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Note: Addenda information is NOT included with the electronic documents available via electronic file transfer. Only bidder or non-bidder package holders listed with the Caltrans Plans and Bid Documents section as described above will receive addenda information.

Seismic Retrofit Project

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

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# NOTICE TO CONTRACTORS

# AND

# SPECIAL PROVISIONS

## FOR CONSTRUCTION ON STATE HIGHWAY IN

**CONTRA COSTA AND SOLANO COUNTIES IN CROCKETT AND VALLEJO FROM OLEUM REFINERY ROAD UNDERCROSSING TO CARQUINEZ BRIDGE TOLL PLAZA**

**DISTRICT 04, ROUTE 80**

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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. 04-013054**

**INFORMAL BIDS CONTRACT**

**04-CC,Sol-80-19.5/22.7,**
**0.0/0.7**

**Bids Open: November 1, 2000**
**Dated: August 14, 2000**

**QCQA**
**OSD**

**********

# A + B BIDDING
# SPECIAL NOTICE

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The bidder's attention is directed to Section 2, "Proposal Requirements and Conditions," Section 3-1.01B, "Award and Execution of Contract," and Section 4, "Beginning of Work, Time of Completion and Liquidated Damages," in the special provisions. In addition to the item prices and totals, the proposal shall set forth the number of working days bid to complete all the Phase I work. Working days are defined in Section 4. All bids will be compared on the basis of the sum of the Engineer's Estimate of the quantities of work to be done (TOTAL BID (A)), plus the product of the number of working days bid to complete all the Phase I work and the cost per day shown on the Engineer's Estimate (TOTAL BID (B)). The lowest bid will be determined on the basis of the "Total Basis for Comparison of Bids" set forth in the Engineer's Estimate.

**Bids in which the number of working days bid exceed 695 for all the Phase I work will be considered non-responsive and will be rejected.**

The bidder's attention is also directed to the provisions in Section 4 of the special provisions regarding liquidated damages. The total number of working days to complete all work in the contract shall be the number of working days bid excluding working days when only plant establishment is to be performed.

**No incentive payments will be paid nor will disincentive deductions be charged on this project.**

**For purposes of determining liquidated damages, all work must be completed for a given Phase and the contract accepted by the Director, as specified in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications.**

Examples of determining liquidated damages for Phase I work are as follows:

Completing all the work in Phase I, at 11:55 p.m. on day 600 shall be deemed completing all the work in Phase I shown on the project plans on day 600.

Completing all the work in Phase I, at 12:05 a.m. on day 601 shall be deemed completing all the work in Phase I shown on the project plans on day 601.

Examples of determining liquidated damages for Phase I working days bid and Phase II work (except plant establishment work) are as follows:

Contractor bids 650 working days for Phase I work. The Contractor completely finishes all the work in Phase I, on day 590. The Contractor has 1260 (650 plus 610) working days to completely finish Phase II work.

Contractor bids 600 working days for Phase I work. The Contractor completely finishes all the work in Phase I, on day 590. The Contractor has 1210 (600 plus 610) working days to completely finish Phase II work.

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# IMPORTANT SPECIAL NOTICES

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The bidder's attention is directed to the following special requirements for this project concerning award and execution of the contract, and beginning of work:

The contract shall be signed by the successful bidder and shall be received with contract bonds by the Division of Office Engineer within 4 days, not including Saturdays, Sundays and legal holidays, after the contract has been awarded. (See Section 3 of the special provisions.)

The Contractor may begin work after award of the contract at his own risk. The contract work shall be completed before the expiration of the number of working days bid to complete all the work, **beginning at 12:01 a.m. of the day after the day of contract award**. (See Section 4 of the special provisions).

The time limit within which Contractors are allowed to bid, as specified in the Special Provisions is considered insufficient to permit completion of the work by the Contractor working a normal number of hours per day or week on a single shift basis. It is expected that additional shifts will be required throughout the life of the contract to the extent deemed necessary to ensure that the work will be completed within the time the Contractor bid. (See Section 4 of the Special Provisions).

The bidder's attention is directed to the following special requirements for this project concerning submission of DVBE information, award and execution of contract, and beginning of work:

First-tier subcontractors that will be used for meeting DVBE goals must be listed in the \"List of Subcontractors\" form regardless of dollar amount of work to be performed. Second- and lower-tier subcontractors need not be listed on the \"List of Subcontractors\" form. Other, non-DVBE subcontractors are to be listed on the \"List of Subcontractors\" form in conformance with the requirements in Section 2-1.054 of the Standard Specifications and the Special Provisions.

Identify second- and lower-tier DVBE subcontractors on the \"Caltrans Bidder DVBE Information\" form.

DVBE information shall be submitted **with the bid proposal**. (See **Section 2-1.04** of the special provisions.) The evaluation of the effort to meet the DVBE goal will be based on the information provided with the bid proposal. If the goal was not met, Caltrans' determination of good faith effort will be based on the information provided with the bid, and the decision will be final. Bidders and all subcontractors listed in the DVBE Information shall be available, by phone, on the day following the bid opening.

The DVBE information shall include all DVBE partners.

It is anticipated that this contract will be awarded within **10 days after bid opening**.

If the Bidder submits cash or a cashier's check or a certified check as the form of bidder's security (see Section 2-1.07 of the Standard Specifications), the Bidder shall also include with the bid submittal a signed and notarized affidavit from an admitted surety insurer that contract bonds, as required by Section 3-1.02, \"Contract Bonds,\" of the Standard Specifications, will be provided within the specified time for executing and returning the contract for approval.

If the bidder claims a mistake was made in his bid, the bidder shall give the Department written notice within 48-hours, not including Saturdays, Sundays and legal holidays, after the opening of bids of the alleged mistake in lieu of the 5 days specified in Section 2-1.095, \"Relief of Bidders,\" in the Standard Specifications. (See Section 2-1.01 of the special provisions.) Caltrans' FAX number for submitting this information is (916)227-6282. Such information shall be submitted \"Attention Office Engineer.\"

The contract shall be signed by the successful bidder and shall be received with contract bonds by the Office of Office Engineer within **4 days**, including Saturdays, Sundays and legal holidays, after the bidder has received notice that the contract has been awarded. (See Section 3 of the special provisions.)

If properly executed by the bidder, it is anticipated the contract will be approved within 24 hours of when the executed contract and contract bonds are received by the Department.

The Contractor shall begin work within 5 calendar days after receiving notice that the contract has been approved. The contract work shall be completed before the expiration of **1305 WORKING DAYS** beginning at **12:01 a.m. on the DAY AFTER THE DAY OF CONTRACT AWARD.** The definition of a working day has been re-defined for this project. (See Section 4 of the special provisions.)

The time limit specified in the Special Provisions for the completion of work contemplated herein is considered insufficient to permit completion of the work by the Contractor working a normal number of hours per day or week on a single shift basis. It is expected that additional shifts will be required throughout the life of the contract to the extent deemed necessary to ensure that the work will be completed within the time limit specified. (See Section 4 of the Special Provisions).

The following forms have been included at the end of the Proposal and Contract book to assist the successful bidder in early execution of the contract documents: Payment Bond, Performance Bond, Insurance, Payee Data Record.

**SURETY 2000**

Caltrans is conducting a pilot program in cooperation with Surety 2000, to test electronic bond verification systems. The purpose of the pilot program is to test the use of Surety 2000 for verifying a bidder's bond electronically.

Surety 2000 is an Internet-based surety verification and security system, developed in conjunction with the surety industry. Surety agents may contact Surety 2000 at 1-800-660-3263.

Bidders are encouraged to participate in the pilot program. To participate, the bidder is asked to provide the "Authorization Code" provided by Surety 2000, on a separate sheet, together with the standard bidder's bond required by the specifications. The bidder's surety agent may obtain the "Authorization Code" from Surety 2000.

The Department will use the "Authorization Code" to access the Surety 2000 database, and independently verify the actual bidder's bond and document the functioning of the Surety 2000 system.

"Authorization Codes" will be used only to verify bidder's bonds, and only as part of the pilot program. The use of "Authorization Codes" will not be accepted in lieu of the bidder's bond or other bidder's security required in the specifications during the pilot study.

The function of the Surety 2000 system is to provide an easier way for Contractors to protect their bid security, and to discourage fraud. This system is available to all California admitted sureties and surety agents.

The results of the pilot study will be tabulated, and at some time in the future, the Department may consider accepting electronic bidder's bond verification in lieu of the bidder's bond specified.

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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 |
| A24A | Pavement Markings - Arrows |
| A24B | Pavement Markings - Arrows |
| A24C | Pavement Markings - Symbols and Numerals |
| A24D | Pavement Markings - Words |
| A24E | Pavement Markings - Words and Crosswalks |
| A35A | Portland Cement Concrete Pavement (Undoweled Transverse Joints) |
| A35C | Portland Cement Concrete Pavement Joint and End Anchor Details |
| A62A | Excavation and Backfill - Miscellaneous Details |
| A62D | Excavation and Backfill - Concrete Pipe Culverts |
| A62DA | Excavation and Backfill - Concrete Pipe Culverts |
| A62F | Excavation and Backfill - Metal and Plastic Culverts |
| A73A | Object Markers |
| A73B | Markers |
| A73C | Delineators, Channelizers and Barricades |

| | |
|---|---|
| A76A | Concrete Barrier Type 60 |
| A76B | Concrete Barrier Type 60 |
| A77AA | Metal Beam Guard Railing – Typical Steel Post With Wood Block |
| A77B | Metal Beam Guard Railing - Standard Hardware |
| A77CA | Metal Beam Guard Railing – Steel Post and Wood Block Details |
| A77D | 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 |
| A77G | Metal Beam Guard Railing – End Treatment, Terminal Anchor Assembly (Type SFT) |
| A77H | Metal Beam Guard Railing - Anchor Cable and Anchor Plate Details |
| A77L | Metal Beam Guard Railing and Single Faced Barrier Railing - End Treatment |
| A77M | Metal Beam Guard Railing and Single Faced Barrier Railing - End Treatment |
| A81B | Crash Cushion, Sand Filled (Unidirectional) |
| A85 | Chain Link Fence |
| A87 | Curbs, Dikes and Driveways |
| A88A | Curb Ramp Details |
| D73 | Drainage Inlets |
| D74C | Drainage Inlet Details |
| D77A | Grate Details |
| D77B | Bicycle Proof Grate Details |
| D79 | Precast Reinforced Concrete Pipe - Direct Design Method |
| D88 | Construction Loads On Culverts |
| D89 | Pipe Headwalls |
| D93B | Drainage Inlet Riser Connections |
| D94A | Metal and Plastic Flared End Sections |
| D94B | Concrete Flared End Sections |
| D99A | Structural Section Drainage System Details |
| D99B | Edge Drain Outlet and Vent Details |
| D99C | Edge Drain Cleanout and Vent Details |
| D102 | Underdrains |
| 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 |
| H7 | Planting and Irrigation Details |
| H8 | Planting and Irrigation Details |
| T1A | Temporary Crash Cushion, Sand Filled (Unidirectional) |
| T1B | Temporary Crash Cushion, Sand Filled (Bidirectional) |
| T2 | Temporary Crash Cushion, Sand Filled (Shoulder Installations) |
| T3 | Temporary Railing (Type K) |
| T7 | Construction Project Funding Identification Signs |
| T10 | Traffic Control System for Lane Closure On Freeways and Expressways |
| 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 |
| T16 | Traffic Control System for Moving Lane Closure On Multilane Highways |
| T17 | Traffic Control System for Moving Lane Closure On Two Lane Highways |
| B0-1 | Bridge Details |
| B0-3 | Bridge Details |
| B0-5 | Bridge Details |
| B0-13 | Bridge Details |
| B2-6 | Pile Details-Class 400C and Class 625C |
| B7-1 | Box Girder Details |
| B7-6 | Deck Drains - Types D-1 and D-2 |
| B7-10 | Utility Opening - Box Girder |

| | |
|---|---|
| B8-5 | Cast-in-Place Prestressed Girder Details |
| B11-52 | Chain Link Railing Type 7 |
| B11-53 | Concrete Barrier Type 25 |
| B14-3 | Communication and Sprinkler Control Conduits (Conduit Less Than size 103) |
| B14-5 | Water Supply Line (Details) (Pipe Sizes Less Than NPS 4) |
| RS1 | Roadside Signs, Typical Installation Details No. 1 |
| RS2 | Roadside Signs - Wood Post, Typical Installation Details No. 2 |
| S2 | Overhead Signs - Truss, Single Post Type - Post Types II Thru VII |
| S3 | Overhead Signs - Truss, Two Post Type - Post Types I-S Thru VII-S |
| S5 | Overhead Signs - Truss Two Post Type - Structural Frame Members |
| S6 | Overhead Signs - Truss, Structural Frame Details |
| S7 | Overhead Signs -Truss, Frame Juncture Details |
| ES-1A | Signal, Lighting and Electrical Systems - Symbols and Abbreviations |
| ES-1B | Signal, Lighting and Electrical Systems - Symbols and Abbreviations |
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| ES-2C | Signal, Lighting and Electrical Systems - Service Equipment Notes, Type III Series |
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| ES-2F | Signal, Lighting and Electrical Systems - Service Equipment and Typical Wiring Diagram Type III-C Series |
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| ES-3F | Signal, Lighting and Electrical Systems - Telephone Demarcation Cabinet Details, Type C |
| ES-3G | Signal, Lighting and Electrical Systems – Telephone Demarcation Cabinet, Type C Details |
| 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 |
| ES-6A | Lighting Standards - Types 15, 21 and 22 |
| ES-6B | Lighting Standards - Types 15 AND 21, Barrier Rail Mounted Details |
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| ES-6F | Lighting Standards - Type 30 and 31 Base Plate Details |
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| ES-7A | Signal Standards - Push Button Posts |
| ES-7B | Signal and Lighting Standards - Type 1 Standards and Equipment Numbering |
| ES-7C | Signal and Lighting Standards - Case 1 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 7.6 m to 9.1 m |
| ES-7D | Signal and Lighting Standards - Case 2 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 6.1 m to 9.1 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-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-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 |

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| ES-15C | Sign Illumination - Sign Illumination Equipment |
| ES-15D | Sign Illumination - Sign Illumination Control |
| ES-16A | Closed Circuit Television Pole Details |
| ES-16B | Closed Circuit Television Pole Details - Overhead Sign Mounted |

**Seismic Retrofit State Project with DVBE Goals (03-08-00)**

## DEPARTMENT OF TRANSPORTATION

# NOTICE TO CONTRACTORS

# THIS IS AN INFORMAL BIDS CONTRACT

**CONTRACT NO. 04-013054**

**04-CC,Sol-80-19.5/22.7,**
**0.0/0.7**

Sealed proposals for the work shown on the plans entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR CONSTRUCTION ON STATE HIGHWAY IN CONTRA COSTA AND SOLANO COUNTIES IN CROCKETT AND VALLEJO FROM OLEUM REFINERY ROAD UNDERCROSSING TO CARQUINEZ BRIDGE TOLL PLAZA**

will be received at the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, CA 95814, until 2 o'clock p.m. on November 1, 2000, at which time they will be publicly opened and read in Room 0100 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 CONTRA COSTA AND SOLANO COUNTIES IN CROCKETT AND VALLEJO FROM OLEUM REFINERY ROAD UNDERCROSSING TO CARQUINEZ BRIDGE TOLL PLAZA**

General work description: Widen existing freeway, reconst. interchange, replace structures.

