicular traffic signal units (except programmed visibility type) will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Type SV-1-T mountings with 5 sections and SV-2-TD mountings shall be bolted to the standard through the upper pipe fitting in the same manner shown for bolting the terminal compartment.

## 10-3.27 PROGRAMMED VISIBILITY VEHICLE TRAFFIC SIGNAL HEADS

Lamps shall be furnished by the Contractor.

A signal technician qualified to program the programmed visibility signal heads shall be present at the time the signal heads are placed in operation.

Lamps for the signal units shall be 150-W, 120 V(ac), incandescent lamps with a minimum average rated life of 6000 hours. The lamp and socket shall be the 3-prong type.

## 10-3.28 PEDESTRIAN SIGNALS

Light Emitting Diode (LED) signal modules for Type A pedestrian signals will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

## 10-3.29 DETECTORS

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Loop wire shall be Type 2.

Loop detector lead-in cable shall be Type B.

Slots shall be filled with hot-melt rubberized asphalt sealant.

At the Contractor's option, where a Type A or a Type B loop is designated on the plans, a Type E loop may be substituted.

For 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 20 mm. Loop wire for circular loops shall be Type 2. Slots of circular loops shall be filled with elastomeric sealant or 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**

Preformed 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.

Preformed inductive loops shall not be installed in existing structure decks.

## 10-3.30 EMERGENCY VEHICLE DETECTOR SYSTEM

Each traffic signal shall have an emergency vehicle detector system which shall conform to the details shown on the plans and these special provisions.

### Cable

Optical detector cable (EV-C) shall meet the requirements of IPCEA-S-61-402/NEMA WC 5, Section 7.4, 600-V (ac) control cable, 75°C, Type B, and the following:

A. The cable shall contain 3 conductors, each of which shall be No. 20 (7 x 28) stranded, tinned copper with low-density polyethylene insulation. Minimum average insulation thickness shall be 0.63-mm. Insulation of individual conductors shall be color coded: 1-yellow, 1-blue, 1-orange.
B. The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20 percent overlap. Where film is used, a No. 20 (7 x 28) stranded, tinned, bare drain wire shall be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
C. The jacket shall be black polyvinyl chloride with minimum ratings of 600 V (ac) and 80°C and a minimum average thickness of 1.1 mm. The jacket shall be marked as required by IPCEA/NEMA.
D. The finished outside diameter of the cable shall not exceed 8.9 mm.
E. The capacitance, as measured between any conductor and the other conductors and the shield, shall not exceed 157 pf per meter at 1000 Hz.
F. The cable run between each detector and the controller cabinet shall be continuous without splices or shall be spliced only as directed by the detector manufacturer.

## 10-3.31 VIDEO DETECTION SYSTEM

### General

This specification sets forth the minimum requirements for a system that detects vehicles on a roadway using only video images of vehicle traffic.

The video detection system shall consist of one or two video cameras, a video detection processor (VDP) which mounts in a standard detector rack; a detector rack mounted extension module (EM), and a pointing device.

The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only an on board video menu and a pointing device to place the zones on a video image. Up to 24 detection zones per camera shall be available. A separate computer shall not be required to program the detection zones.

**Functional Capabilities**

The VDP shall process video from one or two sources, as specified. The source can be a video camera or video tape player. The video shall be input to the VDP in RS-170 format and shall be digitized and analyzed in real time. Dual video VDP's shall process images from both inputs simultaneously.

The VDP shall detect the presence of vehicles in up to 24 detection zones per camera.

Detection zones shall be programmed via an on board menu displayed on a video monitor and a pointing device connected to the VDP. The menu shall facilitate placement of detection zones and setting of zone parameters or to view system parameters. A separate computer shall not be required for programming detection zones or to view system operation.

The VDP shall store up to three different detection zone patterns. The VDP can switch to any one of the three different detection patterns within 1 second of user request via menu selection with the pointing device.

The VDP shall detect vehicles in real time as they travel across each detector zone.

The VDP shall have an RS-232 port for communications with an external computer. The VDP RS-232 port shall be multi-drop compatible.

The VDP shall accept new detector patterns from an external computer through the RS-232 port when the external computer uses the correct communications protocol for downloading detector patterns. A Windows™-based software designed for local or remote connection and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.

The VDP shall send its detection patterns to an external computer through the RS-232 port when requested when the external computer uses the appropriate communications protocol for uploading detector patterns.

The extension module (EM) shall be available to avoid the need of rewiring the detector rack, by enabling the user to plug an extension module into the appropriate slot in the detector rack. The extension module shall be connected to the VDP by an 8-wire cable with modular connectors. VDP and EM communications shall be accommodated by methods using differential signals to reject electrically coupled noise. The extension module shall be available in both 2 and 4 channel configurations. EM configurations shall be programmable from the VDP.

The camera system shall be able to transmit an NTSC video signal, with minimal signal degradation, up to 300 meters under ideal conditions.

The associated VDP shall default to a safe condition, such as a constant call on each active detection channel, in the event of loss of video signal.

The system shall be capable of automatically detecting a low-visibility condition such as fog and respond by placing all defined detection zones in a constant call mode. A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists.

**Vehicle Detection**

A minimum of 24 detection zones shall be supported and each detection zone shall be user definable in size and shape to suit the site and the desired vehicle detection region.

A single detection zone shall be able to replace multiple inductive loops and the detection zones shall be OR'ed as the default or may be AND'ed together to indicate vehicle presence on a single phase of traffic movement.

Placement of detection zones shall be done by using only a pointing device, and a graphical interface built into the VDP and displayed on a video monitor, to draw the detection zones on the video image from the video camera. No separate computer shall be required to program the detection zones.

A minimum of 3 detection zone patterns shall be saved within the VDP memory. The VDP's memory shall be non-volatile to prevent data loss during power outages. The VDP shall continue to operate (e.g. detect vehicles) using the existing zone configurations even when the operator is defining/modifying a zone pattern. The new zone configuration shall not go into effect until the configuration is saved by the operator.

The selection of the detection zone pattern for current use shall be done through a menu or remote computer via RS-232 port. It shall be possible to activate a detection zone pattern for a camera from VDP memory and have that detection zone pattern displayed within 1 second of activation.

When a vehicle is detected crossing a detection zone, the corners of the detection zone will flash on the video overlay display screen to confirm the detection of the vehicle.

Detection shall be at least 98% accurate in good weather conditions and at least 96% accurate under adverse weather conditions (rain, snow, or fog). Detection accuracy is dependent upon site geometry; camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality.

The VDP shall provide up to 24 channels of vehicle presence detection per camera through a standard detector rack edge connector and one or more extension modules.

The VDP shall provide dynamic zone reconfiguration (DZR) to enable normal detector operation of existing channels except the one where a zone is being added or modified during the setup process. The VDP shall output a constant call on any detection channel corresponding to a zone being modified.

Detection zone setup shall not require site specific information such as latitude, longitude, date and time to be entered into the system.

The VDP shall output a constant call for each enabled detector output channel if a loss of video signal occurs. The VDP shall output a constant call during the background learning period.

Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.

Up to six detection zones shall be capable to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the RS-232 port. The data collection interval shall be user definable in periods of 5, 15, 30 or 60 minutes.

**VDP and EM Hardware**

The VDP and EM shall be specifically designed to mount in a standard TS-1, TS-2, 170 type detector rack, using the edge connector to obtain power and provide contact closure outputs. No adapters shall be required to mount the VDP or EM in a standard detector rack. Detector rack rewiring shall not be required.

The VDP and EM shall operate in a temperature range from -34°C to +74°C and a humidity range from 0%RH to 95%RH, non-condensing.

The VDP and EM shall be powered by 12 or 24 V(dc). These modules shall automatically compensate for the different input voltages.

VDP power consumption shall not exceed 300 milliamps at 24 V(dc). The EM power consumption shall not exceed 120 milliamps at 24 V(dc).

The VDP shall include an RS-232 port for serial communications with a remote computer. The VDP RS-232 port shall be multi-drop compatible. This port shall be a 9-pin "D" subminiature connector on the front of the VDP.

The VDP shall utilize flash memory technology to enable the loading of modified or enhanced software through the RS-232 port without modifying the VDP hardware.

The front of the VDP shall include detection indications, such as LED's, for each channel of detection that display detector outputs in real time when the system is operational.

The front of the VDP shall include one or two BNC video input connection suitable for RS-170 video inputs as required. The video input shall include a switch selectable 75-ohm or high impedance termination to allow camera video to be routed to other devices, as well as input to the VDP for vehicle detection. Video must be inputted via a BNC connector on the front face of the processor. RCA type connectors/jacks for video input are not allowed. Video shall not be routed via the edge connectors of the processor.

The front of the VDP shall include one BNC video output providing real time video output that can be routed to other devices. An RCA type connector/jack for video output is not allowed.

The front panel of the VDP and EM shall have a detector test switch to allow the user to place calls on each channel. The test switch shall be able to place either a constant call or a momentary call depending on the position of the switch.

**Video Detection Camera**

The video cameras used for traffic detection shall be furnished by the VDP supplier and shall be qualified by the supplier to ensure proper system operation.

The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 0.1 lux to 10,000 lux scene illumination.

The camera shall use a CCD sensing element and shall output monochrome video with resolution of not less than 380 lines horizontal.

The camera shall include an electronic shutter control based upon average scene luminance and shall be equipped with a factory adjusted manual iris. Auto-iris lenses are not allowed.

The camera shall include a variable focal length (zoom) lens with variable focus that can be adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier. The horizontal field of view shall be adjustable from 8.1 to 45.9 degrees. A single camera configuration shall be used for all approaches in order to minimize the setup time and spares required by the user.

The camera electronics shall include AGC to produce a satisfactory image at night.

The camera shall be housed in a weather-tight sealed enclosure. The housing shall be field rotatable to allow proper alignment between the camera and the traveled road surface.

The camera enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sunshield shall be less than 150 mm diameter, less than 480 mm long, and shall weigh less than 2.8 kg when the camera and lens are mounted inside the enclosure.

The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the camera at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure. The enclosure shall be charged with dry nitrogen and pressurized to 35 kPa.

When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -34 °C to +60 °C and a humidity range from 0% RH to 100% RH.

The camera shall be powered by 120-240 V(ac) 50/60 Hz. Power consumption shall be 15 watts or less under all conditions.

Recommended camera placement height shall be 10 meters above the roadway, and over the traveled way on which vehicles are to be detected. For optimum detection the camera should be centered above the traveled roadway. The camera shall view approaching vehicles at a distance not to exceed 100 meters for reliable detection (height to distance ratio of 1:10). Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier.

The camera enclosure shall be equipped with separate, weather-tight connections for power and setup video cables at the rear of the enclosure. These connections may also allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or pole using a lens adjustment module (LAM) supplied by the VDP supplier. Video and power shall not be connected within the same connector.

The video signal output by the camera shall be black and white in RS-170 or CCIR format.

The video signal shall be fully isolated from the camera enclosure and power cabling.

**Installation**

The coaxial cable to be used between the camera and the VDP in the traffic cabinet shall be a 75 ohm, precision video cable with 20 gauge solid bare copper conductor 3.24 ohms/100 meters, solid polyethylene insulating dielectric, 98% (min) tinned copper double-braided shield and black polyethylene outer covering, Belden 8281, Alpha 9055 or equal. The signal attenuation shall not exceed 2.55 dB per 100 meters at 10 MHz. Maximum outside diameter is 8 mm. The coax cable shall be a continuous unbroken run from the camera to the VDP. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. 75-ohm BNC plug connectors shall be used at both the camera and cabinet ends. The coaxial cable, BNC connector, and crimping tool shall be approved by the supplier of the video detection system, and the manufacturer's instructions must be followed to ensure proper connection.

The power cabling shall be 16 AWG three conductor cable. The cabling shall comply with the National Electric Code, as well as local electrical codes. Cameras may acquire power from the luminaire if necessary.

The video detection system shall be installed by supplier factory certified installers and as recommended by the supplier and documented in installation materials provided by the supplier. Proof of factory certification shall be provided.

**Limited Warranty**

The supplier shall provide a limited two-year warranty on the video detection system. See suppliers standard warranty included in the Terms and Conditions of Sale documentation.

During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

During the warranty period, updates to VDP software shall be available from the supplier without charge.

**Maintenance and Support**

The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the video detection system. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of sale for said parts.

The supplier shall maintain an ongoing program of technical support for the video detection system. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for on site technical support services.

Installation or training support shall be provided by a factory authorized representative.

All product documentation shall be written in the English language.

## 10-3.32 MICROWAVE VEHICLE DETECTION SENSOR SYSTEM

The microwave vehicle detection sensor (MVDS) system shall include all microwave detector units, enclosures, connectors, cables, junction box, mounting equipment and hardware, local and remote software, firmware, power supply units and all other support equipment for a fully operational, fully calibrated and tested system in conformance with these special provisions.

### MATERIALS LIST AND DRAWINGS

A list of materials which the Contractor proposes to install for the MVDS systems together with the drawings, documents fully defining the unit's open communication protocol (that fully defines the message structure as well as all information necessary to make use of such messages and are available in the public domain)and other data shall be submitted to the Engineer in conformance with the provisions in Section 86-1.04, "Equipment List and Drawings," of the Standard Specifications.

The following shall be included in the documentation before the completion of the contract, but after approval of the operational performance and accuracy of each MVDS system:

**Lane configuration-** The documentation shall include a projection of the microwave beam and resulting lane coverage that demonstrates the correlation of the physical road lane assignments with the configuration zone assignments. This documentation will be used by the State to decode the MVDS transmitted information into coherent data. The Engineer shall determine the acceptability of the documentation, and approval of the documentation at his/her discretion.

**Calibration programming**- The contractor shall provide the calibration, tuning, alignment, and other programming and documentation on a Compact Disk (CD). The information provided shall be formatted in such a manner that the files can easily matched with the equipment calibrated or aligned. The documentation shall contain files that allow replacement equipment to be loaded with the same configuration.

**Acceptance testing documentation-** The Contractor shall provide any and all documentation that is required to utilize the support equipment. The documentation shall be organized in such a manner that the Engineer will be able to perform acceptance testing using the documentation alone, without assistance from the Contractor or sub-Contractors.

**Mouting and wiring information** - One set of the approved detailed diagrams for each MVDS system that includes wiring and service connections shall be covered separately on each side with clear, self-adhesive plastic and placed in a heavy-duty plastic envelope. The envelope shall be attached securely to the inside of the cabinet door or at a convenient location designated by the Engineer.

### FUNCTIONAL REQUIREMENTS

The Contractor shall be responsible for the compatibility and adjustment of all components as necessary to insure the successful operation of the completed installation. The acceptance criteria shall be demonstrated using methodology spelled out elsewhere in this Section of these Special Provisions. In the final installed configuration, the MVDS shall maintain at least 90% accuracy of detection for each zone established within the beam footprint defined within these special provisions as well as 95% or better accuracy during all weather conditions for the full roadway. The detector shall measure average speed with an accuracy +/- 15% per lane for vehicles traveling between 50 km/h and 110 km/h.

### TECHNICAL REQUIREMENTS

The MVDS beam footprint (field of view) shall have a minimum detection range of 3 m to 60m.

The MVDS shall operate from a source voltage of 10.2V to 26.4 V, AC or DC and shall draw less than 10 watts of power. The MVDS sensor unit shall have an orderly recovery after a power failure that automatically restores normal operation without introducing erroneous data or requiring manual intervention.

The MVDS sensor unit shall be encased in a weatherproof NEMA-3R enclosure, pole mounted and directed perpendicular to the flow of traffic lanes as shown on the plans. The MVDS sensor unit shall not exceed 250 mm x 250 mm x 250 mm in size and shall not weigh more than 5 kg . The unit shall operate over a temperature range from –34˚C to +74˚C, with up to 95 percent relative humidity.

### INSTALLATION REQUIREMENTS

Each MVDS unit shall be supplied with a connectorized MVDS cable harness with appropriate cable length for each installation. The connector shall be a standard plug, Military Part Number MS3476 or equivalent. This connector shall

include contacts for powering the sensor unit, the EIA-232 serial data communications and contact pairs for each detection zone.

All wire and cable shall meet the requirements detailed in the manufacturer's installation documents. One continuous wire run is required. No splices are allowed between the detector and controller cabinet. The Contractor shall wire the MVDS cable harness and power conductors to a 10 position DIN rail mounted terminal block in the controller or electrical cabinet as directed by the Engineer. The ISA-232 serial data communication output conductors shall be terminated at the service panel terminal block, TB-0, and additionally continue for one meter to a DB9 connector for setup and diagnostic access. The contact pair output conductors shall be terminated at their input panel terminal block, TB-2. The ends of all unused and spare conductors shall be taped to prevent accidental contact to other circuits. The locations for the installation of a Microwave vehicle detection sensor system will be determined by the Engineer and all aerial equipment shall be installed on existing sign structures, or lighting standards. Power will be provided from these structures.

**TESTING REQUIREMENTS**

**Support Equipment-** The Contractor shall provide as part of the MVDS system, any and all calibration equipment that may be required to setup, calibrate, and maintain the MVDS system. The Contractor shall provide 1 unit of equipment for each 5 MVDS units installed; e.g. 6 MVDS units shall require 2 units of equipment. The equipment shall be given to the Engineer at the testing of the MVDS unit(s).

**Software-** The Contractor shall provide any and all programming and software required to support the MVDS system. The Programming and software shall be installed in the appropriate equipment at the time of acceptance testing, and shall be used in the acceptance testing.

**Methodology-** Each unit shall be tested individually, however multiple units may be tested simultaneously. The accuracy of each unit shall determined and documented in such a manner that the unit may be analyzed and approved or rejected separately. The Contractor shall perform all acceptance testing in the presence of the Engineer, and submit the recorded medium and other acceptance materials to the Engineer at the conclusion of the test. Failure to submit the testing materials at the conclusion of testing invalidates the test. The recorded media serves as acceptance evidence and shall not be used for calibration. The calibration shall have been completed prior to testing and verification.

**Acceptance Notification-** The Contractor shall notify the Engineer 10 working days before the unit is ready for acceptance testing. If cancellation or postponement of the test is necessary for any reason, an additional 10 day notification shall be required for rescheduling.

**Acceptance Preparation-** The Contractor shall provide any and all equipment, software, documentation, support equipment, and any other materials, personnel and devices that may be required for the acceptance testing. The scheduling for the testing shall be organized in such a manner that the testing shall be accomplished before the end of the normal work shift. If the testing period extends beyond the normal work shift and/or beginning peak hours, the Engineer may at his/her discretion cancel the testing for that day and reschedule for another day and invalidate the test. If the Contractor schedules testing, but fails to provide the necessary material for the testing within 1 hour of the scheduled testing start time, the Engineer may, at his/her discretion, cancel the testing for that day and reschedule for another day. If the testing is cancelled due to the Contractor's failure to provide the required materials, the Contractor shall reimburse the State for costs associated with the testing. The Engineer shall determine what those costs may be.

**Demonstration of calibration programming-** The Contractor shall demonstrate to the Engineer that the calibration programming for each location may be reloaded by either replacing the unit or by removing the programming. Then the saved parameters shall be loaded into the unit. The final acceptance testing and documentation shall be based on this - the reprogrammed - MVDS unit.

**Comparison method-** The accuracy of the MVDS system shall be verified utilizing a VHS video recorder. The recording device shall be oriented as well as possible to minimize manual counting errors. The contractor shall provide any and all recording equipment and materials and install any and all recording equipment and materials. The recording period shall be of a duration such that every lane being tested has no less than 100 vehicles for the test period. The total vehicle count for every lane shall be used including the first and last vehicles for each lane, even if the exact timing of these vehicles cannot be determined. The acceptance criteria allows for errors in the start and finish counts for both MVDS system and manual errors. The Contractor shall make a copy of the VHS tape for the Contractor's use. The Contractor shall analyze the copied test recording and the MVDS reported count and present the Engineer with the analysis for verification within 3

working days. Determination of any vehicle anomalies or unusual occurrences shall be decided by the Engineer, and he/she has the final say on all aspects of the test.

**Contact closure mode-** When configuration of the unit utilizes the model 170 controller and input file, the count data shall include the interface cards. The Engineer shall supply to the Contractor, a program used by the State, which is used to accumulate data from the model 170 controller. It is a DOS based program and is usually run on a laptop PC for a period of days to collect data. The Engineer will make available someone to assist the Contractor in set up and use of the program when requested, but only 2 times for any contract. The Contractor shall set up the equipment and software and install the equipment that interfaces with the model 170 controller. Following the test period, the Contractor shall give the data recorded by the PC to the Engineer for analysis verification. The Contractor shall use the data files for analysis in the acceptance portion of the contract.

**Accuracy requirement-** The accuracy of the MVDS unit count shall be compared to manual counts of vehicle traffic in typical traffic conditions. Types of vehicles are not relevant to the test as long as the vehicles are licensed for use on State roads. The percent error shall be determined by the formula (TC-MC)/TC where TC= Traffic Count derived from the VHS recording, and MC = MVDS Count over the same period of time.

**Processed data-** The following requirements are for both processed data and for contact closure mode. The individual percent error for each lane shall be better than +/- 10%. If only 1 lane being tested, the accuracy shall be better than +/- 5%. The aggregate percent error for all lanes on a single unit shall be better than +/- 5%. If the acceptance or failure depends on disputed counts or vehicles, then the unit shall be found to have failed the test. The burden of proof for acceptance is on the Contractor, and all data or counts that is not agreed upon by the Engineer shall be considered errors and count against the unit's calibration.

**TRAINING**

The Contractor shall provide a minimum 8 hour training secession for up to 10 students. The content of the training shall be how to maintain the unit including how to calibrate, align, program, and adjust the unit. The Contractor shall provide all materials and equipment for the training. The Contractor shall give the Engineer 10 working days notice prior to the training day. The time and location shall be agreed upon by the Engineer and the Contractor. If no agreement can be reached, the Engineer shall dictate the time and location.

**MANUFACTURER REQUIREMENTS**

The manufacturer of the MVDS systems shall be registered and in compliance with ISO 9001. In addition, the manufacturer shall be able to support the Contractor through training, demonstrations, site surveys and technical assistance as needed to meet the required MVDS system requirements as defined in these special provisions.

**Certificate Of Compliance**

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the microwave vehicle detection sensor system comply with the requirements of these specifications. The certificate shall also include a copy of all test reports on the installed final configuration of the individual MVDS systems reviewed and approved by the manufacturer.

**Warranty**

The manufacturer shall provide a written warranty against defects in materials and workmanship for the microwave vehicle detection sensor system for a period of 12 months after installation of system. Replacement of any part of the microwave vehicle detection sensor system shall be provided within 5 days after receipt of failed part at no cost to the State, except the cost of shipping the failed parts or units. All warranty documentation shall be given to the Engineer prior to installation. Replacement parts shall be delivered to Caltrans Maintenance Electrical Shop

**PAYMENT**

Full compensation for microwave vehicle detector system shall be considered as included in the contract lump sum price paid for the item requiring the microwave vehicle detector system and no separate paymentwill be made therefor.

## 10-3.33 TRAFFIC MONITORING STATION (COUNT)

Traffic monitoring station shall conform to the details shown on the plans and these special provisions.

Inductive loop detectors for traffic monitoring station and the installation thereof shall conform to the provisions in "Detectors" of these special provisions.

Terminal strips, convenience outlet, lighting fixture, circuit protection device and switches shall be provided as detailed on the "Traffic Count Monitoring Details" sheet of the plans.

The exact location of the cabinet will be approved by the Engineer.

Sensor units shall be labeled in conformance with the provisions in Section 86-3.05A, "Labels," of the Standard Specifications.

**PIEZO-ELECTRIC AXLE SENSORS**

Piezo-electric axle sensors shall consist of a 25 $mm^2$ cross-section aluminum U-shaped channel that contains the piezo-cable surrounded by an elastomer. Each sensor is to be 2.4 m in length and include a screened coaxial transmission cable attached. The sensors are to be installed in an array of one inductive loop detector and two axle sensors per lane.

**10-3.34 TRAFFIC MONITORING STATION (INCIDENT)**

Traffic monitoring station shall conform to the details shown on the plans and these special provisions.

Inductive loop detectors for traffic monitoring station and the installation thereof shall conform to the provisions in "Detectors" of these special provisions.

Terminal strips, convenience outlet, lighting fixture, circuit protection device and switches shall be provided as detailed on the "Traffic Count Monitoring Details" sheet of the plans.

The exact location of the cabinet will be determined by the Engineer.

Sensor units shall be labeled in conformance with the provisions in Section 86-3.05A, "Labels," of the Standard Specifications.

**10-3.35 LUMINAIRES**

Ballasts shall be the lag regulator type.

**10-3.36 SOFFIT AND WALL LUMINAIRES**

A No. 7 pull box shall be installed adjacent to each soffit luminaire as shown on the plans.

**10-3.37 SIGN LIGHTING FIXTURES-INDUCTION**

**GENERAL**

Induction sign lighting fixture 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 (HF) generator and a fuse block.

The system lifetime shall be rated at 60 000 hours with a failure rate of less than 10 percent. The system shall be rated at a nominal wattage of 87 W, 120/240 V (ac). The power factor of the system shall be greater than 90 percent and the total harmonic distortion (THD) shall be less than 10 percent. The system shall be UL approved for wet locations and be FCC Class A listed.

The mounting assembly shall 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.

The overall weight 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 on the outside and inside of the housing.

**HOUSING**

The housing shall have a door designed to hold a refractor or lens. The housing door shall be designed to be opened without the use of tools. The housing and door shall have a powder coat or polyester paint finish of a gray color resembling unfinished fabricated aluminum.

**REFLECTOR**

The reflector may be designed to be removed as a unit that includes the lamp and power coupler.

**REFRACTOR**

Refractors (or lenses, if used) shall have smooth exteriors. The lens shall be flat or convex. Convex lenses shall be made from high-impact resistant, tempered glass.

The convex lens shall be so designed or shielded 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. The interior lamp walls shall be fluorescent phosphor coated. Lamp light output shall be not less than 70 percent at 60 000 hours. Lamps shall have a color-rendering index (CRI) of not less than 80. Lamps shall be rated at a color temperature of 4 000K. Lamps shall be removable without the use of tools.

**POWER COUPLER**

The power coupler 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 no more than common hand tools.

**HIGH FREQUENCY GENERATOR**

High frequency (HF) generators shall provide reliable lamp starting and operation at ambient temperatures down to -25°C for the rated life of the lamp.

The generator output frequency shall be 2.65 MHz +/- 10 percent. The generator radio frequency interference shall meet the requirements of Part 18 of the FCC.

High frequency generators shall be designed for continuous operation at ambient air temperatures from -20°C to 25°C without reduction in generator life. High frequency generators shall have a design life of not less than 100 000 hours at 55°C.

A Certificate of Compliance, conforming to the provisions in Section 6-1.07, "Certificates of Compliance," and a copy of the high frequency generator test methods and results shall be submitted by the manufacturer with each lot of sign lighting fixtures. The certificate shall state that the high frequency generators meet, in every respect, the above requirements and the generator specifications of the lamp manufacturer.

High frequency generators shall also conform to the following:

A. High frequency generators shall be capable of being easily replaced. All conductor terminals shall be identified as to the component terminal to which they connect.
B. High frequency generators shall be mounted so as to use the portion of the sign lighting fixture upon which they are mounted as a heat sink.

**RETROFIT KIT**

Each fixture retrofit kit shall consist of a reflector, a lamp, a power coupler and a high frequency (HF) generator. The installation of the retrofit kit shall not require modification of the existing housing and door.

**WARRANTY**

Each fixture shall be warranted by the fixture manufacturer for a period of not less than four years (against mechanical and electrical defects) and with component warranties as follows: lamps for not less than four years; power couplers for not less than four years; high frequency generators for not less than four years; and housing and door surface finish for not less than four years.

## 10-3.38 INTERNALLY ILLUMINATED SIGNS

The "METER ON" sign shall be a Type A pedestrian signal modified so that the reflector shall be a single chamber with 2 Light Emitting Diode (LED) signal modules.

The message shall be white "METER ON" as shown on the plans. White color shall be in conformance with the provisions in Section 86-4.06, "Pedestrian Signal Faces," of the Standard Specifications.

## 10-3.39 CLOSED CIRCUIT TELEVISION SYSTEM (AT VARIOUS LOCATIONS)

**GENERAL**

Closed circuit television (CCTV) system (at various locations) 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 Type 334-CCTV Cabinet assembly .

**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.

Camera pole type is CCTV35.

**CLOSED CIRCUIT TELEVISION (CCTV) CAMERA ASSEMBLY**

Closed circuit television 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. Details of the camera and operational elements shall be provided by the Contractor to the Engineer with the material submittals.

**CCTV Camera**

The CCTV camera shall meet the following requirements:

| Parameter | Specification |
|---|---|
| Camera format size | 8.5 mm (1/3 inch) |
| Pick-up device | Color CCD, interline transfer |
| Active pixels | 768(H) x 494(V) (minimum) |
| Horizontal resolution | 460 television lines (minimum) |
| Minimum Illumination<br>(at 3200ºK faceplate illumination) | Full video output: 6.5 lux (AGC off)<br>80% video: 0.5 lux (AGC on) |
| Signal to Noise Ratio-Minimum | 48 dB at 1.0 V peak to peak (AGC off) |
| Output Signal | Standard color NTSC video signal<br>1.0 V peak to peak at 75 Ohms |
| Video Output Connector | Quick disconnect BNC on rear of camera |
| Operating voltage | 115 VAC ±15%, 60 Hz ±5% (12 to 24 VAC or VDC with 115 VAC adapter is acceptable) |
| Power consumption | 10.0 W (maximum) |
| Camera Mount | 6.35 mm (0.79 threads/mm) -tap |
| Lens mount | "C" mount |
| Operating temperature | -10° C. to 50° C. (minimum range) |
| Maximum dimensions | 70 mm H x 70 mm W x 216 mm L |
| Maximum camera weight | 0.726 kg |

The CCTV Camera shall be a color interline CCD type with Digital Signal Processing (DSP). The CCTV Camera shall, when directed to by an operator on the remote IBM compatible personal computer running the camera control program, display a on-screen menu of current DSP settings that are adjustable by the operator.

The camera shall be designed for use at low light levels having a wide dynamic range and minimal blooming and transfer smear characteristics.

The camera shall incorporate Automatic Gain Control (AGC) circuitry to provide for compensation at low light levels. Automatic light range circuits shall be included to provide compensation for variations in scene brightness.

The camera, or a separate pressure sensor in the environmental enclosure, shall be capable of displaying an alarm message on the 508 mm CCTV or computer monitors in the TMC indicating a loss of pressure in the environmental enclosure.

The camera shall have user selectable shutter speeds of from 1/60 second to 1/10,000 second with a minimum of 8 different speeds. The shutter speed shall be adjustable at a remote site on an IBM compatible personal computer running the camera control software.

The camera shall operate from an EIA Standard RS-170 sync as provided by an internal integrated sync generator and phase lock loop circuit to synchronize the camera to power line zero crossing.

Externally accessible controls shall be covered or protected to prevent accidental adjustment.

The camera shall include any required power supply/adapter equipment to allow operation from an input voltage of 115 VAC ±15 percent, 60 Hz ±5 percent.

**Camera Lens**

The camera lens shall be one of the following two formats:

| Format | Maximum Focal Length |
|---|---|
| 16.9 mm | 115 ± 5 mm |
| 12.7 mm | 120 ± 5 mm |

The camera lens shall meet the following requirements:

| Parameter | Specification |
|---|---|
| Aperture Range | F1.8 to T1800 (minimum) |
| Zoom Range | 10:1 (minimum range) |
| Iris | Automatic with Manual Override |
| View Angle at with a 8.5mm CCD camera at maximum focal length | Horizontal: 2.4° (maximum)<br>Vertical: 1.8° (maximum) |
| Operating Voltage | 5, 9 or 12 VDC |
| Power Consumption | 1 Watt (maximum) |
| Operating Temperature | -10°C to 50°C (minimum range) |
| Maximum Dimensions | 96 mm (H) x 121 mm (W) x 184 mm (L) |
| Lens Mount | "C" mount |
| Maximum Lens Weight | 1.81 kg. |

The lens shall have a neutral density spot filter.

Power interruption protection shall be provided to close the lens iris in case of power loss and the lens shall be held closed by a delay circuit for a minimum of 5 seconds during power start-up.

Lens elements shall be glass.

The lens shall be supplied with zoom/focus preset position potentiometers.

The lens shall be designed to prevent bright light "flare" caused by indirect sunlight outside the angle of view of the lens affecting the viewed scene.

The lens shall be supplied with a matching cable, or connector to connect the auto iris feature to the camera body.

Said lens shall have focal optics such that when distant objects are brought into focus they remain in focus after zooming in on them.

A telescopic converter or extender shall not be used to achieve required focal length range.

**Environmental Enclosure**

The enclosure shall be pressurized using 34.5 kPa dry nitrogen and have a Schraeder valve for pressurizing. A pressure relief valve with a 138 kPa rating shall be provided to protect the enclosure from overcharging.

The enclosure shall have provisions for internally mounting the assembled CCTV camera and lens, and shall have sufficient internal dimensions to house the assembled CCTV camera and lens and all internal wiring. A single sealed, multi-pin connector shall be provided on the rear of the enclosure for the connection of all external video, power and control cabling. A sealed and weatherproof mating connector shall be provided with pinout description.

The enclosure shall include an internal thermostatically controlled heater assembly to minimize external faceplate condensation.

The enclosure shall meet Military Specification MIL-STD-810D or MIL-E-5400T, para. 3.2.24.4 for humidity.

All CCTV camera assemblies shall be plug compatible and interchangeable such that technicians can exchange CCTV camera assemblies in the field.

The enclosure shall include a sun shroud to provide protection from direct solar radiation. The enclosure shall include an adjustable mount and be physically compatible with the pan/tilt unit.

The enclosure shall have a maximum weight of 20.4 kg, excluding CCTV camera and lens. The minimum operating temperature range of the enclosure shall be -17°C to 50°C.

Desiccant shall be provided inside the enclosure to remove any residual moisture that may get trapped in the enclosure as a result of camera and lens installation.

A humidity indicator shall be factory installed in the enclosure. It shall be visible through the camera window to properly indicate moisture accumulation inside the enclosure.

A cradle mount shall be positioned anywhere around the entire circumference of the enclosure body or its full length. The cradle shall be attached to the body using two stainless steel straps supplied with the enclosure. Said enclosure shall be UL listed.

**Pan and Tilt Drive Unit**

The pan and tilt drive unit shall be fully compatible with the CCTV camera assembly and have a cableguard.

The travel angle of the pan and tilt drive unit shall be from 0 degrees to 355 degrees in the horizontal (pan) mode, and from +60 degrees upward to -90 degrees in the vertical (tilt) mode with the camera assembly attached.

The unit shall be fully load rated to accept the CCTV camera assembly under wind load conditions of 40.23 m/s. It shall also be load rated to at least 22.68 kg. within a temperature range of -17°C to 60°C.

All cable connectors shall be fully weather protected type.

Pan and tilt movements shall both be worm gear driven to minimize backlash and to eliminate wind drift. The worm shall be made from stainless steel and shall be ground and polished, and the worm gear shall be manufactured from a non-metallic material. This assembly shall not require any type of lubrication and shall be adjustable to compensate for wear.

Access into pan/tilt for routine maintenance or adjustments of any kind shall not require the removal of the pan and tilt from the installation site, nor removal of the camera enclosure from the pan/tilt unit. Access cover shall be readily removable regardless of the tilt position.

Pan and tilt movement shall have the ability to be automatically directed to a specified preset position and also to be manually controlled. The pan and tilt unit shall be capable of returning (feedback) voltages to indicators that reflect azimuth and elevation position of pan/tilt. Pan/tilt shall be controllable by either a hardwire controller with position readouts or by a control signal transmission system. (Javelin Omni Quest or Omni Quic control system or equivalent).

External body components shall be manufactured from aluminum which have been anodized to prevent oxidation and corrosion.

The pan and tilt drive unit shall instantaneously reverse motor action. The pan and tilt drive unit shall incorporate dynamic braking to prevent drift. The unit shall pan at a nominal speed of 9 degrees per second, and a nominal tilt at 3 degrees per second. The speed of the unit shall be confirmed prior to installation.

Mounting holes shall be located to provide for securely mounting the pan and tilt drive unit to the mounting bracket for installations on pole tops, or other support structures identified on the plans. Provision shall be made for mounting the camera assembly securely and to prevent hardware from becoming loose.

The dimensions of the pan and tilt drive unit shall not exceed 381 mm (W) x 457 mm (H) x 229 mm (D). The weight of the pan and tilt drive unit shall not exceed 27.2 kg.

The pan and tilt drive unit shall operate on an input voltage of 120 VAC, 50/60 Hz supplied by the CCR. The pan and tilt drive unit motors shall have a nominal power consumption of less than 100 watts with a peak load not to exceed 4 times the nominal loading. The pan and tilt drive unit shall have internal overload protection.

The cableguard shall consist of an aluminum rod and shall be complete with attaching hardware. The cableguard shall provide protection from abrasion of the cable harness.

The pan and tilt range settings shall be individually set by the Contractor and approved by the Engineer at each camera site during installation.

After installation and with the CCTV camera assembly installed, the pan and tilt drive unit shall be panned 355 degrees and tilted over the full vertical range, controlled from the camera control cabinet and communication hub structure.

**TYPE 334 CCTV CABINET ASSEMBLY**

Each Type 334-CCTV Cabinet Assembly shall consist of the following:

A. One Type 334-CCTV cabinet
B. One camera control receiver (CCR) – rack mount
C. One multiple outlet strip - rack mount
D. Interconnect wiring
E. One TCVR transmitter
F. One Interconnect termination unit- rack mount (ITU)

**Type 334-CCTV Cabinet**

Type 334-CCTV cabinet shall be State furnished.

**Camera Control Unit**

The camera control receiver shall be a 482.6 mm rack mounted receiver/driver device that converts data on an RS 232 input to output signals that operate the pan and tilt drive unit and motorized camera lens in the CCTV camera assembly.

The CCR shall operate on 120 VAC, 60 Hz input power and provide the 120 VAC, 60 Hz required for the pan and tilt drive unit and the 5, 9 or 12 VDC required for the motorized camera lens in the CCTV camera assembly.

Built-in diagnostics shall be provided that will permit quick and simple testing of camera functions locally.

The CCR shall be capable of executing preset positions for both the pan and tilt drive unit and motorized lens in the CCTV camera assembly. The presets shall be accurate to 5 percent of the original set location.

The CCR shall have a programmable source identification generator that allows written messages to be stored in non-volatile memory so that it is retained if supply power is removed from the camera. The message shall be capable of displaying a minimum of 3 lines with a minimum of 20 characters per line.

The camera control receiver shall meet the following requirements:

| | |
|---|---|
| Supply Voltage: | 120 ±10 percent, 60 Hz. |
| Power requirements: | 100 W, maximum. |
| Mounting: | 482.6 mm rack mount |
| Pan/Tilt drive voltage: | 24 or 120 VAC, field selectable |
| Lens drive voltage: | 5, 9 or 12 VDC, field selectable |
| Camera supply voltage: | 24 or 120 VAC or 12 VDC field selectable |
| Preset positions: | 8 minimum. |
| Input data communications format: | RS 232. |
| Size: | 121 mm H x 483 mm W x 356 mm D maximum (fits 133 mmhigh EIA rack space) |
| Operating temperature range: | -17°C to +60°C minimum range. |
| Humidity range: | 0 to 90 percent minimum |

**Multiple Outlet Strip - Rack Mount**

One multiple outlet strip - rack mount shall be furnished and installed in each type 334-CCTV cabinet. The multiple outlet strip-rack mount shall conform to the following requirements:

| | |
|---|---|
| Mounting: | 482.6 mm rack mount |
| No. of outlets: | 6 or greater |
| Electrical Rating: | 15 A, 125 VAC, 60 Hz |
| Circuit Breaker: | 12 A, 125 VAC |
| Max. Surge Current | >6500 A |
| Max. Energy Dissipation: | >210 J |
| Modes of Surge Protection: | Hot-to-Neutral |
| Clamping Response Time | Less than one nanosecond |
| Modes of Noise Protection: | Transverse and Common |
| Noise Attenuation: | 20 to 40 dB |
| Noise Frequency Range: | 150 kHz - 100 MHz |
| Type of Cordset: | SJT 14/3 |

**Interconnect Wiring**

The interconnect wiring between the CCTV camera assembly, pan and tilt unit and the transceiver (TCVR) and the camera control receiver (CCR) shall be a composite cable that includes flexible 75 Ohm coaxial cable and control cable.

Connectors shall be in accordance with manufacturer's recommendation.

Interconnect wiring and connectors shall be supplied and installed to make the CCTV subsystem completely operational.

Specifications of all cable assemblies, including connectors with strain relief backshells, shall be submitted to the Engineer as part of the shop drawings for review and approval.

Wiring shall run continuous from source to destination without splices.

Cables shall be installed without damaging the conductors, insulation, or jacket. The coaxial cables shall not be kinked or bent tighter than the manufacturer's recommended bending radius.

Sufficient slack shall be provided for equipment movement. The cable shall be secured and protected from physical damage.

All interconnect wiring and connectors shall meet or exceed all necessary standards with regards to voltage, current, and environmental ratings.

Control cable shall be routed from the CCTV camera assembly and pan and tilt drive unit to the CCR and TCVR inside the camera pole. A ground wire shall be provided between the CCTV camera assembly and the camera pole. When interconnect cable is broken out onto a terminal strip, the coaxial cable shall be terminated with a BNC type connector. The BNC type connectors shall be an integral part of the terminal strip.

The cables and connectors shall be installed to allow the camera and lens to be disconnected without removing the environmental camera enclosure and to remove the environmental camera enclosure (including camera) without removing the pan and tilt drive unit.

The Contractor shall be responsible for all testing and documentation required to establish approval and acceptance of the production, installation, and operation of these materials and equipment. The following identifies the specific quality control requirements for this special provision:

The Contractor shall test all cables for continuity and shorts or grounds. Tests on cables with connectors attached (connectorized) shall be performed after installation.

The Contractor shall carry out system integration testing to ensure that the video interface and camera interconnect wiring performs to the specified standards when used in operation with all other devices installed under the contract.

**CAMERA TRANCEIVER (TCVR)**

The Contractor shall furnish and install TCVR at the camera site to interface with the CCTV camera assembly, and with the fiber optic cable.

The TCVR shall operate on one singlemode fiber.

The TCVR shall support high quality, simultaneous two-way transmission of camera control data and one-way transmission of camera video over one singlemode 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 singlemode fiber.

Supply voltage shall be 120 VAC ±10 percent, 60 Hz. Lower voltage units will be acceptable if a UL listed power conversion module is used to adapt from the 120 VAC source.

Power required shall be 50 watts 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<br>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 dBminimum
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 µm 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 shall be tested for the following functions:

The camera control system shall address all TCVR units and shall operate all remote control functions, i.e. pan/tilt, zoom in/out, focus near/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.

### 10-3.40 VIDEO MULTIPLEXER

The video multiplexer and the video demultiplexer system components shall be from the same manufacturer and shall be fully compatible and interoperable with each other.

The multiplexer shall be capable of providing optical transmission (multiplexing) of up to 16 channels of RS-250C baseband video via an 8-bit linear pulse code modulation digitally-encoded multiplexer, from the communications hub to 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 multiplexer shall not require any user-adjustments to facilitate installation or operation. It shall accept an NTSC baseband video signal at any of the 16 video inputs and convert them to a digitized format that is time division multiplexed with the other digitally-encoded video input signals, to produce an aggregate digital bitstream that is applied to the integral optical transmitter.

The video multiplexer unit shall not utilize video compression techniques and shall introduce zero latency to each of the 16 transmitted video channels.

Operating Wavelength: 1300 nm., single mode
Optical Emitter: Laser Diode
Optical Connector Type: Type SC
Operating Power: 115 VAC

LED status indicators shall be provided on the video multiplexer unit for ascertaining the status of the following parameters:

Video sync presence for each video input channel
Operating Power

**INSTALLATION:**

The Video multiplexer system shall be installed at the communication hub 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, as well as the correct video interface cables to the multiplexer inputs and multiplexer outputs as specified by the equipment manufacturer. The contractor shall coordinate the physical space required by the Video multiplexer with the space allocated with any other equipment. The contractor shall connect the Video multiplexer power supply to one of the 120 V (ac), 60 hz power receptacles reserved for communication equipment in the Hub. The fiber optic path for each video link shall be tested and verified in accordance with the contract prior to installing the video multiplexor. 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.

**10-3.41 VIDEO REPEATER**

The broadband FM video optical repeater unit will be compatible to the (nk) Model AWS 3000/384404-3 systems and capable of optically repeating up to 16 individual frequency division multiplexed FM RF video channels over one single mode optical fiber. The video repeater will be within a single self-contained 482 mm rack-mountable assembly. The enclosures will be modular in nature so as to permit easy replaceability.

| | |
|---|---|
| SNR (Weighted Signal-to-Noise) | > 60 dB |
| Differential Phase (10-90 APL) | < 2 degrees |
| Differential Gain (10-90 APL) | < 2 % |
| Video Bandwidth at -3 dB | 10 MHz |
| Max. channel capacity per wavelength | 16 |
| Line Time Distortion | 0.5 IRE, peak to peak |
| AC Input | 120 VAC, 60 Hz |
| Operating Temperature Range | -15 to +55°C, ambient |
| Storage Temperature | -20 to +65°C, ambient |

Optical Specifications:

| | |
|---|---|
| Operating wavelength | 1300 nm (nominal) |
| Launch power (transmitter) | 3 dBm into singlemode fiber |
| Maximum Sensitivity (receiver) | -15 dBm maximum |
| Optical Loss Budget: | 18 dB |
| Fiber compatibility: | 8.3/125 µm singlemode |
| Optical Connectors | SC |
| Bandwidth | 700 MHz |

The video repeater shall be installed at the hub location as shown on the plans. The contractor shall connect the correct optical pigtail or patch cord to the optical connectors on the repeater. The Contractor shall connect the video repeater power supply to one of the 120 VAC, 60 Hz power receptacle located in the respective hub.

**10-3.42 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.

### 10-3.43 VIDEO SWITCH EXPANSION CARD

The video switch expansion card shall be Betatech Model AUB16M64. Install the Video switch expansion cards into existing Betatech Video Blox. The unit shall be installed as directed by Engineer.

### 10-3.44 COMMUNICATION EQUIPMENT

**GLOSSARY**

| | |
|---|---|
| APD | Avalanche Photodetector. |
| ADPCM | Adaptive Differential Pulse Code Modulation. |
| ALBO | Automatic Line Buildout. ALBO provides automatic cable equalization in T1 span-line interface equipment. |
| AMI | Alternate Mark Inversion. |
| AT&T | American Telephone and Telegraph Company. |
| B7 | Binary 7. |
| B8ZS | Binary 8 Zero Substitution. A technique that modifies the alternate mark inversion encoding to ensure pulse density without altering the customer. |

| | |
|---|---|
| BER | Bit error rate. |
| BERTS | Bit error rate test set. |
| bps | bits per second. |
| CCITT | Consultative Committee on International Telegraphy and Telephony. |
| CGA | Carrier Group Alarm. A service alarm showing out-of-frame (OOF) conditions in the multiplexer. |
| CRC | Cyclic Redundancy Check. |
| D-4 | A T1 framing format for channel bank operation. |
| DACS | Digital Access Cross connect System. |
| DDS | Digital Data System. DDS is a private line digital service provided by the Public Telephone Network. It supports data rates at 2400, 4800, 9600 and 56,000 bits per second. |
| DS0-A | A process where a subrate signal (2.4, 4.8, 9.6, 19.2 or 56 kbps) is repeated 20, 10 or 5 times carried over a signal DS0. |
| DS0-B | A process performed by a subrate mutliplexer where twenty 2.4 kbps, ten 4.8 kbps or five 9.6 kbps signals are multiplexed into one 64 kbps DS0 channel. |
| DS0 | Digital Signal, level zero. A 64 kbps signal. It is equal to one voice conversation digitized under pulse code modulation. |
| DS1 | Digital Signal, level one. A 1.544 Mbps digital signal carried on a T1 transmission facility. |
| DSP | Digital Signal Processor. |
| DSU | Data Service Unit. |
| DSX-1 | Digital Signal Cross-connect Level 1. A set of standard electrical parameters for cross-connecting DS1 lines. |
| DSX | Digital System Cross-connect frame. A bay or panel to which T1 lines and DS1 circuit packs are wired and that permits cross-connections by patch cords and plugs. |
| DTMF | Dual Tone Multi-Frequency. |
| E & M | Ear and Mouth. |
| ERL | Echo Return Loss. |
| ESF | Extended Super Frame. A T1 format that uses the 193rd bit as a framing bit. ESF provides frame synchronization, cyclic redundancy checking and data link bits. |
| FXO | Foreign Exchange Office. |
| FXS | Foreign Exchange Subscriber. |
| GS | Ground Start. |
| I/O | Input / Output. |
| IRE | An IRE is 1/100 part of the luminance (blanking to reference white) range. The zero IRE shall be at the blanking level and 100 IRE at reference white level. IRE below blanking level shall be referred to as negative values. |
| ISDN | Integrated Services Digital Network. |
| LBO | Electrical Line Build Out. |
| LGS | Loop Ground Start. |
| LS | Loop Start. |
| OCU | Office Channel Unit. |
| NTSC | National Television Systems Committee. |
| PCM | Pulse Code Modulation. |
| PLAR | Private line, Automatic Ringdown. |
| PLR | Pulse Link Repeater. |
| ppm | periodic pulse metering. |
| QRSS | Quasi Random Signal Source. |
| SRL | Signal Return Loss. |
| Switched 56 | A switched line digital service provided by the Private Telephone Network. It supports 56,000 bits per second data rate only. |
| T1 | A standard digital transmission link with a capacity of 1.544 Mbps normally handles 24 voice channels at 64 kbps. |
| TLP | Transmission Level Point. |
| VF | Voice Frequency. |
| μ-law | PCM coding and companding standard used in North America. |

**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.

**10-3.45 EQUIPMENT RACKS.**

Equipment racks shall be aluminum and self-supporting. Dimensions shall be for a standard 19" EIA rack with mounting hole dimensions of 18 3/16" width, EIA: 3" x 1.265" channel and 1/4" thick flange. The base angles shall be a 3 1/2" x 6" x 3/8" thick pair with top cross angles of 1 1/2" x 1 1/2" x 1/4" as a pair. Rack height shall be 8' with 154 mounting holes. Cable raceways shall be 3/8" x 1 1/2" x 0.65" wall rectangular steel tubing with cross members welded at 12" intervals. Cable raceway width shall be 9" and standard length of 9' 11 1/2". Butt splice kits shall be used to connect cable raceway sections. Equipment racks and cable raceways shall be arranged in the communication hub as shown on plans. Fiber optic cables shall enter the communication hub structure at any of the four sides and run along perimeter cable raceway. Power cords shall run from distribution panel on the wall to cable raceway directly above equipment racks. All cables shall drop down from cable raceway to equipment racks.

**10-3.46 ASYNCHRONOUS FIBER OPTIC MODEM (AFOM)**

The asynchronous fiber optic modem 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 asynchronous fiber optic modem 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 | VDC version: +9 to +14 VDC @ 32 mA, nominal.<br>VAC version: 115 VAC ±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.<br>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 | -20ºC to +70ºC. |
| Storage Temperature | -40ºC to +85ºC. |

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 patchcords 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 $10^9$ shall be demonstrated.

## 10-3.47 MODEL 170 CONTROLLER INTERFACE

The Model 170 controller interface shall consist of an asynchronous fiber optic modem, an interface cable, and interconnect and termination unit located in the Model 170 controller cabinet. The asynchronous fiber optic modem is described elsewhere in these special provisions.

### Interface Cable

Interface cable shall consist of six No. 22, stranded tinned copper conductors. Each conductor shall be insulated with 250 µm, minimum nominal thickness, color coded polypropylene material. Conductors shall be in twisted pairs. Each pair shall be wrapped with an aluminum polyester shield and shall have a No. 22 or larger, stranded, tinned copper drain wire inside the shielded pair.

The cable jacket shall be polyvinyl chloride, rated for a minimum of 300 V and 60°C, and shall have a minimum nominal wall thickness of 1 mm. The cable shall be 1 m long with an connector for termination to the Model 170 controller and a DB-25 connector to the asynchronous fiber optic modem. The connector at the Model 170 controller shall meet the following requirements:

| Amphenol or equivalent | |
|---|---|
| Part | Number |
| Shield | 201378-2 |
| Block | 201355-1 |
| Guide Pin | 200390-4 |
| Socket | 200389-4 |

The cable has the following pin configuration as directed by the Engineer

| Asynchronous F/O Modem | | Model 170 Controller | |
|---|---|---|---|
| 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 | +5VDC |

Pin J shall be looped back to pin M

## 10-3.48 DS1 OPTICAL MODEM

The DS1 optical modem converts between the electrical signals of the T1/DS1 multiplexer aggregate interface card and the optical signals used on the single mode optical fiber facility. An LED indicator shall be provided for use in determining received optical power. Two modems and the fibers connecting them will form the T-l transmission facility.

The DS1 optical modem shall be fully compatible and interoperable with the existing International Fiber Systems Inc. model D1230-R3 (rack mount).

The electrical DSl interface of the optical modem shall comply with the ANSI T1.102-1987 standard and compatible with the T1/DS1 multiplexer.

The optical interface shall be designed for single-mode operation using an optical wavelength of between 1250 and 1350 nm.

The optical launch power of the transmitter shall be at least 15 dB greater than the sensitivity of the receiver. Sensitivity is defined as the minimum optical receive power required to maintain the specified error rate. The saturation level is the maximum optical received power that the receiver can tolerate before the error rate is exceeded.

At no time shall the received optical power exceed the receiver's saturation level. Optical attenuators with a return loss of 15 dB, shall be provided.

A bit error rate of less than or equal to 1 in $10^9$ shall be certified over the specified operating ranges.

The DSl optical modem shall be transparent to any zero-code suppression used by the T1/DS1 Multiplexer and/or terminal equipment.

The DS1 modem shall be rack-mount version. The rack mount card cage shall be capable of housing a minimum of 15 modems in no more than 150 mm of vertical rack space. The modems shall have the same mechanical size as the asynchronous fiber optic modem.

All hardware necessary for mounting the modem in a standard 482 mm rack shall be provided.

The DSl cables shall be routed between the T1/DS1 Multiplexer and the optical modems.

The DSl cables shall be connectorized as appropriate and specified by the T1/DS1 multiplexer manufacturer.

The output power of each modem shall be externally attenuated to be compatible with the optical loss of the fiber being used. The optical receive power at each modem shall be measured and recorded before connection of the receiver optical patchcord or pigtail. The optical patch cords or pigtails shall be attached as required.

The DS1 optical modem shall meet the following requirements:

| | |
|---|---|
| Electrical Power: | Rack mount version: +12 to 18 VDC @ 115 mA per module or 12 to 16 VAC at 2W. |
| Bit Error Rate: | 1 in $10^9$ within optical budget |
| System Bandwidth: | DC to 2.048 Mbps |
| Optical Wavelength: | 1300 nm, nominal |
| Connectors Optical: | Type SC |
| Connectors Electrical (Data): | The physical interface shall be either a female 15 pin D-type connector or a 8-position screw terminal with cable shield |
| Environmental Ambient Temperature Range: | -20°C to +50°C |
| Storage Temperature: | -40°C to +85°C |

Patchcords and pigtails 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 losses of 10 dB at 1300 nm. A DS-l test set shall be connected to the modem and set for ESF framing, B8ZS coding, internal timing, and a QRSS pattern. The test set shall also be set for the standard AMI framing, DSX-l output level and terminated input. 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 patchcords and attenuators with a loss of 10 dB in each direction. The DS-l interface shall be looped back on one modem and a DS-l test set connected to the DS-l interface of the other modem. A bit error rate of less than 1 in $10^9$ shall be demonstrated.

**10-3.49 T1/DS1 MULTIPLEXER**

The T1/DS1 multiplexer shall replicate the T1 multiplexing, switching and diagnostic functions and features of the Newbridge Networks' Model 3600 Mainstreet Bandwidth Manager or equal. The T1/DS1 multiplexer shall provide equipment communications via a standard T1 bandwidth of 1.544 Mbps interface. The T1/DS1 Multiplexer shall support voice, RS 232, V.35, RS-449/X.21/RS-422, X.27, V.11, V.24, V.28 communications with standard data rates of 1.2 kbps to 2.048 Mbps. Remote data on RS 232 field interconnections to the T1/DS1 Multiplexer shall be provided through the RS 232 Distribution Panels and the asynchronous fiber optic modems. The remote TOS cabinet's T1 multiplexer interconnections to the T1/DS1 multiplexer in the communications hub assembly shall be provided through the DS1 optical modem.

The T1/DS1 multiplexer and associated equipment shall meet the following standards:

FCC part 15, Subpart J, Class A device
FCC part 68
AT&T Publication 43202
AT&T Publication 43801
AT&T Publication 54016
AT&T Publication 62310
AT&T Publication 62411
UL Standard 94
UL Standard 510
UL Standard 910
UL Standard 1441
UL Standard 1581
UL Standard 1666
UL Standard 1863

The DS1 signal shall meet the following minimum electrical requirements:

| |
|---|
| 1.544 Mbps ± 200 bps line rate with stratum 4 clock |
| ESF and D4 Mode 3 format |
| 24 DS0 at 64 kbps framing with 8 kbps overhead |
| B7, B8ZS, or AMI line coding |
| B8ZS clear channel |
| 100 ±10 Ω balanced impedance |

**Front panels.**—Channel units and common equipment shall be of plug-in design each incorporating locking devices on the front face insuring proper position, without requiring unique tools to perform installation or removal. Each unit shall incorporate a label describing the card type.

**Mounting.**—All equipment shall provide for a minimum of four mounting screws in order to flush mount the equipment in a standard 482 mm EIA-310 rack space, unless otherwise specified elsewhere in these specifications.

**Function.**—The T1/DS1 multiplexer equipment shall provide the functions of digital cross-connect, drop and insert, channel bank, fractional T1, ISDN and integrated voice and data multiplexer in a combination of single function systems or as a combined system on a non-blocking basis and be software configurable at the DS0 level. There shall be software internal to the T1/DS1 multiplexer for diagnostics, maintenance, setup and operations.

**T1 Equipment Shelf**

The T1 equipment shelf 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 VAC power supplies that meet the following requirements:

Operating AC power supply voltage range from: 102 V to 132 V.

Each T1/DS1 multiplexer shall have the provision to be configured with a dual internal redundant load sharing -48 VDC power supplies. In the event of a commercial AC power failure the T1 multiplexer shall be capable of uninterrupted operation by deriving -48 VDC 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 VDC. 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 backplane.

The T1 equipment shelf shall have a nominal size of 482 mm (W) x 254 mm (D) x 482 mm (H).

**Backplane requirements.**—The T1/DS1 multiplexer shall be designed with shelf motherboard (backplane) connecting the channel cards and common equipment together. Specifically a wire-wrap or bundled wiring harness construction shall not be permitted.

The backplane shall be designed to support a mixture of voice and high speed data.

**Crosstalk.**—The T1/DS1 multiplexer shall be designed to allow physical separation of voice and data traffic to different connectors on the backplane. High speed data lines shall not be permitted to produce crosstalk on adjacent high speed data lines.

Ringing 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.

Network specifications:

| | |
|---|---|
| Line Rate: | 1.544 Mbps ±32 ppm |
| Line Code: | AMI and B8ZS |
| Frame Code: | D4 and ESF |
| Output Signal: | ± 3.0 V peak to peak nominal |
| Impedance: | 100 Ω |
| Input Signal: | ± 3.0 V peak to peak nominal |
| Sensitivity below DSX-1: | -10 dB (0 dB = 2.4 V peak to peak) |
| Pre-Equalization Ranges: | 0 to 45 m<br>46 m to 137 m<br>138 m to 198 m |

Pulse Density specifications:

| | |
|---|---|
| Zero suppression (software controllable): | AT&T Publications 62411 |

Connector specifications:

| | |
|---|---|
| Connector Type: | 25-pair Amp Champ Connector on the backplane |

**ESF Facility Data Link (FDL)**.—The FDL shall meet AT&T TR publication 54016, SPRINT TS-0031, and SPRINT TS-0025. The FDL shall decode the CRC-6 error algorithms, maintain error statistic counters, and make such statistics available to the network technician. FDL reports shall include, at a minimum, current ESF error event counter report, one hour performance report and twenty-four hour performance report.

**DS0 map assignments**.—The T1/DS1 multiplexer shall have at least eight internal maps to store different DS0 assignments of the channel cards. New DS0 assignments may be made in an "off-line" manner and shall not affect traffic until all the new DS0 assignments have been completed and a change of map command issued. New DS0 assignment shall

be made through Simple Network Management Protocol (SNMP) or Control Packet Switching System (CPSS) protocol. Contractor shall provide the Engineer the protocol packet technical specification. DS0 maps shall be capable of handling any 24 DS0 combinations in both T1 spans simultaneously and all physical channel card slots in the channel bank. Two configured matrix maps from each T1 to T1 span shall be active simultaneously. Any physical channel card slot shall be assignable to any multiple of DS0 time slot in either T1 line.

**Clock source.**—the primary clock source shall be software selectable from an internal master clock, an external master clock, or from the T1 span. If the internal source fails the programmed alternate source shall be selected automatically. The T1/DS1 multiplexer shall accept an external master clock that provides a clock frequency from 8 kHz to 1.544 MHz in any multiple of 1600 Hz.

**Universal Channel Slot Cards**.—The T1/DS1 multiplexer equipment shall support the following channel cards:

**Aggregate Cards:**

**Dual and single 1.544 Mbps T1/DS1 Cards**—Dual and single 1.544 Mbps T1/DS1 aggregate cards shall be remotely and locally configurable via the control port, meet the DS1 electrical signal requirements and AT&T publications as specified elsewhere.

**Fixed 56/64 kbps cards.**—Fixed 56/64 kbps cards shall be remotely and locally configurable via a control port and meet the following requirements:

Synchronous
Interface types: (1) V.35, V.24/RS 232, V.36 and V.37 and (2) X.21/V.11
Modes: (1) Bi-directional - transmit on the primary or the secondary T1, (2) Point to point and (3) Polled - shared time slots CGA alarm capable.

**56/64 x n kbps cards.**—The 56/64 x n kbps cards shall be remotely and locally configurable via the control port and meet the following requirements:

Synchronous
Interface types: (1) V.35, V.24/RS 232, V.36 and V.37 and (2) X.21/V.11
Modes: (1) bi-directional transmit on the primary or the secondary T1, (2) Point to point and (3) polled - shared time slots CGA alarm capable.

**Data Cards:**

**Direct Connect Cards.**—Direct connect cards shall be remotely and locally configurable via the control port and meet the following requirements:

Synchronous or Asynchronous
Interface type: V.24/RS 232
Date rates: from 150 bps to 64 kbps.
6 or more RS 232 channels per card capacity with DB-25 female connectors.
Capable of supporting a real time polling system for network management utilizing Simple Network Management Protocol (SNMP) or Control Packet Switching System (CPSS).

**Subrate Multiplexer Cards.**—Subrate data multiplexer cards shall be remotely and locally configurable via the control port and meet the following requirements:

Synchronous or Asynchronous
Interface types and data rates shall support: (1) X.21 - 50 bps to 19.2 kbps (2) V.35 - 2.4 to 19.2 kbps (3) V.24/RS 232 - 50 bps to 64 kbps
DS0-A and DS0-B DDS compatible
6 or more DS0-A or DS0-B channel per card capacity
Capable of supporting a real time polling system for network management utilizing Simple Network Management Protocol (SNMP) and/or Control Packet Switching System (CPSS).

**Voice Cards:**

**E&M 4-wire voice cards.**—The E&M 4-wire voice cards shall be remotely and locally configurable via the control port and meet the following requirements:

Nominal transmission levels (dBm):
Transmit: -16.0 to +7.0
Receive: -16.0 to +7.0

Frequency response from 300 to 3000 Hz:
Transmit: +0.15 to -0.15 dB
Receive: +0.15 to -0.15 dB

4-Wire impedance: 600 Ω
Return loss from 300 to 3000 Hz: 23 dB
Signaling modes: standard E&M, E&M tandem loop start, and E&M tandem ground start.
Signaling types: E&M types I, II, III, and PLR types I, II.
Transmission direction: shall be selectable to either the primary or secondary T1.
VF cards shall be able to be taken out of service without dropping all other active circuits.
VF cards shall visually indicate on front panel their active, idle and ringing status.
For inventory control purposes, all cards shall report via software their serial number and revision level.

**FXS 2-Wire voice cards**.—The FXS 2-Wire voice cards shall be remotely and locally configurable via the control port and meet the following requirements:

Nominal transmission levels (dBm):
Transmit: -12.0 to + 0.0
Receive: -10.0 to + 6.0

Frequency response from 300 to 3000 Hz:
Transmit: -0.25 to +0.5 dB
Receive: -0.25 to +0.5 dB

2-Wire impedance either 600 or 900 Ω with return loss:
ERL > 34 dB, minimum
SRL > 20 dB, minimum

Signaling modes to be supported: FXS, LS, GS and PLAR.
PCM μ-law voice signaling and companding conversion standards shall be supported.
Signaling types shall be loop start and ground start.
Transmission direction shall be software selected from either the primary or secondary T1.