This project has a goal of 3 percent disabled veteran business enterprise (DVBE) participation.

No prebid meeting is scheduled for this project.

The time limit specified for the completion of the work contemplated herein is considered insufficient to permit completion of the work 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 conformance with the \"Progress Schedule\" required in these special provisions, additional shifts will be required to the extent necessary to ensure that the progress conforms to the abovementioned schedule and that the work will be completed within the time limit specified.

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.

The Contractor must also be properly licensed at the time the bid is submitted, except that on a joint venture bid a joint venture license may be obtained by a combination of licenses after bid opening but before award in conformance with Business and Professions Code, Section 7029.1.

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

Preference will be granted to bidders properly certified as a "Small Business" as determined by the Department of General Services, Office of Small Business Certification and Resources at the time of bid opening in conformance with the provisions in Section 2-1.05, "Small Business Preference," of the special provisions, and Section 1896 et seq, Title 2, California Code of Regulations. A form for requesting a "Small Business" preference is included with the bid documents. Applications for status as a "Small Business" must be submitted to the Department of General Services, Office of Small Business Certification and Resources, 1531 "I" Street, Second Floor, Sacramento, CA 95814, Telephone No. (916) 322-5060.

A reciprocal preference will be granted to "California company" bidders in conformance with Section 6107 of the Public Contract Code. (See Sections 2 and 3 of the special provisions.) A form for indicating whether bidders are or are not a "California company" is included in the bid documents and is to be filled in and signed by all bidders.

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 available at the office of the District Director of Transportation of the district in which the work is situated in paper copy format.

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

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. Future effective general prevailing wage rates which have been predetermined and are on file with the Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated August 14, 2000