**FX0 2-Wire voice cards.**—The FX0 2-Wire voice cards shall be remotely and locally configurable via the control port and meet the following requirements:

Nominal transmission levels (dBm):
Transmit: -12.0 to + 0.0
Receive: +10.0 to + 6.0

Frequency response from 300 to 3000 Hz:
Transmit: -0.25 to +0.5 dB
Receive: -0.25 to +0.5 dB

2-Wire impedance either 600 or 900 Ω with return loss:
ERL > 28 dB, minimum
SRL > 20 dB, minimum

Signaling modes to be supported: FX0, LS and GS
PCM μ-law voice signaling companding conversion standards shall be supported.
Signaling types shall be loop start and ground start.
Transmission direction shall be software selected from either the primary or secondary T1.

**Order wire voice cards.**—The Order wire voice cards shall be remotely and locally configurable via the control port and meet the following requirements:

Nominal transmission levels (dBm):
Transmit: -12.0 to +0.0
Receive: -10.0 to +6.0
Frequency response from 300 to 3000 Hz:
Transmit: -0.25 to +0.5 dB
Receive: -0.25 to +0.5 dB
2-Wire impedance either 600 or 900 Ω with return loss:
ERL > 28 dB, minimum
SRL > 20 dB, minimum
Signaling modes to be supported: LS, GS and PLAR.
Individual DTMF addressing from any other order wire card.
Operating modes to be supported: loop ground start operation, voice activated transmission, and tone and pulse dialing.

**Telco Cards:**

**Office Channel Unit Data Port.**—The office channel unit data port (OCUDP) shall be remotely and locally configurable via the control port and meet the following requirements:

4-wire baseband digital interface
Switched 56 and DDS services shall be supported
Bi-directional transmit to either the primary or secondary T1
56 kbps or 64 kbps transmission
Switched 56 or DDS compatible with or without secondary channel (Type I)
DDS I and DDS II compatible
Error Correction
Automatic Line Buildout (LBO)
Full two mile span from line drivers.
Automatic Equalization
DDS loopback capability (CSU, DSU and OCU loopbacks)
Sealing current

**Transmit Only 4-Wire Voice Cards.**—The transmit only (TO) 4-wire voice cards shall be remotely and locally configurable via the control port and meet the following requirements:

Nominal transmission levels (dBm):

Transmit: -17.5 to +13.0
Receive: -17.0 to +8.0

Frequency response from 300 to 3000 Hz:

Transmit: +0.15 to -0.15 dB, minimum
Receive: +0.15 to -0.15 dB, minimum

4-Wire impedance either 600 or 900 Ω
Return loss from 300 to 3000 Hz: = > 23 dB
Transmission only without robbed bit signaling
Transmission direction shall be selected from either the primary or secondary T1.

VF cards shall be capable of being taken out of service without dropping active customers.
VF cards shall visually indicate on the front panel their active or idle state.
For inventory control purposes all cards shall report via software their serial number and revision level.

**Resource Cards:**

**Frame Relay Switch Card.**—Frame relay switch card shall be capable of being remotely or locally configured via the control port and provide frame routing, dynamic bandwidth allocation, congestion control and frame error checking.

**Digital Signal Processor (DSP) Cards.**—Digital signal processor (DSP) cards shall be capable of being remotely or locally configured via the control port and meet the following type requirements:

**DSP-1 Card.**--The DSP-1 card shall support 26 DS0 channels and provide subrate multiplexing and multidrop data bridging applications.

**DSP-2 Card.**--The DSP-2 card shall support 26 DS0 channels and provide subrate multiplexing, multidrop data bridging, PCM bridging, and DDS applications.

**DSP-3 Card.**--The DSP-3 card shall support 48 DS0 channels and provide subrate multiplexing, multidrop data bridging, PCM bridging, DDS and High Capacity Voice applications.

**DSP-4 Card.**--The DSP-4 card shall support 48 DS0 channels and provide subrate multiplexing, switching, multidrop data bridging, PCM bridging, DDS and High Capacity Voice applications.

**Data Communications (DCP) Card**.—Data communications (DCP) card shall be capable of being remotely and locally configured via the control port and meet the following requirements:

31 Control packet switching system (CPSS) channels per card capacity
High speed and high capacity CPSS packet switching
DDS and ADPCM compatible

**Common Control Cards:**

**System Control Card 3.**—The system control card 3 shall be capable of being remotely and locally configurable via the control port and meet the following requirements:

Have integral memory module with the latest software version.
Contain built-in test circuitry which detects a failure or fault condition and supplies a fault indication.
Node system processing, maintenance and timing generation.
Digital cross connect switching (DCS).
Communications from internal memory module using non-volatile memory to resource cards, application cards, channel units and data termination units/panels.
Alarm monitoring and notification
Display T1/DS1 Multiplexer status
Two RS 232 serial ports

**General Facilities Card.**—The general facilities card shall be capable of being remotely and locally configurable via the control port and meet the following requirements:

μ-law faceplate as per AT&T specifications
Alarm port
Voltage testpoints for T1/DS1 Multiplexer and channel card power supplies
Network testpoints: 600 Ohm terminating impedance at 0 dB TLPs
Tone generator as per CCITT G.711 standard
Timing input for T1 and composite 64 kHz signals
Order wire configurable as a LGS circuit with either a passive communications link or an audio monitoring channel.

**Expander Card.**—The expander module shall provide additional digital cross connect switching matrix resources to the universal channel slot cards by doubling the bandwidth of the cards by up to 64 Mbps.

**Universal Channel Slot and Circuit Board Extender Card.**—The universal channel slot and circuit board extender card shall meet the following requirements:

The circuit board extender shall extend a circuit board to permit full access to the circuit for testing and maintenance.

A circuit board placed into the circuit board extender shall be fully functional.

Circuit board extender cards shall be provided to permit "extending" any one circuit board at a time.

Each channel slot of the multiplexer shall meet all performance requirements specified herein while any circuit board extender is installed.

### 10-3.50 CARD CAGE ASSEMBLY

Card cage assembly shall have capacity for 15-25.4 mm wide cards. Overall dimensions for the card cage assembly shall be 133 mm H x 482.6 mm W x 254 mm D made from an aluminum chassis, and having an unloaded weight of under 2.268 kg. Operating temperature shall have a range of –20°C to 50°C. Card cage assembly shall have a power supply for the modems and TCVRs with line cord with input power range of 115 VAC ± 15 percent, 60 Hz. The interface cable between the asynchronous fiber optic modems and TCVR-CHs in the card cage assembly and the RS-232 distribution panel shall be specified by the RS-232 distribution panel manufacturer and provided and installed by the Contractor.

### 10-3.51 T-1 MULTIDROP COMMUNICATIONS SYSTEM

T1 Multidrop Communication System shall consist of installing the following equipment into the T1/DS1 multiplexer system at the Communications Hub H at the 60/15 interchange:

| Qty | Description |
|---|---|
| 1 | T1/DS1 multiplexer shelf and equipment |
| 5 | RS 232 distribution panel |
| 2 | DS1 optical modem / switch |
| 20 | RS-232 serial cables |

The T1/DS1 multiplexer shelf and equipment consist of the following equipment:

| Qty | Description | Newbridge Part No. |
|---|---|---|
| 1 | T-1 shelf | 90-0010-10 |
| 2 | AC power shelf | 90-0435-02 |
| 2 | AC power shelf upgrade kit | 90-0481-02 |
| 2 | T1 dual card | 90-0564-01 |
| 4 | T1 LIM module | 90-0567-01 |
| 1 | Dual shelf cable assembly | 90-0090-05 |
| 6 | Data Cards: Direct connect cards | |
| 4 | Resource Cards: DSP-3 Cards | |
| 2 | Common Control Cards: System Control Card 3 | |
| 2 | Common Control Cards: General facilities card | |
| 2 | Common Control Cards: Expander card | |

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. 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:

Length: Minimum of 0.5 meters
Termination: DB-25p, Bare-wire for screw terminal
Conductors: Straight through DB-25 to DB-25, No. 22 AWG, THWN
Cable Jacket: Polyethylene

**10-3.52 QUICKNET SERVER**

Hardware:
Dual Intel Xeon processors with speeds of 3.0 GHz minimum
2 GB of ECC DDR SDRAM (Use 4X512MB)
RAID Controllers to provide RAID levels of 1 minimum
Minimum of RAID level 1 Hard Drives configuration
Dual 73 GB Hard Drives (73 GB each drive) 15000 RPM Hot Swappable for RAID 1 operation
Hard Drive and Controllers supporting Hot Plug operation
Standard IDE and Floppy Drive Controllers
Fastest available DVD Recorder that supports +RW, -RW, CDR format
1.44MB Floppy Drive.
Minimum of two 100/1000 NICs
Ports required: two USB, two PS/2, two Serial, one Parallel, and one IEEE 1394
Fibre Channel Controller
Video Graphic Controller w/ 64MB that support DVI and analog XGA interface
Standard Windows Keyboard
Standard PS/2 mouse
Chassis shall be Tower Configuration
Redundant Power Supplies (Minimum two Power Supplies)
UPS, Stand alone version rated 1000 VA with 15 minutes battery life at 1000 VA and true sine wave output.

Any other parts for normal server operations

Software: Microsoft Windows 2000 Server or the latest Microsoft Windows Server OS.
Microsoft Office - Professional version
Server Backup Software
Antivirus Software
Network Firewall Software
Server Management Software
Any other software for normal Server operations

Documentation: Hard Copy Documentation for all items
Warranty: At least 3 years of free replacement of parts and cost of labor
Service: At least 3 years of same day onsite service and unlimited telephone tech support.

**10-3.53 QUICKNET SERVER NOTEBOOK**

Hardware: Intel Pentium class processors with speeds of 1.6 GHz or above
1 MB of integrated cache memory
256 MB of Main Memory
20 GB Hard Drive
Minimum of 14" LCD XGA (1024x768) active matrix TFT display
Video Graphic Controller supporting 1024x768x32 resolution minimum
One type 1 or type II PC Card Slot
One integrated V.90 modem
One integrated 10/100 NIC
Ports: One IEEE 1394, one USB, one Serial, and one Parallel
Internal or external DVD recorder (Compatible with +RW and -RW format)
Internal Floppy Drive
Weigh less than 3 lbs. With HD and Battery installed
Greater than 4 hours of continuous operation on battery mode
All necessary controllers, cables, connectors for normal operation

Software: Microsoft Windows XP Professional
Microsoft Office XP - Professional version
Antivirus Software

Documentation: Hard Copy Documentation for all items

Warranty: At least 1 year of free replacement of parts and cost of labor

Service: One-year telephone tech support.

**10-3.54 COMMUNICATION HUB STRUCTURE**

**GENERAL**

The communication hub structure consists of a prefabricated reinforced concrete structure with all required equipment to maintain the environmental requirements for installation of the communication hub equipment in conformance with the details shown on the plans and as specified in these special provisions or as directed by the Engineer. The structure shall be pre-manufactured by a company normally engaged in the fabrication of controlled environmental aboveground structures. The plans and working drawing shall be signed by registered civil engineer and electrical engineer.

The communication hub structure shall include the following equipment:

Single phase, 3-wire circuit main breaker panel board equipped with provisions for ten 15A and twenty 20A circuit breakers.

Interior lighting consisting of 6 ceiling-mounted, 2-lamp, 4-foot fluorescent fixtures, at the approximate locations shown on the plans.

Emergency lighting shall consist of a 2-bulb, battery operated light and shall conform to the following specifications:

Completely self contained with an external test switch.
Contain a motion detector sensor.
Fully automatic operation, wired to operate when commercial power fails and motion is detected and shall continue to operate for 10 minutes minimum after no motion is detected.
Able to operate continuously for 2 hours minimum under full charge.
Contain a maintenance free battery with a 15-year rated life.
Lamps shall be glare-free sealed beam PAR 36.
Charger shall be solid state and feature an automatic low voltage disconnect and operate on 120 VAC.

An emergency power input connector shall be located above the collar adjacent to the entranceway cover. The connector shall be enclosed in a weatherproof housing and shall consist of a 100 amperes, 3-pole, 4-wire connector rated at .120/208 volts

Convenience outlets for 120 Volts components are shown on the plans.

Ventilation blower with the minimum capacity of 28 cubic meters/minitues at 1.25 Total Static Pressure. Shall be controlled by environment controller panel

Heater equal to at least a 1,250-watt electrical wall heater.

Dehumidifier with a minimum capacity of 12 liters per 24 hours.

Dual air conditioners, thermostatically controlled to provide a minimum capacity of 24,000 BTU each.

Atmospheric monitors, factory calibrated sensors for 100 ppm carbon monoxide, combustible sensor 5,000 ppm methane with red and green indicator lamps (located in entrance hatch).

Electro-Mechanical Control Panel.

Exterior light (dual incandescent) shall be controlled by a timer switch.

The communication hub structure shall be designed to meet the following structure requirements, in addition to those shown on the plans:

Precast concrete shall have minimum compressive strength of 35Mpa at 28 days.
Reinforcing steel shall be ASTM Designation: A 615, Grade 60, or equal.
Design Loading: Roof, ;2.9KPa Floor, ;4.8 KPa Wind, ;225 kph and Seismic, Zone 4.
Dimensions shown on the plans are minimum for inside dimensions and nominal for outside dimensions.
Four, 103 mm conduit entrances through the floor at each end of the structure shall be provided (total of 8).
The exterior of the communication hub structure shall have an architectural ribbed finish painted as specified elsewhere in these special provisions.

**EARTHWORK**

Earthwork shall conform to the provisions of Section 19, "Earthwork," of the Standard Specifications and these special provisions. And as per shown on plan If the manufacturer's requirements for installation of the communication hub structure exceeds those provisions of Section 19 of the Standard Specifications, the more rigorous requirements shall apply.

Excess material removed as "Structure Excavation" shall be utilized in embankment construction or disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

**ELECTRICAL**

All electrical work for the communication hub structure shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

The communication hub structure shall be From the transformer panel as shown on plan. The grounding system shall be installed in hub structure.

The alarm features provided in the communication hub structure shall provide local audio and visional indicators and remotely be connected to an alarm terminal port for connection to the transportation management center, as shown on the plans and described in "Communication Equipment" elsewhere in these special provisions. The following is a list of alarms and conditions for the alarms, that shall be provided showing the status of the communication hub structure:

High Humidity Alarm - activated over an adjustable humidity range, set between 20 to 85 percent.

Intrusion Alarm - activated whenever the entranceway cover is opened without first being bypassed using an interrupt switch located near the entrance hatch. The interrupt switch shall automatically reset to the active state once the entranceway cover is closed. Once activated the alarm shall be cleared locally, but not automatically.

High and Low Temperature Alarm - activated over an adjustable high temperature range between 80 to 140º F. and an adjustable low temperature range between 30 to 75º F.

Commercial Power Alarm (failure) - activated whenever commercial power is interrupted for more than 2 cycles.

Toxic and Explosive Gas Detector - activated whenever a hazardous gases or low oxygen condition is present that makes the hub structure unsafe for human occupancy.

Smoke Alarm - activated whenever smoke or fire is detected in the hub structure. The smoke detector shall be a photo-electric smoke detector with battery back-up.

Ventilation Alarm - activated whenever the ventilation blower fail to activate when required or when a low air-flow condition exist.

These alarms shall be able to connect to a RS-232 distribution panel, which shall then be connected to a T1 multiplexer.

**DOOR AND DOOR HARDWARE**

Door shall be 914 mm wide by 2.05 meter high (minimum), 18-gage honeycomb core steel door.

Door shall be right-hand swing with the hinges installed on the right side when facing the door from the outside the building.

Door shall be equipped with weatherstripping, 1 1/2-pair of butt hinges, lockset, door stop, and threshold.

Weatherstripping shall be installed on both sides and the top of the door.

Butt hinges shall be the 114 mm X 114 mm size with ball bearings, non-removable pins, and US

26D finish; Stanley FBB 179, Hager BB 1279, Lawrence BB 4101, McKinney TB 2713 or equal.

Lockset shall be "Classroom" lockset with US 26D finish; Corbin 455SS, Harmony, Yale 5508 Mystic, Schage C70PD Tulip or equal. Lockset cylinder shall be keyed to match a sample key supplied by the Engineer.

Door and frame shall be installed rigidly, securely, plumb, and true. The door shall operate free without rubbing or binding. Clearance between the frame and door shall be not more than .3 mm

Hardware items shall be accurately fitted, securely applied, and adjusted in accordance with the manufacturers' instructions.

Hardware items shall be removed from surfaces to be painted during painting.

**EXTERIOR PAINTING**

Surfaces shall be coated according to the following requirements:

Brass surfaces, nameplates, weatherstripping, push buttons, operating handles, locks, plastic parts, cover plates on wall mounted outlets and switches, and any other item which would be impaired in legibility, life expectancy or function shall not be coated. Said items in place prior to coating shall be removed or loosened as required for operations and replaced upon completion of the work. Anodized aluminum surfaces shall not be coated.

All coatings shall be the best quality grade of specified types as regularly manufactured by a recognized coating manufacturer.

Color shall be "Dusty Gray". Paint shall be Sinclair Plast-O-Life water base exterior flat vinyl acrylic, color No. 2000-25940 or equal.

Coatings shall be applied only when surfaces are dry and properly prepared and the surrounding conditions are satisfactory for coating. Surfaces shall be cleaned of all dust, dirt, grease, wax, loose coatings, and other substances that would impair bonding of the coating.

The building shall have a flat paint finish. The door and exterior air conditioner surfaces shall have a semi-gloss paint finish the same color as the building. Masonary paint shall be used on concrete surfaces.

**10-3.55 NEW COMMUNICATION HUB ASSEMBLY (H)**

The communication hub assembly (60/215 IC) shall consist of installing the following equipment into new racks as per plans and these special provisions.

| Qty | Description |
|---|---|
| | |
| 2 | VIDEO MULTIPLEXERS |
| 3 | EQUIPMENT RACKS |
| 1 | T-1 MULTIDROP COMMUNICATION SYSTEM |
| 20 | AFOM |
| 3 | FIBER DISTRIBUTION FRAME |
| 10 | TCVR-CH A-D |
| 3 | UNINTERRUPTABLE POWER SUPPLY (UPS) |
| 4 | CARD CAGE ASSEMBLY |
| | |

The Fiber distribution cage, TVCR, UPS and Card cage are described elsewhere in these special provisions.

**10-3.56 MODIFY COMMUNICATION HUB ASSEMBLY (B)**

The modify communication hub assembly (91/60/215 IC) shall consist of installing the following equipment into existing racks:

| Qty | Description |
|---|---|
| 1 | Video Multiplexer 16 channel |
| 4 | RS 232 Distribution Panels |
| 20 | AFOMS |
| 4 | Direct connect card |
| 52 | Fiber patch cords |
| 4 | Card Cage assembly |
| 12 | TCVR-CH A-D |
| | |

The Data Card (Direct connect), AFOM, Fiber patch cords, TCVR-CH A-D, Video Multiplexer are described elsewhere in these special provisions.

**10-3.57 MODIFY TRANSPORTATION MANAGEMENT CENTER (TMC)**

The modify transportation management center (TMC) assembly shall consist of installing the following equipment into existing racks:

**TMC EQUIPMENT**

| Qty | Description |
|---|---|
| 1 | Telco Expansion card |
| 1 | CTNET (SERVER) |
| 2 | Video Demultiplexer 16 Channel |
| 2 | Video Switch Expansion cards |
| 2 | Direct connect card |
| 32 | Fiber patch cords |
| 2 | Quick-net server Notebook |

The Data Card (Direct connect), Telco Expansion card and Fiber patch cords are described elsewhere in these special provisions.

## 10-3.58 TRAINING FOR FIBER OPTIC OPERATIONS AND MAINTENANCE

An operation and maintenance training course shall be developed by the Contractor and presented to the Engineer. A training area will be provided by the State at the District Office Building at 464 West Fourth Street San Bernardino California, California. The Contractor may, at his option, provide the training at his plant or office if it is located within reasonable travel distance (Within 25 miles from the district 8 offices located at 464 West Fourth Street San Bernardino California).

The operation and maintenance 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 maintenance course. The course shall not be less than three eight-hour (excluding lunch and breaks) days in duration. No more than thirty State employees with technical backgrounds will attend this course. Each person shall receive a training manual. The remaining manuals shall be given to the Engineer for redistribution to other employees. The training manual shall be written especially for the CCTV and Communication System installed by the Contractor and shall provide complete procedures for operating, maintaining, and trouble-shooting the cable plant, camera site equipment, and equipment located at the TMC. 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.

The maintenance course shall also include a comprehensive "hands on" field training using operational equipment at the cable, data and video nodes, at hubs and at the TMC. The field training shall include the operational site checkouts such as cable, data and video nodes, hubs and TMC, and shall discuss the location of and access to the various system field elements.

The information for this course shall be separated into appropriately titled sections such as:

A. System Design.
B. Hardware.
C. Software.
D. Operation.
E. Maintenance.
F. Operating System.

All manuals provided for this course shall be collected at the completion of each course by the Instructor and delivered to the Engineer for later distribution to State personnel. The Contractor shall provide an evaluation sheet to be completed by the attendees. The evaluation sheets will be turned in to the Engineer and a copy will be provided to the Contractor.

One copy of the manual for this course shall be delivered to the Engineer for approval at least 8 weeks prior to the scheduled class time. The Engineer will notify the Contractor of the number of State personnel who will attend. Course documentation shall be delivered to the Engineer one week before the scheduled start date of the class. The operation and maintenance course shall be completed prior to the acceptance of the contract.

### PAYMENT

The contract lump sum price paid for training shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in training, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-3.59 SYSTEM TESTING AND DOCUMENTATION

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 paragraphs,

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 meets 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.

**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.

**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 Contractor shall notify the Engineer of his intent to proceed with testing 48 hours prior to commencement of each test.

Tests and inspections shall include:

Visual inspection for damaged or incorrect installation;
Adjustments and alignment; and
Measurement of parameters and operating conditions.

**Fiber Optic Cable Testing.—**Fiber optic cable testing is described in Section 10-4, "Fiber Optic Communication Cable Plant," of these special provisions.

**Video Link Testing.—**The test shall be conducted in accordance with an approved installation and test plan.

Measurements shall be made from the baseband-in to baseband-out connections. A video communications link shall include a TVCR at the CCTV assembly, TVCR at the Communication Hub, interconnecting optical fiber, connectors and power supplies. Video System performance tests for any particular video link shall be performed after the associated camera has been installed and tested.

Each video link in the communications system shall be tested with a video test signal at the video TCVR at CCTV assembly input.

The Contractor shall perform all level adjustments and alignments required on the video link in order for it to operate in accordance with the Contract.

If any video link fails to meet the performance requirements, the Contractor shall take all steps necessary to restore the failed link to the required performance.

Each video link in the communications system shall be tested for qualitative performance with its associated camera turned on and connected to the BNC connector at the camera on top of the pole.

The output video signal in the communication hub shall be connected to a test monitor. The observed picture on the monitor shall be assessed for qualitative performance. All qualitative comments shall be recorded for each camera.

Each video TCVR link shall be tested and recorded for the following performance characteristics. The Contractor shall demonstrate that the performance meets or exceeds the specified requirements.

Differential Gain
Differential Phase
Chrominance to Luminance Delay Inequality
Amplitude vs. Frequency Characteristic
Signal to Noise Ratio
Signal to Periodic Noise Ratio
Signal to Low Frequency Noise
Output Signal Level.

The second type of link shall be tested with a video test signal at the video TCVR at the CCTV assembly through the baseband video channel inputs to the video multiplexer unit to the baseband video output channels at the communication hub. All measurements and tests shall be performed as outlined in the first type of link.

**Data Link Testing.—**This section is for the alignment and testing of the data system. The activities shall include verification of all data circuits in the low speed data links, high speed data ring network and in the integrated data system.

The test shall be conducted in accordance to an approved installation and test plan.

The Contractor shall adjust levels required for the data system to operate.

Data link tests shall consist of functional tests conducted between the T-1 multidrop communications system and Model 170 controller interface. The audio channel shall be verified in both directions using telephone instruments. The signaling system shall be verified in both directions.

Data link performance tests shall be conducted between the T-1 multidrop communications system at the communication hub and each field element cabinet or device (vehicle detection stations, ramp meters and closed circuit televisions). Records of all tests shall be delivered to the Engineer Bit error rate tests shall be conducted using (1) asynchronous fiber optic modems at 1200 bps and (2) DS1 optical modem at 1.544 Mbps each configured in a loop back path, from the communication hub to the circuit terminus, looped back into the circuit to the communication hub. A BERTS shall be used in a 2 hour test of each circuit. All circuits shall provide an error rate less than 1 in $10^9$.

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:

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 $10^{-8}$.

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.

**SYSTEM DOCUMENTATION**

The Contractor shall submit a draft copy of all documentation for review and approval prior to production of documentation. The Engineer will review and approve or reject the draft documentation within four weeks of receipt.

The Contractor shall modify the documentation if required and submit provisional documentation. The Engineer will approve or reject the provisional documentation within three weeks of receipt. The Contractor shall arrange for re-submission in a timely manner to meet the schedule in the case that the documents are being rejected.

Draft documentation shall be submitted eight weeks prior to the start of installation. The draft documentation shall show the general approach in preparing the final manuals.

Upon approval of the draft documentation, provisional documentation shall be supplied 3 weeks prior to the start of site testing. The provisional documentation shall be of the same format as the final manuals but with temporary insertion for items which cannot be finalized until the system is completed, tested and accepted. Final documentation shall be submitted no later than 4 weeks after completion of the acceptance tests and shall incorporate all comments made during the approval stages. The Contractor shall be responsible for all delay caused by non-compliance to the specified requirements.

Final documentation shall be approved prior to its production. Five copies of all final documents shall be delivered. The copies shall be 216 mm x 279 mm and bound in three-ring, hard-covered binders, complete with dividers. Documentation shall consist of a operations and maintenance (O & M) manual with drawings and shall include the information necessary to operate, maintain and repair the equipment and cable to the lowest module or component level described. It shall contain as a minimum the following:

**Master Items Index:** This shall be the first section of the O & M manual. The section shall describe the purpose of each manual and brief description to the directory of the manual. It shall also reference equipment manuals as required for additional and support material.

**System Description and Technical Data:** This section shall contain an overall description of the system and associated equipment and cables with illustrative block diagrams. This section shall identify all equipment and cables in the system stating the exact module and option number that are employed in the system. Technical data, specification and settings for every type of equipment or cable shall be provided. Any modification that has been done on the equipment shall be clearly described.

**Theory of Operation:** The manual shall contain a functional description of each element of the system, explaining how each function is being achieved separately and how each element works together to form the complete system.

**Operations:** The manual shall describe how to operate the system and each particular type of equipment and software. Equipment layout, layout of controls, displays, software operating procedures and all other information required to correctly operate the system and each functional unit shall be provided. Procedures shall also be provided for initial tune-up of the system and adjustment and checkout required to ensure that the system is functioning within the performance requirements. Warning of special procedures shall be given. The functions and setting of all parameters shall be explained.

**Corrective Maintenance:** The manual shall include fault diagnostic and repair procedures to permit the location and correction of faults to the level of each replaceable modules. Procedures shall include alignment and testing of the equipment following repair, the test equipment, tools, diagnostic software required and the test set up.

**Preventative Maintenance:** The manual shall include procedures for preventative maintenance in order to maintain the performance parameters of the system, equipment and cables within the requirements of the specifications.

**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.

**10-3.60 PAYMENT**

The contract lump sum price paid for communication hub structure shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the communication hub structure, complete in place, including earthwork and electrical equipment, 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 traffic monitoring station at various locations shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in modifying traffic monitoring station at various locations and connecting to the existing fiber optic backbone and any ancillary or incidental items required to provide full equipment operation at each site, 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 traffic monitoring station at various locations shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in installing the traffic monitoring station at various locations and connecting to the existing fiber optic backbone and any ancillary or incidental items required to provide full equipment operation at each site, 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 signal and lighting at various locations shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in installing the signal and lighting at various locations and connecting to the existing fiber optic backbone and any ancillary or incidental items required to provide full equipment operation at each site, 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 signals and lighting at various locations shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in installing the modify signal and lighting at various locations and connecting to the existing fiber optic backbone and any ancillary or incidental items required to provide full equipment operation at each site, 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 fiber optic communication system shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in modify fiber optic communications system as shown on the plans, relocating the fiber optic cables under bridge, including temporary poles and cables and modify or remove vehicle detection stations and any ancillary or incidental items required to provide full equipment operation at each site, 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 closed circuit television system at various locations shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, including CCTV camera assembly, Type 334 CCTV cabinet assembly and camera pole including foundation, with equipment as shown on the plans and described in these special provisions and for doing all the work involved in installing closed circuit television systems at various locations, complete in place, including any ancillary or incidental items required to provide full equipment operation at each site, 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 shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in modify transportation management center, complete in place, including all ancillary or incidental items required to provide full equipment operation at each site, as shown on 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 communication hub assembly at various locations shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in modifying communication hub assembly at various locations, complete in place, including all ancillary or incidental items required to provide full equipment operation at each site, as shown on plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for communication hub assembly at various locations shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in communication hub assembly at various locations, complete in place, including all ancillary or incidental items required to provide full equipment operation at each site, as shown on plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for changeable message sign shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in changeable message sign, complete in place, including foundation, 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.

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.

Full compensation for furnishing and installing the Model 170 controller interface be considered as included in the lump sum price paid for in the various contract items of work requiring Model 170 controller interface and no separate payment will be made therefore.

## SECTION 11-1. QUALITY CONTROL/QUALITY ASSURANCE

Asphalt concrete shall conform to the provisions in this Section 11-1, "Quality Control / Quality Assurance," and the section entitled "Asphalt Concrete" in Section 10-1, "General," of these special provisions. Section 39, "Asphalt Concrete," of the Standard Specifications shall not apply to Type A and Type B asphalt concrete.

## SECTION 39: ASPHALT CONCRETE

## 39-1 GENERAL

### 39-1.01 DESCRIPTION

This work shall consist of furnishing and mixing aggregate and asphalt binder at a central mixing plant, transporting, spreading and compacting the mixture, and furnishing and placing pavement reinforcing fabric, in conformance with this Section 11-1, "Quality Control / Quality Assurance," and with "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

The Contractor shall be responsible for controlling the quality of the asphalt concrete product entering the work, including aggregate, asphalt binder, additives, and asphalt concrete mixture; for controlling the quality of the work performed, including mix design, and mixing, transporting, spreading, and compacting the asphalt concrete; for controlling the quality of the finished roadway surface; and for developing, implementing, and maintaining a quality control program. The Contractor shall be responsible for the inspection, sampling, and testing required to control the quality of the asphalt concrete and the work performed.

The inspection, sampling, and testing required to control the quality of the workmanship and the asphalt concrete shall conform to this Section 11-1. Sampling shall be in conformance with the requirements of this Section 11-1 and with California Test 125. Testing shall be performed using California Tests unless otherwise directed by the Engineer or this Section 11-1.

Asphalt concrete is designated as Type A or Type B. The type of asphalt concrete will be shown on the plans or specified in "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

## 39-2 MATERIALS

### 39-2.01 ASPHALTS

Asphalt binder to be mixed with aggregate shall be steam-refined paving asphalt conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications. Asphalt binder shall be Grade AR-4000 unless the grade is designated in "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

Liquid asphalt for prime coat shall conform to the provisions in Section 93, "Liquid Asphalts," of the Standard Specifications and shall be the grade designated by the contract item or conform to the provisions in "Asphalt Concrete," in Section 10-1, "General," of these special provisions.

Asphalt emulsion for paint binder (tack coat) shall conform to the provisions in Section 94, "Asphaltic Emulsions," of the Standard Specifications for the rapid-setting or slow-setting type and grade approved by the Engineer.

Paving asphalt to be used as a binder for pavement reinforcing fabric shall be a steam-refined paving asphalt conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications, and shall be Grade AR-4000, unless otherwise ordered by the Engineer or designated in "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

### 39-2.02 AGGREGATE

Aggregate and combined aggregate shall conform to the quality and gradation provisions in this Section 11-1, "Quality Control / Quality Assurance," for the asphalt concrete types and sizes conforming to the provisions in "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

Aggregates shall be clean and free from decomposed or organic materials and other deleterious substances. Coarse aggregate is material retained on the 4.75-mm sieve, fine aggregate is material passing the 4.75-mm sieve, and supplemental fine aggregate is added fine material passing the 600-µm sieve, including, but not limited to, cement and stored fines from dust collectors.

The target value for the percent passing each designated sieve size for the aggregate blend used in the proposed asphalt concrete mix design shall fall within the "Target Value Limits" of the following table:

Table 39-1 - AGGREGATE GRADATION
Type A and Type B Asphalt Concrete
Percentage Passing

| 19-mm Maximum, Coarse | | 19-mm Maximum, Medium | |
|---|---|---|---|
| Sieve Sizes | Target Value Limits | Sieve Sizes | Target Value Limits |
| 25-mm | 100 | 25-mm | 100 |
| 19-mm | 90-100 | 19-mm | 90-100 |
| 9.5-mm | 60-75 | 9.5-mm | 65-80 |
| 4.75-mm | 45-50 | 4.75-mm | 49-54 |
| 2.36-mm | 32-36 | 2.36-mm | 36-40 |
| 600-µm | 15-18 | 600-µm | 18-21 |
| 75-µm | 3-7 | 75-µm | 3-8 |

| 12.5-mm Maximum, Coarse | | 12.5-mm Maximum, Medium | |
|---|---|---|---|
| Sieve Sizes | Target Value Limits | Sieve Sizes | Target Value Limits |
| 19-mm | 100 | 19-mm | 100 |
| 12.5-mm | 95-100 | 12.5-mm | 95-100 |
| 9.5-mm | 75-90 | 9.5-mm | 80-95 |
| 4.75-mm | 55-61 | 4.75-mm | 59-66 |
| 2.36-mm | 40-45 | 2.36-mm | 43-49 |
| 600-µm | 20-25 | 600-µm | 22-27 |
| 75-µm | 3-7 | 75-µm | 3-8 |

During asphalt concrete production, aggregate gradation shall be within the limits specified in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1. Conformance with the grading requirements shall be determined by California Test 202, modified by California Test 105, when there is a difference in specific gravity of 0.2 or more between the coarse and fine portions of the aggregate or between the blends of the different aggregates. The percent passing the 75-µm sieve shall be reported to the first decimal place (tenths).

The combined aggregate shall conform to the following quality requirements prior to the addition of the asphalt binder:

Table 39-2 - AGGREGATE QUALITY REQUIREMENTS

| Quality | California Test | Asphalt Concrete Type A | Asphalt Concrete Type B |
|---|---|---|---|
| Percent of Crushed Particles | 205 | | |
| Coarse Aggregate (Min.) | | 90% | 25% |
| Fine Aggregate (Passing 4.75-mm, Retained on 2.36-mm) (Min.) | | 70% | 20% |
| Los Angeles Rattler | 211 | | |
| Loss at 100 Rev. (Max.) | | 12% | |
| Loss at 500 Rev. (Max.) | | 45% | 50% |
| Sand Equivalent (Min.)[1] | 217 | 47 | 42 |
| Kc Factor (Max.) | 303 | 1.7 | 1.7 |
| Kf Factor (Max.) | 303 | 1.7 | 1.7 |

Note:

1. Reported value shall be the average of 3 tests split from a single sample.

## 39-2.03 ASPHALT CONCRETE MIXTURE

The asphalt concrete mixture, composed of the proposed aggregate blend and the proposed asphalt binder content as determined by California Test 367, shall conform to the following requirements:

Table 39-3 - ASPHALT CONCRETE MIXTURE REQUIREMENTS

| Design Parameters | California Test | Asphalt Concrete Type and Location: Coast and Valley Type A | Coast and Valley Type B | Desert (per Engineer) Type A | Desert (per Engineer) Type B |
|---|---|---|---|---|---|
| Hveem Stabilometer Value (Min.) | 367[1, 2] | 37 | 35 | 37 | 35 |
| Percent air voids (Mix Design) | 367[1] | 3-5[3] | 3-5[3] | 4-6[4] | 4-6[4] |
| (Start-Up Production Evaluation) | | Design Value ±1.0 | | | |
| Swell [5] (mm) (Max) | 305 | 0.76 | 0.76 | 0.76 | 0.76 |

Notes:

1. Reported value shall be the average of 3 tests from a single split sample.
2. If the range of stability for the 3 briquettes is more than 12 points, the briquettes shall be discarded and new samples shall be fabricated.
3. Modify California Test 367, paragraph C5, to "most nearly 4%."
4. Modify California Test 367, paragraph C5, to "most nearly 5%."
5. Measured at Mix Design only.

During production and placement, the asphalt concrete mixture shall conform to the requirements of Table 39-4, "Minimum Process Control Requirements," and Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1. Changes in cold feed or hot bin proportions to conform to the aggregate grading requirements shall not be considered changes in the mix design.

Whenever asphalt concrete production has been suspended for longer than 30 days, the Contractor, on the first day of resumption of production, shall sample and test the asphalt concrete to demonstrate conformance with the requirements of Table 39-3, "Asphalt Concrete Mixture Requirements," Table 39-4, "Minimum Process Control Requirements," and Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1.

The target value for asphalt content may be changed by as much as ± 0.2 percent during the production start-up evaluation specified in Section 39-10.02A, "Production Start-Up Evaluation," of this Section 11-1 or after production start-up evaluation and before the first day of regular production with the Engineer's approval. The Contractor shall demonstrate that asphalt concrete that has been produced through the plant using the modified target value for asphalt content is in conformance with this Section 11-1 by submitting test results for samples obtained from the first 500 tonnes of production. Stability and percent air voids shall be determined using 3 briquettes constructed from a single sample taken from 4 locations across the mat in conformance with the requirements of California Test 125.

Changes from one mix design to another shall not be made during the progress of the work, unless approved by the Engineer. Changes in asphalt content, other than those allowed during the start-up evaluation process, or in aggregate grading target values shall be considered to be a change in the asphalt concrete mixture and shall require a new mix design

proposal. Changes in the asphalt content or aggregate grading target values approved by the Engineer will not be applied retroactively for acceptance or payment.

### 39-2.04 PAVEMENT REINFORCING FABRIC

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

## 39-3 ASPHALT CONCRETE MIX DESIGN PROPOSAL AND REVIEW

### 39-3.01 CONTRACTOR MIX DESIGN PROPOSAL

The Contractor shall submit for the Engineer's review a proposed asphalt concrete mix design for each asphalt concrete mixture to be used at least 14 days prior to production of that asphalt concrete mixture. The asphalt concrete mix design shall be prepared by a laboratory (or laboratories) whose proficiency has been reviewed and qualified in conformance with the Department's Quality Assurance Program. Aggregate quality and asphalt concrete mix design test results shall be no more than one year old when production of the asphalt concrete mixture starts. For projects of more than one year's duration, asphalt concrete may be produced using the asphalt concrete mix design that was reviewed and accepted at the start of the project provided the asphalt concrete mixture continues to conform to the provisions of this Section 11-1, "Quality Control / Quality Assurance."

The Contractor shall submit a mix design letter that indicates the target values proposed for gradation, asphalt content, and percent air voids. This submittal shall include test results for aggregate and asphalt mixture quality; plots of the combined gradings showing the production tolerances; plots of unit weight, stability, and percent air voids versus asphalt content for the asphalt contents considered in the design process. In addition, this submittal shall include test results for stability, percent air voids, and swell for 3 briquettes constructed using the submitted aggregate and asphalt blended at the proposed target values for each asphalt concrete mixture to be used.

The Contractor shall submit the following for each asphalt concrete mixture proposed:

A. Aggregate and mineral filler:

1. Target values for percent passing each sieve size for the aggregate blend;
2. Results of tests for aggregate quality requirements;
3. Source of each aggregate to be used including producer, location, and California Mine Identification number;
4. Percentage of each aggregate stockpile, cold feed or hot bin to be used;
5. Gradation of each aggregate stockpile, cold feed or hot bin to be used; and
6. Samples that are representative of the aggregate to be used. Minimum sample sizes shall be as follows:

| |
|---|
| 60 kg of each coarse aggregate; |
| 40 kg of each fine aggregate; and |
| 5 kg of each supplemental fine aggregate. |

B. Asphalt binder:

1. Asphalt binder source and target value;
2. Four one-liter samples of the asphalt binder;
3. Results of the asphalt binder quality tests conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications; and
4. Material Safety Data Sheets.

C. Antistrip additives**,** when applicable:

1. A 5-kg sample of the dry additive or a one-liter sample of the liquid antistrip additive, including name of product, manufacturer, manufacturer's designation and proposed rate, location, and method of addition; and
2. Material Safety Data Sheets.

The proposed asphalt concrete mix design submittal will be considered complete only when the mix design letter, test results, plots, and samples have been received by the Engineer.

### 39-3.02 ENGINEER REVIEW OF ASPHALT CONCRETE MIX DESIGN

The Engineer will review the proposed aggregate and asphalt concrete mixture for conformance with this Section 11-1, "Quality Control / Quality Assurance." The proposed asphalt concrete mixture will be reviewed at the proposed target values for aggregate grading and asphalt content. The Engineer will have 14 days to review each submittal of a proposed mix design. Production of asphalt concrete shall not begin until written notification has been received from the Engineer that the aggregates and proposed mix design meet the quality requirements of this Section 11-1.

The Engineer will reject a proposed asphalt concrete mixture that, during review, fails to meet the quality requirements of Table 39-2, "Aggregate Quality Requirements," and Table 39-3, "Asphalt Concrete Mixture Requirements," of this Section 11-1. The Contractor shall resubmit a mix design letter providing new test results, plots, and material samples.

Disagreements in mix design review shall be resolved in conformance with Section 39-6, "Dispute Resolution," of this Section 11-1. The Contractor shall use a mix design on the project only after the Engineer concurs that the aggregate and asphalt concrete represented by the proposed mix design conforms to the provisions ofthis Section 11-1.

The Engineer will review one proposed asphalt concrete mix design for each asphalt concrete type and aggregate size from each plant proposed for use on this project at the State's expense. Costs for additional reviews due to failure to conform to the quality requirements of this Section 11-1 and for reviewing other proposed asphalt concrete mix designs will be deducted from moneys due or to become due the Contractor. The cost for each review will be $1,500. Costs for reviewing changes in a mix design that are initiated by the Engineer will be waived. Contractor's retesting due to errors in the Engineer's testing will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Costs for reviewing mix designs not used in this project will be deducted from moneys due or to become due the Contractor.

## 39-4 CONTRACTOR QUALITY CONTROL

### 39-4.01 GENERAL

The Contractor shall be responsible for the quality of the asphalt concrete entering into the work and of the work performed. In addition, the Contractor shall be responsible for the quality of asphalt concrete or ingredients procured from subcontractors or vendors. A quality control system shall be established, maintained, and modified, if needed, that will provide assurance that materials and completed work conform to contract requirements.

At least 14 days prior to the start of production of asphalt concrete, the Contractor shall submit a written Quality Control Plan. At the request of the Engineer or the Contractor, the Contractor shall discuss the Quality Control Plan with the Engineer.

### 39-4.02 QUALITY CONTROL PLAN

The Quality Control Plan shall describe the organization and procedures that will be used to administer the quality control system including the procedures used to control the production process, the procedures used to determine when changes to the production process are needed, and the procedures proposed to be used to implement the required changes. The Quality Control Plan shall meet the minimum standards set forth in the Department's "Manual for Quality Control and Quality Assurance for Asphalt Concrete," available as specified in "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

Asphalt concrete production and placement shall not begin until the Quality Control Plan has been approved by the Engineer. Approval of the Quality Control Plan does not imply a warranty by the Engineer that adherence to the plan will result in production of asphalt concrete that complies with this Section 11-1. It shall remain the responsibility of the Contractor to demonstrate such compliance.

The Quality Control Plan shall include the name and qualifications of a Quality Control Manager. The Quality Control Manager shall be responsible for the administration of the Quality Control Plan, including compliance with the plan and plan modifications. The Quality Control Manager shall be responsible to the Contractor, shall have the authority to make decisions concerning quality of the work or product, and shall be available to the project within less than 3 hours during paving. Except in cases of emergency and with the approval of the Engineer, the Quality Control Manager cannot be a foreman, member of the production or paving crew, an inspector or tester on this project during pavement production and placement.

The Quality Control Plan shall identify personnel, equipment and documentation required for a complete inspection, sampling and testing program. The Quality Control Plan shall include, but not be limited to, a list of inspectors, samplers and testers, their duties, their certifications if required, and their experience if no certification is required. It shall also list the name and location of laboratories that shall be providing information to the Engineer, the testers who conducted the tests and their certifications and the name of the Laboratory Quality Control Manager responsible for oversight of the testing program. It shall also show examples of the test result forms (if different from those in the Department's "Manual for Quality Control and Quality Assurance for Asphalt Concrete"), the roadway and plant inspection forms, the Quality Control Manager's daily

summary form, and the compliance charts. It shall include the method by which random sampling shall be determined, a list of the testing and sampling equipment to be used and the current calibration dates and calibration charts, and copies of nuclear gauge licenses.

The Quality Control Plan shall include the name and certification of a testing consultant to be an Independent Third Party in dispute resolution. By mutual agreement during dispute resolution, the Independent Third Party may be a District Independent Assurance Sampler and Tester, the testing consultant or both. The proficiency of the testing consultant shall be reviewed and certified in conformance with the requirements of the Department's Quality Assurance Program before the test consultant participates in dispute resolution. Attention is directed to Section 39-6, "Dispute Resolution," of this Section 11-1.

The Quality Control Plan may be modified as work progresses. A supplement shall be submitted whenever there are changes to quality control procedures or personnel. Asphalt concrete production and placement shall not resume or continue until revisions to the Quality Control Plan or quality control personnel have been approved by the Engineer.

### 39-4.03 CONTRACTOR QUALITY CONTROL INSPECTION, SAMPLING, AND TESTING

The Contractor shall perform process and quality control sampling and testing, provide inspection, and exercise management control to ensure that asphalt concrete production and placement conforms to the provisions of this Section 11-1. Staffing for process and quality control shall meet the minimum requirements outlined in the Department's "Manual for Quality Control and Quality Assurance for Asphalt Concrete."

Process and quality control, sampling, testing, and inspection shall be provided during the asphalt concrete work. Sampling, testing, and inspection shall be performed at a rate sufficient to ensure that asphalt concrete conforms to the provisions of this Section 11-1.

A roadway inspector shall be provided while asphalt concrete paving operations are in progress. The roadway inspector shall ensure that asphalt concrete placement conforms to industry standards and to the spreading, compacting, and finishing requirements of this Section 11-1, "Quality Control / Quality Assurance." Plant inspection shall be performed as necessary to maintain control of the asphalt concrete production.

Minimum sampling and testing requirements for process and quality control are specified in Table 39-4, "Minimum Process Control Requirements," and Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1. Sampling shall be statistically based and random.

During production start-up evaluation, the Contractor shall sample and test in conformance with the provisions in Section 39-10.02A, "Production Start-Up Evaluation," of this Section 11-1.

A testing laboratory and personnel shall be provided for the performance of process and quality control testing. The Engineer shall have unrestricted access to mix design, sampling, and testing.

The proficiency of testing laboratories and sampling and testing personnel shall be reviewed, qualified, and certified by the Department's Independent Assurance Sampler and Tester before providing services to the project. Inspectors shall meet the standards set forth in the Department's "Manual for Quality Control and Quality Assurance for Asphalt Concrete."

### 39-4.04 CONTRACTOR PROCESS CONTROL

Process control sampling and testing shall be performed and control shall be exercised to ensure that asphalt concrete production conforms with this Section 11-1.

Minimum process control sampling and testing shall be performed in compliance with the following:

Table 39-4 - MINIMUM PROCESS CONTROL REQUIREMENTS

| Quality Characteristic | Action Limit | California Test | Minimum Sampling and Testing Frequency | Point of Sampling ‡ | Reporting Time Allowance |
|---|---|---|---|---|---|
| Sand Equivalent (Min) | 47 (Type A)<br>42 (Type B) | 217 | One sample per 2500 tonnes | Batch plant - from hot bins. Drum plant - from cold feed. | 24 hours |
| | | (Reported value shall be the average of 3)[1] | Not less than one sample per 2 days | | |
| Stability | 37 (Type A)<br>35 (Type B) | 366[2] | See Note 4 | Mat behind paver | 48 hours |
| | | (Reported value shall be the average of 3)[1,3,5] | Not less than one sample per 5 days | | |

Notes:

‡ In conformance with the requirements of California Test 125.

1. Samples used for the 3 tests to be averaged shall be from a single split sample.
2. Reheat for sample preparation shall be 2 hours maximum.
   Do not place sample or briquette in oven for 15-hour cure.
3. Briquettes shall be fabricated from a single, combined sample obtained from at least 4 locations across the mat behind the paver in conformance with the requirements of California Test 125.
   If the range of stability for the three briquettes is more than 12 points, the samples shall be discarded and new samples shall be obtained before the end of the following shift of paving and tested in conformance with the requirements of Table 39-3, "Asphalt Concrete Mixture Requirements."
4. Asphalt concrete will be sampled and tested each of the first 5 days of production and may be decreased to one for each 5 days thereafter unless stability falls below the action limit.
   When stability falls below the action limit, sampling will be increased to one sample for each of the first 5 days of production and may be decreased to one for each 5 days thereafter.
   The sequence of the first 5 test results shall not be broken by more than 7 days of suspended operations.
5. During production start-up evaluation, a correlation factor for cured vs. uncured specimens shall be established in conformance with the requirements of Section 39-10.02A, "Production Start-Up Evaluation."

The process control test results shall be plotted on specification compliance charts indicating the action limits for the quality characteristic. When one test result falls below the action limit for an individual measurement, the Contractor shall notify the Engineer, take corrective action, and sample and test within the next 500 tonnes of production. When 2 consecutive test results for an individual characteristic fall below the action limit, the asphalt concrete represented by the 2 tests shall be considered not in compliance. When 2 consecutive test results for an individual characteristic fall below the action limit, the Contractor shall suspend production, notify the Engineer, and take corrective action. With the approval of the Engineer, up to 1000 tonnes of asphalt concrete may be placed to demonstrate that the asphalt concrete is once again in compliance with the provisions of this Section 11-1. Production shall begin only after the Engineer has received test results confirming compliance.

Asphalt concrete that has 2 consecutive stability test results less than or equal to 26 for Type A asphalt concrete or less than or equal to 24 for Type B asphalt concrete shall be removed at the Contractor's expense. Asphalt concrete placed to demonstrate compliance that does not meet the provisions of this Section 11-1 shall be removed at the Contractor's expense.

### 39-4.05 CONTRACTOR QUALITY CONTROL

Quality control, sampling, testing, and inspection shall be provided during asphalt concrete work. Sampling, testing, and inspection shall be performed at a rate sufficient to ensure that the asphalt concrete product conforms to the requirements in this Section 11-1. Sampling for testing to be reported to the Engineer shall be performed at the minimum frequency specified in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1, "Quality Control / Quality Assurance."

Quality control samples of aggregates and asphalt concrete mixture shall be obtained and split. One split portion of each sample shall be used for quality control testing and the other portion shall be reserved for possible retest during dispute

resolution, in conformance with Section 39-6, "Dispute Resolution," of this Section 11-1. Quality control samples shall be stored in a location listed in the Quality Control Plan until disposal has been approved by the Engineer.

The Contractor shall obtain a one-liter sample of the asphalt binder in conformance with Section 39-7.01C, "Asphalt Binder Storage," of this Section 11-1 for each day of asphalt concrete production. The sample containers shall be labeled as shown in the "Manual for Quality Control and Quality Assurance for Asphalt Concrete" and shall be sent by the Contractor to the Transportation Laboratory on a weekly basis, except for modified asphalts that shall be shipped daily. A copy of the transmittal form shall be attached to the daily report of inspection.

When test results for a single quality characteristic deviate beyond the limits specified in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1 the Contractor shall take corrective action and shall bring the asphalt concrete within the specification limits. The corrective action taken shall be documented in the records of inspection in conformance with Section 39-4.06B, "Records of Inspection and Testing," of this Section 11-1. When a single quality characteristic deviates 3 consecutive times beyond the limits specified in Table 39-9, "Minimum Quality Control Test Requirements," of this Section 11-1, the Contractor shall suspend production, shall notify the Engineer, and shall take corrective action. With the approval of the Engineer, up to 1000 tonnes of asphalt concrete may be placed and the requirements of Section 39-10.02A, "Production Start-Up Evaluation," of this Section 11-1 shall be used to demonstrate that the asphalt concrete is once again in compliance with this Section 11-1. Production of asphalt concrete shall start only after the Engineer has received test results confirming compliance. When an individual quality characteristic deviates 3 consecutive times beyond the specification limits and production of asphalt concrete has been suspended, the lot shall be terminated.

If an ignition oven is used for asphalt content in conformance with the requirements of California Test 382, gradations of the remaining aggregates shall be provided for each 5000 tonnes of production. Testing of the aggregates shall be in conformance with the requirements of California Test 202, Sections F and G, "Sieve Analysis of Fine and Coarse Aggregates." Test results from these gradings shall be provided prior to completion of the project. Gradings from the aggregates recovered from the ignition oven will not be used in the statistical analysis for quality or for pay. Payment for these gradings will be made as extra work as provided in Section 4-1.03D of the Standard Specifications at the rate of $150 per test result for the cost of the additional testing.

## 39-4.06 CHARTS AND RECORDS

The Contractor shall record sampling and testing results for both process control and for quality control on forms as provided in the Department's "Manual for Quality Control and Quality Assurance for Asphalt Concrete" or on forms approved by the Engineer. Complete testing records shall be maintained and posted in the Contractor's laboratory. Models of forms that are different from those in the Department's "Manual for Quality Control and Quality Assurance for Asphalt Concrete," locations of postings, and times and means of submissions shall be provided in the Quality Control Plan.

For every 5000 tonnes of asphalt concrete produced, the Contractor shall provide an electronic copy of the process and quality control test results using the Department's statistical evaluation program "ACPay" available as specified in "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

Compliance charts and inspection and testing records, except stability test results used for process control, shall be submitted within 24 hours after completion of that shift of asphalt concrete production. If the record is incomplete or in error, a copy of the record will be returned with the deficiencies noted by the Engineer. The Contractor shall correct deficiencies and return the updated record by the start of the following working day. When errors or omissions in the inspection or testing records repeatedly occur, asphalt concrete production and placement shall be suspended and the procedures by which the records are produced shall be corrected before production and placement will be restarted.

### 39-4.06A Compliance Charts

The Contractor shall develop and maintain time linear specification compliance charts. The compliance charts shall identify the project, test number, test parameter, applicable upper and lower specification limits, and test results.

Compliance charts shall be kept current and shall be posted at a location designated in the Quality Control Plan. Compliance charts shall be updated each day of asphalt concrete production, and up-to-date copies shall be included in the submittals to the Engineer of each day's test results.

### 39-4.06B Records of Inspection and Testing

For each day of asphalt concrete production, the Contractor shall prepare an "Asphalt Concrete Construction Daily Record of Inspection," on forms provided in the Department's "Manual for Quality Control and Quality Assurance for Asphalt Concrete." A form shall be submitted for inspection at the plant and at the roadway.

For each day of asphalt concrete production, the Contractor shall prepare an "Asphalt Concrete Inspection and Testing Summary" on a form provided in the Department's "Manual for Quality Control and Quality Assurance for Asphalt Concrete." Plant and roadway inspection forms documenting the day's plant production and roadway placement shall be completed. Deviations from the specifications or the Contractor's regular practice shall be listed and explained. Individual

inspection forms shall be signed by the inspector and initialed by the Quality Control Manager and attached to the summary at submittal. Test forms documenting test results shall be complete, signed by the tester, checked and initialed by the Quality Control Manager, and attached to the summary at submittal. Sampling and testing data and calculations that support a test result shall be made available to the Engineer within 48 hours when requested.

The "Asphalt Concrete Inspection and Testing Summary" shall include the following certification signed by the Quality Control Manager:

> It is hereby certified that the information contained in this record is accurate, and that information, tests or calculations documented herein comply with the requirements of the contract and the standards set forth in the testing procedures. Exceptions to this certification are documented as a part of this record.

## 39-5 ENGINEER QUALITY ASSURANCE

### 39-5.01 GENERAL

The Engineer will assure conformance to contract specifications by review of the Contractor's mix design proposal, by inspection of the Contractor's procedures, by oversight of the Contractor's quality control inspection and records, by splitting and testing samples with the Contractor during evaluation of the plant production start-up and the nuclear density test strip, and by independent verification sampling and testing of the asphalt concrete and aggregates during asphalt concrete production.

The Contractor may witness assurance sampling and testing. However, the Engineer will not be required to notify the Contractor of anticipated sampling schedules or locations and will not delay sampling or testing if the Contractor is unable to attend. The Contractor shall not use samples taken for assurance testing for testing and submittal as a quality control test result.

The Engineer will provide the Contractor with copies of the assurance test results not more than 2 working days after receipt of the results. Sampling and testing data and calculations that support a test result shall be made available to the Contractor within 48 hours when requested.

The Engineer may test the asphalt, aggregates or asphalt concrete mixture to determine conformance with this Section 11-1, "Quality Control / Quality Assurance," whenever an asphalt concrete mixture or ingredient appears defective or inconsistent or whenever a test result indicates a change in the characteristics of the asphalt concrete mixture or an ingredient. Asphalt, aggregates or asphalt concrete that does not conform with this Section 11-1 will be rejected in conformance with Section 39-11, "Acceptance of Work," of this Section 11-1.

The Contractor, when directed by the Engineer, shall obtain representative samples of the asphalt concrete mixture or ingredients that appear defective or inconsistent. The samples shall be split into 4 portions. The Contractor shall retain 1 portion for testing if the Contractor chooses and 3 portions shall be delivered to the Engineer. The asphalt concrete or ingredient need not be sampled if the Contractor elects to remove and replace the asphalt concrete, at the Contractor's expense, or if the Contractor uses a method of correcting the situation that has been approved by the Engineer. Test results from these additional samples shall not be used as a basis for a calculated pay factor.

### 39-5.02 SAMPLING AND TESTING FOR VERIFICATION

Independent of the Contractor's quality control testing, the Engineer will obtain random samples of the aggregate and asphalt concrete mixture and test for in-place density.

Samples of aggregates and asphalt concrete will be obtained during asphalt concrete production and placement, and will be split into at least 4 portions. One of the split portions will be tested by the Engineer and used to verify quality control test results, one portion will be provided to the Contractor, and 2 portions will be reserved and stored for testing in conformance with the provisions in Section 39-6, "Dispute Resolution," of this Section 11-1. When verifying the relative compaction, the Engineer will obtain a sample of a sample of asphalt concrete from the mat behind the paver, will split the sample and apportion the sample as described above, and will test the sample for test maximum density.

The Engineer will test for material quality characteristics specified in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1. Verification tests will be at a frequency of not less than 10 percent of the minimum quality control sampling and testing frequency and will be performed in conformance with the test methods specified in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1. Verification tests will be performed using the same test methods used for quality control testing.

During the Engineer's verification of the relative compaction, the Engineer will determine the location of 500 tonnes of asphalt concrete to be tested using a random number, will obtain an asphalt concrete sample from within this location for determination of the test maximum density, and will determine the relative compaction of the in-place asphalt concrete as specified in California Test 375. The Contractor shall obtain one of the split samples of asphalt concrete for determination of test maximum density and shall determine the relative compaction of the 500 tonnes of asphalt tested by the Engineer using

the same testing sites determined by the Engineer. The results of this common testing will be compared to the allowable testing difference defined in Table 39-6, "Allowable Testing Differences," of this Section 11-1. If the test maximum density or the relative compaction does not comply with the allowable testing difference, then the Engineer and Contractor will use the first 500 tonnes of the next day's production to re-correlate the nuclear gauges used in testing as defined by California Test 375.

During production start-up evaluation, the Engineer will witness the sampling of asphalt concrete and aggregates and will perform tests on the materials in conformance with Section 39-10.02A, "Production Start-Up Evaluation," of this Section 11-1.

### 39-5.03 VERIFICATION

The Engineer will determine the acceptability of the quality control test results by using the *t*-test for sample means to test whether or not the means of the quality control test results and verification test results are within an allowable testing difference. Quality control test results and verification test results for each indexed quality characteristic will be used in the verification process.

The *t*-value of the group of test data to be verified is computed as follows:

$$t = \frac{\left| \overline{X}_c - \overline{X}_v \right|}{S_p \sqrt{\frac{1}{n_c} + \frac{1}{n_v}}} \qquad \text{and} \qquad S_p^2 = \frac{S_c^2 (n_c - 1) + S_v^2 (n_v - 1)}{n_c + n_v - 2}$$

where:

| | | |
|---|---|---|
| $n_c$ | = | Number of Contractor's quality control tests (minimum of 2 required) |
| $n_v$ | = | Number of Verification tests (minimum of 1 required) |
| $\overline{X}_c$ | = | Mean of the Contractor's quality control tests |
| $\overline{X}_v$ | = | Mean of the Verification tests |
| $S_p$ | = | Pooled standard deviation<br>(When $n_v = 1$, $S_p = S_c$) |
| $S_c$ | = | Standard deviation of the Contractor's quality control tests |
| $S_v$ | = | Standard deviation of the Verification tests (when $n_v > 1$) |

The comparison of quality control test results and verification test results will be considered at a level of significance, $\alpha = 0.01$. Compute *t* using the equation above and compare to the critical *t*-value, $t_{crit}$ , from the following table:

Table 39-5 - CRITICAL t-VALUE FOR VERIFICATION OF QUALITY CONTROL TESTING

| degrees of freedom (nc+nv-2) | $t_{crit}$ (for $\alpha = 0.01$) | degrees of freedom (nc+nv-2) | $t_{crit}$ (for $\alpha = 0.01$) |
|---|---|---|---|
| 1 | 63.657 | 18 | 2.878 |
| 2 | 9.925 | 19 | 2.861 |
| 3 | 5.841 | 20 | 2.845 |
| 4 | 4.604 | 21 | 2.831 |
| 5 | 4.032 | 22 | 2.819 |
| 6 | 3.707 | 23 | 2.807 |
| 7 | 3.499 | 24 | 2.797 |
| 8 | 3.355 | 25 | 2.787 |
| 9 | 3.250 | 26 | 2.779 |
| 10 | 3.169 | 27 | 2.771 |
| 11 | 3.106 | 28 | 2.763 |
| 12 | 3.055 | 29 | 2.756 |
| 13 | 3.012 | 30 | 2.750 |
| 14 | 2.977 | 40 | 2.704 |
| 15 | 2.947 | 60 | 2.660 |
| 16 | 2.921 | 120 | 2.617 |
| 17 | 2.898 | $\infty$ | 2.576 |

Quality control test results are verified if the *t*-value computed is less than or equal to $t_{crit}$ ($t \leq t_{crit}$), and the difference between the means of the quality control test results and verification test results are within an allowable testing difference. Quality control test results are not verified if the *t*-value computed is greater than $t_{crit}$ ($t > t_{crit}$), and the difference between the means exceeds the allowable testing difference. The allowable testing difference shall be as follows:

Table 39-6 - ALLOWABLE TESTING DIFFERENCE

| Quality | California Test | Allowable Testing Difference |
|---|---|---|
| Sand Equivalent (min.) | 217 | 8 |
| Hveem Stabilometer Value (min.) | 366 | 10 |
| Percent Air Voids | 367 | 1.5 |
| Asphalt Content | 379 or 382 | 0.3% |
| Gradation | 202 | |
| 19 or 12.5 mm | | 2 |
| 9.5 mm | | 4 |
| 4.75 mm | | 3 |
| 2.36 mm | | 2 |
| 600 µm | | 2 |
| 75 µm | | 1.0 |
| Relative Compaction | 375 | 0.8% |
| Test Maximum Density | | 0.03 g/cc |

If quality control test results are not verified, the Contractor will be notified of the difference. The Engineer will sample asphalt concrete production at a more frequent interval. Resolution of the problem shall be in conformance with the provisions in Section 39-6, "Dispute Resolution," of this Section 11-1.

## 39-6 DISPUTE RESOLUTION

### 39-6.01 GENERAL

The Contractor and the Engineer shall work together to avoid potential conflicts and to resolve differences that may arise from a disagreement regarding test result comparisons.

Should the results of the testing fail to meet the criteria of the stage at which the disagreement arose, production shall be suspended. Production shall not start or resume nor shall asphalt concrete be accepted until the differences have been

resolved and the Engineer is assured that the asphalt concrete conforms to this Section 11-1, "Quality Control / Quality Assurance."

When the Engineer and the Contractor, together or separately, are unable to determine the source of error, an Independent Third Party shall act as witness and referee.

In disagreements, if the Engineer's testing process meets the requirements of this Section 11-1, costs related to the review shall be borne by the Contractor. The Contractor's sampling and testing program shall be modified as necessary. New test results shall be submitted to the Engineer. Test results judged to be in error shall be removed from consideration and the new test results shall be substituted. If split samples are not available and retesting is not possible, that portion of the asphalt concrete produced or placed prior to and during the disagreement will be evaluated based on the results of the Engineer's verification test results.