RRF/SPM

**COPY OF ENGINEER'S ESTIMATE**

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

**04-013054**

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 1 | 019450 | TEMPORARY CREEK DIVERSION SYSTEM | LS | LUMP SUM |
| 2 | 019451 | ELECTRONIC MOBILE DAILY DIARY COMPUTER SYSTEM DATA DELIVERY | LS | LUMP SUM |
| 3 | 070018 | TIME RELATED OVERHEAD | LS | LUMP SUM |
| 4 | 070010 | PROGRESS SCHEDULE (CRITICAL PATH) | LS | LUMP SUM |
| 5 | 019452 | NON-STORM WATER DISCHARGE | LS | LUMP SUM |
| 6 | 074019 | PREPARE STORM WATER POLLUTION PREVENTION PLAN | LS | LUMP SUM |
| 7 | 074020 | WATER POLLUTION CONTROL | LS | LUMP SUM |
| 8 | 074029 | TEMPORARY SILT FENCE | M | 900 |
| 9 | 019453 | TEMPORARY COVER | M2 | 1000 |
| 10 | 019454 | TEMPORARY DRAINAGE INLET PROTECTION | EA | 90 |
| 11 | 121100 | TEMPORARY EROSION CONTROL | M2 | 26 900 |
| 12 | 019455 | TEMPORARY CONCRETE WASHOUT | EA | 10 |
| 13 | 019456 | TEMPORARY FENCE (TYPE ESA) | M | 200 |
| 14 | 019457 | TEMPORARY ROCK BAG BARRIER | M | 160 |
| 15 | 019458 | TEMPORARY ENTRANCE/EXIT | LS | LUMP SUM |
| 16 (S) | 120090 | CONSTRUCTION AREA SIGNS | LS | LUMP SUM |
| 17 (S) | 120100 | TRAFFIC CONTROL SYSTEM | LS | LUMP SUM |
| 18 (S) | 120120 | TYPE III BARRICADE | EA | 20 |
| 19 | 120149 | TEMPORARY PAVEMENT MARKING (PAINT) | M2 | 35 |
| 20 | 120159 | TEMPORARY TRAFFIC STRIPE (PAINT) | M | 15 700 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 21 | 120165 | CHANNELIZER (SURFACE MOUNTED) | EA | 121 |
| 22 | 120300 | TEMPORARY PAVEMENT MARKER | EA | 7530 |
| 23 (S) | 128650 | PORTABLE CHANGEABLE MESSAGE SIGN | EA | 30 |
| 24 | 129000 | TEMPORARY RAILING (TYPE K) | M | 11 000 |
| 25 | 129100 | TEMPORARY CRASH CUSHION MODULE | EA | 130 |
| 26 | 150206 | ABANDON CULVERT | EA | 20 |
| 27 | 150605 | REMOVE FENCE | M | 260 |
| 28 | 150662 | REMOVE METAL BEAM GUARD RAILING | M | 30 |
| 29 | 150667 | REMOVE DOUBLE METAL BEAM BARRIER | M | 490 |
| 30 | 150711 | REMOVE PAINTED TRAFFIC STRIPE | M | 9010 |
| 31 | 019459 | REMOVE YELLOW PAINTED TRAFFIC STRIPE | M | 3170 |
| 32 | 150712 | REMOVE PAINTED PAVEMENT MARKING | M2 | 35 |
| 33 | 150714 | REMOVE THERMOPLASTIC TRAFFIC STRIPE | M | 1090 |
| 34 | 150174 | REMOVE YELLOW THERMOPLASTIC TRAFFIC STRIPE | M | 160 |
| 35 | 150715 | REMOVE THERMOPLASTIC PAVEMENT MARKING | M2 | 9 |
| 36 | 150722 | REMOVE PAVEMENT MARKER | EA | 9720 |
| 37 | 150744 | REMOVE ROADSIDE SIGN (WOOD POST) | EA | 20 |
| 38 | 150747 | REMOVE ROADSIDE SIGN (STRAP AND SADDLE BRACKET METHOD) | EA | 20 |
| 39 | 150760 | REMOVE SIGN STRUCTURE | EA | 3 |
| 40 | 150805 | REMOVE CULVERT | M | 140 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 41 | 150820 | REMOVE INLET | EA | 21 |
| 42 | 150829 | REMOVE RETAINING WALL | M3 | 200 |
| 43 | 150846 | REMOVE CONCRETE PAVEMENT | M3 | 3170 |
| 44 | 150857 | REMOVE ASPHALT CONCRETE SURFACING | M3 | 1120 |
| 45 | 150860 | REMOVE BASE AND SURFACING | M3 | 6440 |
| 46 | 150870 | REMOVE CONCRETE DECK SURFACE | M2 | 44 |
| 47 | 151264 | SALVAGE FENCE | M | 215 |
| 48 | 151272 | SALVAGE METAL BEAM GUARD RAILING | M | 80 |
| 49 | 151281 | SALVAGE ROADSIDE SIGN | EA | 7 |
| 50 | 152390 | RELOCATE ROADSIDE SIGN | EA | 9 |
| 51 | 152394 | RELOCATE SIGN STRUCTURE | EA | 2 |
| 52 | 152423 | ADJUST MONUMENT TO GRADE | EA | 1 |
| 53 | 152440 | ADJUST MANHOLE TO GRADE | EA | 1 |
| 54 | 152443 | ADJUST PIPE INLET TO GRADE | EA | 4 |
| 55 | 152609 | MODIFY INLET TO MANHOLE | EA | 1 |
| 56 (S) | 019460 | PLANE ASPHALT CONCRETE PAVEMENT (45MM MAX) | M2 | 6200 |
| 57 (S) | 019461 | PLANE ASPHALT CONCRETE PAVEMENT (75MM MAX) | M2 | 10 300 |
| 58 | 153210 | REMOVE CONCRETE | M3 | 580 |
| 59 | 153229 | REMOVE CONCRETE BARRIER (TYPE K) | M | 700 |
| 60 | 155003 | CAP INLET | EA | 5 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 61 | 157551 | BRIDGE REMOVAL, LOCATION A | LS | LUMP SUM |
| 62 | 157552 | BRIDGE REMOVAL, LOCATION B | LS | LUMP SUM |
| 63 | 157553 | BRIDGE REMOVAL, LOCATION C | LS | LUMP SUM |
| 64 | 157564 | BRIDGE REMOVAL (PORTION), LOCATION D | LS | LUMP SUM |
| 65 | 157565 | BRIDGE REMOVAL (PORTION), LOCATION E | LS | LUMP SUM |
| 66 | 158100 | SALVAGE CRASH CUSHION | EA | 2 |
| 67 | 160101 | CLEARING AND GRUBBING | LS | LUMP SUM |
| 68 | 190101 | ROADWAY EXCAVATION | M3 | 191 000 |
| 69 | 190112 | ROADWAY EXCAVATION (TYPE A) | M3 | 11 500 |
| 70 | 190185 | SHOULDER BACKING | STA | 2 |
| 71 (F) | 192003 | STRUCTURE EXCAVATION (BRIDGE) | M3 | 712 |
| 72 (F) | 192020 | STRUCTURE EXCAVATION (TYPE D) | M3 | 8748 |
| 73 (F) | 192021 | STRUCTURE EXCAVATION (TYPE DH) | M3 | 586 |
| 74 (F) | 192023 | STRUCTURE EXCAVATION (TYPE H) | M3 | 203 |
| 75 (F) | 192049 | STRUCTURE EXCAVATION (SOLDIER PILE WALL) | M3 | 2125 |
| 76 | 192502 | SAND BEDDING | M3 | 76 |
| 77 (F) | 193003 | STRUCTURE BACKFILL (BRIDGE) | M3 | 6058 |
| 78 (F) | 193029 | STRUCTURE BACKFILL (SOLDIER PILE WALL) | M3 | 690 |
| 79 | 193114 | SAND BACKFILL | M3 | 1000 |
| 80 (F) | 193119 | LEAN CONCRETE BACKFILL | M3 | 1072 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 81 (F) | 048329 | CLASS 1 CONCRETE BACKFILL | M3 | 1460 |
| 82 | 194001 | DITCH EXCAVATION | M3 | 4.6 |
| 83 (F) | 197020 | EARTH RETAINING STRUCTURE | M2 | 1056 |
| 84 | 198007 | IMPORTED MATERIAL (SHOULDER BACKING) | M3 | 27 |
| 85 | 019462 | GEOGRID | M2 | 19 800 |
| 86 (S) | 200001 | HIGHWAY PLANTING | LS | LUMP SUM |
| 87 | 200101 | IMPORTED TOPSOIL | M3 | 4560 |
| 88 | 203001 | EROSION CONTROL (BLANKET) | M2 | 78 |
| 89 (S) | 203003 | STRAW (EROSION CONTROL) | TONN | 11 |
| 90 (S) | 203024 | COMPOST (EROSION CONTROL) | KG | 2160 |
| 91 (S) | 203014 | FIBER (EROSION CONTROL) | KG | 920 |
| 92 (S) | 203021 | FIBER ROLLS | M | 4110 |
| 93 (S) | 203045 | PURE LIVE SEED (EROSION CONTROL) | KG | 270 |
| 94 (S) | 203056 | COMMERCIAL FERTILIZER (EROSION CONTROL) | KG | 330 |
| 95 (S) | 203061 | STABILIZING EMULSION (EROSION CONTROL) | KG | 580 |
| 96 (S) | 204099 | PLANT ESTABLISHMENT WORK | LS | LUMP SUM |
| 97 (S) | 208000 | IRRIGATION SYSTEM | LS | LUMP SUM |
| 98 | 048330 | NPS 1.5 SUPPLY LINE (BRIDGE) | M | 140 |
| 99 | 208039 | NPS 4 SUPPLY LINE (BRIDGE) | M | 140 |
| 100 | 048331 | MODIFY NPS 4 SUPPLY LINE (BRIDGE) | M | 22 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 101 | 208731 | 200 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT | M | 41 |
| 102 | 250401 | CLASS 4 AGGREGATE SUBBASE | M3 | 9510 |
| 103 | 260301 | CLASS 3 AGGREGATE BASE | M3 | 1840 |
| 104 | 280000 | LEAN CONCRETE BASE | M3 | 4970 |
| 105 | 290211 | ASPHALT TREATED PERMEABLE BASE | M3 | 440 |
| 106 | 390095 | REPLACE ASPHALT CONCRETE SURFACING | M3 | 23 |
| 107 | 390155 | ASPHALT CONCRETE (TYPE A) | TONN | 18 000 |
| 108 | 390171 | ASPHALT CONCRETE BASE (TYPE A) | TONN | 860 |
| 109 | 394002 | PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA) | M2 | 400 |
| 110 | 394040 | PLACE ASPHALT CONCRETE DIKE (TYPE A) | M | 1650 |
| 111 | 394048 | PLACE ASPHALT CONCRETE DIKE (TYPE E) | M | 360 |
| 112 | 394049 | PLACE ASPHALT CONCRETE DIKE (TYPE F) | M | 350 |
| 113 | 397001 | ASPHALTIC EMULSION (PAINT BINDER) | TONN | 190 |
| 114 | 401000 | CONCRETE PAVEMENT | M3 | 9610 |
| 115 | 048332 | DRILLED HOLE (750 MM) | M | 655 |
| 116 | 048333 | DRILLED HOLE (900 MM) | M | 3108 |
| 117 | 048334 | DRILLED HOLE (1000 MM) | M | 325 |
| 118 | 490505 | FURNISH STEEL PILING (HP 250 X 62) | M | 312 |
| 119 (S) | 490506 | DRIVE STEEL PILE (HP 250 X 62) | EA | 21 |
| 120 | 490570 | FURNISH STEEL PILING (HP 360 X 174) | M | 3613 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 121 (S) | 490571 | DRIVE STEEL PILE (HP 360 X 174) | EA | 120 |
| 122 (S) | 490657 | 600 MM CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 5632 |
| 123 (S) | 490658 | 750 MM CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 1890 |
| 124 (S) | 490671 | 2.4 M CAST-IN-DRILLED-HOLE CONCRETE PILING | M | 74 |
| 125 (F) | 048335 | STEEL SOLDIER PILE (W360 X 79) | M | 500 |
| 126 (F) | 048336 | STEEL SOLDIER PILE (W360 X 101) | M | 2312 |
| 127 (F) | 048337 | STEEL SOLDIER PILE (W410 X 114) | M | 208 |
| 128 (F) | 048338 | STEEL SOLDIER PILE (W410 X 149) | M | 318 |
| 129 (F) | 048339 | STEEL SOLDIER PILE (W460 X 97) | M | 175 |
| 130 (F) | 048340 | STEEL SOLDIER PILE (W460 X 128) | M | 108 |
| 131 (F) | 048341 | STEEL SOLDIER PILE (W530 X 219) | M | 370 |
| 132 (F) | 048342 | STEEL SOLDIER PILE (W690 X 265) | M | 265 |
| 133 | 499036 | FURNISH CAST-IN-STEEL-SHELL CONCRETE PILING (762 MM) | M | 5075 |
| 134 (S) | 499037 | DRIVE CAST-IN-STEEL-SHELL CONCRETE PILE (762 MM) | EA | 194 |
| 135 (S) | 500001 | PRESTRESSING CAST-IN-PLACE CONCRETE | LS | LUMP SUM |
| 136 (S) | 500050 | TIEBACK ANCHOR | EA | 454 |
| 137 (F) | 048343 | STRUCTURAL CONCRETE FACING | M3 | 485 |
| 138 (F) | 048344 | ARCHITECTURAL SURFACE TREATMENT | M2 | 502 |
| 139 (F) | 510051 | STRUCTURAL CONCRETE, BRIDGE FOOTING | M3 | 3245 |
| 140 (F) | 510053 | STRUCTURAL CONCRETE, BRIDGE | M3 | 21 109 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 141 (F) | 510086 | STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N) | M3 | 190 |
| 142 (F) | 510502 | MINOR CONCRETE (MINOR STRUCTURE) | M3 | 210 |
| 143 | 510526 | MINOR CONCRETE (BACKFILL) | M3 | 25.45 |
| 144 (F) | 048345 | LIGHTWEIGHT CONCRETE (BRIDGE) | M3 | 1729 |
| 145 (F) | 511064 | FRACTURED RIB TEXTURE | M2 | 920 |
| 146 | 511106 | DRILL AND BOND DOWEL | M | 70 |
| 147 (F) | 513501 | CONCRETE CLOSURE WALL | M2 | 52 |
| 148 (S) | 518050 | PTFE BEARING | EA | 19 |
| 149 (S) | 048346 | PTFE BEARING (SPHERICAL) | EA | 48 |
| 150 (S) | 519127 | JOINT SEAL ASSEMBLY (MR 90 MM) | M | 8 |
| 151 (S) | 519128 | JOINT SEAL ASSEMBLY (MR 100 MM) | M | 44 |
| 152 (S) | 519129 | JOINT SEAL ASSEMBLY (MR 101 MM - 160 MM) | M | 8 |
| 153 (S) | 519130 | JOINT SEAL ASSEMBLY (MR 161 MM - 240 MM) | M | 52 |
| 154 (S) | 519132 | JOINT SEAL ASSEMBLY (MR 321 MM - 400 MM) | M | 62 |
| 155 (S-F) | 520102 | BAR REINFORCING STEEL (BRIDGE) | KG | 4 735 500 |
| 156 (S) | 048347 | WELDED HEADED BAR REINFORCEMENT | EA | 47 025 |
| 157 (S-F) | 520103 | BAR REINFORCING STEEL (RETAINING WALL) | KG | 87 400 |
| 158 (S-F) | 520110 | BAR REINFORCING STEEL (EPOXY COATED) (BRIDGE) | KG | 388 000 |
| 159 (F) | 530100 | SHOTCRETE | M3 | 152 |
| 160 (S-F) | 550102 | STRUCTURAL STEEL (BRIDGE) | KG | 60 080 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 161 (S-F) | 550203 | FURNISH STRUCTURAL STEEL (BRIDGE) | KG | 395 200 |
| 162 (S-F) | 550204 | ERECT STRUCTURAL STEEL (BRIDGE) | KG | 395 200 |
| 163 (S-F) | 048348 | ISOLATION CASING | KG | 12 512 |
| 164 (S-F) | 560218 | FURNISH SIGN STRUCTURE (TRUSS) | KG | 35 435 |
| 165 (S-F) | 560219 | INSTALL SIGN STRUCTURE (TRUSS) | KG | 35 435 |
| 166 (S) | 561009 | 920 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION) | M | 44 |
| 167 | 562002 | METAL (BARRIER MOUNTED SIGN) | KG | 160 |
| 168 | 562004 | METAL (RAIL MOUNTED SIGN) | KG | 400 |
| 169 | 566011 | ROADSIDE SIGN - ONE POST | EA | 12 |
| 170 | 566012 | ROADSIDE SIGN - TWO POST | EA | 8 |
| 171 | 568001 | INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD) | EA | 14 |
| 172 | 568007 | INSTALL SIGN OVERLAY | M2 | 2.8 |
| 173 | 568016 | INSTALL SIGN PANEL ON EXISTING FRAME | M2 | 6 |
| 174 (F) | 575004 | TIMBER LAGGING | M3 | 458 |
| 175 | 048349 | CLEAN AND PAINT SOLDIER PILE | LS | LUMP SUM |
| 176 (S) | 590115 | CLEAN AND PAINT STRUCTURAL STEEL | LS | LUMP SUM |
| 177 (S) | 590135 | SPOT BLAST CLEAN AND PAINT UNDERCOAT | M2 | 2543 |
| 178 (S) | 048350 | WORK AREA MONITORING (LOCATION A) | LS | LUMP SUM |
| 179 (S) | 048351 | WORK AREA MONITORING (LOCATION B) | LS | LUMP SUM |
| 180 | 620901 | 150 MM ALTERNATIVE PIPE CULVERT | M | 0.8 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 181 | 620904 | 300 MM ALTERNATIVE PIPE CULVERT | M | 2 |
| 182 | 620909 | 450 MM ALTERNATIVE PIPE CULVERT | M | 600 |
| 183 | 620913 | 600 MM ALTERNATIVE PIPE CULVERT | M | 140 |
| 184 | 620924 | 900 MM ALTERNATIVE PIPE CULVERT | M | 630 |
| 185 | 650069 | 450 MM REINFORCED CONCRETE PIPE | M | 870 |
| 186 | 650075 | 600 MM REINFORCED CONCRETE PIPE | M | 390 |
| 187 | 650079 | 900 MM REINFORCED CONCRETE PIPE | M | 130 |
| 188 | 650084 | 1200 MM REINFORCED CONCRETE PIPE | M | 110 |
| 189 | 664009 | 300 MM CORRUGATED STEEL PIPE (1.63 MM THICK) | M | 30 |
| 190 | 664010 | 300 MM CORRUGATED STEEL PIPE (2.01 MM THICK) | M | 17 |
| 191 | 664014 | 450 MM CORRUGATED STEEL PIPE (1.63 MM THICK) | M | 17 |
| 192 | 681134 | 80 MM PLASTIC PIPE (EDGE DRAIN) | M | 370 |
| 193 | 682049 | CLASS 3 PERMEABLE MATERIAL (BLANKET) | M3 | 7250 |
| 194 | 685067 | 200 MM ALTERNATIVE PIPE UNDERDRAIN | M | 2250 |
| 195 | 019463 | 300 MM TRENCH DRAIN | M | 1890 |
| 196 | 019464 | 400 MM TRENCH DRAIN | M | 22 |
| 197 | 703542 | 300 MM WELDED STEEL PIPE (2.67 MM THICK) | M | 3.3 |
| 198 | 705336 | 450 MM ALTERNATIVE FLARED END SECTION | EA | 3 |
| 199 | 721009 | ROCK SLOPE PROTECTION (FACING, METHOD B) | M3 | 1.9 |
| 200 | 725001 | SACKED CONCRETE SLOPE PROTECTION | M3 | 3.7 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 201 | 729010 | ROCK SLOPE PROTECTION FABRIC | M2 | 7 |
| 202 | 731502 | MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION) | M3 | 640 |
| 203 (F) | 731517 | MINOR CONCRETE (GUTTER) | M | 528 |
| 204 (S-F) | 750001 | MISCELLANEOUS IRON AND STEEL | KG | 10 900 |
| 205 (S-F) | 750501 | MISCELLANEOUS METAL (BRIDGE) | KG | 54 430 |
| 206 (S-F) | 750505 | BRIDGE DECK DRAINAGE SYSTEM | KG | 36 160 |
| 207 (S-F) | 800386 | CHAIN LINK FENCE (TYPE CL-1.2, VINYL-CLAD) | M | 300 |
| 208 (S) | 800391 | CHAIN LINK FENCE (TYPE CL-1.8) | M | 550 |
| 209 (S-F) | 800392 | CHAIN LINK FENCE (TYPE CL-1.8, VINYL-CLAD) | M | 232 |
| 210 (S) | 802592 | 2.4 M CHAIN LINK GATE (TYPE CL-1.8) | EA | 1 |
| 211 (S) | 019465 | 9.6 M CHAIN LINK GATE (TYPE CL-1.8) | EA | 1 |
| 212 | 019466 | 4.8 M CHAIN GATE (TYPE CL-1.8) | EA | 1 |
| 213 | 820107 | DELINEATOR (CLASS 1) | EA | 150 |
| 214 | 019467 | CONCRETE BARRIER MARKER | EA | 161 |
| 215 | 820141 | OBJECT MARKER (TYPE K-1) | EA | 1 |
| 216 | 019468 | OBJECT MARKER (TYPE Q) | EA | 6 |
| 217 (S) | 832002 | METAL BEAM GUARD RAILING (STEEL POST) | M | 720 |
| 218 (S-F) | 833032 | CHAIN LINK RAILING (TYPE 7) | M | 4 |
| 219 (F) | 833125 | CONCRETE BARRIER (TYPE 25) | M | 3267 |
| 220 (F) | 833165 | CONCRETE BARRIER (TYPE 27B MODIFIED) | M | 120 |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 221 (F) | 833187 | CONCRETE BARRIER (TYPE 27 MODIFIED) | M | 471 |
| 222 (F) | 048352 | CONCRETE BARRIER (TYPE 41) | M | 565 |
| 223 (S-F) | 048353 | BARRIER MOUNTED BRIDGE RAILING | M | 591 |
| 224 (S-F) | 048354 | PEDESTRIAN RAILING | M | 584 |
| 225 (S) | 839559 | TERMINAL SYSTEM (TYPE ET) | EA | 1 |
| 226 (S) | 839565 | TERMINAL SYSTEM (TYPE SRT) | EA | 15 |
| 227 (S) | 839591 | CRASH CUSHION, SAND FILLED | EA | 2 |
| 228 | 839701 | CONCRETE BARRIER (TYPE 60) | M | 100 |
| 229 | 839702 | CONCRETE BARRIER (TYPE 60A) | M | 1215 |
| 230 (F) | 839704 | CONCRETE BARRIER (TYPE 60D) | M | 300 |
| 231 (S) | 840515 | THERMOPLASTIC PAVEMENT MARKING | M2 | 299 |
| 232 (S) | 840561 | 100 MM THERMOPLASTIC TRAFFIC STRIPE | M | 13 815 |
| 233 (S) | 840563 | 200 MM THERMOPLASTIC TRAFFIC STRIPE | M | 1105 |
| 234 (S) | 840571 | 100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 5.18 M - 2.14 M) | M | 91 |
| 235 (S) | 850101 | PAVEMENT MARKER (NON-REFLECTIVE) | EA | 2960 |
| 236 (S) | 850111 | PAVEMENT MARKER (RETROREFLECTIVE) | EA | 1596 |
| 237 (S) | 860201 | SIGNAL AND LIGHTING | LS | LUMP SUM |
| 238 (S) | 019469 | LIGHTING STAGE CONSTRUCTION-LOCATION 1 | LS | LUMP SUM |
| 239 (S) | 019470 | LIGHTING STAGE CONSTRUCTION-LOCATION 2 | LS | LUMP SUM |
| 240 (S) | 019471 | LIGHTING AND SIGN ILLUMINATION AND TRAFFIC OPERATIONS SYSTEM STAGE CONSTRUCTION- LOCATION 3 | LS | LUMP SUM |