In disagreements, if the Engineer's testing process fails to meet the requirements of this Section 11-1, costs related to the review shall be borne by the State. The Engineer's sampling and testing program will be modified as necessary. Test results judged to be in error shall be removed from consideration and the new test results shall be substituted. Contractor's retesting due to errors in the Engineer's testing will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. If, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of delays or errors in the Engineer's testing, the delay will be considered a right of way delay as provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

In disagreements, if both the Contractor's and the Engineer's testing processes have failed to meet the requirements of this Section 11-1 or if the cause cannot be determined, each party will bear the costs related to their own review. When appropriate, the Contractor's and the Engineer's sampling and testing programs shall be modified as necessary, split samples of the Contractor's quality control samples or the Engineer's verification samples shall be retested, and the new quality control test results shall be submitted to the Engineer. Test results judged to be in error shall be removed from consideration and the new test results shall be substituted. If split samples of aggregates or asphalt concrete mixture from the Contractor's testing are not available where retesting is required, that portion of the asphalt concrete produced prior to and during the disagreement will be evaluated based on the results of the Engineer's verification test results.

### 39-6.02 DURING THE ASPHALT CONCRETE MIX DESIGN REVIEW

During the asphalt concrete mix design review, if the Engineer's review does not confirm that one or more of the aggregate or the asphalt concrete mixture qualities comply with this Section 11-1, "Quality Control / Quality Assurance," both parties will review their sampling, testing, and test results and shall share their findings. Testers and laboratories shall be made available for witnessing. Calculations and test results shall be made available for review. If an error in the Contractor's testing is detected during this review, the Contractor shall, as is appropriate, recalculate or retest. The new test results shall be submitted to the Engineer. If an error in the Engineer's testing is detected, the Engineer will, as is appropriate, recalculate or retest.

If the Contractor's and Engineer's review does not reveal the source of conflict, the Contractor's and the Engineer's sampling and testing processes shall be witnessed by the Independent Third Party. Testing to resolve the dispute in results for the mix design shall be performed using samples that were obtained and split while being witnessed by the Independent Third Party. Review of sample preparation and testing will be performed at both the Contractor's and the Engineer's laboratory on a portion of the split material while being witnessed by the Independent Third Party. The resulting mix design shall be used for production.

### 39-6.03 DURING THE PRODUCTION START-UP EVALUATION

When the Contractor's and Engineer's test results during production start-up fail to meet the provisions in Section 39-10.02, "Production Start-Up Evaluation and Nuclear Density Test Strips," both parties will review their sampling, testing, and test results, and shall share their findings. Testers and laboratories shall be made available for witnessing. Calculations and test results shall be made available for review. If an error in the Contractor's testing is detected during this review, the Contractor shall, as is appropriate, recalculate or retest. The new test results shall be submitted to the Engineer. If an error in the Engineer's testing is detected, the Engineer will, as is appropriate, recalculate or retest.

If the Contractor's and the Engineer's review does not resolve the differences, the Contractor's and the Engineer's testing processes shall be witnessed by the Independent Third Party using the 2 remaining portions of the split samples. If necessary, a 250-tonne to 500-tonne quantity of asphalt concrete shall be placed at a location agreed to by the Engineer to provide asphalt concrete and ingredients for sampling and testing for the Independent Third Party review.

If an error in the Contractor's testing is detected by the Independent Third Party, the Contractor shall take corrective action and, as appropriate, recalculate or retest the split portion of the trial quantity of asphalt concrete in question. The new test results shall be submitted to the Engineer. If an error in the Engineer's testing is detected by the Independent Third Party, the Engineer will take corrective action and, as appropriate, recalculate or retest the split portion of the first trial quantity.

Production shall not start nor shall asphalt concrete be accepted until the differences have been resolved and the test results meet the provisions in Section 39-10.02, "Production Start-Up Evaluation and Nuclear Density Test Strips," of this Section 11-1.

### 39-6.04 DURING PRODUCTION

When it is determined that the quality control test results could not be verified, both parties will review their sampling, testing, and test results, and shall share their findings. Testers and laboratories will be made available for witnessing. Calculations and results will be made available for review.

If an error in the quality control sampling or testing is detected during the Contractor's or the Engineer's review, the Contractor shall either recalculate or, if appropriate, retest using the reserved split portions of the quality control samples. These new test results shall be submitted to the Engineer. If an error in the verification sampling or testing is detected, the Engineer will recalculate or, if appropriate, retest using a reserved split portion of the verification samples. Using the new test results, the Engineer will repeat the calculation of the *t*-test and will determine if the means of the quality control tests and the verification test results are within the allowable testing difference as specified in Section 39-5.03, "Verification," of this Section 11-1.

When the verification test results do not verify the quality control test results 3 consecutive times, both the Contractor's and the Engineer's testers shall be witnessed by the Independent Third Party while sampling, splitting, and testing samples from the production unit or from the mat . The Contractor may produce and place up to 1000 tonnes of asphalt concrete to provide materials and sampling opportunities. Production and placement of asphalt concrete will be suspended until the Independent Third Party has completed the review of the Contractor's and the Engineer's sampling and testing and resolved the differences.

If an error in the Contractor's testing is detected by the Independent Third Party, the Contractor shall take corrective action and, as appropriate, recalculate or retest the split portion of the quality control samples. The new test results shall be submitted to the Engineer. If an error in the Engineer's testing is detected by the Independent Third Party, the Engineer will take corrective action and, as appropriate, recalculate or retest a split portion of the verification samples. When the error has been detected and corrected, production shall resume and the services of the Independent Third Party will be discontinued.

If a problem is not identified during the Independent Third Party review, the Independent Third Party shall be retained for the duration of the project or until a problem has been identified. Until all asphalt concrete has been produced and placed, the Contractor shall sample and split quality control samples in the presence of the Independent Third Party. One portion of each sample shall be tested by the Contractor in conformance with the intervals specified in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1, and the other portion shall be delivered to the Engineer by the Independent Third Party. The Engineer will test at least one of every 5 of the split samples for verification purposes. A new lot will be designated for asphalt concrete produced since the Independent Third Party was consulted. The pay factor for this lot will be determined in conformance with Section 39-11.02, "Statistical Evaluation and Determination of Pay Factor," of this Section 11-1 with the exception that both the Contractor's quality control test results and the Engineer's verification test results will be combined and will be the basis for acceptance of that portion of the work. The pay factor for the lot of asphalt concrete which brought about the dispute resolution shall be determined in conformance with Section 39-11.02, "Statistical Evaluation and Determination of Pay Factor," of this Section 11-1 with the exception that both the Contractor's quality control test results and the Engineer's verification test results will be combined and will be the basis for acceptance of that portion of the work.

## 39-7 STORING, PROPORTIONING AND MIXING MATERIALS

### 39-7.01 STORAGE

The Contractor shall store the aggregate for asphalt concrete so that separately sized aggregates will not be intermingled and shall store asphalt binder so that different grades of asphalt will not be intermingled. Aggregate that has been intermingled with aggregate of another size shall be removed by the Contractor and replaced with aggregate of specified grading.

When the Contractor adds supplemental fine aggregate, each supplemental fine aggregate used shall be stored separately and kept thoroughly dry.

The measurement and storage provisions of this Section shall not apply to the dust collected in skimmers and expansion chambers (knock-out boxes) or to the dust collected in centrifugal (cyclone) collectors. Dust from these collectors may be returned to the aggregate without being measured or stored separately, provided the dust is returned uniformly at a point in advance of the sampling device in batch-mixing plants or is returned at or before mixing in continuous mixing plants.

Aggregate and asphalt binder shall be stored in conformance with the following requirements.

### 39-7.01A Aggregate Cold Storage

Material shall be fed from storage with a mechanical feeder. Before being fed to the drier, aggregate shall be separated into 3 or more sizes and stored separately.

### 39-7.01B Aggregate Hot Storage

Aggregate for asphalt concrete to be mixed in batch mixing plants shall be stored, after being dried, in conformance with the following requirements:

1. Aggregates for asphalt concrete shall be separated into 3 or more sizes.
2. After the aggregate is separated, each size shall be stored in a separate bin, and shall be recombined in conformance with the provisions in Section 39-7.03A, "Proportioning for Batch Mixing," of this Section 11-1 in order to conform to the gradings specified in Section 39-2, "Materials," of this Section 11-1. Storage bins shall be provided with chutes to prevent overflow into adjacent bins.

### 39-7.01C Asphalt Binder Storage

Asphalt to be used as a binder for asphalt concrete shall be stored in heated tanks.

A suitable sampling device shall be provided in asphalt feed lines connecting plant storage tanks to the asphalt weighing system or spray bar. The sampling device shall consist of a valve with a nominal diameter between 10 mm and 20 mm, constructed in such a manner that a one-liter sample may be slowly withdrawn during plant operations. The valve shall be maintained in good condition and, if the valve fails to function properly, the valve shall be replaced. The sampling device shall be readily accessible and in an area free of dangerous obstructions and shall be between 600 mm and 750 mm above the platform. A drainage receptacle shall be provided for flushing the device prior to sampling.

The discharge end of the asphalt binder circulating pipe shall be maintained below the surface of the asphalt binder in the storage tank to prevent discharging hot asphalt binder into open air.

A temperature sensing device shall be installed in the asphalt feed line. The device shall measure the temperature of the asphalt and shall be accurate to 5˚C increments. An automatic, continuous recording device shall be provided and used to maintain accurate records of the asphalt temperature during production. Where the plant controller has the capability of capturing production data electronically, including ingredient temperatures, and when this data represents the temperature at the time of production and is captured at intervals of not greater than 5 minutes, this process will be considered to be continuous recording. Captured data shall be retained for the duration of the contract and shall be submitted to the Engineer on request.

## 39-7.02 DRYING

Aggregate shall be fed directly to a drier-drum mixer or to a drier at a uniform rate.

Aggregate shall be dried such that, at the time of spreading, the moisture content of the completed asphalt concrete mixture shall not exceed 1.0 percent and the minimum and maximum asphalt concrete mixture temperatures are not exceeded. Moisture content will be determined in conformity with the requirements of California Test 370.

The drier or drier-drum mixer shall be provided with a device that senses the temperature of the material leaving the drier or the drier-drum mixer. The temperature-sensing device shall be accurate to the nearest 5˚C. The indicator shall be located and maintained at the point where the proportioning operations are controlled. An automatic continuous recording device shall be provided and used to maintain accurate records of the temperatures during production. Where the plant controller has the capability of capturing production data electronically, including ingredient temperatures, and when this data represents the temperature at the time of production and is captured at intervals of not greater than 5 minutes, this process will be considered to be continuous recording. Captured data shall be retained for the duration of the contract and shall be submitted to the Engineer on request.

The burner used for heating the aggregate shall achieve complete combustion of the fuel.

## 39-7.03 PROPORTIONING

Proportioning shall be either by hot-feed control or cold-feed control. Hot-feed control and cold-feed control indicate the location of the measuring devices or controls.

The Contractor's mixing equipment shall be equipped with a suitable, safe sampling device that will provide a sample, representative of actual production, of the aggregate being incorporated into the asphalt concrete. The delivery point of samples shall be safe and convenient. When samples are taken from a location above ground level, a means shall be provided for lowering the aggregate samples to the ground.

### 39-7.03A Proportioning for Batch Mixing

When the Contractor elects to use batch mixing equipment, each aggregate hot storage bin shall be equipped with a sampling device that will provide a sample of the aggregate discharged into the weigh hopper.

Fine material collected in dust control systems, other than centrifugal collectors or knock-out boxes, shall be considered to be supplemental fine aggregate. When supplemental fine aggregate is used, it shall be proportioned by mass.

A sampling device for supplemental fine aggregate shall be installed in each feed line or surge tank preceding the weigh hopper.

#### 39-7.03A(1) Batching Tolerances

Aggregate and asphalt shall be proportioned by mass as follows:

A. The zero tolerance for aggregate scales shall be 0.5-percent of the total batch mass of the aggregate. The zero tolerance for separate scales for weighing supplemental fine aggregate or asphalt binder shall be 0.05-percent of the total batch mass of the aggregate.
B. Unless otherwise approved by the Engineer, the indicated mass of material drawn from storage shall not vary from the preselected scale setting as defined by target values of the approved mix design by more than the following percentages of the total batch mass of the aggregate:

    1. Aggregate shall be within one percent, except that when supplemental fine aggregate is used and is weighed cumulatively with the aggregate, the draft of aggregate drawn immediately before the supplemental fine aggregate shall be within 0.5-percent.
    2. Supplemental fine aggregate shall be within 0.5-percent.
    3. Asphalt binder shall be within 0.1-percent.

The asphalt binder shall be measured by a tank scale.

#### 39-7.03A(2) Automatic Controls

Batch proportioning shall be by an automatic plant controller. The proportioning devices shall be automatic to the extent that the only manual operation required for proportioning materials for one batch shall be a single operation of a switch or starter.

Proportioning devices shall be of a type in which materials discharged from the several bins are controlled by gates or by mechanical conveyors. The batching devices shall be so interlocked that no new batch may be started until weigh hoppers are empty, the scales are at zero, and the discharge gates are closed. The means of withdrawal from the bins and of discharge from the weigh box shall be interlocked so that not more than one bin can discharge onto a given scale at one time, and so that the weigh box cannot be tripped until the required quantity from each of the bins has been deposited therein. In addition, automatic proportioning devices shall be interlocked so that the weighing cycle will be interrupted whenever the amount of material drawn from storage varies from the pre-selected amount by more than the tolerances specified in this Section 11-1. Whenever the weighing cycle is interrupted, that specific batch shall not be used in the work unless it can be manually adjusted to meet the specified tolerances based on the total mass of the batch. When partial batches are batched, the interlock tolerances, except the zero tolerance, shall apply to the total mass of aggregate in the partial batch.

Proportioning devices shall be operated so that all mass increments required for a batch are preset at the same time. Controls shall be designed so that these settings may be changed without delay and the order of discharge from the several bins can be changed.

Proportioning controls shall be equipped with the means for inspection of the interlock tolerance settings. Instructions for performing the inspection shall be available at the point of operation.

The necessary means shall be provided to check the mass of various proportioned amounts on a separate vehicle scale located at the plant site.

### 39-7.03B Proportioning for Continuous Mixing

Asphalt binder shall be introduced into the mixer through a meter conforming to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications. The asphalt meter shall automatically compensate for changes in the asphalt temperature, unless the meter is the mass flow, coriolis effect, type. The system shall be capable of varying the rate of delivery of binder proportionate with the delivery of aggregate. During a day's run, the temperature of asphalt binder shall not vary more than 30˚C. The meter and lines shall be heated and insulated. The binder storage shall be equipped with a device for automatic plant cut-off when the level of binder is lowered sufficiently to expose the pump suction line.

When supplemental fine aggregate is used, it shall be proportioned by a method that uniformly feeds the material within 2 percent of the required amount. Supplemental fine aggregate shall be discharged from the proportioning device directly into the mixer.

The supplemental fine aggregate proportioning system shall function with a degree of accuracy such that, when operated between 30 percent and 100 percent of maximum operating capacity, the average difference between the indicated mass of material delivered and the actual mass delivered shall not exceed one percent of the actual mass for three individual 15-minute runs. For the 3 individual 15-minute runs, the indicated mass of material delivered shall not vary from the actual mass delivered by more than 2 percent of the actual mass.

The fine material collected in dust control systems may be returned to the aggregate production stream without proportioning if returned at a rate commensurate with overall plant production, and if returned at or before the mixer. A return rate of less than 100 percent of the collection rate shall be metered as specified above for supplemental fine aggregate.

The asphalt feeder, each of the aggregate feeders, the supplemental fine aggregate feeder, if used, and the combined aggregate feeder shall be equipped with devices by which the rate of feed can be determined while the plant is in full operation.

The combined aggregate shall be weighed using a belt scale. The belt scale shall be of such accuracy that, when the plant is operating between 30 percent and 100 percent of belt capacity, the average difference between the indicated mass of material delivered and the actual mass delivered shall not exceed one percent of the actual mass for three individual 3-minute runs. For the 3 individual 3-minute runs, the indicated mass of material delivered shall not vary from the actual mass delivered by more than 2 percent of the actual mass.

The actual mass of material delivered for proportioning device calibrations shall be determined by a vehicle scale located at the plant site conforming to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications. The vehicle scale shall be error checked within 24 hours of checking the plant's proportioning devices. The plant shall be equipped so that this accuracy check can be made prior to the first production operation for a project and at other times when requested by the Engineer.

The belt scale for the combined aggregate, the proportioning devices for supplemental fine aggregate, if used, and the asphalt proportioning meter shall be interlocked so that the rates of feed of the aggregates and asphalt will be adjusted automatically (at all production rates and production rate changes) to maintain the asphalt ratio (kilograms of asphalt per 100 kg of dry aggregate including supplemental fine aggregate, if used) designated in the mix design in conformance with the provisions in Section 39-2.03, "Asphalt Concrete Mixture," of this Section 11-1. The plant shall not be operated unless this automatic system is functioning and in good working condition.

Asphalt meters and aggregate belt scales used for proportioning aggregates and asphalt shall be equipped with rate-of-flow indicators to show the rates of delivery of asphalt and aggregate. Meters and scales shall be equipped with resettable totalizers so that the total amounts of asphalt and aggregate introduced into the asphalt concrete mixture can be determined. Rate-of-flow indicators and totalizers for like materials shall be accurate within one percent when compared directly. The asphalt cement totalizer shall not register when the asphalt metering system is not delivering material to the mixer.

The bin or bins containing the fine aggregate and supplemental fine aggregate, if used, shall be equipped with vibrating units or other equipment that will prevent hang-up of material while the plant is operating. Each belt feeder shall be equipped with a device to monitor the depth of aggregate between the troughing rollers. The device for monitoring depth of aggregate shall automatically shut down the plant whenever the depth of aggregate is less than 70 percent of the target depth. To avoid erroneous shut down by normal fluctuations, a delay between sensing less than 70 percent flow and shutdown of the plant will be permitted, as determined by the Engineer, at the time of the initial California Test 109. A second device shall be located either in the stream of aggregate beyond the belt or where it will monitor movement of the belt by detecting revolutions of the tail pulley on the belt feeder. The device for monitoring no-flow or belt movement, as the case may be, shall stop the plant automatically and immediately when there is no flow. The plant shall not be operated unless both low-flow and no-flow monitoring devices are in good working condition and functioning properly.

For continuous pugmill mixing plants, an aggregate sampling device that will provide a 25-kg to 40-kg sample of the combined aggregate while the plant is in full operation shall be provided in advance of the point where the aggregate enters the mixer.

For drier-drum mixing plants, an aggregate sampling device that will provide a 25-kg to 40-kg sample of the combined aggregate while the plant is in full operation shall be provided in advance of the point where the aggregate enters the drier-drum mixer.

When supplemental fine aggregate is used, a sampling device shall be installed in each feed line or surge tank preceding the proportioning device for the supplemental fine aggregate.

**39-7.04 (BLANK)**

## 39-7.05 MIXING

Aggregate, supplemental fine aggregate, and asphalt binder shall be mixed in a batch mixer, continuous mixing pugmill mixer, or continuous mixing drier-drum. The charge in a batch mixer, or the rate of feed to a continuous mixer, shall not exceed that which will permit complete mixing of the material. Dead areas in the mixer, in which the material does not move or is not sufficiently agitated, shall be corrected by a reduction in the volume of material or by other adjustments.

Asphalt binder shall be at a temperature of not less than 120°C nor more than 190°C when added to the aggregate.

The temperature of the aggregate before adding the binder shall not be more than 165°C.

### 39-7.05A Batch Mixing

When asphalt concrete is produced by batch mixing, the mixer shall be equipped with a sufficient number of paddles of a type and arrangement so as to produce a properly mixed batch.

The binder shall be introduced uniformly into the mixer along the center of the mixer parallel to the mixer shafts, or by pressure spraying. When a pan is used, it shall be equipped with movable vanes in order that the flow of binder may be directed across the width of the pan, as desired. The vanes shall be equipped with a means for quick adjustment, and a positive lock to prevent shifting.

The mixer platform shall be of ample size to provide safe and convenient access to the mixer and other equipment. The mixer housing and weighbox housing shall be equipped with gates of ample size to permit ready sampling of the discharge of aggregate from each of the plant bins and from each feed line or surge tank of supplemental fine aggregate, if used. The Contractor shall provide a sampling device capable of delivering a representative sample of sufficient size to permit the required tests.

The mixer shall be equipped with a timing device that will indicate by a definite audible or visual signal the expiration of the mixing period. The device shall measure the time of mixing within 2 seconds.

The time of mixing a batch shall begin on the charging stroke of the weighhopper dumping mechanism and shall end when discharge is started. Mixing shall continue until a homogeneous asphalt concrete mixture of uniformly distributed and properly coated aggregates of unchanging appearance is produced. The time of mixing shall be not less than 30 seconds.

An interval timer shall control the time of mixing. The interval timer shall be interlocked so that the mixer cannot be discharged until the materials have been mixed for the full amount of time specified.

### 39-7.05B Continuous Mixing

Continuous mixing plants shall utilize pugmill or drier-drum mixers.

When asphalt concrete is produced by pugmill mixing, the mixer shall be equipped with paddles of a type and arrangement to provide sufficient mixing action and movement to the asphalt concrete mixture to produce properly mixed asphalt concrete. The combined aggregate shall be fed directly from the drier to the mixer at a uniform and controlled rate.

Mixing shall continue until a homogeneous asphalt concrete mixture of thoroughly and uniformly coated aggregates of unchanging appearance is produced at the discharge point from the mixer.

The temperature of the completed asphalt concrete mixture shall not exceed 165°C upon discharge from the mixer.

The mixer shall discharge into a storage silo with a capacity of not less than that specified in Section 39-7.06, "Asphalt Concrete Storage," of this Section 11-1. The Contractor shall provide a means of diverting the flow of asphalt concrete away from the silo to prevent incompletely mixed portions of the asphalt concrete mixture from entering the silo.

## 39-7.06 ASPHALT CONCRETE STORAGE

When asphalt concrete is stored, it shall be stored only in silos. Asphalt concrete shall not be stockpiled. The minimum quantity of asphalt concrete in a silo during mixing shall be 18 tonnes except for the period immediately following a shut-down of the plant of 2 hours or more. A means shall be provided to indicate that storage in each silo is being maintained as required.

Storage silos shall be equipped with a surge-batcher sized to hold a minimum of 1800 kg of material. A surge-batcher consists of equipment placed at the top of the storage silo that catches the continuous delivery of the completed asphalt concrete mix and changes it to individual batch delivery to prevent the segregation of product ingredients as the completed asphalt concrete mix is placed into storage. The surge-batcher shall be center loading and shall be constructed to prevent material buildup. Rotary chutes shall not be used as surge-batchers.

The surge-batcher shall be independent and distinct from conveyors or chutes used to collect or direct the completed asphalt concrete mixture being discharged into storage silos and shall be the last device to handle the material before it enters the silo. Multiple storage silos shall be served by an individual surge-batcher for each silo. Material handling shall be free of oblique movement between the highest elevation (conveyor outfall) and subsequent placement in the silo. Discharge gates on surge-batchers shall be automatic in operation and shall discharge only after a minimum of 1800 kg of material has been

collected and shall close before the last collected material leaves the device. Discharge gate design shall prevent the deflection of material during the opening and closing operation.

Asphalt concrete stored in excess of 18 hours shall not be used in the work. Asphalt concrete mixture containing hardened lumps shall not be used. A storage facility that contained the material with the hardened lumps shall not be used for further storage until the cause of the lumps is corrected.

### 39-7.07 ASPHALT CONCRETE PLANTS

Plants, including commercial plants, that produce asphalt concrete subject to these specifications shall conform to the provisions in Section 7-1.01F, "Air Pollution Control," of the Standard Specifications, and shall be equipped with a wet-tube dust washer or equal and other devices that will reduce the dust emission to the degree that adjacent property is not damaged. The washer and other equipment shall function efficiently when the plant is in operation.

During production, petroleum products such as diesel fuel and kerosene shall not be used as a release agent on belts, conveyors, hoppers, or hauling equipment.

Plants shall be equipped with an inspection dock constructed so that a quality control technician or inspector standing on the dock can inspect the completed asphalt concrete mixture and take samples, as necessary, from the hauling vehicle before the vehicle leaves the plant site. This inspection dock shall allow the hauling vehicle to pull alongside and shall meet applicable safety requirements of the California Division of Occupational Safety and Health. Haul vehicle drivers shall be instructed to stop at the dock whenever a quality control technician or inspector is on the dock and to remain there until directed to leave by that individual.

## 39-8 SUBGRADE, PRIME COAT, PAINT BINDER (TACK COAT), AND PAVEMENT REINFORCING FABRIC

### 39-8.01 SUBGRADE

Immediately prior to applying prime coat or paint binder (tack coat), or immediately prior to placing the asphalt concrete when a prime coat or paint binder (tack coat) is not required, the subgrade to receive asphalt concrete shall conform to the compaction requirement and elevation tolerances specified for the material involved and shall be free of loose or extraneous material. If the asphalt concrete is to be placed on an existing base or pavement that was not constructed as part of the contract, the surface shall be cleaned by sweeping, flushing or other means to remove loose particles of paving, dirt, and other extraneous material immediately before applying the prime coat or paint binder (tack coat).

### 39-8.02 PRIME COAT AND PAINT BINDER (TACK COAT)

A prime coat of liquid asphalt shall be applied to the areas to be surfaced when there is a contract item for the work or when the work is required in "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

Prime coat shall be applied only to those areas designated by the Engineer.

Prime coat shall be applied at the approximate total rate of 1.15 L per square meter of surface covered. The exact rate and number of applications will be determined by the Engineer.

Prime coat shall be applied at a temperature conforming to the range of temperatures specified in Section 93-1.03, "Mixing and Applying," of the Standard Specifications for distributor application of the grade of liquid asphalt being used.

A paint binder (tack coat) of asphaltic emulsion shall be furnished and applied in conformance with the provisions in Section 94, "Asphaltic Emulsions," of the Standard Specifications and shall be applied to vertical surfaces of existing pavement, curbs, gutters, and construction joints in the surfacing against which additional material is to be placed, to a pavement to be surfaced, and to other surfaces designated in "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

Paint binder (tack coat) shall be applied in one application at a rate of from 0.10-L to 0.45-L per square meter of surface covered. The exact rate of application will be determined by the Engineer.

At the Contractor's option, paving asphalt may be used for paint binder (tack coat) instead of asphaltic emulsion. If paving asphalt is used, the grade to be used and the rate of application will be determined by the Engineer. The paving asphalt shall be applied at a temperature of not less than 140°C or more than 175°C.

Prime coat or paint binder (tack coat) shall be applied in advance of placing the surfacing only as far as shall be approved by the Engineer. When asphaltic emulsion is used as a paint binder (tack coat), the asphalt concrete shall not be placed until the asphaltic emulsion has cured.

Immediately in advance of placing asphalt concrete, additional prime coat or paint binder (tack coat) shall be applied as directed by the Engineer to areas where the prime coat or paint binder (tack coat) has been damaged. Loose or extraneous material shall be removed and no additional compensation will be allowed therefor.

### 39-8.03 PAVEMENT REINFORCING FABRIC

Pavement reinforcing fabric shall be placed on existing pavement to be surfaced or between layers of asphalt concrete when such work is shown on the plans, or specified in "Asphalt Concrete" in Section 10-1, of these special provisions, or ordered by the Engineer.

Immediately prior to placing binder, pavement reinforcing fabric, and asphalt concrete surfacing, the pavement shall be cleaned of loose and extraneous materials such as, but not limited to, vegetation, sand, dirt, gravel and water.

Before placing the pavement reinforcing fabric, a binder of paving asphalt Grade AR-8000 shall be applied uniformly to the surface to receive the pavement reinforcing fabric at a rate of not less than 1.15 L per square meter of surface covered. Pavement reinforcing fabric shall not be placed in areas of conform tapers when the thickness of the overlying asphalt concrete will be 40 mm or less. When pavement reinforcing fabric is placed in areas of conform tapers the binder shall be spread at the approximate rate of 1.4 L per square meter of surface covered. The exact rate will be determined by the Engineer. The binder shall be applied to a width equal to the width of the fabric mat plus 75 mm on each side.

Asphaltic emulsion shall not be substituted for paving asphalt binder for pavement reinforcing fabric.

Before applying binder, large cracks, spalls, and depressions in existing pavement shall be repaired as directed by the Engineer and, if not included in the item, the repair work will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

The pavement reinforcing fabric shall be aligned and placed with no wrinkles that lap. The test for lapping shall be made by gathering together the pavement reinforcing fabric in a wrinkle. If the height of the doubled portion of extra fabric is 15 mm or more, the fabric shall be cut to remove the wrinkle, then lapped in the direction of paving. Lap in excess of 50 mm shall be removed.

If manual laydown methods are used, the pavement reinforcing fabric shall be unrolled, aligned, and placed in increments of approximately 9 m.

Adjacent borders of the pavement reinforcing fabric shall be lapped 50 mm to 100 mm. The preceding roll shall be lapped 50 mm to 100 mm over the following roll in the direction of paving at ends of rolls or at a break. At pavement reinforcing fabric overlays, both the binder and the fabric shall overlap previously placed fabric by the same amount.

Seating of the pavement reinforcing fabric with rolling equipment after placing will be permitted. Turning of the paving machine and other vehicles shall be gradual and kept to a minimum to avoid damage to the fabric.

A small quantity of asphalt concrete, to be determined by the Engineer, may be spread over the pavement reinforcing fabric immediately in advance of placing asphalt concrete surfacing in order to prevent fabric from being damaged by construction equipment.

Pavement reinforcing fabric shall not be exposed to public traffic, Contractor's equipment or elements that will damage the fabric prior to placement of asphalt concrete surfacing, as determined by the Engineer. Public access cross traffic may be allowed to cross the fabric under traffic control after the Contractor has placed a small quantity of asphalt concrete over the fabric.

Care shall be taken to avoid tracking binder material onto the pavement reinforcing fabric or distorting the fabric during seating of the fabric with rolling equipment. If necessary to protect the pavement reinforcing fabric, exposed binder material may be covered lightly with sand.

## 39-9 SPREADING AND COMPACTING EQUIPMENT

### 39-9.01 SPREADING EQUIPMENT

Asphalt pavers shall be self-propelled mechanical spreading and finishing equipment provided with a screed or strike-off assembly capable of distributing the material to not less than the full width of a traffic lane unless otherwise approved by the Engineer. Screed action shall include cutting, crowding or other practical action that is effective on the asphalt concrete mixture without tearing, shoving or gouging and that produces a surface texture of uniform appearance. The screed shall be adjustable to the required section and thickness. The screed shall be provided with a suitable full width compacting device. Pavers that leave ridges, indentations or other marks in the surface shall not be used unless the ridges, indentations or marks are eliminated by rolling or prevented by adjustment in the operation.

When end dump haul vehicles are used, the asphalt paver shall operate independently of the vehicle being unloaded or shall be capable of propelling the vehicle being unloaded. The load of the haul vehicle shall be limited to that which will insure satisfactory spreading. While being unloaded, the haul vehicle shall be in contact with the machine and the brakes on the haul vehicle shall not be depended upon to maintain contact between the vehicle and the machine.

No portion of the mass of hauling or loading equipment, other than the connection, shall be supported by the asphalt paver. No vibrations or other motions of the loader that could have a detrimental effect on the riding quality of the completed pavement shall be transmitted to the paver.

When asphalt concrete is placed directly upon asphalt treated permeable base, the asphalt concrete shall be placed in a manner and with equipment that will not disturb or displace the asphalt treated permeable base.

### 39-9.02 COMPACTING EQUIPMENT

A sufficient number of rollers shall be provided to obtain the specified compaction and surface finish required by this Section 11-1. Rollers shall be sized to achieve the required results.

Rollers shall be equipped with pads and water systems that prevent sticking of the asphalt concrete mixtures to the pneumatic or steel-tired wheels. A parting agent that will not damage the asphalt concrete mixture may be used to aid in preventing the asphalt concrete mixture from sticking to the wheels.

## 39-10 SPREADING AND COMPACTING

### 39-10.01 GENERAL REQUIREMENTS

Asphalt concrete shall be handled, spread, and compacted in a manner which is in conformance with this Section 11-1, "Quality Control / Quality Assurance."

Asphalt concrete shall be placed in such a manner that cracking, shoving, and displacement will be avoided.

Type A and Type B asphalt concrete shall be placed only when the ambient temperature is above 10°C.

Asphalt concrete shall not be placed when the underlying layer or surface is frozen or not dry or when weather conditions will prevent proper handling, finishing or compaction of the mixture.

Asphalt concrete shall be spread and compacted in the layers and thicknesses indicated in the following table:

Asphalt Concrete Layers and Thickness

| Total Thickness Shown on the Plans* | Number of Layers | Top Layer Thickness (Millimeters) | | Next Lower Layer Thickness (Millimeters) | | All Other Lower Layers Thickness (Millimeters) | |
|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Min. | Max. | Min. | Max. |
| 75 mm or less | 1 | ---- | ----- | ---- | ---- | ---- | ---- |
| 76 through 89 mm | 2 | 35 | 45 | 35 | 45 | ---- | ---- |
| 90 through 135 mm | 2 | 45 | 60 | 45 | 75 | — | — |
| 136 mm or more | ** | 45 | 60 | 45 | 75 | 45 | 120 |

Notes:
*When pavement reinforcing fabric is shown to be placed between layers of asphalt concrete, the thickness of asphalt concrete above the pavement reinforcing fabric shall be considered to be the "Total Thickness Shown on the Plans" for the purpose of spreading and compacting the asphalt concrete above the pavement reinforcing fabric.
**At least 3 layers if total thickness is more than 135 mm and less than 255 mm. At least 4 layers if total thickness is 255 mm or more.