| Item | Item Code | Item | Unit of Measure | Estimated Quantity |
|---|---|---|---|---|
| 241 (S) | 019472 | SIGNAL AND LIGHTING STAGE CONSTRUCTION-LOCATION 4 | LS | LUMP SUM |
| 242 (S) | 860462 | LIGHTING (LOCATION 2) | LS | LUMP SUM |
| 243 (S) | 860551 | LIGHTING AND SIGN ILLUMINATION (LOCATION 1) | LS | LUMP SUM |
| 244 (S) | 019473 | CAMERA UNIT | EA | 1 |
| 245 (S) | 019474 | PAN/TILT UNIT | EA | 1 |
| 246 (S) | 019475 | CAMERA CONTROL UNIT | EA | 1 |
| 247 (S) | 019476 | VIDEO ENCODER UNIT | EA | 1 |
| 248 (S) | 019477 | INTEGRATED SERVICE DIGITAL NETWORK TERMINAL ADAPTER | EA | 1 |
| 249 (S) | 019478 | CLUSTER CONTROLLER FOR MICROWAVE VEHICLE DETECTION SENSOR SYSTEM | EA | 1 |
| 250 (S) | 019479 | ANALOG DATA STATION TERMINATION | EA | 1 |
| 251 (S) | 019480 | TRAFFIC OPERATIONS SYSTEM (LOCATION-1) | LS | LUMP SUM |
| 252 (S) | 019481 | TRAFFIC OPERATIONS SYSTEM (LOCATION-2) | LS | LUMP SUM |
| 253 (S) | 019482 | TRAFFIC OPERATIONS SYSTEM (LOCATION-3) | LS | LUMP SUM |
| 254 (S) | 019483 | CALLBOX SYSTEM | LS | LUMP SUM |
| 255 (S) | 869072 | SEISMIC MONITORING SYSTEM | LS | LUMP SUM |
| 256 (S) | 048355 | INSTALL SEISMIC MONITORING CASING | M | 184 |
| 257 | 999990 | MOBILIZATION | LS | LUMP SUM |

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

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# SPECIAL PROVISIONS

**Annexed to Contract No. 04-013054**

## 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.

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 indented 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.

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.

## 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.

The proposal shall set forth the unit prices, item totals, TOTAL BID (A), the number of working days bid for completion of all the work in Phase I times the cost per day shown on the Engineer's Estimate (TOTAL BID (B)), and the "Total Basis for Comparison of Bids (A+B)," all in clearly legible figures, in the respective spaces provided, and shall be signed by the bidder, who shall fill out all blanks in the proposal form as therein required.

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 name and address of each DVBE subcontractor to be used for credit in meeting the goal, and to whom the bidder proposes to directly subcontract portions of the work. The list of subcontractors shall also set forth the portion of work that will be performed by each subcontractor listed. A sheet for listing the subcontractors is included in the Proposal.

If the Bidder submits cash or a cashier's check or a certified check as the form of bidder's security (See said Section 2-1.07 of the Standard Specifications), the Bidder shall also include with the bid submittal a signed and notarized affidavit from an admitted surety insurer that contract bonds, as required by Section 3-1.02, \"Contract Bonds,\" of the Standard Specifications, will be provided within the time specified elsewhere in these special provisions for executing and returning the contract for approval.

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. The amount of the bidder's security required in Section 2-1.07, "Proposal Guaranty" of the Standard Specifications shall be based on the "TOTAL BID (A)" set forth on the proposal form.

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.

If the bidder claims a mistake was made in his bid, the bidder shall give the Department written notice within 48 hours, not including Saturdays, Sundays and legal holidays, after the opening of bids of the alleged mistake, in lieu of the 5 days specified in Section 2-1.095, \"Relief of Bidders,\" in the Standard Specifications. The notice of alleged mistake shall specify in detail how the mistake occurred.

Submit request for substitution of an "or equal" item, and the data substantiating the request to the Department of Transportation, Division Of Construction - Duty Senior, Mail Station: 3 - B, 111 Grand Avenue / P. O. Box 23660, Oakland, Ca 94623-0660, 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.

**2-1.02 DISABLED VETERAN BUSINESS ENTERPRISE (DVBE)**

Section 10115 of the Public Contract Code requires the Department to implement provisions to establish a goal for Disabled Veterans Business Enterprise (DVBE) in contracts.

It is the policy of the Department that Disabled Veteran Business Enterprise (DVBE) shall have the maximum opportunity to participate in the performance of contracts financed solely with state funds. The Contractor shall ensure that DVBEs have the maximum opportunity to participate in the performance of this contract and shall take all necessary and reasonable steps for this assurance. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of subcontracts. Failure to carry out the requirements of this paragraph shall constitute a breach of contract and may result in termination of this contract or other remedy the Department may deem appropriate.

Bidder's attention is directed to the following:

A. "Disabled Veteran Business Enterprise" (DVBE) means a business concern certified as a DVBE by the Office of Small Business Certification and Resources, Department of General Services.
B. A DVBE may participate as a prime contractor, subcontractor, joint venture partner with a prime or subcontractor, or vendor of material or supplies.
C. Credit for DVBE prime contractors will be 100 percent.
D. A DVBE 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 DVBE joint venture partner must share in the ownership, control, management responsibilities, risks and profits of the joint venture. The DVBE joint venturer must submit the joint venture agreement with the Caltrans Bidder DVBE Information form required in Section 2-1.04, "Submission of DVBE Information," elsewhere in these special provisions.
E. A DVBE 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. Credit for DVBE vendors of materials or supplies is limited to 60 percent of the amount to be paid to the vendor for the material unless the vendor manufactures or substantially alters the goods.
G. Credit for trucking by DVBEs will be as follows:

    1. One hundred percent of the amount to be paid when a DVBE trucker will perform the trucking with his/her own trucks, tractors and employees.
    2. Twenty percent of the amount to be paid to DVBE trucking brokers who do not have a "certified roster."
    3. One hundred percent of the amount to be paid to DVBE trucking brokers who have signed agreements that all trucking will be performed by DVBE truckers if credit is toward the DVBE goal, a "certified roster" showing that all trucks are owned by DVBEs, and a signed statement on the "certified roster" that indicates that 100 percent of revenue paid by the broker will be paid to the DVBEs listed on the "certified roster."
    4. Twenty percent of the amount to be paid to trucking brokers who are not a DVBE but who have signed agreements with DVBE truckers assuring that at least 20 percent of the trucking will be performed by DVBE truckers if credit is toward the DVBE goal, a "certified roster" showing that at least 20 percent of the number of trucks are owned by DVBE truckers, and a signed statement on the "certified roster" that indicates that at least 20 percent of the revenue paid by the broker will be paid to the DVBEs listed on the "certified roster."

    The "certified roster" referred to herein shall conform to the requirements in Section 2-1.04, "Submission Of DVBE Information," elsewhere in these special provisions.
H. DVBEs and DVBE joint venture partners must be certified DVBEs as determined by the Department of General Services, Office of Small Business Certification and Resources, 1531 "I" Street, Second Floor, Sacramento, CA 95814, on the date bids for the project are opened before credit may be allowed toward the DVBE goal. It is the Contractor's responsibility to verify that DVBEs are certified.
I. Noncompliance by the Contractor with these requirements constitutes a breach of this contract and may result in termination of the contract or other appropriate remedy for a breach of this contract.

**2-1.03 DVBE GOAL FOR THIS PROJECT**

The Department has established the following goal for Disabled Veteran Business Enterprise (DVBE) participation for this project:

Disabled Veteran Business Enterprise (DVBE): 3 percent.

It is the bidder's responsibility to make a sufficient portion of the work available to subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DVBE subcontractors and suppliers, so as to assure meeting the goal for DVBE participation.

The Office of Small Business Certification and Resources, Department of General Services, may be contacted at (916) 322-5060 or visit their internet web site at http://www.osmb.dgs.ca.gov/ for program information and certification status. The Department's Business Enterprise Program may also be contacted at (916) 227-9599 or the internet web site at http://www.dot.ca.gov/hq/bep/.

**2-1.04 SUBMISSION OF DVBE INFORMATION**

The required DVBE information shall be submitted WITH THE BID on the following \"CALTRANS BIDDER - DVBE - INFORMATION\" and \"TELEPHONE LOG AND LIST OF REJECTED DVBEs.\"

It is the bidder's responsibility to meet the goal for DVBE participation or to establish that, prior to bidding, the bidder made good faith efforts to do so based on the information in the \"CALTRANS BIDDER - DVBE - INFORMATION\" and \"TELEPHONE LOG AND LIST OF REJECTED DVBEs.\"

The information to show that the DVBE goal will be met on the \"CALTRANS BIDDER - DVBE - INFORMATION\" form shall include the names of DVBEs and DVBE joint venture partners to be used, with a complete description of work or supplies to be provided by each and the dollar value of each such DVBE transaction. When 100 percent of a contract item of work is not to be performed or furnished by a DVBE, a description of the exact portion of said work to be performed or furnished by that DVBE shall be included in the DVBE information, including the planned location of said work. DVBE prime contractors shall enter their Office of Small Business Certification and Resources (OSBCR) - DVBE reference number and/or DBA name, as listed with OSBCR, on the line provided. (Note: DVBE subcontractors to whom the bidder proposes to directly subcontract portions of the work are to be named in the bid. - See Section 2-1.054, \"Required Listing of Proposed Subcontractors,\" of the Standard Specifications and Section 2-1.01, \"General,\" of these special provisions, regarding listing of proposed subcontractors.)

If credit for trucking by a DVBE trucking broker is shown on the bidder's information as 100 percent of the revenue to be paid by the broker is to be paid to DVBE truckers, a \"certified roster\" of the broker's trucks to be used must be included with the bid. The \"certified roster\" must indicate that all the trucks are owned by certified DVBEs and must show the DVBE truck numbers, owner's name, Public Utilities Commission Cal-T numbers, and the DVBE certification numbers. The roster must indicate that all revenue paid by the broker will be paid to DVBEs listed on the \"certified roster\".

If credit for trucking by a trucking broker who is not a DVBE is shown in the bidder's information, a \"certified roster\" of the broker's trucks to be used must be included with the bid. The \"certified roster\" must indicate that at least 20 percent of the broker's trucks are owned by DVBEs and must show the DVBE truck numbers, owner's name, Public Utilities Commission Cal-T numbers, and the DVBE certification numbers. The roster must indicate that at least 20 percent of the revenue paid by the broker will be paid to DVBEs listed on the \"certified roster\".

Information necessary to establish the bidder's good faith efforts to meet the DVBE goals shall be included in the \"TELEPHONE LOG AND LIST OF REJECTED DVBEs\" form located in the Proposal and shall include:

A. The names, dates and times of notices of all certified DVBEs solicited by telephone for this project and the dates, times and methods used for following up initial solicitations to determine with certainty whether the DVBEs were interested.
B. The names of DVBEs who submitted bids which were not accepted and the reason for rejection of the DVBEs bid.

Bidders are cautioned that even though their submittal indicates they will meet the stated DVBE goal, their submittal should also include the telephone log and rejected DVBE information 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.

It is the bidders responsibility to be available, by phone, both the day of and the day after the bid opening to answer questions and provide good faith effort clarification. The bidder shall also assure that listed DVBEs are available, by phone, on both days.

If it is found that the goal has not been met, the Department will review the information submitted with the bid to determine the bidder’s good faith effort. In the event that the Department determines that a bidder has not made a good faith effort based on the information submitted with the bid and its independent investigation, the Department’s decision will be final.

## 2-1.05 SMALL BUSINESS PREFERENCE

Attention is directed to "Award and Execution of Contract" of these special provisions.

Attention is also directed to the Small Business Procurement and Contract Act, Government Code Section 14835, et seq and Title 2, California Code of Regulations, Section 1896, et seq.

Bidders who wish to be classified as a Small Business under the provisions of those laws and regulations, shall be certified as Small Business by the Department of General Services, Office of Small Business Certification and Resources, 1531 "I" Street, Second Floor, Sacramento, CA 95814.

To request Small Business Preference, bidders shall fill out and sign the Request for Small Business Preference form in the Proposal and shall attach a copy of their Office of Small Business Certification and Resources (OSBCR) small business certification letter to the form. The bidder's signature on the Request for Small Business Preference certifies, under penalty of perjury, that the bidder is certified as Small Business at the time of bid opening and further certifies, under penalty of perjury, that under the following conditions, at least 50 percent of the subcontractors to be utilized on the project are either certified Small Business or have applied for Small Business certification by bid opening date and are subsequently granted Small Business certification.