A layer shall not be placed over a layer that exceeds 75 mm in compacted thickness until the temperature of the layer being covered is less than 70°C at mid-depth unless approved by the Engineer.

Asphalt concrete to be placed on shoulders, and on other areas off the traveled way having a width of 1.50 m or more, shall be spread in the same manner as specified above.

The completed mixture shall be deposited on the roadbed at a uniform quantity per linear meter, as necessary to provide the required compacted thickness without resorting to spotting, picking-up or otherwise shifting the mixture. During transporting, spreading and compacting, petroleum products such as diesel fuel and kerosene shall not be used as a release agent on trucks, spreaders or compactors in contact with the asphalt concrete.

Segregation shall be avoided. Surfacing shall be free from pockets of coarse or fine material. Asphalt concrete containing hardened lumps shall not be used.

Longitudinal joints in the top layer of Type A or Type B asphalt concrete shall correspond with the edges of planned traffic lanes. Longitudinal joints in other layers shall be offset not less than 150 mm alternately each side of the edges of traffic lanes.

Unless otherwise provided herein or approved by the Engineer, the top layer of asphalt concrete for shoulders, tapers, transitions, road connections, private drives, curve widenings, chain control lanes, turnouts, left-turn pockets, and other areas shall not be spread before the top layer of asphalt concrete for the adjoining through lane has been spread and compacted. At locations where the number of lanes is changed, the top layer for the through lanes shall be paved first. When existing pavement is to be surfaced and the specified thickness of asphalt concrete to be spread and compacted on the existing pavement is 75 mm or less, the shoulders or other adjoining areas may be spread simultaneously with the through lane

provided the completed surfacing conforms to the requirement of this Section 11-1. Tracks or wheels of spreading equipment shall not be operated on the top layer of asphalt concrete until final compaction has been completed.

At those locations shown on the plans, as specified in "Asphalt Concrete" in Section 10-1, "General," of these special provisions, or as directed by the Engineer, the asphalt concrete shall be tapered or feathered to conform to existing surfacing or to other highway and non-highway facilities.

At locations where the asphalt concrete is to be placed over areas inaccessible to spreading and rolling equipment, the asphalt concrete shall be spread by practical means to obtain the specified results and shall be compacted thoroughly to the required lines, grades, and cross sections by means of pneumatic tampers or by other methods that will produce the same degree of compaction as pneumatic tampers.

## 39-10.02 PRODUCTION START-UP EVALUATION AND NUCLEAR DENSITY TEST STRIPS

The Contractor shall demonstrate that the proposed asphalt concrete mixture is being produced and placed on the roadway in conformance with this Section 11-1, "Quality Control / Quality Assurance." The production start-up evaluation shall demonstrate that the aggregates and asphalt concrete mixture conform to the requirements of Table 39-3, "Asphalt Concrete Mixture Requirements," and of Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1 when produced using the plant proposed for this project. The nuclear density test strip serves to provide the Contractor with a location to develop a correlation between cores taken from the test strip and the Contractor's and Engineer's nuclear density gage readings taken from the same locations on the test strip and for the Contractor to demonstrate the ability to achieve a minimum of 96 percent relative compaction.

Production start-up evaluation and the nuclear density test strip may be constructed separately or at the same time to serve both purposes. Asphalt concrete used in the nuclear density test strip shall be representative of the asphalt concrete that shall be placed in the project.

Should the test results or testing program fail to meet these criteria, production will be suspended and the Contractor shall resolve the problem in conformance with the provisions in Section 39-6, "Dispute Resolution," of this Section 11-1.

Attention is directed to longitudinal and transverse construction joint requirements specified in "Asphalt Concrete" in Section 10-1, "General," of these special provisions.

Test data used for the production start up evaluation and the nuclear gage test strips shall not be included with the test data used for acceptance of the work in conformance with the provisions in Section 39-11, "Acceptance of Work," of this Section 11-1.

A production start-up evaluation and a nuclear density test strip shall be used when production of asphalt concrete has been resumed following a suspension of production due to unsatisfactory material quality as specified in Section 39-4.04, "Contractor Process Control," Section 39-4.05, "Contractor Quality Control," and Section 39-11.02A, "General" of this Section 11-1.

### 39-10.02A Production Start-Up Evaluation

Before or on the first day of asphalt concrete production, the Contractor shall produce a trial quantity of between 250 tonnes and 500 tonnes of asphalt concrete to demonstrate that asphalt concrete produced for this project conforms to the quality characteristics of this Section 11-1. The location of the production start-up evaluation shall be approved by the Engineer.

Asphalt concrete shall be produced by production procedures intended for the entire project. Production of asphalt concrete shall stop after placement of the trial quantity of asphalt concrete. Asphalt concrete production and placement may resume after the quality characteristics of the asphalt concrete mixture have been tested and found to be in conformance with the quality requirements of this Section 11-1.

The Contractor shall randomly obtain 3 aggregate samples from the plant and 3 asphalt concrete mixture samples from the mat behind the paver. Each sample from the plant shall be split into 4 portions; each sample from the mat shall be split into 4 portions. One portion of each sample shall be tested by the Contractor and one portion of each sample shall be provided to the Engineer for testing. The remaining portions shall be delivered to the Engineer and stored for dispute resolution should the test results not conform to this Section 11-1. The Contractor and the Engineer shall evaluate the samples for conformance to the requirements for sand equivalent, stability, percent air voids, and the quality characteristics designated in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1. The percent air voids of the asphalt concrete mixture shall be within ± 1.0 percent of the percent air voids designated in the Contractor's mix design.

The trial quantity of asphalt concrete will be accepted if:

A. Not more than 3 of the test results from the combined 6 test results from the Contractor's and Engineer's samples for quality characteristics indexed 2, 3, 4, and 5 in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1 are outside the specified limits.

B. Not more than one of the test results from the combined 6 test results from the Contractor's and the Engineer's samples for sand equivalent, stability, percent air voids or critical start-up characteristics designated in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1 are outside the specified limits.

If the test results from the combined 6 test results fail to meet the conditions above, corrective action shall be taken, and a new trial quantity of asphalt concrete shall be placed and evaluated in conformance with the provisions in this section to demonstrate conformance. If the test results from the combined 6 test results fail to meet the requirements above, then the trial quantity of asphalt concrete will be rejected.

The testing program will be considered adequate only if the average of the Contractor's test results and the average of the Engineer's test results for sand equivalent, stability, percent air voids, and the quality characteristics designated in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1 are within the allowable testing difference designated in Table 39-6, "Allowable Testing Difference," of this Section 11-1.

The Contractor shall not proceed to regular production until the requirements of this Section 39-10.02A, "Production Start-Up Evaluation" have been met. At the request of the Contractor, the Engineer may elect to leave the asphalt concrete which does not meet the requirements of this Section 39-10.02A in place if mitigation at the Contractor's expense can be agreed to. If this quantity of asphalt concrete is left in place, the Contractor will be paid 75 percent of the contract price paid per tonne for asphalt concrete.

The Contractor shall establish a correlation factor for stability of cured versus uncured briquettes. From a single split sample of asphalt concrete, 6 briquettes shall be fabricated. Three of the 6 briquettes shall be cured for 15 hours in conformance with the requirements of California Test 366 and 3 briquettes shall not be cured. The difference between the average stability value determined for the cured and the uncured specimens shall be considered the correlation factor, and shall be applied to stability values determined on uncured samples throughout the life of the project. The correlation factor may range from zero to 4. If the correlation factor is less than zero, a factor of zero shall be applied. If the factor is greater than 4, the correlation factor shall be approved by the Engineer.

### 39-10.02B Nuclear Density Test Strip

On the first day of placement of each layer of asphalt concrete the Contractor shall place a test strip in conformance with the requirements of California Test 375. The purpose of the test strip is to determine a correlation between cores taken from the test strip and the nuclear density gage readings taken at the core locations and to demonstrate that the asphalt concrete can be placed and compacted to the standards of this Section 11-1, "Quality Control / Quality Assurance." Asphalt concrete used in the nuclear density test strip shall be representative of the asphalt concrete that shall be placed in the project. The location for the nuclear density test strip shall be approved by the Engineer.

The Contractor shall place nuclear density test strips until conditions of the test method and this Section 11-1 have been met. The requirements of this section and the test method shall apply for the correlation of each gage that is used to determine relative compaction for this project. Relative compaction results will not be accepted if they have been determined using a nuclear gage that has not been correlated using a test strip.

Asphalt concrete in test strips may be left in place under the following conditions:

A. If the relative compaction for the test strip is determined to be 96 percent or greater, the Contractor will be paid at the contract price per tonne of asphalt concrete.
B. If the relative compaction for the test strip is determined to be less than 96 percent but greater than 93 percent, the Contractor will be paid at 75 percent of the contract price per tonne of asphalt concrete. A new test strip will be required, and mitigation measures shall be at Contractor's expense.

Asphalt concrete in test strips will be rejected when the relative compaction for the test strip is below 93 percent. Production and placement shall not begin until the Contractor has demonstrated the ability to achieve 96 percent relative compaction in conformance with this Section 11-1.

## 39-10.03 SPREADING

Layers shall be spread with an asphalt paver, unless otherwise specified or approved by the Engineer. Asphalt pavers shall be operated in such a manner as to insure continuous and uniform movement of the paver.

In advance of spreading asphalt concrete over an existing base, surfacing or bridge deck, if there is a contract item for asphalt concrete (leveling) or if ordered by the Engineer, asphalt concrete shall be spread by mechanical means that will produce a uniform smoothness and texture. Asphalt concrete (leveling) shall include, but not be limited to, the filling and leveling of irregularities and ruts. Asphalt concrete used to change the cross slope or profile of an existing surface shall not be considered as asphalt concrete (leveling).

Paint binder (tack coat) shall be applied to each layer in advance of spreading the next layer.

Before placing the top layer adjacent to cold transverse construction joints, the joints shall be trimmed to a vertical face on a neat line. Transverse joints shall be tested with a 3.6-m ± 0.06-m straightedge and shall be cut back for surface smoothness as required in conformance with Section 39-10.04, "Compacting," of this Section 11-1. Connections to existing surfacing shall be feathered to conform to the requirements for smoothness. Longitudinal joints shall be trimmed to a vertical face and on a neat line if the edges of the previously laid surfacing are, in the opinion of the Engineer, in such a condition that the quality of the completed joint will be affected.

### 39-10.04 COMPACTING

Compacting equipment shall conform to the provisions in Section 39-9.02, "Compacting Equipment," of this Section 11-1, "Quality Control / Quality Assurance."

Rolling shall commence at the lower edge and shall progress toward the highest portion. When compacting layers that exceed 75 mm in compacted thickness, rolling shall commence at the center and shall progress outwards.

Asphalt concrete shall be compacted to a relative compaction of not less than 96 percent and shall be finished to the lines, grades, and cross sections shown on the plans. In-place density of asphalt concrete will be determined prior to opening the pavement to public traffic. No rolling will be permitted after the asphalt concrete temperature is below 60°C.

Asphalt concrete placed in dig outs, as a leveling course, for slope correction, for detours not included in the finished roadway prism, in areas where in the judgment of the Engineer compaction or compaction measurement by conventional methods is impeded or on the uppermost lift of shoulders with rumble strips shall be compacted by a method approved by the Engineer.

Relative compaction shall be determined in conformance with the requirements of California Test 375 except that only a nuclear gauge with thin lift capability shall be used for asphalt concrete layer of 30 mm to 59 mm in thickness. Laboratory specimens shall be compacted in conformance with the requirements of California Test 304. Test locations will be established for asphalt concrete areas to be tested, as specified in California Test 375. If the Contractor compacts the asphalt concrete in any form or quantity after sites for testing have been chosen in conformance with the requirements of California Test 375 or after California Test 375 has begun, the quality control tester shall choose a new set of random numbers for locating test sites.

Upon completion of rolling operations, if ordered by the Engineer, the asphalt concrete shall be cooled by applying water. Applying water shall conform to the provisions in Section 17, "Watering," of the Standard Specifications.

The completed surfacing shall be thoroughly compacted, smooth, and free from ruts, humps, depressions, or irregularities. Ridges, indentations or other objectionable marks left in the surface of the asphalt concrete by blading or other equipment shall be eliminated by rolling or other suitable means. The use of equipment that leaves ridges, indentations or other objectionable marks in the asphalt concrete shall be discontinued.

When a straightedge 3.6 m ± 0.06-m long is laid on the finished surface and parallel with the centerline, the surface shall not vary more than 3-mm from the lower edge of the straightedge. The transverse slope of the finished surface shall be uniform to a degree such that no depressions greater than 6 mm are present when tested with a straightedge 3.6 m ± 0.06-m long in a direction transverse to the centerline and extending from edge to edge of a 3.6-m traffic lane.

Pavement within 15 m of a structure or approach slab shall conform to the smoothness tolerances specified in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications.

## 39-11 ACCEPTANCE OF WORK

### 39-11.01 GENERAL

The Engineer shall select the procedure used to determine the quantities of asphalt concrete for acceptance and payment determination in conformance with the provisions of this Section 11-1, "Quality Control / Quality Assurance."

Quality control test results that have been verified shall form the basis for statistical evaluation of the work in conformance with Section 39-11.02, "Statistical Evaluation and Determination of Pay Factor," of this Section 11-1. The quality requirements on which statistical evaluation will be based are specified in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1.

Work determined to be in conformance with the provisions of this Section 11-1 will be accepted and paid for at the contract price per tonne for asphalt concrete and may be subject to compensation adjustment in conformance with Section 39-11.02C, "Pay Factor Determination and Compensation Adjustment," of this Section 11-1.

Work that is not in compliance with the provisions of this Section 11-1 may be rejected by the Engineer and shall be removed and replaced at the Contractor's expense.

When there are fewer than 5 verified quality control tests, the work will be accepted or rejected based on whether the individual test results meet the quality requirements specified in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1. Section 39-11.02, "Statistical Evaluation and Pay Factor Determination," of this Section 11-1 shall not apply.

Aggregates, asphalt binder, and asphalt concrete mixtures that do not conform to this Section 11-1 shall not be used.

The Engineer may reject a quantity of material that is determined to be defective based on visual inspection or noncompliance with the provisions of this Section 11-1.

## 39-11.02 STATISTICAL EVALUATION AND DETERMINATION OF PAY FACTOR

Statistical evaluation of the work shall be used to verify the Contractor's quality control test results to determine compliance with this Section 11-1, "Quality Control / Quality Assurance."

### 39-11.02A General

The quality characteristics to be evaluated and the specification limits are specified in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1. Asphalt content, aggregate gradation (600-µm and 75-µm sieves), and relative compaction shall be considered for purposes of this Section 11-1 to be critical quality characteristics.

A lot represents the total quantity of asphalt concrete placed. More than one lot will occur if changes in the target values, material sources or mix design are requested by the Contractor and made in conformance with this Section 11-1 or if production of asphalt concrete is suspended due to unsatisfactory performance. However, asphalt concrete placed in dig outs, as a leveling course, for slope correction, for detours not to be included in the finished roadway prism, in areas where in the judgment of the Engineer compaction or compaction measurement by conventional methods is impeded or on the uppermost lift of shoulders with rumble strips shall be considered as a separate lot from other asphalt concrete. In addition, a new lot may be designated by the Engineer if the production and placement have been suspended for longer than 30 days due to seasonal suspension of phases of work.

A minimum of 5 samples shall be required to perform a statistical evaluation. The maximum obtainable pay factor with the 5 samples shall be 1.01. A minimum of 8 samples shall be required to obtain a pay factor of 1.05. If the sampling frequencies and quantity of work would otherwise result in fewer than 8 samples, the Contractor may submit a written request to increase the sampling frequency to provide a minimum of 8 samples. The request shall be included in the Quality Control Plan.

The lot will be accepted and a final pay factor determined when the Contractor's sampling, inspection, and test results are completed, have been submitted and evaluated, and the Engineer has visually inspected the pavement. Quality control test results shall be verified using the *t*-test in conformance with the provisions of Section 39-5.03, "Verification," of this Section 11-1 before the results will be used in considering the acceptance of asphalt concrete.

If the current composite pay factor of a lot is greater than 0.90, the lot will be accepted, provided the lowest single pay factor is not within the reject portion of Table 39-8, "Pay Factors," of this Section 11-1. If the lowest single pay factor is within the reject portion of Table 39-8, "Pay Factors," of this Section 11-1, the lot will be rejected. Rejected asphalt concrete shall be removed from the project site at the Contractor's expense.

If the current composite pay factor of a lot is less than 0.90, production of asphalt concrete shall be terminated and corrective action taken. Upon approval of the Engineer, up to 1000 tonnes of asphalt concrete may be placed to demonstrate that the asphalt concrete is once again in conformance with this Section 11-1. Production of asphalt concrete shall not start until the Engineer has received test results confirming conformance with this Section 11-1. A new lot will be established when production resumes.

If a pay factor for a critical quality characteristic designated in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1 is less than 0.90 for the lot or is within the rejection range for the last 5 tests, production of asphalt concrete shall be terminated and corrective action taken. Upon approval of the Engineer, up to 1000 tonnes of asphalt concrete may be placed to demonstrate that the asphalt concrete is once again in conformance with this Section 11-1. Production of asphalt concrete shall not start until the Engineer has received test results confirming conformance with this Section 11-1. A new lot will be established when production resumes.

Defective asphalt concrete may be voluntarily removed and replaced with new asphalt concrete to avoid a low pay factor. New material will be sampled, tested, and evaluated in conformance with this Section 11-1.

### 39-11.02B Statistical Evaluation

The Variability-Unknown/Standard Deviation Method will be used to determine the estimated percentage of the lot that is outside specification limits. The number of significant figures used in the calculations will be in conformance with the requirements of AASHTO Designation R-11, Absolute Method.

The estimated percentage of work that is outside of the specification limits for each quality characteristic will be determined as follows:

1. Calculate the arithmetic mean ( $\overline{X}$ ) of the test values;

$$\overline{X} = \frac{\Sigma x}{n}$$

where:

| | | |
|---|---|---|
| $\sum$ | = | summation of |
| x | = | individual test values |
| n | = | total number of test values |

2. Calculate the standard deviation (s);

$$s = \sqrt{\frac{n\sum(x^2)-(\sum x)^2}{n(n-1)}}$$

where:

| | | |
|---|---|---|
| $\sum(x^2)$ | = | summation of the squares of individual test values |
| $(\sum x)^2$ | = | summation of the individual test values squared |
| n | = | total number of test values |

3. Calculate the upper quality index ($Q_u$);

$$Q_u = \frac{USL - \overline{X}}{s}$$

where:

| | | |
|---|---|---|
| USL | = | upper specification limit |
| s | = | standard deviation |
| $\overline{X}$ | = | arithmetic mean |

(Note: The USL is equal to the upper specification limit or the target value plus the production tolerance.)

4. Calculate the lower quality index ($Q_L$);

$$Q_L = \frac{\overline{X} - LSL}{s}$$

where:

| | | |
|---|---|---|
| LSL= | | lower specification limit or target value minus production tolerance |
| s | = | standard deviation |
| $\overline{X}$ | = | arithmetic mean |

5. From Table 39-7, "Estimated Percent of Work Outside Specification Limits," of this Section 11-1, determine $P_U$ ;

where:

$P_U$ = the estimated percentage of work outside the USL.
($P_U$ = 0, when USL is not specified.)

6. From Table 39-7, "Estimated Percent of Work Outside Specification Limits," of this Section 11-1, determine $P_L$;

where:

$P_L$ = the estimated percentage of work outside the LSL.
($P_L$ = 0, when LSL is not specified.)

7. Calculate the total estimated percentage of work outside the USL and LSL, Percent Defective;

Percent Defective = $P_U + P_L$

where:

$P_U$ = the estimated percentage of work outside the USL

$P_L$ = the estimated percentage of work outside the LSL

8. Repeat Steps 1 through 7 for each quality characteristic listed for acceptance.

**39-11.02C Pay Factor Determination and Compensation Adjustment**

The pay factor and compensation adjustment for a lot will be determined as follows:

1. From Table 39-8, "Pay Factors," of this Section 11-1, determine the pay factor for each quality characteristic, ($PF_{QC}$), using the total number of test result values and the total estimated percentage outside the specification limits ($P_U + P_L$) from Step 7 in Section 39-11.02B, "Statistical Evaluation," of this Section 11-1.
2. The pay factor for the lot is a composite of single pay factors determined for each quality characteristic designated in Table 39-9, "Minimum Quality Control Requirements," of this Section 11-1. The following formula is used:

$$PF_C = \sum_{i=1}^{8} w_i \, PF_{QC_i}$$

where:

$PF_C$ = the composite pay factor for the lot,

$PF_{QC}$ = the pay factor for the individual quality characteristic,

$w$ = the weighting factor listed in Table 39-9, and

$i$ = the quality characteristic index number in Table 39-9.

3. Payment to the Contractor for the lot of asphalt concrete will be subject to a compensation adjustment. The Compensation Adjustment Factor (CAF) will be determined as follows:

$CAF = PF_C - 1$

4. The amount of the compensation adjustment will be calculated as the product of:

a. the Compensation Adjustment Factor (CAF)
b. the total tonnes represented in the lot, and
c. the contract price paid per tonne for the item of asphalt concrete involved.

If the compensation adjustment is a negative value, the compensation adjustment will be deducted from moneys due, or that may become due, the Contractor under the contract. If the compensation adjustment is a positive value, the compensation adjustment will be added to moneys due, or that may become due, the Contractor under the contract.

Table 39-7.—ESTIMATED PERCENT OF WORK OUTSIDE SPECIFICATION LIMITS

| $P_U$ and/or $P_L$ | Sample Size (n) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | 10-11 | 12-14 | 15-17 | 18-22 | 23-29 | 30-42 | 43-66 | >66 |
| | Upper Quality Index $Q_U$ or Lower Quality Index $Q_L$ | | | | | | | | | | | | |
| 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 |

Table continues below

Table 39-7 (cont.).—ESTIMATED PERCENT OF WORK OUTSIDE SPECIFICATION LIMITS

| $P_U$ and/or $P_L$ | Sample Size (n) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | 10-11 | 12-14 | 15-17 | 18-22 | 23-29 | 30-42 | 43-66 | >66 |
| | Upper Quality Index $Q_U$ or Lower Quality Index $Q_L$ | | | | | | | | | | | | |
| 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 |

Notes:

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 $P_L$.

Table 39-8.—PAY FACTOR

| Pay Factor | Sample Size (n) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | 10-11 | 12-14 | 15-17 | 18-22 | 23-29 | 30-42 | 43-66 | >66 |
| | Maximum Allowable Percent of Work Outside Specification Limits for A Given Pay Factor ($P_U + P_L$) | | | | | | | | | | | | |
| 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 |
| | 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 |
| Reject | 62 | 59 | 57 | 56 | 54 | 53 | 51 | 49 | 47 | 45 | 44 | 42 | 39 |
| | 63 | 61 | 58 | 57 | 55 | 54 | 52 | 50 | 48 | 47 | 45 | 43 | 40 |
| | 64 | 62 | 60 | 58 | 57 | 55 | 53 | 51 | 49 | 48 | 46 | 44 | 41 |
| Reject Values Greater Than Those Shown Above | | | | | | | | | | | | | |

Notes:

1. To obtain a pay factor when the estimated percent outside specification limits from Table 39-7, "Estimated Percent of Work Outside Specification Limits," does not correspond to a value in the table, use the next larger value.
2. The maximum obtainable pay factor is 1.05 (with a minimum of 8 test values).

Table 39-9.—MINIMUM QUALITY CONTROL REQUIREMENTS

| Index (i) | Quality Characteristic | Specification Limits | Weighting Factor (w) | California Test | Minimum Sampling and Testing Frequency | Point of Sampling |
|---|---|---|---|---|---|---|
| 1 | **Asphalt Content** [2,3] | TV ± 0.5% | 0.30 | 379 or 382 | One sample per 500 tonnes or part thereof<br>Not less than one sample per day | Mat behind paver |
| | **Gradation** | | | 202 | One sample per 500 tonnes or part thereof<br>Not less than one sample per day | Batch Plant - from hot bins<br>Drum Plant - from cold feed |
| 2 | 19 or 12.5 mm [4] | TV ± 5 | 0.01 | | | |
| 3 | 9.5 mm | TV ± 6 | 0.01 | | | |
| 4 | 4.75 mm | TV ± 7 | 0.05 | | | |
| 5 | 2.36 mm | TV ± 5 | 0.05 | | | |
| 6 | 600 µm [2,3] | TV ± 4 | 0.08 | | | |
| 7 | 75 µm [2] | TV ± 2 | 0.10 | | | |
| 8 | **Relative Compaction** [2] | 96% | 0.40 | 375 [5] | One sample per 500 tonnes or part thereof<br>Not less than one test per day | Finished mat after final rolling |
| | **Test Maximum Density** | | | 375 | Per Test Method | Mat behind the paver |
| 9 | **Mix Moisture Content** | ≤1% | | 370 | One sample per 1000 tonnes or part thereof<br>Not less than one sample per day | |
| | **Asphalt and Mix Temperature** | 120ºC to 190ºC (Asphalt)<br>≤165ºC (Mix) | | | Continuous using an automated recording device | Plant |

Notes:
1. TV = Target Value from contractor's proposed mix design.
2. Depending on aggregate gradation specified.
3. Quality characteristics 1, 6, 7, and 8 are defined as critical quality characteristics in the verification testing process.
4. Quality characteristics 1, 6, and 7 are defined as critical start-up characteristics in the Production Start-Up Evaluation.
5. California Test 375, Part 3, Section B, "Testing Frequency," is revised to change 450 tonnes to 500 tonnes and 45 tonnes to 50 tonnes.

## 39-12 MEASUREMENT AND PAYMENT

### 39-12.01 MEASUREMENT

Asphalt concrete will be measured by mass. The quantity to be paid for will be the combined mass of the mixture for the various types of asphalt concrete, as designated in the Engineer's Estimate.

The mass of the materials will be determined in conformance with the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

Quantities of paving asphalt, liquid asphalt, and asphaltic emulsion to be paid for as contract items of work will be determined in conformance with the methods provided in Section 92, "Asphalts," Section 93, "Liquid Asphalts," or Section 94, "Asphaltic Emulsions," of the Standard Specifications, as the case may be.

When recorded batch masses are printed automatically, these masses may be used for determining pay quantities provided the following requirements are complied with:

A. Total aggregate and supplemental fine aggregate mass per batch shall be printed. When supplemental fine aggregate is weighed cumulatively with the aggregate, the total batch mass of aggregate shall include the supplemental fine aggregate.
B. The total bitumen mass per batch shall be printed.

C. Zero-tolerance mass shall be printed prior to weighing the first batch and after weighing the last batch of each truckload.
D. The time, date, mix number, load number, and truck identification shall be correlated with the load slip.
E. A copy of the recorded batch masses shall be certified by a licensed weighmaster and submitted to the Engineer.

Pavement reinforcing fabric will be measured and paid for by the square meter for the actual pavement area covered.

**39-12.02 PAYMENT**

Asphalt concrete placed in the work, unless otherwise specified, will be paid for at the contract price per tonne for asphalt concrete of the types designated in the Engineer's Estimate.

Compensation adjustment for asphalt concrete will be in conformance with Section 39-11.02C, "Pay Factor Determination and Compensation Adjustment," of this Section 11-1, "Quality Control / Quality Assurance."

When there is a contract item for asphalt concrete (leveling), quantities of asphalt concrete placed for leveling will be paid for at the contract price per tonne for asphalt concrete (leveling). When there is no contract item for asphalt concrete (leveling), and leveling is ordered by the Engineer, asphalt concrete so used will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

For asphalt concrete placed in dig outs, as a leveling course, for slope correction, for detours not included in the finished roadway prism, in areas where in the judgment of the Engineer compaction or compaction measurement by conventional methods is impeded or on the uppermost lift of shoulders with rumble strips the relative compaction provisions of Section 39-11.02, "Statistical Evaluation and Determination of Pay Factor," of this Section 11-1, shall not apply. In the computation of the composite pay factor ($PF_C$) for the lot composed of this asphalt concrete, an individual pay factor of 1.0 for the relative compaction ($PF_{QC8}$) shall be used.

Full compensation for the Contractor's Quality Control Plan, including furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in developing, implementing, modifying, and fulfilling the requirements of the Quality Control Plan shall be considered as included in the contract price paid per tonne for asphalt concrete of the types designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for Contractor sampling, testing, inspection, testing facilities, and preparation and submission of results shall be considered as included in the contract price paid per tonne for asphalt concrete of the types designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

Quantities of pavement reinforcing fabric placed and paving asphalt applied as a binder for the pavement reinforcing fabric will be paid for at the contract price per square meter for pavement reinforcing fabric and per tonne for paving asphalt (binder-pavement reinforcing fabric). Full compensation for furnishing and spreading sand to cover exposed binder material, if necessary, shall be considered as included in the contract price paid per tonne for paving asphalt (binder-pavement reinforcing fabric) and no separate payment will be made therefor.

Small quantities of asphalt concrete placed on pavement reinforcing fabric to prevent the fabric from being displaced by construction equipment or to allow public traffic to cross over the fabric shall be considered as part of the layer of asphalt concrete to be placed over the fabric and will be measured and paid for by the tonne as asphalt concrete of the types designated in the Engineer's Estimate.

When there is a contract item for liquid asphalt (prime coat), the quantity of prime coat will be paid for at the contract price per tonne for the designated grade of liquid asphalt (prime coat). When there is no contract item for liquid asphalt (prime coat) and the special provisions require the application of a prime coat, full compensation for furnishing and applying the prime coat shall be considered as included in the contract price paid per tonne for asphalt concrete of the types designated in the Engineer's Estimate and no separate payment will be made therefor.

When there is a contract item for asphaltic emulsion (paint binder), the quantity of asphaltic emulsion or paving asphalt used as paint binder (tack coat) will be paid for at the contract price per tonne for asphaltic emulsion (paint binder). When there is no contract item for asphaltic emulsion (paint binder), full compensation for furnishing and applying paint binder (tack coat) shall be considered as included in the contract price paid per tonne for asphalt concrete of the types designated in the Engineer's Estimate and no separate payment will be made therefor.

Fog seal coat will be paid for as provided in Section 37-1, "Seal Coats," of the Standard Specifications.

No adjustment of compensation will be made for an increase or decrease in the quantities of paint binder (tack coat) or fog seal coat required, regardless of the reason for such increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the items of paint binder or fog seal coat.

The above contract prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing asphalt concrete, complete in place, as shown on the plans, as specified in this Section 11-1, "Quality Control / Quality Assurance," and "Asphalt Concrete" in Section 10-1, "General," of these special provisions, and as directed by the Engineer.

## SECTION 12. (BLANK)

## SECTION 13. RAILROAD RELATIONS AND INSURANCE REQUIREMENTS

## PART 1 -- DOWN STREET OVERHEAD

### 13.01 General

- **13.01.01** The Contractor shall cooperate with **THE BURLINGTON NORTHERN AND SANTA FE 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 bridge widening and construction of connector ramps at the Down Street Overhead in Riverside County, PUC No. 2B-8.70-A, DOT No. 026477F.

- **13.01.02** The Contractor shall 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 2 of said Exhibit "C-1".

- **13.01.03** The Contractor shall plan, schedule and conduct all work activities so as not to interfere with the movement of any trains on Railway Property.

- **13.01.04** 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.

- **13.01.05** The Contractor is responsible for determining and complying with all Federal, State and Local Governmental laws and regulations, including, but not limited to environmental, health and safety. The Contractor shall be responsible for and indemnify and save Railway harmless from 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.

- **13.01.06** The Contractor shall notify the Railway's Manager Public Projects, telephone number (**909) 386-4474** at least thirty (30) working days before commencing any work on Railway Property. Contractors notification to Railway, shall refer to Railroad's file **026477F** .

- **13.01.07** For any falsework above any tracks or any excavations located, whichever is greater, within twenty-five (25) feet of the nearest track or intersecting a slope from the plane of the top of rail on a 1 ½ 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 shall furnish the Railway five sets of working drawings showing details of construction affecting Railway Property and tracks. The working drawing shall 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. All calculations shall take into consideration railway surcharge loading and shall 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 shall be stamped by a registered professional engineer licensed to practice in the state the project is located. The Contractor shall not begin work until notified by the Railway that plans have been approved. The Contractor shall 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 shall the Contractor be relieved of responsibility for results obtained by the implementation of said approved plans.

- **13.01.08** 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 shall 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.