The conditions requiring the aforementioned 50 percent level of subcontracting by Small Business subcontractors apply if:

A. The lowest responsible bid for the project exceeds $100,000; and
B. The project work to be performed requires a Class A or a Class B contractor's license; and
C. Two or more subcontractors will be used.

If the above conditions apply and Small Business Preference is granted in the award of the contract, the 50 percent Small Business subcontractor utilization level shall be maintained throughout the life of the contract.

## 2-1.06 CALIFORNIA COMPANY PREFERENCE

Attention is directed to "Award and Execution of Contract" of these special provisions.

In conformance with the requirements of Section 6107 of the Public Contract Code, a "California company" will be granted a reciprocal preference for bid comparison purposes as against a nonresident contractor from any state that gives or requires a preference to be given contractors from that state on its public entity construction contracts.

A "California company" means a sole proprietorship, partnership, joint venture, corporation, or other business entity that was a licensed California contractor on the date when bids for the public contract were opened and meets one of the following:

A. Has its principal place of business in California.
B. Has its principal place of business in a state in which there is no local contractor preference on construction contracts.
C. Has its principal place of business in a state in which there is a local contractor construction preference and the contractor has paid not less than $5000 in sales or use taxes to California for construction related activity for each of the five years immediately preceding the submission of the bid.

To carry out the "California company" reciprocal preference requirements of Section 6107 of the Public Contract Code, all bidders shall fill out and sign the California Company Preference form in the Proposal. The bidder's signature on the California Company Preference form certifies, under penalty of perjury, that the bidder is or is not a "California company" and if not, the amount of the preference applied by the state of the nonresident Contractor.

A nonresident Contractor shall disclose any and all bid preferences provided to the nonresident Contractor by the state or country in which the nonresident Contractor has its principal place of business.

Proposals without the California Company Preference form filled out and signed may be rejected.

## 2-1.07 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.

In the resolution of disputes involving the project, 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.

The bidder shall include with the proposal, the identification of the bidder's representative authorized to present the bid documentation and the persons responsible for preparing the bidder's estimate.

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 from subcontractors and suppliers; estimates of field and home office overhead; contingency and margin for each contract item of work; and other reports, calculations 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 whose total subcontract exceeds $250,000. Subcontractor bid documentation shall be enclosed with the Contractor's submittal. The examination of subcontractors' bid documentation will be accomplished in the same manner as for the Contractor's bid documentation. If a subcontractor is replaced, bid documentation for the new subcontractor shall be submitted for review and escrow before authorization for the substitution will be granted. Upon request of a subcontractor, the bid documentation from that subcontractor shall be reviewed only by the subcontractor 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 District 04 Office, 111 Grand Avenue, Room 12-820, Oakland, CA, on the first Monday, at 1:00 p.m., following the time indicated in the "Notice to Contractors" for the opening of bids.

Bid documentation shall be submitted 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 bank.

Bid documentation submitted by the second and third apparent low bidders will be jointly deposited at agreed commercial banks. 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. Upon execution and final approval of the contract or rejection of all bids, the bid documentation will be returned to any remaining unsuccessful bidders.

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 in the settlement of claims or disputes.

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 bank 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 contract, if it be awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed and who has met the goal for DVBE participation or has demonstrated, to the satisfaction of the Department, adequate good faith efforts to do so. Meeting the goal for DVBE 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.

It is anticipated that this contract will be awarded within 10 days after the bid opening.

The contract shall be signed by the successful bidder and shall be received with contract bonds by the Department within 4 days, including Saturdays, Sundays and legal holidays, after the bidder has received notice that the contract has been awarded. 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, P.O. Box 942874, Sacramento, CA 94274-0001, Attn: Office Engineer (MS 43)- Contracts.

Within 2 days, not including Saturdays, Sundays and legal holidays, of return of the executed contract and bonds, the Department will notify the successful bidder of either approval of the contract by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation, or disapproval of the submittal. Should the Department fail to provide notification within said 2 days, 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.

The bidder shall bid the number of working days for it to complete the work in Phase I of this contract. Bids in which the number of working days bid for completion of all the work in Phase I exceed 695 days will be considered non-responsive and will be rejected.

All bids will be compared on the basis of the Engineer's Estimate of the quantities of work to be done (TOTAL BID (A)), plus the product of the number of working days bid for completion of all the work in Phase I and the cost per day shown on the Engineer's Estimate (TOTAL BID (B)).

The apparent lowest bid will be determined on the basis of the "Total Basis for Comparison of Bids (A + B)" set forth in the Engineer's Estimate. The contract price for the awarded contract will be the "TOTAL BID (A)" set forth in the proposal.

Each of the two bonds specified in Section 3-1.02, "Contract Bonds," of the Standard Specifications shall be the sum equal to 100 percent of the "Total Bid (A)" set forth on the proposal form.

The contract shall be signed by the successful bidder and shall be received with contract bonds by the Division of Office Engineer within 4 days, not including Saturdays, Sundays and legal holidays, after the contract has been awarded. Failure to do so shall be just cause for forfeiture of the proposal guaranty.

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, vendor 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 20 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.

It is expected that within 2 days, not including Saturdays, Sundays and legal holidays, of return of the executed contract and bonds, the Department will notify the successful bidder of either approval of the contract by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation, or disapproval of the submittal.

Attention is also directed to "Small Business Preference" of these special provisions. Any bidder who is certified as a Small Business by the Department of General Services, Office of Small Business Certification and Resources will be allowed a preference in the award of this contract, if it be awarded, under the following conditions:

A. The apparent low bidder is not certified as a Small Business, or has not filled out and signed the Request for Small Business Preference included with the bid documents and attached a copy of their Office of Small Business Certification and Resources (OSBCR) small business certification letter to the form; and
B. The bidder filled out and signed the Request for Small Business Preference form included with the bid documents and attached a copy of their Office of Small Business Certification and Resources (OSBCR) small business certification letter to the form.

The small business preference will be a reduction in the bid submitted by the small business contractor, for bid comparison purposes, by an amount equal to 5 percent of the amount bid by the apparent low bidder, the amount not to exceed $50,000. If this reduction results in the small business contractor becoming the low bidder, then the contract will be awarded to the small business contractor on the basis of the actual bid of the small business contractor notwithstanding the reduced bid price used for bid comparison purposes.

Attention is also directed to "California Company Preference" of these special provisions.

The amount of the California company reciprocal preference shall be equal to the amount of the preference applied by the state of the nonresident contractor with the lowest responsive bid, except where the "California company" is eligible for a California Small Business Preference, in which case the preference applied shall be the greater of the two, but not both.

If the bidder submitting the lowest responsive bid is not a "California company" and with the benefit of the reciprocal preference, a "California company's" responsive bid is equal to or less than the original lowest responsive bid, the "California company" will be awarded the contract at its submitted bid price except as provided below.

Small business bidders shall have precedence over nonsmall business bidders in that the application of the "California company" preference for which nonsmall business bidders may be eligible shall not result in the denial of the award to a small business bidder.

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

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

The 72 hours advance notice before beginning work as referred to in Section 8-1.03, "Beginning of Work," is changed to 24 hours advance notice for this project.

A working day as defined in Section 8-1.06, "Time of Completion," is re-defined for this project with the following exceptions:

Subparagraph (a) shall not apply. Saturdays, Sundays and legal holidays, including days of inclement weather that do not exceed the days described below, shall be counted as working days.

Subparagraph (b) is re-defined to the following: A rainy season is defined as the twelve month period ,beginning after the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation. For each rainy season of the contract, **forty-five** days (**45**) of inclement weather are expected. The Contractor is expected to anticipate the loss of **forty-five** days of work to inclement weather in his bid for each rainy season as defined above. The **forty-five** days of inclement weather per rainy season shall be reduced for any partial rainy season on the contract as follows:

Partial Year Inclement
Weather Days = ((**forty-five** days/12) x (months remaining in raining season))

The contract will be extended an additional working day for each inclement weather day in excess of the days described above. The Contractor will not be charged for a working day for days on which the Contractor is prevented by inclement weather or conditions resulting immediately therefrom adverse to the current controlling operation or operations, as determined by the Engineer for proceeding with at least 75 percent of the normal labor and equipment force engaged on such operation or operations for at least 60 percent of the total daily time being currently spent on the controlling operation or operations in excess of the days described above.

The work shall be completed in two phases. Phase I consists of completing work as shown on the contract plan SC-4 (Stage Construction, Stage 3 Phase 1) and such other work, including the bridge barriers, the railing on the westerly barrier, all signs, lighting and electrical systems, traffic operations and call box systems that will allow the New Crockett Viaduct to

be completely open to traffic with a minimum of four lanes with final pavement delineation. Phase II consists of all remaining work.

The total number of working days to complete all work in Phase I of the contract shall be the number of working days bid excluding working days for other phases of work and plant establishment are to be performed.

**Said work shall be diligently prosecuted to completion before the expiration of the number of working days bid, beginning at 12:01 a.m. on the day after the day of contract award.**

The Contractor shall pay to the State of California the sum of $35,000 per day, for each and every calendar day's delay in finishing the work in Phase I excess of the number of working days bid.

Delays due to actions required by the Engineer performing normal inspection, testing and review duties shall be considered as included in the number of working days bid for completion of the contract and no extensions of time will be allowed for such actions in determining liquidated damages.

The maximum number of days specified for the completion of the Phase I work contemplated herein is considered insufficient to permit completion of the work 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" required in these special provisions, additional shifts will be required to the extent deemed necessary, be added to ensure that the progress conforms to the above mentioned schedule and that the work will be completed within the number of working days bid.

Phase II work (except plant establishment work) shall be diligently prosecuted to completion before the expiration of the number of working days bid for Phase I plus an additional 610 working days beginning at 12:01 a.m. on the day after the day of contract award.

The Contractor shall pay to the State of California the sum of $ 2,900 per day, for each and every calendar day's delay in finishing Phase II work (except plant establishment work) in excess of the total number of Phase I and Phase II working days prescribed above.

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.

**No incentive payments will be paid nor will disincentive deductions be charged on this project.**

The 72 hours advance notice before beginning work as referred to in said Section 8-1.03 is changed to 24 hours advance notice for this project.

The time limit specified for the completion of the work contemplated herein is considered insufficient to permit completion of the work 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 conformance with the \"Progress Schedule\" required in these special provisions, additional shifts will be required to the extent necessary to ensure that the progress conforms to the abovementioned schedule and that the work will be completed within the time limit specified.

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.

### 5-1.015 LABORATORY

When a reference is made in the specifications to the "Laboratory," the reference shall mean the Division of Materials Engineering and Testing Services and the Division of Structural Foundations 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 the Division of Materials Engineering and Testing Services and the Division of Structural Foundations, located at 5900 Folsom Boulevard, Sacramento, CA 95819, Telephone (916) 227-7000.

## 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.

## 5-1.03 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 SURFACE MINING AND RECLAMATION ACT

Attention is directed to the Surface Mining and Reclamation Act of 1975, commencing in Public Resources Code, Mining and Geology, Section 2710, which establishes regulations pertinent to surface mining operations.

Material from mining operations furnished for this project shall only come from permitted sites in compliance with the Surface Mining and Reclamation Act of 1975.

The requirements of this section shall apply to materials furnished for the project, except for acquisition of materials in conformance with the provisions in Section 4-1.05, "Use of Materials Found on the Work," of the Standard Specifications.

### 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.

**5-1.08 SUBCONTRACTOR AND DVBE RECORDS**

The Contractor shall maintain records of all subcontracts entered into with certified DVBE subcontractors and records of materials purchased from certified DVBE suppliers. The records shall show the name and business address of each DVBE subcontractor or vendor and the total dollar amount actually paid each DVBE subcontractor or vendor.

Upon completion of the contract, a summary of these records shall be prepared on Form CEM-2402 (S) and certified correct by the Contractor or the Contractor's authorized representative, and shall be furnished to the Engineer.

**5-1.086 PERFORMANCE OF DVBE SUBCONTRACTORS AND SUPPLIERS**

The DVBEs listed by the Contractor in response to the provisions in Section 2-1.04, "Submission of DVBE Information," and Section 3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified DVBEs, 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 utilize other forces or sources of materials may be requested for the following reasons:

A. The listed DVBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract, when the written contract, based upon the general terms, conditions, plans and specifications for the project, or on the terms of the subcontractor's or supplier's written bid, is presented by the Contractor.
B. The listed DVBE becomes bankrupt or insolvent.
C. The listed DVBE 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 DVBE 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. The listed DVBE subcontractor is not licensed pursuant to the Contractor's License Law.
G. It would be in the best interest of the State.

The Contractor shall not be entitled to payment for the work or material unless it is performed or supplied by the listed DVBE 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, Section 2, "Proposal Requirements and Conditions," Section 2-1.04, "Submission of DVBE Information," and Section 3, "Award and Execution of Contract," of these special provisions and these special provisions.

Pursuant to the provisions in 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 DVBE information furnished under Section 2-1.04, \"Submission of DVBE Information,\" of these special provisions is in addition to the subcontractor information required to be furnished in Section 8-1.01, "Subcontracting," and Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications.

Section 10115 of the Public Contract Code requires the Department to implement provisions to establish a goal for Disabled Veteran Business Enterprise (DVBE) participation in highway contracts that are State funded. As a part of this requirement:

A. No substitution of a DVBE subcontractor shall be made at any time without the written consent of the Department, and
B. If a DVBE subcontractor is unable to perform successfully and is to be replaced, the Contractor shall make good faith efforts to replace the original DVBE subcontractor with another DVBE subcontractor.

The provisions in Section 2-1.02, "Disabled Veteran Business Enterprise (DVBE)," of these special provisions that DVBEs shall be certified on the date bids are opened does not apply to DVBE 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.

**5-1.11 (BLANK)**

**5-1.12 DISPUTE REVIEW BOARD**

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. 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 special provision shall be considered as an essential prerequisite to filing a claim, for arbitration or 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 until the day of acceptance of the contract, at which time the work of the DRB will cease except for completion of unfinished dispute hearings and reports. After acceptance of the contract, disputes or potential claims that the Contractor wants to pursue that have not been settled, 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 completion of the State's administrative claims procedure, the Contractor may resort to arbitration in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications.

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 claims not actionable against the State as specified in these special provisions. 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.

The DRB shall consist of one member selected by the State, one member selected by the Contractor, 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 DRB Chairperson.

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 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.

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.

DRB members shall be especially knowledgeable in the type of construction and contract documents potentially anticipated by the contract. The members shall discharge their responsibilities impartially and as an independent body considering the facts and circumstances related to the matters under consideration, applicable laws and regulations, and the pertinent provisions of the contract.

The State and the Contractor shall select their respective 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 member along with the prospective member's written disclosure statement.

Before their appointments are final, the first 2 prospective DRB members shall submit complete disclosure statements to both the State and the Contractor. The statement shall include a resume of the prospective member's experience, together with a declaration describing past, present, and anticipated or planned future 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, the parties' principals or the parties' counsel. The DRB members shall also include a full disclosure of close professional or personal relationships with all key members of the parties to the contract. Either the Contractor or the State may object to the others nominee and that person will not be selected for the DRB. No reason need be given for the first objection. Objections to subsequent nominees must be based on a specific breech or violation of nominee responsibilities under this specification. A different person shall then be nominated within 14 Days. The third DRB member shall supply a full disclosure statement to the first 2 DRB members and to the parties prior to appointment. Either party may reject any of the 3 prospective DRB members who fail to fully comply with all required employment and financial disclosure conditions of DRB membership as described in the Dispute Review Board Agreement and herein. A copy of the Dispute Review Board Agreement is included in this special provision.

The first duty of the State and Contractor selected members of the DRB is to select and recommend prospective third member(s) 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 14 days of the notification.

An impasse shall be considered to have been reached if the parties are unable to approve a third member within 14 days of receipt of the recommendation of the first 2 DRB members, or if the first 2 members are unable to agree upon a recommendation within the 14 day time limit allowed in the preceding paragraph. In the event of an impasse in selection of the third DRB member, the State and the Contractor shall each propose 3 candidates for the third 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.

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 14 days of the parties' concurrence in the selection of the third member. 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.

The State and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB board member shall be compensated at an agreed rate of $1,000 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB board member shall be compensated at an agreed rate of $600 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, that has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of $100 per hour. The agreed amount of $100 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than

one DRB, 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 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 its 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.

Service of a DRB member may be terminated at any time with not less than 14 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 members for the removal of the third member.
D. Upon resignation of a member.

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 14 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.

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, including provision of applicable cost documentation; or file written protests or notices pursuant to Section 4-1.03A, "Procedure and Protest," Section 8-1.06, "Time of Completion," Section 8-1.07, "Liquidated Damages," or Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.
B. The Engineer will respond, in writing, to the Contractor's written protest or notice within 14 days of receipt of the written protest or notice.
C. Within 14 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 the Contractor's objection to the Engineer's decision, 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 reply 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.
E. The Contractor, by failing to submit the written notice of referral of the matter to the DRB, within 21 days after receipt of the State's written reply, waives future claims 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 14 days prior to the date the DRB is scheduled to convene the hearing for the dispute. Either party shall produce such additional evidence as the DRB may deem necessary to reach an understanding and 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 will not consider evidence not furnished in conformance with the terms specified herein.
G. 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 shall complete its reports, including minority opinion, if any, and submit them to the parties within 30 days of the DRB hearing, 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, applicable laws and regulations, the pertinent provisions of the Contract and the actual costs and time incurred as shown on the Contractor's cost accounting records.
H. 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 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 by both parties, the DRB will 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 will 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.

I. 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.

J. 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.

K. The State or the Contractor shall not call 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.

L. 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.

M. 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 CLAIMS**

For purposes of this section, a "subcontractor claim" shall include any claim by a subcontractor (including also any pass through 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 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 claim or claims.

B. The Contractor shall include, as part of its submission pursuant to Step 4 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 claim. The Contractor shall submit a certification that the subcontractor claim is acknowledged and forwarded by the Contractor. The form for these certifications are available from the Engineer.

C. At any DRB meeting on a dispute that includes one or more subcontractor claims, the Contractor shall require that each subcontractor that is involved in the dispute have present an authorized representative with actual knowledge of the facts underlying the subcontractor claim to assist in presenting the subcontractor claim and to answer questions raised by the DRB members or the Department's representatives.

D. Failure by the Contractor to declare a subcontractor claim on behalf of its subcontractor (including lower tier subcontractors' and suppliers' pass through claims) at the time of submission of the Contractor's claims, as provided hereunder, shall constitute a release of the Department by the Contractor on account of such subcontractor claim.

E. The Contractor shall include in all subcontracts under this contract that subcontractors and suppliers of any tier (a) agree to submit subcontractor 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 claims; (c) agree that, to the extent a subcontractor 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 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 claims between the subcontractor(s) or supplier(s) and the Contractor that is not actionable by the Contractor against the Department.

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 (01-05-98)

**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 which 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 the pertinent contract provisions, and the facts and circumstances involved in the dispute. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered.

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 hearings, 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 6 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 claims.

The STATE's representative will prepare minutes of all regular meetings and circulate them for revision and approval by all concerned.

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 DRB shall determine the time and location of DRB hearings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. If the matter is not urgent, it may be scheduled for the time of the next scheduled DRB visit to the project. For an urgent matter, and upon the request of either party, the DRB shall meet at its earliest convenience.

Normally, hearings shall be conducted at or near the project site. However, any location which 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 hearings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, 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 hearing 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 hearings 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 hearings and all other DRB activities. The parties shall have a representative at all hearings. Failure to attend a duly noticed 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 may ask questions, seek clarification, or request further data from either of the parties. 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. Claims shall not necessarily be computed by merely subtracting bid price from the total cost of the affected work. However, if claims are based on the "total cost method," then, to be considered by the DRB, they shall be supported by evidence furnished by the CONTRACTOR that (1) the nature of the dispute(s) makes it impossible or impracticable to determine costs with a reasonable degree of accuracy, (2) the CONTRACTOR's bid estimate was realistic, (3) the CONTRACTOR's actual costs were reasonable, and (4) the CONTRACTOR was not responsible for the added expenses. As to claims based on the CONTRACTOR's field or home office accounting records, those claims shall be supported by an audit report of an independent Certified Public Accountant unless the contract includes special provisions that provide for an alternative method to calculate unabsorbed home office overhead. Any of those claims shall also be subject to audit by the DRB with the concurrence of the parties. In large or complex cases, additional hearings 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 hearings, 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 hearings 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 chairman shall complete and furnish a summary report to the DRB Program Manager, Construction Program, 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 14 days. This AGREEMENT will 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 which are or may become necessary for the DRB to perform their function. Pertinent documents are 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 board member shall be compensated at an agreed rate of $1,000 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB board member shall be compensated at an agreed rate of $600 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 $100 per hour. The agreed amount of $100 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB, 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 AGREEMENT, THE DRB, AND DRB MEMBERS**

DRB members may resign from the DRB by providing not less than 14 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power, in conformance with the terms of the contract.

**SECTION IX LEGAL RELATIONS**

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

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

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

**SECTION X CONFIDENTIALITY**

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

**SECTION XI DISPUTES**

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

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

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

**SECTION XIII FEDERAL REVIEW AND REQUIREMENTS**

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

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

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

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

| | |
|---|---|
| DRB MEMBER | DRB MEMBER |
| By: _____ | By: _____ |
| Title: _____ | Title :_____ |
| DRB MEMBER | |
| By :_____ | |
| Title :_____ | |
| CONTRACTOR | CALIFORNIA STATE DEPARTMENT OF TRANSPORTATION |
| By: _____ | By: _____ |
| Title: _____ | Title: _____ |

**5-1.13 PLANS AND WORKING DRAWINGS**

When the specifications require working drawings to be submitted to the Engineer, the drawings shall be submitted to: Office of Resident Engineer, 3045 Research Drive, Richmond, CA 94086-5206.

**5-1.14 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 will be to maintain cooperative communication and mutually resolve conflicts at the lowest possible management level.

A one-day “Training in Partnering Concepts” forum will be conducted regardless of whether the Contractor requests the formation of a “Partnering” relationship. The forum will be conducted locally for the Contractor and the Engineer’s project representatives. The Contractor shall be represented by a minimum of two representatives, one being the Contractor’s authorized representative pursuant to Section 5-1.06, “Superintendence,” of the Standard Specifications. If, upon the Contractor’s request, “Partnering” is approved by the Engineer, “Training in Partnering Concepts” shall be conducted prior to the “Partnering” workshop. Scheduling of “Training in Partnering Concepts,” selection of the Engineer’s representatives to participate in “Training of Partnering Concepts,” and selection of the partnering concepts trainer and site shall be as determined by the Engineer.

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.

The costs involved in providing a trainer and site for the "Training in Partnering Concepts" forum will be borne by the State. The Contractor shall pay all compensation for the wages and expenses of the facilitator and of the expenses for obtaining the workshop site. The State will reimburse the Contractor for these costs as extra work in conformance with the provisions in Section 4-1.03D of the Standard Specifications. Full compensation for the wages and expenses of the Contractor's representatives, including travel costs, 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 costs involved in providing a “Partnering” facilitator and a workshop site will be borne equally by the State and the Contractor. The Contractor shall pay all compensation for the wages and expenses of the facilitator and of the expenses for obtaining the workshop site. The State's share of such costs will be reimbursed to the Contractor in a change order written by the Engineer.

Markups will not be added to the costs of “Training in Partnering Concepts” or the costs of providing a “Partnering” facilitator and workshop site. All other costs associated with the "Partnering" relationship will be borne separately by the party incurring the costs.

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.

### 5-1.15 CLAIMS SUBMITTAL

Claims submittal may be made on work completed, except for plant establishment work, upon receiving relief from maintenance and responsibility for the completed work in lieu of acceptance by the Director as specified in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. Claims submitted upon granting of relief from maintenance and responsibility will be processed in conformance with the provisions in Section 9–1.07B, "Final Payment and Claims," of the Standard Specifications and these special provisions.

Upon the request of the Contractor, relief from maintenance and responsibility for work completed in conformance with the requirements of the contract and to the satisfaction of the Engineer may be granted in conformance with the provisions in Section 7-1.15, "Relief From Maintenance and Responsibility," of the Standard Specifications. Within 90 days of granting relief from maintenance and responsibility, the Engineer will issue to the Contractor, in writing, a final progress pay estimate showing the completed items of work. Within 30 days after receiving the final progress pay estimate, the Contractor may submit to the Engineer a written statement of the claims arising under the contract exclusive of plant establishment work. No claim arising from work for which relief of maintenance and responsibility were granted will be considered unless it was included in the written statement of claims.

The proposed final estimate for the contract will be submitted to the Contractor after acceptance of the work, including plant establishment. After submittal of the proposed final estimate, no claim will be considered except for those arising from plant establishment work or additional work ordered by the Engineer during the plant establishment period of the contract.

The process for resolution of the contract claims, including plant establishment work, by arbitration shall not begin until acceptance of the work by the Engineer and shall be in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications.

### 5-1.16 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

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

| ITEM CODE | ITEM |
|---|---|
| 390155 | ASPHALT CONCRETE (TYPE A) |
| 290211 | ASPHALT TREATED PERMEABLE BASE |
| 390171 | ASPHALT CONCRETE BASE (TYPE A) |

The compensation payable for asphalt concrete, asphalt concrete base and asphalt treated permeable base will be increased or decreased in conformance with the provisions of this section for paving asphalt price fluctuations exceeding 5 percent (Iu/Ib is greater than 1.05 or less than 0.95) 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, asphalt concrete base or asphalt treated permeable base is included in a monthly estimate:

A. Total monthly adjustment = AQ

B. For an increase in paving asphalt price index exceeding 5 percent:

$$A = 0.90\ (1.1023)\ (Iu/Ib - 1.05)\ Ib$$

C. For a decrease in paving asphalt price index exceeding 5 percent:

$$A = 0.90\ (1.1023)\ (Iu/Ib - 0.95)\ Ib$$

D. Where:

A = Adjustment in dollars per tonne of paving asphalt used to produce asphalt concrete, asphalt concrete base 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 and asphalt concrete base 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. The total price adjustment for price index increases of paving asphalt on this project shall not exceed $76,200.00.
D. 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.

**5-1.17 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.

**5.1.18 FORCE ACCOUNT PAYMENT**

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

Attention is directed to "Progress Schedule (Critical Path) 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 a markup of 28 percent to the cost of labor, 10 percent to the cost of materials, and 10 percent to the equipment rental. These markups shall be applied to all 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 "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 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," 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 all overhead costs for work performed on a force account basis, and for which no adjustment is made to the contract lump sum price for related overhead pursuant to "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 accordance 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.

**5-1.19 COST REDUCTION INCENTIVE PROPOSAL**

Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications is amended by adding the following paragraph:

Prior to preparing a cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept and to determine whether the cost reduction proposal will be considered by the Department. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, traffic considerations, safety, health issues, design criteria, and review times required by the Department and other agencies. Determination by the Engineer that a cost reduction proposal will not be considered further will be deemed rejection of the proposal.