### 13.02 Agreement

- **13.02.01 No employee of the Contractor, its subcontractors, agents or invitees shall enter Railway Property without first having completed Railway's Contractor Safety Orientation, found on the web site . The Contractor shall ensure that each of its employees, subcontractors, agents or invitees have received Railway's Contractor**

**Safety Orientation through internet sessions conducted by the or through the Contractor before any work is performed on the Project. The Contractor shall ensure that each of its employees, subcontractors, agents or invitees have verification that they have completed the Safety Orientation and that every employee of the Contractor, its subcontractors, agents or invitees have a card, in his or her possession, that is properly signed and dated certifying that they have received the Safety Orientation before entering Railway Property. The Contractor is responsible to pay the cost of the Safety Orientation. It is required that the Safety Orientation be renewed annually. Further clarification can be found on the web site or from the Railway's Representative.**

**13.03 Railway Requirements**

- **13.03.01** The Contractor shall 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 shall be paid for by the Agency.

- **13.03.02** The Contractor shall notify the Railway's General Manager **Michael Shircliff at (909) 386-4150** and provide blasting plans to the Railway for review seven (7) calendar days prior to conducting any blasting operations adjacent to or on Railway's Property.

- **13.03.03** The Contractor shall abide by the following clearances during construction:

  - 25'-0" Horizontally from centerline of nearest track
  - 22'-6" Vertically above top of rail (Temporary Falsework Clearance may be reduced to 21'-6" Subject to Railway and Public Utilities Commission approval)
  - 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

- **13.03.04** Any infringement within State statutory clearances due to the Contractor's operations shall be submitted to the Railway and to the State and shall not be undertaken until approved in writing by the Railway, and until the State 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.

- **13.03.05** In the case of impaired vertical clearance above top of rail, Railway shall 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 shall be borne by the Agency.

- **13.03.06** The details of construction affecting the Railway's Property and tracks not included in the contract plans shall be submitted to the Railway by State for approval before work is undertaken and this work shall not be undertaken until approved by the Railway.

- **13.03.07** At other than public road crossings, the Contractor shall not move any equipment or materials across Railway's tracks until permission has been obtained from the Railway. The Contractor shall obtain a "Temporary Private Crossing Agreement" from the Railway prior to moving his equipment or materials across the Railways tracks. The temporary crossing shall be gated and locked at all times when not required for use by the Contractor. The temporary crossing for use of the Contractor shall be at the expense of the Contractor.

- **13.03.08** Discharge, release or spill on the Railway Property of any hazardous substances in excess of a reportable quantity or any hazardous waste is prohibited and Contractor shall immediately notify the Railway's Resource Operations Center at 1(800) 832-5452, of any discharge, release or spills. Contractor shall not allow Railway Property to become a treatment, storage facility as those terms are defined in the Resource Conservation and Recovery Act or any state analogue.

- **13.03.09** The Contractor upon completion of the work covered by this contract, shall 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 shall cause Railway's Property to be left in a condition acceptable to the Railway's representative.

- **13.03.10** No Project construction activity that would interfere with operations of the Rail Corridor shall be permitted during the months of October, November, and December. It is understood that trains cannot be subjected to delay during this time period.

**13.04 Contractor Roadway Worker on Track Safety Program and Safety Action Plan**

- **13.04.01 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 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 shall develop and implement the Safety Action Plan, as provided for on the web site , which shall be made available to Railway prior to commencement of any work on Railway Property. During the performance of work, the Contractor shall audit it's compliance with the Safety Action Plan. The Contractor shall designate an on-site Project Supervisor who shall serve as the contact person for the Railway and who shall maintain a copy of the Safety Action Plan and subsequent audits at the job site for inspection and review by the Railway at any time during the course of the project. Below is a partial list of what should be contatined in the Safety Action Plan, a complete list can be found on the web site. (NOTE – Should there be a descrepency between the information contained on the web site and the list below, the web site shall govern.);**

- **Contractors Employee Safety**
  **All employees working on Railway property have completed Railway's annual Safety Orientation Program through the internet(Sec 13.02.01)**
  **Job Briefings (Sec13.06.01 & 13.06.02)**
  **Personal Protective Equipment ( Sec 13.06.08)**
  **Protection of Railway Facilities and Railway Flagger Services (Sec 13.03.05 & 13.05)**

All emp;loyees working on Railway property, who will be working within 25 feet from centerline of track, have completed annual Roadway Worker Protection/On Track Safety Training(Secs 13.04.01 and 13.06.03)

  **Work After Hours (Sec 13.06.04)**
- **Contractor Employee Training**
  **Personal Injury Reporting (Sec 13.09)**
  **Accident Investigation and Analysis**
- **High Risk Work Areas/Situations**
  **Notification of Damage to Railway property or hazards that could effect the safe operation of trains (Sec 13.06.06)**
  **Falsework/Shoring affecting the integrity of tracks (Sec 13.01.06)**
  **Clearances affecting the integrity of train operations (Sec 13.03.03)**
  **Moving Equipment and Materials across Railway's tracks (Sec 13.03.07)**
  **Security of Machines, Equipment and Vehicles (Sec 13.06.10)**
  **Power line Safety (Sec 13.06.12)**
  **Excavation Safety (Sec 13.07)**
- **High Risk Employees**
  **Alcohol and Drug Use (Sec 13.06.05)**
  **Firearms or Deadly Weapons (Sec 13.06.07)**
- **Property Damage, Housekeeping and Clean-up (Sec 13.03.01 & 13.03.09)**
  **Storage of Materials (Sec 13.06.09)**
  **Facility Auditing**
- **Compliance with Laws (Sec 13.01.04)**
- **Hazardous Substances and Materials**
  **Discharges, Releases and Spills (Sec 13.03.08)**
  **Hazardous Materials encountered in excavations (Sec 13.08)**

**13.05 Protection of Railway Facilities and Railway Flagger Services:**

- **13.05.01** The Contractor shall give a minimum of **10** working days notice to **Augie Morales** the Railways Roadmaster at **(909) 386-4060** , in advance of when flagging services will be required.

- **13.05.02** Unless determined otherwise by Railway's Project Representative, Railway flagger and protective services and devices will be required and furnished when Contractors work activities are located over or under of and within twenty-five (25) feet measured horizontally from centerline of the nearest track and when cranes or similar equipment positioned outside of 25-foot horizontally from track centerline that could foul the track in the event of tip over or other catastrophic occurrence, but not limited thereto for the following conditions:

- **13.05.02a** When in the opinion of the Railway's Representative it is necessary to safeguard Railway's Property, employees, trains, engines and facilities.

- **13.05.02b** 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.
-
- **13.05.02c** When work in any way interferes with the safe operation of trains at timetable speeds.

- **13.05.02d** 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.

- **13.05.02e** Special permission must be obtained from the Railway before moving heavy or cumbersome objects or equipment which might result in making the track impassable.

- **13.05.03** Flagging services will be performed by qualified Railway flaggers.

- **13.05.03a** 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.

- **13.05.03b** Each time a flagger is called, the minimum period for billing shall be the eight (8) hour basic day.

- **13.05.03c** The cost of flagger services provided by the Railway, when deemed necessary by the Railway's representative, will be borne by the State for a period of 195 consecutive calendar days beginning on the date work commences on or near the Railroad's property. The Contractor shall pay to the State liquidated damages in the sum of $500.00 per day for each day in excess of the above 195 consecutive calendar days the Contractor works on or near Railroad property, and which requires flagging protection of Railroad's facilities and trains.

- **13.05.03d** The average train traffic on this route is **75** freight trains per 24-hour period at a timetable speed **55** MPH and **10** passenger trains at a timetable speed of **60** MPH.

**13.06 Contractor General Safety Requirements**

- **13.06.01 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 shall be in compliance with FRA Roadway Worker Protection Regulations.**

- **13.06.02 Before beginning any task on Railway Property, a thorough job safety briefing shall 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).**

- **13.06.03 Workers shall not work nearer than 25 feet to the centerline of any track without an on track safety strategy approved by the Railway'S Project Representative, unless the track is protected by track bulletin and work has been authorized by the Railway. 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 flag/work protection, (3) the method of communication to stop and resume work, and (4) entry into flag/work limits when designated. Men or**

**equipment entering flag/work limits that were not previously job briefed, must notify the flagger immediately, and be given a job briefing if working at less than 25 feet from center line of track.**

- **13.06.04 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 shall be present at all times.**

- **13.06.05** Any Contractor employee, its subcontractors employee, agents or invitees 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.

- **13.06.06** Any damage to Railway Property, or if any hazard is noticed on passing trains, shall be reported immediately to the Railway's representative in charge of the project. Any vehicle or machine which may come in contact with a track, signal equipment, or structure could result in a train derailment and shall be reported by the quickest means possible 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 shall be posted at the job site.

- **13.06.07** All persons are prohibited from having pocket knife with blade in excess of three (3) inches, firearms or other deadly weapons in their possession while working on Railway's Property.

- **13.06.08** All personnel protective equipment used on Railway Property shall meet applicable OSHA and ANSI specifications. Current Railway personnel protective equipment requirements are listed on the web site, **,** however a partial list of the requirements include; a) safety glasses: permanently affixed side shields; no yellow lenses, b) hard hats with high visibility orange cover, c) safety shoes: hardened toe, above-the-ankle lace-up with a defined heel and d), high visibility retro-reflective orange vests are required as specified by the Railroad's representative in charge of the project. Hearing protection, fall protection and respirators will be worn as required by State and Federal regulations. **(NOTE – Should there be a descrepency between the information contained on the web site and the information in this paragraph, the web site shall govern.)**

- **13.06.09** The Contractor shall not pile or store any materials, machinery or equipment closer than 25'-0" to the center line of the nearest Railway track. At highway/rail at-grade crossings materials, machinery or equipment shall not be stored or left temporarily which interferes with the sight distances of motorists approaching the crossing. Prior to beginning work, the Contractor, will establish a storage area with concurrence of the Railroad's representative.

- **13.06.10** 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.

- **13.06.11** Workers must not create and leave any conditions at the work site that would interfere with water drainage. Any work performed over water shall meet all Federal, State and Local regulations.

- **13.06.12** 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 shall 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, 750 to 1000 KV - 45 feet and if capacity of the line is not known, minimum clearance of 45 feet must be maintained. A person shall 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.

**13.07 Excavation**

- **13.07.01** Before excavating, it must be ascertained by the Contractor if there are any underground pipe lines, electric wires, or cables, including fiber optic cable systems that either cross or run parallel with the track which are located within the Projects work area. Excavating on Railway's Property could result in damage to buried cables resulting in delay to Railway traffic, including disruption of service to users resulting in business interruptions involving loss of revenue and profits. Before any excavation commences, the Contractor must contact the Railway's Signal Supervisor

and Roadmaster. All underground and overhead wires must be considered HIGH VOLTAGE and dangerous until verified with the company having ownership of the line. It is also 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.

- **13.07.02** The Contractor must cease all work and the Railway must be notified immediately before continuing excavation in the area if obstructions are encountered that do not appear on drawings. If the obstruction is a utility, and the owner of the utility can be identified, then the owner should also be notified immediately. If there is any doubt about the location of underground cables or lines of any kind, no work will be performed until the exact location has been determined. There will be no exceptions to these instructions.

- **13.07.03** All excavations shall be conducted in compliance with applicable OSHA regulations and regardless of depth shall be shored where there is any danger to tracks, structures or personnel.

- **13.07.04** 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.

**13.08 Hazardous Waste, Substances and Material Reporting**

- **13.08.01** 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 shall 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.

**13.09 Personal Injury Reporting**

- **13.09.01** 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 County: (if non-Railway location)
2. Date:
3. Temperature:
4. Weather
Time:

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: (i.e. (a) Laceration (b) Hand) (b) Body Part:

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**

**EXHIBIT "C-1"**

**Agreement**
**Between**
**THE BURLINGTON NORTHERN AND SANTA FE RAILWAY COMPANY**
**and the**
**CONTRACTOR**

**THE BURLINGTON NORTHERN AND SANTA FE RAILWAY COMPANY**
740 E. Carnegie Drive
San Bernardino, CA. 92408-3571
**Attention: Manager Public Projects**

**Railway File: 026477F**
**Agency Project: Bridge Widening and Construction of Connector Ramps at Down Street Overhead**

Gentlemen:

The undersigned, hereinafter referred to as Contractor, has entered into a Contract dated , 2003 with the State of California ("State") for the performance of certain work in connection with the project, the bridge widening and construction of connector ramps at the Down Street Overhead, in the performance of which work the Contractor will necessarily be required to conduct operations within THE BURLINGTON NORTHERN AND SANTA FE RAILWAY COMPANY ("Railway"), right of way and property ("Railway Property"). The Contract provides that no work shall be commenced within Railway Property until the Contractor employed in connection with said work for State shall have executed and delivered to Railway an Agreement, in the form hereof, and shall have provided insurance of the coverage and limits specified in said Contract and Section 2 of this Agreement. If this Agreement is executed by other than the Owner, General Partner, President or Vice President of Contractor, evidence is furnished to you herewith certifying that the signatory is empowered to execute this Agreement for the Contractor.

Accordingly, as one of the inducements to and as part of the consideration for Railway granting permission to Contractor to enter upon Railway Property, Contractor, effective on the date of said Contract, has agreed and does hereby agree with Railway as follows:

**Section 1. RELEASE OF LIABILITY AND INDEMNITY**

Contractor agrees to release Railway from any claims arising from the performance of this Agreement which Contractor or any of its employees, subcontractors, agents or invitees could otherwise assert against Railway, regardless of the negligence of Railway, except to the extent that such claims are proximately caused by the intentional misconduct or gross negligence of Railway.

Contractor shall indemnify and hold 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 failure to perform any obligation hereunder. **THE LIABILITY ASSUMED BY CONTRACTOR SHALL 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 INTENTIONAL MISCONDUCT OR GROSS NEGLIGENCE OF RAILWAY.**

**THE INDEMNIFICATION OBLIGATION ASSUMED BY CONTRACTOR SHALL INCLUDE 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 BOILER INSPECTION ACT, WHENEVER SO CLAIMED.**

Contractor further agrees, at its expense, in the name and on behalf of Railway, that it shall adjust and settle all claims made against Railway, and shall, 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 shall give notice to Contractor, in writing, of the receipt or dependency of such claims and thereupon Contractor shall 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, shall 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.

It is mutually understood and agreed that the assumption of liabilities and indemnification provided for in this Agreement shall survive any termination of this Agreement.

**Section 2. INSURANCE.**

(a) Before commencing any work under this Agreement, Contractor must provide and maintain in effect throughout the term of this Agreement insurance, at Contractor's expense, covering all of the work and services to be performed hereunder by Contractor and each of its subcontractors, as described below:

() Workers' Compensation coverage as is required by State law. **THE CERTIFICATE MUST CONTAIN A SPECIFIC WAIVER OF THE INSURANCE COMPANY'S SUBROGATION RIGHTS AGAINST THE BURLINGTON NORTHERN AND SANTA FE RAILWAY COMPANY.**

() Commercial General Liability insurance covering liability, including but not limited to Public Liability, Personal Injury, Property Damage and Contractual Liability covering the obligations assumed by Contractor in Section 1, with coverage of at least $2,000,000 per occurrence and $6,000,000 in the aggregate. Where explosion, collapse, or underground hazards are involved, the X, C, and U exclusions must be removed from the policy.

() Automobile Liability insurance, including bodily injury and property damage, with coverage of at least $1,000,000 combined single limit or the equivalent covering any and all vehicles owned or hired by the Contractor and used in performing any of the services under this agreement.

() Railroad Protective Liability insurance stating The Burlington Northern and Santa Fe Railway Company is the Named Insured covering all of the liability assumed by the Contractor under the provisions of this Agreement with coverage of at least $2,000,000 per occurrence and $6,000,000 in the aggregate. Coverage shall be issued on a standard ISO form CG 00 35 01 96 and endorsed to include ISO form CG 28 31 10 93 and the Limited Seepage and Pollution Endorsement (see attached copy).

The average train traffic per 24-hour period on this route is **75** freight trains at a timetable speed of **55** MPH and **10** passenger trains at a timetable speed of **60** MPH and **0** switch engine movements.

All insurance shall be placed with insurance companies licensed to do business in the States in which the work is to be performed, and with a current Best's Insurance Guide Rating of A- and Class VII, or better.

In all cases except Workers' Compensation and Railroad Protective Liability coverage the certificate must specifically state that THE BURLINGTON NORTHERN AND SANTA FE RAILWAY COMPANY IS AN ADDITIONAL INSURED.

Any coverage afforded Railway, the Certificate Holder, as an Additional Insured shall apply as primary and not excess to any coverage issued in the name of Railway.

(b) Such insurance shall be approved by the Railway before any work is performed on Railway's Property and shall be carried until all work required to be performed on or adjacent to Railway's Property under the terms of the contract is satisfactorily completed as determined by State, and thereafter until all tools, equipment and materials not

belonging to the Railway, have been removed from Railway's Property and Railway Property is left in a clean and presentable condition. The insurance herein required shall be obtained by the Contractor and Contractor shall furnish Railway with an original certificate of insurance, signed by the insurance company, or its authorized representative, evidencing the issuance of insurance coverage as prescribed in (a) 1, 2 and 3 above, plus the original Railroad Protective Liability insurance policy to:

Attention: Insurance Approvals
Engineering Services
The Burlington Northern and Santa Fe Railway Company
4515 Kansas Avenue
Kansas City, Kansas 66106

The certificate of insurance shall guarantee that the policies will not be amended, altered, modified or canceled insofar as the coverage contemplated hereunder is concerned, without at least thirty (30) days notice mailed by registered mail to Railway.

Full compensation for all premiums which the Contractor is required to pay on all the insurance described hereinafter shall be considered as included in the prices paid for the various items of work to be performed under the Contract, and no additional allowance will be made therefor or for additional premiums which may be required by extensions of the policies of insurance.

It is further distinctly understood and agreed by the Contractor that its liability to the Railway herein under Section 1 will not in any way be limited to or affected by the amount of insurance obtained and carried by the Contractor in connection with said Contract.

**The Railway file reference number and location information shown at the top of this Agreement, must appear on any original insurance policies or certificates of insurance sent to Railway by the Contractor.**

**Section 3.** The Contractor will observe and comply with all the provisions, obligations and limitations to be observed by Contractor which are contained in the subdivision of the specifications of said Contract, entitled SECTION 13.1, CONTRACTOR REQUIREMENTS, and shall include, 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 4.** Contractor shall be responsible to Railway, including its affiliated railway companies, and its tenants for all damages for any unscheduled delay to a freight or passenger train that 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 and train service employees 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 Railway Work. Railway agrees that it will not perform any act to unnecessarily cause train delay.

For loss of use, Contractor will be billed per freight train hour at an average rate of ($385.33 in 1997 with annual adjustments) per hour per train as determined from Railway's record. Any disruption to train traffic may cause delays to multiple trains at the same time for the same period.

In addition to the above damages, passenger, U.S. mail trains and certain other grain, intermodal, coal and freight trains operate under incentive/penalty contracts between Railway and its customer. Under these arrangements, if Railway does not meet its contract service commitment, Railway may suffer loss of performance or incentive pay or be subject to a penalty payment. Contractor shall be 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 subcontractors.

As example, a train arrives 30 minutes after its contract service commitments and Railway is assessed damages per terms of the contract. Either Contractor, and/or subcontractors, caused a 29 minute delay to the train and therefore are not responsible for any train performance and incentive penalties or other contractual economic losses actually incurred by Railway.

As example, a train arrives 30 minutes after its contract service commitments and Railway is assessed damages per terms of the contract. Either Contractor, and/or subcontractors, caused a 31 minute delay to the train and therefore are 100% responsible for any train performance and incentive penalties or other contractual economic losses actually incurred by Railway.

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 maximum extent consistent with Railway confidentiality obligations. Damages for train delay for certain trains could be as high as $50,000.00 per incident.

**Contractor and subcontractors shall 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 undersigned two original copies of this letter, which, upon execution by Railway, shall constitute an Agreement between us.**

Yours truly,

(Contractor)

By

(Title)

Address

City:_____State:___Zip:_____

**The Burlington Northern and Santa Fe Railway Company**

By

Director of Public Projects
Lyn Hartley

Accepted this day of , 2003

**LIMITED SEEPAGE, POLLUTION AND CONTAMINATION COVERAGE ENDORSEMENT WORDING**

In consideration of the premium charged it is understood and agreed that Exclusion f. of Coverage A. of this Policy shall not apply to the liability of the Insured resulting from seepage and/or pollution and/or contamination caused solely by:

a) unintended fire, lightning or explosion: or

b) a collision or overturning of a road vehicle: or

c) a collision or overturning or derailment of a train.

Notwithstanding the foregoing it is agreed that the coverage provided by this Endorsement shall not apply to:

1. loss of, damage to or loss of use of property directly or indirectly resulting from sub-surface operations of the Insured, and/or removal of, loss of or damage to sub-surface oil, gas or any other substance;

2. any site or location used in whole or in part for the handling, processing, treatment, storage, disposal or dumping of any waste materials or substances;

3. the cost of evaluating and/or monitoring and/or controlling seeping and/or polluting and/or contaminating substances;

4. the cost of removing and/or nullifying and/or cleaning up seeping and/or polluting and/or contaminating substances on property at any time owned and/or leased and/or rented by the insured and/or under the control of the Insured.

Notwithstanding the foregoing, Item 1 does not apply to tunnels.

## SECTION 13. RAILROAD RELATIONS AND INSURANCE REQUIREMENTS PART 2 – CHICAGO AVENUE OVERHEAD

### 13-1.01 GENERAL

The term "Railroad" shall mean the Union Pacific Railroad Company.

It is expected that the Railroad will cooperate with the Contractor to the end that the work may be handled in an efficient manner. However, except for the additional compensation provided for hereinafter for delays in completion of specific unit of work to be performed by the Railroad, and except as provided in Public Contracts Code Section 7102, the Contractor shall have no claim for damages, extension of time, or extra compensation in the event his work is held up by work performed by the Railroad.

The Contractor must understand the Contractor's right to enter Railroad's property is subject to the absolute right of Railroad to cause the Contractor's work on Railroad's property to cease if, in the opinion of Railroad, Contractor's activities create a hazard to Railroad's property, employees, and operations.

The Contractor shall sign and submit to the Railroad the Contractor’s Endorsement, in the form attached hereto.

### 13-1.02 RAILROAD REQUIREMENTS

The Contractor shall notify Mr. Freddy Cheung, Manager Industry and Public Projects, 19100 Slover Avenue, Bloomington, CA 92316, Telephone (909) 879-6288, and the Engineer, in writing, at least 10 working days before performing any work on, or adjacent to the property or tracks of the Railroad.

The Contractor shall cooperate with the Railroad where work is over or under the tracks, or within the limits of Railroad property, to expedite the work and avoid interference with the operation of railroad equipment.

The Contractor shall comply with the rules and regulations of Railroad or the instructions of its representatives in relation to protecting the tracks and property of Railroad and the traffic moving on such tracks, as well as the wires, signals and other property of Railroad, its tenants or licensees, at and in the vicinity of the work during the period of construction. The responsibility of the Contractor for safe conduct and adequate policing and supervision of its work at the job site shall not be lessened or otherwise affected by the presence at the work site of Railroad representatives, or by the Contractor's compliance with any requests or recommendations made by Railroad representatives.

The Contractor shall perform work to not endanger or interfere with the safe operation of the tracks and property of Railroad and traffic moving on such tracks, as well as wires, signals and other property of Railroad, its tenants or licensees, at or in the vicinity of the work.

The Contractor shall take protective measures to keep railroad facilities, including track ballast, free of sand or debris resulting from his operations. Damage to railroad facilities resulting from Contractor's operations will be repaired or replaced by Railroad and the cost of such repairs or replacement shall be deducted from the Contractor's progress and final pay estimates.

The Contractor shall contact the Railroad's "Call Before You Dig" at least 48 hours prior to commencing work, at 1-800-336-9193 (a 24 hour number) to determine location of fiber optics. If a telecommunications system is buried anywhere on or near railroad property, the Contractor will coordinate with the Railroad and the Telecommunication Company(ies) to arrange for relocation or other protection of the system prior to beginning any work on or near Railroad Property.

The Contractor shall not pile or store any materials nor park any equipment closer than 7.62-meter (25'-0") to the centerline of the nearest track, unless directed by Railroad's representative.

The Contractor shall also abide by the following temporary clearances during the course of construction:

3.66-meter (12'-0") horizontally from centerline of track
6.40-meter (21'-0") vertically above top of rail

The temporary vertical construction clearance above provided will not be permitted until authorized by the Public Utilities Commission. It is anticipated that authorization will be received not later than 15 days after the approval of the contract by the Attorney General. In the event authorization is not received by the time specified, and, if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of authorization not being received by the said time, SANBAG will compensate the Contractor for such delay to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications and not otherwise.

Walkways with railing shall be constructed by Contractor over open excavation areas when in close proximity of tracks, and railings shall not be closer than 2.60-meter (8'-6") horizontally from centerline of the nearest track, if tangent, or 2.90-meter (9'-6") if curved.

Infringement on the above temporary construction clearances by the Contractor's operations shall be submitted to the Railroad by the Engineer, and shall not be undertaken until approved by the Railroad, and until the Engineer has obtained any necessary authorization from any governmental body or bodies having jurisdiction thereover. No extension of time or extra compensation will be allowed in the event the Contractor's work is delayed pending Railroad approval and governmental authorization.

When the temporary vertical clearance is less than 6.86-meter (22'-6") above top of rail, Railroad shall have the option of installing tell-tales or other protective devices Railroad deems necessary for protection of Railroad trainmen or rail traffic.

Four sets of plans, in 279mm x 432mm (11" x 17") format, and two sets of calculations showing details of construction affecting Railroad's tracks and property not included in the contract plans, including but not limited to shoring and falsework, shall be submitted to the Engineer for review prior to submittal to Railroad for final approval. Falsework shall comply with railroad guidelines. Demolition of existing structures shall comply with Railroad guidelines. Shoring shall be designed in accordance with Railroad's shoring requirement of drawing No. 106613 and guidelines for shoring and falsework, latest edition, issued by Railroad's Office of Chief Engineer. Shoring and faleswork plans and calculations shall be prepared and signed by a professional civil engineer registered in the State of California. This work shall not be undertaken until such time as the Railroad has given such approval. Review by Railroad may take up to 6 weeks after receipt of all necessary information.

The Contractor shall notify the Engineer in writing, at least 25 calendar days but not more than 40 days in advance of the starting date of installing temporary work with less than permanent clearance at each structure site. The Contractor shall not be permitted to proceed with work across railroad tracks until this requirement has been met. No extension of time or extra compensation will be allowed if the Contractor's work is delayed due to failure to comply with the requirements in this paragraph.

Private crossings at grade over tracks of Railroad for the purpose of hauling earth, rock, paving or other materials will not be permitted. If the Contractor, for the purpose of constructing highway-railway grade separation structures, including construction ramps thereto, desires to move equipment or materials across Railroad's tracks, the Contractor shall first obtain permission from Railroad. Should Railroad approve the crossing, the Contractor shall execute Railroad's form of Contractor's Road Crossing Agreement. By this agreement, the Contractor shall bear the cost of the crossing surface, with warning devices that might be required. The Contractor shall furnish its own employees as flagmen to control movements of vehicles on the private roadway and shall prevent the use of such roadway by unauthorized persons and vehicles.

Blasting will be permitted only when approved by the Railroad.

The Contractor shall, upon completion of the work covered by this contract to be performed by the Contractor upon the premises or over or beneath the tracks of Railroad, promptly remove from the premises of Railroad, Contractor's tools, implements and other materials, whether brought upon said premises by said Contractor or any subcontractor, employee or agent of said Contractor, and cause said premises to be left in a clean and presentable condition.

**Under-track pipeline installations shall be constructed in accordance with Railroad's current standards which may be obtained from Railroad. The general guidelines are as follows:**

Edges of jacking or boring pit excavations shall be a minimum of 6.10-meter (20 feet) from the centerline of the nearest track.

If the pipe to be installed under the track is 100 mm (4 inches) in diameter or less, the top of the pipe shall be at least 1.067-meter (42 inches) below base of rail.

If the pipe diameter is greater than 100 mm (4 inches) in diameter, it shall be encased and the top of the steel pipe casing shall be at least 1.60-meter (66 inches) below base of rail.

Installation of pipe or conduit under Railroad's tracks shall be done by dry bore and jack method.

Hydraulic jacking or boring will not be permitted.

## 13-1.03 PROTECTION OF RAILROAD FACILITIES

Upon advance notification of not less than 10 working days by the Contractor, Railroad representatives, conductors, flagmen or watchmen will be provided by Railroad to protect its facilities, property and movements of its trains or engines. Notice shall be made to Freddy Cheung of Railroad at (909) 879-6288. At the time of notification, the Contractor shall provide Railroad with a schedule of dates that flagging services will be needed, as well as times, if outside normal working hours. Subsequent deviation from the schedule shall require 10 working days advance notice from the first affected date. The Railroad will furnish such personnel or other protective devices:

(a) When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from centerline of any track on which trains may operate, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track. However, no flagging will be required for work being performed at grade underneath the Muscoy Underpass.

(b) For any excavation below elevation of track subgrade if, in the opinion of Railroad's representative, track or other Railroad facilities may be subject to settlement or movement.

(c) During any clearing, grubbing, grading or blasting in proximity to Railroad which, in the opinion of Railroad's representative, may endanger Railroad facilities or operations.

(d) During any of Contractor's operations when, in the opinion of Railroad's representatives, Railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines or pipe lines, may be endangered.

The cost of flagging and inspection provided by Railroad during the period of constructing that portion of the project located on or near Railroad property, as deemed necessary for the protection of Railroad's facilities and trains, will be borne by the SANBAG for a period of 190 working days beginning on the date work commences on or near property of Railroad. The Contractor shall pay to the SANBAG liquidated damages in the sum of $500 per day for each day in excess of the above 190 working days the Contractor works on or near Railroad property, and which requires flagging protection of Railroad's facilities and trains.

### 13-1.04 WORK BY RAILROAD

**The following work by Railroad will be performed by Railroad forces and is not a part of the work under this contract.**

(a) The Railroad will perform preliminary engineering inspection and flagging as specified in Section 13-1.03, "Protection of Railroad Facilities," of these special provisions.

### 13-1.05 DELAYS DUE TO WORK BY RAILROAD

No delay due to work by the Railroad is anticipated.

If delays due to work by the Railroad occur, and the Contractor sustains loss which, in the opinion of the Engineer, could not have been avoided by the judicious handling of forces, equipment and plant, the amount of said loss shall be determined as provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

If a delay due to work by Railroad occurs, an extension of time determined pursuant to the provisions in Section 8-1.07, "Liquidated Damages," of the Standard Specifications will be granted.

### 13-1.06 LEGAL RELATIONS

The provisions of Section 13-1, "Relations with Railroad Company," and the provisions of Section 13-2, "Railroad Protective Insurance," of these special provisions shall inure directly to the benefit of Railroad.

## 13-2 RAILROAD PROTECTIVE INSURANCE

In addition to any other form of insurance or bonds required under the terms of the contract and specifications, the Contractor will be required to carry insurance of the kinds and in the amounts hereinafter specified.

Such insurance shall be approved by the Railroad before any work is performed on Railroad's property and shall be carried until all work required to be performed on or adjacent to the Railroad's property under the terms of the contract is satisfactorily completed as determined by the Engineer, and thereafter until all tools, equipment and materials have been removed from Railroad's property and such property is left in a clean and presentable condition.

Full compensation for all premiums which the Contractor is required to pay on all the insurance described hereinafter shall be considered as included in the prices paid for the various items of work to be performed under the contract, and no additional allowance will be made therefor or for additional premiums which may be required by extensions of the policies of insurance.

The following insurance coverage will be required:

(a) **General Liability** insurance providing bodily injury including death, personal injury and property damage coverage with a combined single limit of at least $2,000,000 each occurrence or claim and an aggregate limit of at least $4,000,000. This insurance shall contain broad form contractual liability with a separate general aggregate for the project (ISO Form CG 25 03 or equivalent). Exclusions for explosion, collapse and underground hazard shall be removed. Coverage purchased on a claims made form shall provide for at least a two (2) year extended reporting or discovery period if (a) the coverage changes from a claims made form to an occurrence form, (b) there is a lapse/cancellation of coverage, or (c) the succeeding claims made policy retroactive date is different for the expiring policy.

(b) **Automobile Liability** insurance providing bodily injury and property damage coverage with a combined single limit of at least $2,000,000 each occurrence or claim. This insurance shall cover all motor vehicles including hired and non-owned, and mobile equipment if excluded from coverage under the general public liability insurance.

(c) **Workers' Compensation** insurance covering Contractor's statutory liability under the workers' compensation laws of the state(s) affected by this Agreement, and Employers' Liability. If such insurance will not cover the liability of Contractor in states that require participation in state workers' compensation fund, Contractor shall comply with the laws of such states. If Contractor is self-insured, evidence of state approval must be provided.