**5-1.20 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 $200,000

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. Piling
B. Prestressing steel for cast-in-place members (sealed packages only)
C. Tieback Anchors
D. Bearings
E. Joint Seal Assemblies
F. Bar Reinforcing Steel
G. Structural Steel
H. Isolation Casings
I. Miscellaneous Metal
J. Deck Drainage
K. Metal Railing
L. Chain Link Railing
M. Timber Lagging
N. Subgrade Enhancement Fabric (Geogrid)
O. Metal Sign Structures
P. Culvert Pipe
Q. Underdrain Pipe
R. Miscellaneous Iron and Steel
S. Chain Link Fence and Gates
T. Metal Beam Guard Railing
U. Pavement Markers
V. Lighting Standards

**5-1.21 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.

Between the hours of 7:00 a.m. and 7:00 p.m. there are no sound control restrictions. The Contractor shall furnish and install sound absorption devices around the pile driving operation to reduce noise level emitted from pile driving operations.

The noise level from all of the Contractor's operations, between the hours of 7:00 p.m. and 7:00 a.m. on week days and all hours during the weekend, shall not exceed 86 dbA at a distance of 15 meters.

Said noise level requirement shall apply to all 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.

### 5-1.22 HAZARDOUS AND NON-HAZARDOUS MATERIAL, GENERAL

Attention is directed to "Earthwork" of these special provisions regarding the removal and disposal of hazardous and non-hazardous material described in this section.

Hazardous and non-hazardous material have been discovered through testing within the project limits. The designation "hazardous" shall apply to soil material with contaminant levels that meet or exceed the contaminant levels specified in the California Code of Regulations Title 22. The designation "non-hazardous" shall apply to all soil material with either contaminant levels below the levels specified in California Code of Regulations Title 22 or with non-detect contaminant levels. Portions of the test results are included in the “Materials Information Handout.” The complete report entitled “Site Investigation Report: Carquinez Interchange and South Approach” is available for inspection at the Department of Transportation, Toll Bridge Duty Senior’s Desk, 111 Grand Avenue, Oakland, California, (510) 286-5549. Requests to review the report must be made with the duty senior at least 24 hours in advance. The levels of material designated as hazardous are not regulated under the Resource Conservation and Recovery Act Material designated as non-hazardous in the plans or these special provisions may be utilized as embankment within the project limits.

Hazardous materials shall be transferred directly from the excavation to a registered transport vehicle, a storage container approved for transport of hazardous waste by the United States Department of Transportation, or a stockpile location approved by the Engineer. Non-hazardous materials shall be transferred directly from the excavation to a transport vehicle, a storage container, or a stockpile location approved by the Engineer. Hazardous materials shall be excavated and stockpiled separately from non-hazardous material. Stockpile locations shall be maintained in accordance with the following requirements:

A. The material shall not contain free liquids that separate readily from the material. The presence or absence of free liquids shall be demonstrated by United States Environmental Protection Agency Method 9095 as modified by Section 66264.314 of Title 22 of the California Code of Regulations.
B. The material shall be stored on undamaged 1.5-mm high density polyethylene or an equivalent impermeable barrier unless the stockpiling location is on a paved surface. If the location is on a paved surface the thickness of the barrier can be reduced to 0.5-mm high density polyethylene or its equivalent. The dimensions of the barrier shall exceed the dimensions of the stockpile at all times. Any seams in the barrier shall be sealed to prevent leakage.
C. At the end of each day and during storm events the material shall be covered with undamaged 0.3-mm polyethylene or an equivalent impermeable barrier to prevent windblown dispersion and precipitation run-off and run-on. When more than one sheet is required to cover the material, the sheets shall be overlapped a minimum of 450 mm in a manner that prevents water from flowing onto the material. The cover shall be secured in a manner that keeps it in place at all times. Driven anchors shall not be used except at the perimeter of the stockpile. The cover shall be inspected and maintained in accordance with the requirements of "Water Pollution Control" of these special provisions.

These stockpiling requirements apply to all temporary storage of hazardous and non-hazardous material outside of an excavation or a transport container including, but not limited to, staging of excavated material next to the excavation prior to pick up by loading equipment, accumulating material for full transport loads, and awaiting test results required by a disposal facility. The removal of stockpiles shall begin within 30 days of accumulating 100 kg of hazardous material. After final removal has occurred the Contractor shall be responsible for any cleanup deemed necessary by the Engineer.

All hazardous and non-hazardous material on exteriors of transport vehicles shall be removed and placed either into the current transport vehicle or the excavation prior to the vehicle leaving the loading area. No hazardous or non-hazardous material shall be deposited on public roads. The Contractor shall indemnify the State from any costs due to spillage during the transport of the hazardous or non-hazardous material to the disposal facility.

The Contractor shall monitor the air quality continuously during excavation operations at all locations containing hazardous material.

Excavation operations outside structure excavation pay limits will be at the Contractor’s expense. This resultant material shall be treated as hazardous material if the test results for the location indicate that the material being excavated is hazardous.

**APPLICABLE RULES AND REGULATIONS**

Excavation, transport and disposal of hazardous and non-hazardous material shall be in accordance with the rules and regulations of the following agencies:

United States Department of Transportation (USDOT)
United States Environmental Protection Agency (USEPA)
California Environmental Protection Agency (CAL-EPA)

1. Department of Toxic Substance Control (DTSC)
2. Integrated Waste Management Board
3. Regional Water Quality Control Board, Region 2 (RWQCB)
4. State Air Resources Board

Bay Area Air Quality Management District (BAAQMD)
California Division of Occupational Safety and Health Administration (CAL-OSHA)

**PERMITS AND LICENSES**

The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the hazardous material. The California Environmental Quality Act (CEQA)of 1970 (Chapter 1433, Stats. 1970), as amended may be applicable to permits, licenses and authorizations which the Contractor shall obtain from all agencies in connection with performing the work of the contract. The Contractor shall comply with the provisions of said statutes in obtaining such permits, licenses and other authorizations.

The Engineer will obtain the Environmental Protection Agency Generator Identification No. and Board of Equalization Identification Number and sign all manifests as the State is the Generator.

**HEALTH, SAFETY AND WORK PLAN**

The Contractor shall prepare a detailed Health, Safety and Work Plan for all site personnel in accordance with the DTSC and CAL-OSHA regulations. The Health, Safety and Work Plan shall include a plot plan indicating the exclusion zones, contaminant reduction (decontamination zones) and support zones as described in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities published by the National Institute for Occupational Safety and Health, Occupational Safety and Health Administration, and USEPA; an air monitoring plan; and site clean up procedures. The Health, Safety and Work Plan shall be submitted in accordance with the requirements of "Relations with California Environmental Protection Agency, Department of Toxic Substances Control" elsewhere in these special provisions. Prior to submittal, the Contractor shall have the Health, Safety and Work Plan approved by a Civil Engineer, registered in the State of California and by an Industrial Hygienist certified by the American Board of Industrial Hygiene.

**SAFETY**

Prior to performing any work at the locations containing material classified as hazardous, all personnel, including State Personnel, shall complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified. The training shall be provided by the Contractor. The Contractor shall provide a certification of completion of the Safety Training Program to all personnel. Any personal protective equipment required by the Contractor's Health, Safety and Work Plan for personnel working within the exclusion zone will be supplied to State personnel by the Contractor. The number of State personnel requiring the above mentioned safety training program and personal protective equipment will be 10.

The decontamination area shall be located outside of the exclusion zone. Water from decontamination procedures shall be collected and disposed of at an appropriate disposal site by the Contractor. Non-reusable protective equipment, once used by any personnel, including State personnel, shall be collected and disposed of at an appropriate disposal site by the Contractor. Temporary 6-foot chain link security fence shall be installed to surround and secure the exclusion zone.

**SAMPLING AND ANALYSIS**

The Contractor shall test the material to be excavated at his own expense for any additional acceptance requirements put forth by the disposal facility. Sampling and analysis shall be performed using the sampling and analysis procedure required by the disposal facility.

The Contractor may perform additional tests on the material to be excavated at his option and expense for confirmation of the material classification as hazardous. Sampling and analysis shall be the same or equivalent tests specified in the site investigation report. The Contractor shall submit for approval by the Engineer, his sampling and analysis procedure and the name and address of the laboratory to be used 21 working days prior to beginning any sampling or analysis. The laboratory

used shall be certified by the California Department of Health Services. The contractor shall submit a copy of the test results to the Engineer prior to disposal of the material.

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 affected by this section and no additional compensation will be allowed therefor.

### 5-1.23 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 Department of Transportation at 111 Grand Avenue, Oakland, California 94601. Please call the Construction Office Duty Senior, telephone number (510) 286-5209 at least 24 hours in advance.

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.

### 5-1.24 RELATIONS WITH U.S. ARMY CORPS OF ENGINEERS

The location of the Crockett Interchange is within an area controlled by the U.S. Army Corps of Engineers. Permit has been issued covering work to be performed under this contract. The Contractor shall be fully informed of all rules, regulations and conditions of the permit that may govern the Contractor's operations in said area and shall conduct the Contractor's work accordingly. Said document shall be considered a part of, and shall become, an integral part of the special provisions and contract for this project.

Copies of the Permit may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916)654-4490, and are available for inspection at the Toll Bridge Program Duty Senior at District 04 Office, 111 Grand Avenue, Oakland, California 94612, email duty_senior_tollbridge_district04@dot.ca.gov, telephone number (510) 286-5549.

Any modifications to the permit which are proposed by the Contractor shall be submitted in writing to the Engineer for transmittal to the Army Corps of Engineers for their consideration.

When the Contractor is notified by the Engineer that a modification to the permit is under consideration, no work will be allowed on the proposed modification until the Department takes action on the proposed modification. Any modifications to any agreement between the Department of Transportation and the Army Corps of Engineers shall be fully binding on the Contractor, and the provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Full compensation for conforming to the requirements of this section 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.

### 5-1.25 RELATIONS WITH SAN FRANCISCO BAY CONSERVATION DEVELOPMENT COMMISSION (BCDC)

The location of the Crockett Interchange is within an area controlled by the BCDC. Permit has been issued covering work to be performed under this contract. The Contractor shall be fully informed of all rules, regulations and conditions of the permit that may govern the Contractor's operations in said area and shall conduct the Contractor's work accordingly. Said document shall be considered a part of, and shall become, an integral part of the special provisions and contract for this project.

Copies of the Permit may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No.

(916)654-4490, and are available for inspection at the Toll Bridge Program Duty Senior at District 04 Office, 111 Grand Avenue, Oakland, California 94612, telephone number (510) 286-5549.

Any modifications to the permit which are proposed by the Contractor shall be submitted in writing to the Engineer for transmittal to the BCDC for their consideration.

When the Contractor is notified by the Engineer that a modification to the permit is under consideration, no work will be allowed on the proposed modification until the Department takes action on the proposed modification. Any modifications to any agreement between the Department of Transportation and BCDC shall be fully binding on the Contractor, and the provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

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.

### 5-1.26 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

The location of the Crockett Interchange is within an area controlled by the Regional Water Quality Control Board. Regional Water Quality Control Board Order No. 2118.03 (RHW) omt 2128.03 has been issued covering work to be performed under this contract. The Contractor shall be fully informed of all rules, regulations and conditions that may govern the Contractor's operations in said area and shall conduct the Contractor's work accordingly.

Copies of the agreement may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490, and are available for inspection at the office of the Toll Bridge Program Duty Senior at 111 Grand Avenue, Oakland California 94612, telephone number (510) 286-5549.

Attention is directed to Sections 7-1.11, "Preservation of Property," and 7-1.12, "Responsibility for Damage," of the Standard Specifications.

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.

Any modifications to the permit which are proposed by the Contractor shall be submitted in writing to the Engineer for transmittal to the Regional Water Quality Control Board for their consideration.

When the Contractor is notified by the Engineer that a modification to the permit is under consideration, no work will be allowed on the proposed modification until the Department takes action on the proposed modification.

Any modifications to any agreement between the Department of Transportation and the Regional Water Quality Control Board shall be fully binding on the Contractor, and the provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Full compensation for conforming to the requirements of this section 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.

### 5-1.27 RELATIONS WITH UNITED STATES FISH AND WILDLIFE SERVICE

This project is located within the jurisdiction of the U.S. Fish and Wildlife Service. The Fish and Wildlife Service has issued a Biological Opinion regarding the Delta Smelt and Sacramento Splittail a federal and state endangered species protected under both the federal Endangered Species Act and the California Endangered Species Act. The Department of Transportation has entered into an agreement with the Fish and Wildlife Service regarding handling of Delta Smelt and Sacramento Splittail at the Crockett Interchange. The Contractor shall be fully informed of the requirements of this agreement as well as of all rules, regulations, and conditions that may govern the Contractor's operations in said area and shall conduct the Contractor's operations accordingly.

Copies of the agreement may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-0001, Telephone No. (916) 654-4490, and are available for inspection at the office of the Toll Bridge Retrofit Program Duty Senior at District 04 Office, 111 Grand Avenue, Oakland, California 94612; telephone number (510) 286-5549.

Any modifications to any agreement between the Department of Transportation and the United States Fish and Wildlife Service shall be fully binding on the Contractor, and the provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Full compensation for conforming to the requirements of this section 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.