(d) **Railroad Protective Liability** insurance naming the Railroad as the insured with a combined single limit of $2,000,000 per occurrence with a $6,000,000 aggregate. The policy shall be broad form coverage for "Physical Damage to Property" (ISO Form CG 00 35 or equivalent) and include pollution arising out of fuels and lubricants brought to the job site (ISO Form CG 28 31 or equivalent). A binder of insurance for Railroad Protective Liability must be submitted to the Railroad and the original policy or a certified duplicate original policy must be forwarded to the Railroad when available.

Contractor and its insurers shall endorse the required insurance policy(ies) to waive their right of subrogation against Railroad. Contractor and its insurers also waive their right of subrogation against Railroad for loss of its owned or leased property or property under its care, custody and control. Contractor's insurance shall be primary with respect to any insurance carried by Railroad. The policy(ies) required under (a) and (b) above shall provide severability of interests and shall name Railroad as an additional insured.

Prior to commencing the Work, Contractor shall furnish to Railroad certificate(s) of insurance evidencing the required coverage and endorsements and upon request, a certified duplicate original of any required policy. The certificate(s) shall contain a provision that obligates the insurance company(ies) issuing such policy(ies) to notify Railroad in writing of any material alteration including any change in the retroactive date in any "claims-made" policies or substantial reduction of aggregate limits, if such limits apply, or any cancellation at least thirty (30) days prior thereto.

The insurance policy(ies) shall be written by a reputable insurance company(ies) acceptable to Railroad or with a current Best's Insurance Guide Rating of B and Class VII or better, and authorized to do business in the state(s) in which the Work is located.

Contractor warrants that this Agreement has been thoroughly reviewed by Contractor's insurance agent(s)/broker(s), who has been instructed by Contractor to procure the insurance coverage required by this Agreement.

If Contractor fails to procure and maintain insurance as required, Railroad may elect to do so at the cost of Contractor.

The fact that insurance is obtained by Contractor shall 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 shall not be limited by the amount of the required insurance coverage.

**CONTRACTOR'S ENDORSEMENT**

A. As a condition to entering upon Railroad's right-of-way to perform Work pursuant to this agreement, Licensee's contractor, _____ whose address is _____ (hereinafter "Contractor"), agrees to comply with and be bound by all the terms and provisions of this agreement relating to the Work to be performed and the insurance requirements set forth in Section 13.2 of the Contract Special Provisions. Contractor further acknowledges and agrees that the reference to Cal. Gov. Code §14662.5 in Sections 5.b) and 8.b) of Exhibit A of the Caltrans Right of Entry Agreement does not apply to Contractor and in no way limits the indemnities set forth in those provisions, to which Contractor agrees to be bound.

B. Before the Contractor commences any Work, the Contractor will provide the Railroad with (i) a binder of insurance for the Railroad Protective Liability Insurance described in paragraph (d) of Section 13.2 of the Contract Special Provisions, hereto attached, and the original policy, or a certified duplicate original policy when available, and (ii) a certificate issued by its insurance carrier providing the other insurance coverage required pursuant to Section 13.2 of the Contract Special Provisions in a policy or policies which contains the following type endorsement:

UNION PACIFIC RAILROAD COMPANY is named as an additional insured with respect to all liabilities arising out of Insured's performance of Work on behalf of the Licensee.

C. All insurance correspondence, binders or originals shall be directed to:

Folder No. _____
Union Pacific Railroad Company
Attn: Director - Contracts
1416 Dodge Street, WP001
Omaha, Nebraska 68179

D. Please note that fiber optic cable may be buried on Railroad's property. **Prior to commencing any work, Contractor agrees to contact Railroad's Telecommunications Operation Center at 1-800-336-9193 to determine if any fiber optic cable is located on Railroad's property on or near the location where the work is to be performed.** If there is, Contractor must comply with the terms and conditions of Section 5 of Exhibit A before commencing any work on Railroad's property.

E. **Contractor agrees to also contact Railroad's Manager-Track Maintenance at** _____ at least 48 hours prior to working on Railroad's property in order for Railroad to coordinate the Contractor's work with Railroad's operations and to make arrangements for flagging protection (if applicable).

_____
CONTRACTOR (print name on above line)

By: _____

(sign on above line)

# SECTION 13. RAILROAD RELATIONS AND INSURANCE REQUIREMENTS
# PART 3 – BOX SPRINGS OVERHEAD

## 13.1. General Provisions

A. Contractor shall cooperate with the Riverside County Transportation Commission ("RCTC") where work is over or under on or adjacent to property of RCTC, railroad tracks and property known as the San Jacinto subdivision, and/or rights-of-way (collectively referred to as "RCTC's Property"), during the construction, installation, maintenance, and repair of the Box Springs Overhead, PUC No. 2X-6.42-A, DOT No. 027314A.

B. Contractor shall execute and deliver to RCTC duplicate copies of the Exhibit "B-1" Agreement, in the form attached hereto, obligating Contractor to provide and maintain in full force and effect the insurance called for under Section 2 of said Exhibit "B-1".

C. Contractor shall plan, schedule and conduct all work activities so as not to interfere with the movement of any trains and activities of RCTC on RCTC's Property.

D. Contractor's right to enter RCTC's Property is subject to the absolute right of RCTC to cause Contractor's work on RCTC's Property to cease if, in the opinion of RCTC, Contractor's activities create a hazard to RCTC's Property, employees, and/or operations.

E. Contractor is responsible for determining and complying with all Federal, State and Local Governmental laws and regulations, including, but not limited to, environmental, health and safety. Contractor shall be responsible for and indemnify and save RCTC harmless from all fines or penalties imposed or assessed by Federal, State and Local Governmental Agencies against RCTC which arise out of Contractor's work under the Agreement.

F. Contractor shall notify RCTC at the following address: 3560 University Avenue, Suite 100, Riverside, CA, and the following phone number: (909) 787-7984, at least thirty (30) working days before commencing any work on RCTC's Property.

G. For any falsework above any tracks or any excavations located within twenty-five (25) feet of the nearest track or intersecting a slope from the plane of the top of rail on a 1 horizontal to 1 vertical slope beginning at eleven (11) feet from centerline of the nearest track, whichever is greater, both measured perpendicular to center line of track, Contractor shall furnish RCTC five (5) sets of working drawings showing details of construction affecting RCTC's Property. The working drawings shall include the proposed method of installation and removal of falsework, shoring or cribbing, not included in the contract plans, and two (2) sets of structural calculations of any falsework, shoring or cribbing. All calculations shall take into consideration railway surcharge loading and shall 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 shall be stamped by a registered professional engineer licensed to practice in California. Contractor shall not begin work until notified by RCTC that plans have been approved. Contractor shall be required to use lifting devices such as cranes and/or winches to place or to remove any falsework over RCTC's tracks. In no case shall Contractor be relieved of responsibility for results obtained by the implementation of said approved plans.

H. Subject to the movement of trains, RCTC will cooperate with Contractor such that the work may be handled and performed in an efficient manner.

## 13.2. RCTC Requirements

A. Contractor shall 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.

B. Contractor shall notify RCTC, as required herein, and provide blasting plans to RCTC for review seven (7) calendar days prior to conducting any blasting operations adjacent to or on RCTC's Property.

C. Contractor shall abide by the following clearances during construction:

- 25'-0" Horizontally from centerline of nearest track.
- 22'-6" Vertically above top of rail (Temporary Falsework Clearance may be reduced to 21'-6" subject to RCTC and Public Utilities Commission approval)
- 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

D. The details of construction affecting RCTC's Property not included in the contract plans shall be submitted to RCTC for approval before work is undertaken and this work shall not be undertaken until approved by RCTC.

E. At other than public road crossings, Contractor shall not move any equipment or materials across RCTC's tracks until permission has been obtained from RCTC. The Contractor shall obtain a "Temporary Private Crossing Agreement" from RCTC prior to moving his equipment or materials across RCTCs tracks. The temporary crossing shall be gated and locked at all times when not required for use by Contractor. The temporary crossing for use of Contractor shall be at the expense of Contractor.

F. Discharge, release or spill on RCTC's Property of any hazardous substances in excess of a reportable quantity or any hazardous waste is prohibited and Contractor shall immediately notify RCTC of any discharge, release or spills. Contractor shall not allow RCTC's Property to become a treatment, storage facility as those terms are defined in the applicable federal and state law.

G. Upon completion of the work covered by the Agreement, Contractor shall promptly remove from RCTC'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 shall cause RCTC's Property to be left in a condition acceptable to RCTC.

**13.3. Contractor Safety Action Plan**

Contractor shall develop and implement a safety action plan which shall be made available to RCTC prior to commencement of any work on RCTC's Property. During performance of work, Contractor shall audit it's compliance with the Safety Action Plan. Contractor shall designate an on-site representative who shall serve as the contact person for RCTC and who shall maintain a copy of the safety action plan and subsequent audits at the job site for inspection and review by RCTC at any time during performance of the work.

**13.4. Protection of RCTC Facilities and Activities Performed on RCTC's Property**

A. The Contractor shall give a minimum of 15 working days notice to RCTC and to the Burlington Northern And Santa Fe Railway Company ("BNSF"), in advance of when flagging services will be required. The BNSF contact for flagging is Augie Morales, Roadmaster, at (909) 386-4060.

B. BNSF flagger and protective services and devices will be required and furnished when Contractor's work activities are located over or under of and within twenty-five (25) feet measured horizontally from centerline of the nearest track and when cranes or similar equipment positioned outside of 25-foot horizontally from track centerline that could foul the track in the event of tip over or other catastrophic occurrence, but not limited thereto for the following conditions:

1. When in the opinion of the BNSF's Representative it is necessary to safeguard RCTC and BNSF Property, employees, trains, engines and facilities.

2. When any excavation is performed below the bottom of tie elevation, if, in the opinion of BNSF's representative, track or other RCTC facilities may be subject to movement or settlement.

3. When work in any way interferes with the safe operation of trains at timetable speeds.

4. When any hazard is presented to RCTC track, communications, signal, electrical, or other facilities either due to persons, material, equipment or blasting in the vicinity.

5. Special permission must be obtained from BNSF before moving heavy or cumbersome objects or equipment which might result in making the track impassable.

C. Flagging services will be performed by qualified Railway flaggers.

1. Flagging crew generally consists of one employee. However, additional personnel may be required to protect RCTC and BNSF Property and operations, if deemed necessary by BNSF's Representative.

2. Each time a flagger is called, the minimum period for billing shall be the eight (8) hour basic day.

3. The cost of flagger services provided by BNSF, when deemed necessary by the BNSF's representative, will be borne by the State for a period of 190 working days beginning on the date work commences on or near RCTC's property. The Contractor shall pay to the State liquidated damages in the sum of $500 per day for each day in excess of the above 190 working days the Contractor works on or near RCTC property, and which requires flagging protection of RCTC's and BNSF's facilities and trains.

4. The average train traffic on this route is 2 freight trains per 24-hour period at a timetable speed of 20 MPH and no passenger trains.

**13.5. Contractor General Safety Requirements**

(a) 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 shall be in compliance with FRA Roadway Worker Protection Regulations.

(b) Before beginning any task on RCTC's Property, a thorough job safety briefing shall 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 BNSF's flagger 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 RCTC track(s).

(c) Workers shall not work nearer than 25 feet to the centerline of any track without proper flag/work protection, unless the track is protected by track bulletin and work has been authorized by RCTC. If flag/work protection is provided, every contractor employee must know: (1) who the flagger is, and how to contact the flagger, (2) limits of the flag/work protection, (3) the method of communication to stop and resume work, and (4) entry into flag/work limits when designated. Men or equipment entering flag/work limits that were not previously job briefed, must notify the flagger immediately, and be given a job briefing if working at less than 25 feet from center line of track.

(d) When Contractor's employees are required to work on RCTC's Property after normal working hours or on weekends, RCTC must be notified. A minimum of two employees shall be present during such times.

(e) Any Contractor employee, its subcontractors employee, agents or invitees under suspicion of being under the influence of drugs or alcohol, or in the possession of same, will be removed from RCTC's Property and subsequently released to the custody of a representative of Contractor management. Future access to RCTC's Property by that employee will be denied.

(f) Any damage to RCTC's Property, or any hazard noticed on passing trains, shall be reported immediately to RCTC. Any vehicle or machine which may come in contact with a track, signal equipment, or structure (bridge) that could result in a train derailment and shall be reported by the quickest means possible to RCTC.

(g) All persons are prohibited from having a pocket knife with blade in excess of three (3) inches, firearms or other deadly weapons in their possession while working on RCTC's Property.

(h) All personnel protective equipment used on RCTC's Property shall meet applicable OSHA and ANSI specifications.

(i) Contractor shall not pile or store any materials, machinery or equipment closer than 25'-0" to the center line of the nearest RCTC track. At highway/rail at-grade crossings materials, machinery or equipment shall not be stored or left temporarily which interferes with the sight distances of motorists approaching the crossing. Prior to beginning work, Contractor will establish any storage area with concurrence of RCTC.

(j) 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 RCTC's Property must be left inoperable and secured against movement.

(k) Workers must not create and leave any conditions at the work site that would interfere with water drainage. Any work performed over water shall meet all Federal, State and Local regulations.

(l) 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 shall 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, 750 to 1000 KV - 45 feet and if capacity of the line is not known, minimum clearance of 45 feet must be maintained. A person shall 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.

**13.6. Excavation**

(a) Before excavating, it must be ascertained by Contractor if there are any underground pipe lines, electric wires, or cables, including fiber optic cable systems that either cross or run parallel with the track which are located within the work area. Excavating on RCTC's Property could result in damage to buried cables resulting in delay to traffic, including disruption of service to users resulting in business interruptions involving loss of revenue and profits. Before any excavation commences, Contractor must contact RCTC. All underground and overhead wires must be considered HIGH VOLTAGE and dangerous until verified with the company having ownership of the line. It is also 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.

(b) Contractor must cease all work and RCTC must be notified immediately before continuing excavation in the area if obstructions are encountered that do not appear on drawings. If the obstruction is a utility, and the owner of the utility can be identified, then the owner should also be notified immediately. If there is any doubt about the location of underground cables or lines of any kind, no work will be performed until the exact location has been determined. There will be no exceptions to these instructions.

(c) All excavations shall be conducted in compliance with applicable OSHA regulations and regardless of depth shall be shored where there is any danger to tracks, structures or personnel.

(d) Any excavations, holes or trenches on RCTC'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 RCTC 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.

**13.7. Hazardous Waste, Substances and Material Reporting**

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 RCTC's Property, in or near any surface water, swamp, wetlands or waterways, while performing any work under this Agreement, Contractor shall immediately: (a) notify RCTC 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.

**13.8. Personal Injury Reporting**

RCTC 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 RCTC's Property must be reported immediately (by phone mail if unable to contact in person) to RCTC no later than the close of shift on the date of the injury.

**EXHIBIT "B-1"**

**Agreement between the**
**RIVERSIDE COUNTY TRANSPORTATION COMMISSION**
**and the**
**CONTRACTOR**

Riverside County Transportation Commission
3560 University Avenue, Suite 100
Riverside, CA 92501
Attention:

Ladies and Gentlemen:

The undersigned, hereinafter referred to as Contractor, has entered into a Contract dated _____, 20__, with the California Department of Transportation ("State") for performance of certain work in connection with the construction, installation, maintenance and repair of the Box Springs Overhead, P.U.C. No. 2X-6.42-A. In the performance of such work, the Contractor will necessarily be required to conduct operations within property within the Riverside County Transportation Commission ("RCTC"), railroad tracks, property known as the San Jacinto subdivision, and/or rights of way (collectively referred to as "RCTC's Property").

The Contract provides that no work shall be commenced within RCTC's Property until the Contractor employed in connection with said work for State shall have executed and delivered to RCTC an Agreement, in the form hereof, and shall have provided insurance of the coverage and limits specified in said Contract and Section 2 of this Agreement. If this Agreement is executed by other than the Owner, General Partner, President or Vice President of Contractor, evidence is furnished to you herewith certifying that the signatory is empowered to execute this Agreement for the Contractor.

Accordingly, as one of the inducements to and as part of the consideration for RCTC granting permission to Contractor to enter upon RCTC's Property, Contractor, effective on the date of said Contract, has agreed and does hereby agree with RCTC as follows:

**1. RELEASE OF LIABILITY AND INDEMNITY**

Contractor agrees to release RCTC from any claims arising from the performance of this Agreement which Contractor or any of its employees, subcontractors, agents or invitees could otherwise assert against RCTC, regardless of the negligence of RCTC, except to the extent that such claims are proximately caused by the intentional misconduct or gross negligence of RCTC.

Contractor shall indemnify and hold harmless RCTC for all judgments, awards, claims, demands, and expenses (including attorneys' fees), for injury or death to all persons, including RCTC'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 failure to perform any obligation hereunder. The liability assumed by the Contractor shall 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 RCTC, its agents, servants, employees or otherwise, except to the extent that such claims are proximately caused by the sole negligence or sole wilful misconduct of RCTC.

Contractor further agrees, at its expense, in the name and on behalf of RCTC, that it shall adjust and settle all claims made against RCTC, and shall, at RCTCs discretion, appear and defend any suits or actions of law or in equity brought against RCTC 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 RCTC is liable or is alleged to be liable. RCTC shall give notice to Contractor, in writing, of the receipt or pendency of such claims and thereupon Contractor shall proceed to adjust and handle to a conclusion such claims, and in the event of a suit being brought against RCTC, RCTC may forward summons and complaint or other process in connection therewith to Contractor, and Contractor, at RCTC's discretion, shall defend, adjust, or settle such suits and protect, indemnify, and save harmless RCTC 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.

It is mutually understood and agreed that the assumption of liabilities and indemnification provided for in this Agreement shall survive any termination of this Agreement.

**2. INSURANCE**

**Contractor shall obtain, and shall require any subcontractor entering RCTC's Property to obtain insurance of the types and in the amounts described below and satisfactory to Licensor.**

A. Commercial General Liability Insurance. Contractor and its subcontractors shall maintain occurrence version commercial general liability insurance or equivalent form with a combined single limit of not less then $5,000,000 per occurrence. If such insurance contains a general aggregate limit, it shall apply separately to this Agreement or be no less than two times the occurrence limit. Such insurance shall:

1. Include RCTC, The Burlington Northern And Santa Fe Railway Company, and the Southern California Regional Rail Authority and their officials, officers, employees, agents, and consultants as insureds with respect to the construction and maintenance of the Overcrossing and shall contain no special limitations on the scope of coverage or the protection afforded to these insureds;

2. Be primary with respect to any insurance or self insurance programs covering RCTC, its officials, officers, employees, agents and consultants; and

3. Contain standard separation of insured provisions.

B. Railroad Protective Liability. Contractor shall, in connection with any construction activities undertaken with respect to the Overcrossing either directly by Contractor or by its subcontractors, acquire and keep in force during the period of such construction of railroad protective liability insurances with a combined single limit of $2,000,000 and a general aggregate of $6,000,000.

C. Workers' Compensation Insurance. Contractor shall maintain workers' compensation insurance with statutory limits and employers' liability insurance with limits of not less than $1,000,000 each accident.

D. Certificates of Insurance. Contractor shall, prior to commencement of the installation of the Overcrossing, furnish RCTC with properly executed certificates of insurance and, if requested by RCTC, certified copies of endorsements and policies, which clearly evidence all insurance required under this Agreement and provide that such insurance shall be not canceled, allowed to expire or be materially reduced in coverage, except on 30 days' prior written notice to the Licensor. The certificate shall also evidence the insurer's knowledge of the proximity of Contractor's operation to active railroad tracks. RCTC shall have the sole discretion to determine whether the certificates and endorsements presented comply with the provisions of this Agreement.

E. Coverage Maintenance. Contractor shall replace certificates, policies and endorsements for any insurance expiring prior to the termination of this Agreement. Unless otherwise provided for in this Agreement, Contractor shall maintain such insurance from the execution of this Agreement until the Overcrossing is removed and RCTC's Property fully restored, except as otherwise provided in this Agreement.

F. Licensed Insurer. Contractor shall place such insurance with insurers having A.M. Best Company ratings of no less than A:VIII and licensed to do business in California, unless otherwise approved, in writing, by RCTC.

**3. CONTRACTOR REQUIREMENTS**

Contractor will observe and comply with all the provisions, obligations and limitations to be observed by Contractor which are contained in the subdivision of the specifications of said Contract, entitled Exhibit "B", Contractor Requirements, and shall include, but not be limited to, payment of all costs incurred for any damages to RCTC 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.

**4. DELAYS**

Contractor shall be responsible to RCTC for all damages for any unscheduled delay to a freight or passenger train that affects RCTC's ability to fully utilize its equipment and to meet customer service and contract obligations. Contractor and subcontractors shall 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 undersigned two original copies of this letter. This Agreement shall become effective upon execution by RCTC.

| CONTRACTOR | RIVERSIDE COUNTY TRANSPORTATION COMMISSION |
|---|---|
| By: | By: |
| Title: | Title: |
| Dated: | Dated: |

# SECTION 14 FEDERAL REQUIREMENTS FOR FEDERAL-AID CONSTRUCTION PROJECTS

**GENERAL**.—The work herein proposed will be financed in whole or in part with Federal funds, and therefore all of the statutes, rules and regulations promulgated by the Federal Government and applicable to work financed in whole or in part with Federal funds will apply to such work. The "Required Contract Provisions, Federal-Aid Construction Contracts, "Form FHWA 1273, are included in this Section 14. Whenever in said required contract provisions references are made to "SHA contracting officer", "SHA resident engineer", or "authorized representative of the SHA", such references shall be construed to mean "Engineer" as defined in Section 1-1.18 of the Standard Specifications.

**PERFORMANCE OF PREVIOUS CONTRACT**.—In addition to the provisions in Section II, "Nondiscrimination," and Section VII, "Subletting or Assigning the Contract," of the required contract provisions, the Contractor shall comply with the following:

The bidder shall execute the CERTIFICATION WITH REGARD TO THE PERFORMANCE OF PREVIOUS CONTRACTS OR SUBCONTRACTS SUBJECT TO THE EQUAL OPPORTUNITY CLAUSE AND THE FILING OF REQUIRED REPORTS located in the proposal. No request for subletting or assigning any portion of the contract in excess of $10,000 will be considered under the provisions of Section VII of the required contract provisions unless such request is accompanied by the CERTIFICATION referred to above, executed by the proposed subcontractor.

**NON-COLLUSION PROVISION**.—The provisions in this section are applicable to all contracts except contracts for Federal Aid Secondary projects.

Title 23, United States Code, Section 112, requires as a condition precedent to approval by the Federal Highway Administrator of the contract for this work that each bidder file a sworn statement executed by, or on behalf of, the person, firm, association, or corporation to whom such contract is to be awarded, certifying that such person, firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the submitted bid. A form to make the non-collusion affidavit statement required by Section 112 as a certification under penalty of perjury rather than as a sworn statement as permitted by 28, USC, Sec. 1746, is included in the proposal.

**PARTICIPATION BY MINORITY BUSINESS ENTERPRISES IN SUBCONTRACTING**.—Part 23, Title 49, Code of Federal Regulations applies to this Federal-aid project. Pertinent sections of said Code are incorporated in part or in its entirety within other sections of these special provisions.

Schedule B—Information for Determining Joint Venture Eligibility

(This form need not be filled in if all joint venture firms are minority owned.)

1. Name of joint venture _____
2. Address of joint venture _____
3. Phone number of joint venture _____
4. Identify the firms which comprise the joint venture. (The MBE partner must complete Schedule A.) _____
   _____

   a. Describe the role of the MBE firm in the joint venture. _____
      _____
   b. Describe very briefly the experience and business qualifications of each non-MBE joint venturer: _____
      _____

5. Nature of the joint venture's business _____
   _____
6. Provide a copy of the joint venture agreement.
7. What is the claimed percentage of MBE ownership? _____
8. Ownership of joint venture: (This need not be filled in if described in the joint venture agreement, provided by question 6.).

   a. Profit and loss sharing.
   b. Capital contributions, including equipment.

c. Other applicable ownership interests.

9. Control of and participation in this contract. Identify by name, race, sex, and "firm" those individuals (and their titles) who are responsible for day-to-day management and policy decision making, including, but not limited to, those with prime responsibility for:

a. Financial decisions _____

b. Management decisions, such as:

(1) Estimating _____

(2). Marketing and sales _____

(3). Hiring and firing of management personnel _____

_____

(4) Purchasing of major items or supplies _____

_____

c. Supervision of field operations _____

Note.—If, after filing this Schedule B and before the completion of the joint venture's work on the contract covered by this regulation, there is any significant change in the information submitted, the joint venture must inform the grantee, either directly or through the prime contractor if the joint venture is a subcontractor.

**Affidavit**

"The undersigned swear that the foregoing statements are correct and include all material information necessary to identify and explain the terms and operation of our joint venture and the intended participation by each joint venturer in the undertaking. Further, the undersigned covenant and agree to provide to grantee current, complete and accurate information regarding actual joint venture work and the payment therefor and any proposed changes in any of the joint venture arrangements and to permit the audit and examination of the books, records and files of the joint venture, or those of each joint venturer relevant to the joint venture, by authorized representatives of the grantee or the Federal funding agency. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under Federal or State laws concerning false statements."

| | |
|---|---|
| Name of Firm | Name of Firm |
| Signature | Signature |
| Name | Name |
| Title | Title |
| Date | Date |

Date _____

State of _____

County of _____

On this ____ day of _____, 19 __, before me appeared (Name) _____, to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) _____ to execute the affidavit and did so as his or her free act and deed.

Notary Public _____

Commission expires _____

[Seal]

Date _____

State of _____

County of _____

On this ___ day of _____, 19 __, before me appeared (Name) _____ to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) _____ to execute the affidavit and did so as his or her free act and deed.

Notary Public _____

Commission expires _____

[Seal]

## REQUIRED CONTRACT PROVISIONS
## FEDERAL-AID CONSTRUCTION CONTRACTS

### 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 special provisions, 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, time clocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of $10,000 or more and that it will retain such certifications in its files.

## IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

**1. General:**

a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3)] issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c) the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.

b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

**2. Classification:**

a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

(1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;

(2) the additional classification is utilized in the area by the construction industry;

(3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) with respect to helpers, when such a classification prevails in the area in which the work is performed.

c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

**3. Payment of Fringe Benefits:**

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

**4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:**

a. Apprentices:

(1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing

work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

(3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

(4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

(1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.

(2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.

(4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers**:**

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

**5. Apprentices and Trainees (Programs of the U.S. DOT):**

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

**6. Withholding:**

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

**7. Overtime Requirements:**

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

**8. Violation:**

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

**9. Withholding for Unpaid Wages and Liquidated Damages:**

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

## V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. Compliance with Copeland Regulations (29 CFR 3):

   The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. Payrolls and Payroll Records:

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

(2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;

(3) that each laborer or mechanic has been paid not less that the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure

to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

## VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than $1,000,000 (23 CFR 635) the contractor shall:

   a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.

   b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.

   c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.

2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

## 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 any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more that $10,000 or imprisoned not more than 5 years or both."

## X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water

Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.

3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

## XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

**1. Instructions for Certification - Primary Covered Transactions:**

(Applicable to all Federal-aid contracts - 49 CFR 29)

a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.

f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Primary Covered Transactions**

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

   a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

   b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

   c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and

   d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

**2. Instructions for Certification - Lower Tier Covered Transactions:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions of $25,000 or more - 49 CFR 29)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the

meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Lower Tier Covered Transactions**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

## 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.

## FEDERAL-AID FEMALE AND MINORITY GOALS

In accordance with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-aid Construction Contracts" the following are the goals for female utilization:

Goal for Women (applies nationwide).....(percent) 6.9

The following are goals for minority utilization:

### CALIFORNIA ECONOMIC AREA

| | | Goal (Percent) |
|---|---|---|
| **174** | **Redding, CA:** | |
| | Non-SMSA Counties | 6.8 |
| | CA Lassen; CA Modoc;CA Plumas;CA Shasta; CA Siskiyou; CA Tehama. | |
| **175** | **Eureka, CA** | |
| | Non-SMSA Counties | 6.6 |
| | CA Del Norte; CA Humboldt; CA Trinity. | |
| **176** | **San Francisco-Oakland-San Jose, CA:** | |
| | SMSA Counties: | |
| | 7120 Salinas-Seaside-Monterey, CA | 28.9 |
| | CA Monterey. | |
| | 7360 San Francisco-Oakland | 25.6 |
| | CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo. | |
| | 7400 San Jose, CA | 19.6 |
| | CA Santa Clara. | |
| | 7485 Santa Cruz, CA. | 14.9 |
| | CA Santa Cruz. | |
| | 7500 Santa Rosa, CA | 9.1 |
| | CA Sonoma. | |
| | 8720 Vallejo-Fairfield- Napa, CA | 17.1 |
| | CA Napa; CA Solano | |
| | Non-SMSA Counties | 23.2 |
| | CA Lake; CA Mendocino; CA San Benito | |
| **177** | **Sacramento, CA**: | |
| | SMSA Counties: | |
| | 6920 Sacramento, CA | 16.1 |
| | CA Placer; CA Sacramento; CA Yolo. | |
| | Non-SMSA Counties | 14.3 |
| | CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba. | |
| **178** | **Stockton-Modesto, CA:** | |
| | SMSA Counties: | |
| | 5170 Modesto, CA | 12.3 |
| | CA Stanislaus. | |
| | 8120 Stockton, CA | 24.3 |
| | CA San Joaquin. | |
| | Non-SMSA Counties | 19.8 |
| | CA Alpine; CA Amador; CA Calaveras; CA Mariposa;CA Merced; CA Tuolumne. | |

| | | Goal (Percent) |
|---|---|---|
| **179** | **Fresno-Bakersfield, CA** | |
| | SMSA Counties: | |
| | 0680 Bakersfield, CA | 19.1 |
| | CA Kern. | |
| | 2840 Fresno, CA | 26.1 |
| | CA Fresno. | |
| | Non-SMSA Counties | 23.6 |
| | CA Kings; CA Madera; CA Tulare. | |
| **180** | **Los Angeles, CA:** | |
| | SMSA Counties: | |
| | 0360 Anaheim-Santa Ana-Garden Grove, CA | 11.9 |
| | CA Orange. | |
| | 4480 Los Angeles-Long Beach, CA | 28.3 |
| | CA Los Angeles. | |
| | 6000 Oxnard-Simi Valley-Ventura, CA | 21.5 |
| | CA Ventura. | |
| | 6780 Riverside-San Bernardino-Ontario, CA. | 19.0 |
| | CA Riverside; CA San Bernardino. | |
| | 7480 Santa Barbara-Santa Maria-Lompoc, CA | 19.7 |
| | CA Santa Barbara. | |
| | Non-SMSA Counties | 24.6 |
| | CA Inyo; CA Mono; CA San Luis Obispo. | |
| **181** | **San Diego, CA:** | |
| | SMSA Counties | |
| | 7320 San Diego, CA. | 16.9 |
| | CA San Diego. | |
| | Non-SMSA Counties | 18.2 |
| | CA Imperial. | |

In addition to the reporting requirements set forth elsewhere in this contract the Contractor and subcontractors holding subcontracts, not including material suppliers, of $10,000 or more, shall submit for every month of July during which work is performed, employment data as contained under Form FHWA PR-1391 (Appendix C to 23 CFR, Part 230), and in accordance with the instructions included thereon.

## FEDERAL REQUIREMENT TRAINING SPECIAL PROVISIONS

As part of the Contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The Contractor shall provide on-the-job training to develop full journeymen in the types of trades or job classification involved.

The goal for the number of trainees or apprentices to be trained under the requirements of this special provision will be 30.

In the event the Contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees or apprentices are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The Contractor shall also insure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of trainees or apprentices in each occupation shall be in their first year of apprenticeship or training.

The number of trainees or apprentices shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing work, the Contractor shall submit to the Department for approval the number of trainees or apprentices to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee or apprentice employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees or apprentices as provided hereinafter.

Training and upgrading of minorities and women toward journeymen status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority and women trainees or apprentices (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees or apprentices) to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee or apprentice in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by both the Department and the Federal Highway Administration. The Department and the Federal Highway Administration will approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee or apprentice for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with the State of California, Department of Industrial Relations, Division of Apprenticeship Standards recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the Contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees or apprentices are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or apprentice or pays the trainee's or apprentice's wages during the offsite training period.

No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee or apprentice as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee or apprentice will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees or apprentices be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees or apprentices specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Only trainees or apprentices registered in a program approved by the State of California's State Administrator of Apprenticeship may be employed on the project and said trainees or apprentices shall be paid the standard wage specified under the regulations of the craft or trade at which they are employed.

The Contractor shall furnish the trainee or apprentice a copy of the program he will follow in providing the training. The Contractor shall provide each trainee or apprentice with a certification showing the type and length of training satisfactorily completed.

The Contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.