### 5-1.28 RELATIONS WITH BAY AREA AIR QUALITY MANAGEMENT DISTRICT (ASBESTOS DEMOLITION/RENOVATION)

Portions of the work being performed under this contract are subject to the provisions of Regulation 11, Rule 2, “Asbestos Demolition, Renovation, and Manufacturing,” of the Bay Area Air Quality Management District (BAAQMD). The Contractor shall be fully informed of the provisions of Rule 2 and shall conduct the work accordingly.

The Contractor shall submit the required notification of intent to demolish or renovate to the BAAQMD at least 10 working days, as defined in Rule 2, prior to beginning any demolition, even where no regulated asbestos-containing material (RACM) is present; any renovation operation where the amount of RACM is at least 30.8 linear meter, 9.4 square meters, or 1 cubic meter; and for all dry removals. The Contractor shall pay all fees for conducting the asbestos operations.

An asbestos survey has been completed covering the work areas of this contract. Copies of the report may be obtained and are available for inspection at the office of the Toll Bridge Duty Senior at 111 Grand Avenue, Oakland, CA 94612, telephone no. (510) 286-5549. Notify the Duty Senior at least 24 hours in advance to reserve a copy for review.

Attention is directed to Sections 7-1.01, "Laws to be Observed," 7-1.04, "Permits and Licenses," and 7-1.09, "Public Safety," of the Standard Specifications.

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

### 5-1.29 RELATIONS WITH CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY, DEPARTMENT OF TOXIC SUBSTANCE CONTROL (DTSC)

Attention is directed to "Hazardous and Non-Hazardous Material, General" and "Earthwork" of these special provisions.

The Department of Transportation has entered into a Voluntary Cleanup Agreement with the DTSC for this project. A copy of the Voluntary Cleanup Agreement (VCA), Docket No. HAS 97/98-024 may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California, 94274-0001, Telephone No. (916) 654-4490, and is available for inspection at the office of Toll Bridge Program, Duty Senior's Desk at 111 Grand Avenue, Oakland, California 94612-3171, Telephone No. (510) 286-5549.

The Contractor shall fully inform himself of all rules, regulations and conditions that may govern his operations for handling, transportation and disposal of excavated material and for all other construction related activities which may disturb hazardous soil within the project limits.

The Health, Safety and Work Plan prepared by the Contractor for the project shall be submitted to the Engineer and DTSC for review and comment. Throughout the review process the contractor shall provide 3 copies of the Health, Safety and Work Plan. The Contractor shall allow 10 days for review of the Health, Safety and Work Plan by the Engineer. Upon receipt of response comments by the Engineer, the Contractor shall make all necessary revisions and incorporate responses to all comments in the Health, Safety and Work Plan. The Health, Safety and Work Plan shall then be submitted to the DTSC via the Engineer for review and comment. The Contractor shall allow 20 days for review of the Health, Safety and Work Plan by the DTSC. Upon receipt of response comments by the DTSC, the Contractor shall make all necessary revisions and incorporate responses to all comments in the Health, Safety and Work Plan. If subsequent review is required by the DTSC, then the Contractor shall then resubmit the Health, Safety and Work Plan via the Engineer to the DTSC and allow 15 days for their review. Upon receipt of the final response comments by the DTSC, the Contractor shall make all necessary revisions and incorporate responses to all comments in the final Health, Safety and Work Plan. The contractor shall provide 8 copies of the final Health, Safety and Work Plan to the Engineer.

The Contractor shall also prepare a detailed Soil Management Plan and Transportation Plan for submittal to and review by the DTSC and the Engineer. The Soil Management Plan and Transportation Plan shall be prepared in accordance with the requirements of the VCA and guidance materials available for review at 111 Grand Avenue, Oakland, CA 94612. Contact the Toll Bridge Program Duty Senior at telephone number (510) 286-5549 to reserve a copy of the guidance materials at least 24 hours in advance. Throughout the review process the contractor shall provide 3 copies of the Soil Management Plan and Transportation Plan. The Contractor shall allow 10 days for review of the Soil Management Plan and Transportation Plan by the Engineer. Upon receipt of response comments by the Engineer, the Contractor shall make all necessary revisions and incorporate responses to all comments in the Soil Management Plan and Transportation Plan. The Soil Management Plan and Transportation Plan shall then be submitted to the DTSC via the Engineer for review and comment. The Contractor shall allow 20 days for review of the Soil Management Plan and Transportation Plan by the DTSC. Upon receipt of response comments by the DTSC, the Contractor shall make all necessary revisions and incorporate responses to all comments in the Soil Management Plan and Transportation Plan. If subsequent review is required by the DTSC, then the Contractor shall then resubmit the Soil Management Plan and Transportation Plan to the DTSC via the Engineer and allow 15 days for their review. Upon receipt of the final response comments by the DTSC, the Contractor shall make all necessary revisions and incorporate responses to all comments in the final Soil Management Plan and Transportation Plan. The Contractor shall provide 8 copies of the final Soil Management Plan and Transportation Plan to the Engineer.

The Contractor shall not perform any excavation work at locations containing material classified as hazardous until the Engineer provides written approval of the final Soil Management Plan and Transportation Plan and the final Health, Safety and Work Plan.

The Contractor shall prepare an Implementation Report for submittal to the DTSC via the Engineer within 30 days of completion of field activities. The Implementation Report shall provide a chronological summary of the soil management, health and safety, and soil transportation activities that have occurred on site. The Implementation Report shall be supplemented with photographs and field diaries that document the soil management, health and safety, and soil

transportation activities. The Contractor shall allow 21 days for review of the Implementation Report by the Engineer and the DTSC. Upon receipt of the response comments by the DTSC and the Engineer, the Contractor shall make all necessary revisions and incorporate responses to all comments in the final Implementation Report. The contractor shall provide 8 copies of the final Implementation Report to the Engineer.

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

## 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 inch-pound (Imperial) system 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 as 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.

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 | IMPERIAL 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 $mm^2$ | US CUSTOMARY UNITS 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 SHOWN ON THE PLANS | EQUIVALENT IMPERIAL BAR DESIGNATION NUMBER TO BE SUBSTITUTED |
|---|---|
| 13 | 4 |
| 16 | 5 |
| 19 | 6 |
| 22 | 7 |
| 25 | 8 |
| 29 | 9 |
| 32 | 10 |
| 36 | 11 |
| 43 | 14 |
| 57 | 18 |

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.

The sizes in the following tables of materials and products are exact conversions of metric sizes of materials and products and are listed as acceptable equivalents:

CONVERSION 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 | EQUIVALENT IMPERIAL SIZE 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 |

CONVERSION 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<br>mm | EQUIVALENT US STANDARD GAGE<br>inch | METRIC THICKNESS SHOWN ON THE PLANS<br>mm | EQUIVALENT GALVANIZED SHEET GAGE<br>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 | -------- | -------- |

CONVERSION TABLE FOR WIRE

| METRIC THICKNESS SHOWN ON THE PLANS mm | EQUIVALENT USA STEEL WIRE THICKNESS 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 |

CONVERSION TABLE FOR PIPE PILES

| METRIC SIZE SHOWN ON THE PLANS mm x mm | EQUIVALENT IMPERIAL SIZE 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 inches (T") represents an exact conversion of the metric thickness in millimeters (T).

CONVERSION 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 | EQUIVALENT NOMINAL US SIZE 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 |

CONVERSION TABLE FOR NAILS AND SPIKES

| METRIC COMMON NAIL, SHOWN ON THE PLANS<br>Length, mm<br>Diameter, mm | METRIC BOX NAIL, SHOWN ON THE PLANS<br>Length, mm<br>Diameter, mm | METRIC SPIKE, SHOWN ON THE PLANS<br>Length, mm<br>Diameter, mm | EQUIVALENT IMPERIAL SIZE<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 |

CONVERSION 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 | EQUIVALENT NOMINAL US SIZE 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 |

**8-1.02 APPROVED TRAFFIC PRODUCTS**

The Department maintains the following list of Approved Traffic Products. The Engineer shall not be precluded from sampling and testing products on the list of Approved Traffic Products.

The manufacturer of products on the list of Approved Traffic Products 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.

Signing and delineation materials and products shall not be used in the work unless the material or product is on the list of Approved Traffic Products.

Materials and products may be added to the list of Approved Traffic Products 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**

A. Apex, Model 921 (100 mm x 100 mm)
B. Ray-O-Lite, Models SS (100 mm x 100 mm), RS (100 mm x 100 mm) and AA (100 mm x 100 mm)
C. Stimsonite, Models 88 (100 mm x 100 mm), 911 (100 mm x 100 mm), 953 (70 mm x 114 mm)
D. 3M Series 290 (89 mm x 100 mm)

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

A. Ray-O-Lite "AA" ARS (100 mm x 100 mm)
B. Stimsonite, Models 911 (100 mm x 100 mm), 953 (70 mm x 114 mm)
C. 3M Series 290 (89 mm x 100 mm)

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

(Used for recessed applications)

A. Stimsonite, Model 948 (58 mm x 119 mm)
B. Ray-O-Lite, Model 2002 (58 mm x 117 mm)
C. Stimsonite, Model 944SB (51 mm x 100 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 For Use With Epoxy Adhesive, 100 mm Round**

A. Apex Universal (Ceramic)
B. Highway Ceramics, Inc. (Ceramic)

**Non-Reflective For Use With Bitumen Adhesive, 100 mm Round**

A. Apex Universal (Ceramic)
B. Apex Universal, Model 929 (ABS)
C. Elgin Molded Plastics, "Empco-Lite" Model 900 (ABS)
D. Highway Ceramics, Inc. (Ceramic)
E. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
F. Interstate Sales, "Diamond Back" (ABS) and (Polypropylene)
G. Alpine Products, D-Dot (ABS)
H. Road Creations, Model RCB4NR (Acrylic)

**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. Davidson Plastics Corp., Model 3.0 (100 mm x 100 mm)
C. Elgin Molded Plastics, "Empco-Lite" Model 901 (100 mm x 100 mm)
D. Road Creations, Model R41C (100 mm x 100 mm)
E. 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. Davidson Plastics, Models T.O.M., T.R.P.M., and "HH" (High Heat)
C. Hi-Way Safety, Inc., Model 1280/1281

**STRIPING AND PAVEMENT MARKING MATERIALS**

**Permanent Traffic Striping and Pavement Marking Tape**

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

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

A. Brite-Line, Series 100
B. P.B. Laminations, Aztec, Grade 102
C. Swarco Industries, "Director-2"
D. 3M, "Stamark," Series 620
E. 3M Series A145 Removable Black Line Mask
(Black Tape: For use only on Asphalt Concrete Surfaces)
F. Advanced Traffic Marking Black "Hide-A-Line"
(Black Tape: For use only on Asphalt Concrete Surfaces)

**Preformed Thermoplastic (Heated in place)**

A. Flint Trading, "Premark" and "Premark 20/20 Flex"
B. Pavemark, "Hotape"

**Removable Traffic Paint**

A. Belpro, Series 250/252 and No. 93 Remover

**CLASS 1 DELINEATORS**

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

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

**Special Use Flexible Type, 1700 mm**

A. Carsonite, "Survivor" (with 450 mm U-Channel base)
B. FlexStake, Model 604
C. GreenLine Models HWD and CGD (with 450 mm U-Channel base)
D. Safe-Hit with 200 mm pavement anchor (SH248-GP1)
E. Safe-Hit with 380 mm soil anchor (SH248-GP2) and with 450 mm soil anchor (SH248-GP3)

**Surface Mount Flexible Type, 1200 mm**

A. Bent Manufacturing Company, "Masterflex" Model MF-180EX-48
B. Carsonite, "Super Duck II"
C. FlexStake, Surface Mount, Models 704 and 754TM

**CHANNELIZERS**

**Surface Mount Type, 900 mm**

A. Bent Manufacturing Company, "Masterflex" Models MF-360-36 (Round) and MF-180-36 (Flat)
B. Carsonite, "Super Duck" (Flat SDF-436, Round SDR-336)
C. Carsonite, "Super Duck II" Model SDCF203601MB "The Channelizer"
D. Davidson Plastics, Flex-Guide Models FG300LD and FG300UR
E. FlexStake, Surface Mount, Models 703 and 753TM
F. GreenLine, Model SMD-36
G. Hi-Way Safety, Inc. "Channel Gudie Channelizer" Model CGC36
H. The Line Connection, "Dura-Post" Model DP36-3 (Permanent)
I. The Line Connection, "Dura-Post" Model DP36-3C (Temporary)
J. Repo, Models 300 and 400
K. Safe-Hit, Guide Post, Model SH236SMA

**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. Roadmaker Company "Stacker"
D. TrafFix Devices "Grabber"

**OBJECT MARKERS**

**Type "K", 450 mm**

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

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

(Shown as Type "Q" in the Traffic Manual)

A. Bent Manufacturing "Masterflex" Model MF-360-24
B. Carsonite, Super Duck II
C. FlexStake, Model 701KM
D. Repo, Models 300 and 400
E. Safe-Hit, Models SH8 24SMA_WA and SH8 24GP3_WA
F. The Line Connection, Model DP21-4Q

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

**Impactable Type**

A. ARTUK, "FB"
B. Davidson Plastics, Model PCBM-12
C. Duraflex Corp., "Flexx 2020" and "Electriflexx"
D. Hi-Way Safety, Inc., Model GMKRM100

**Non-Impactable Type**

A. ARTUK, JD Series
B. Stimsonite, Model 967 (with 83 mm Acrylic cube corner reflector)
C. Stimsonite, Model 967LS
D. Vega Molded Products, Models GBM and JD

**THRIE BEAM BARRIER MARKERS**

(For use to the left of traffic)

A. Duraflex Corp., "Railrider"
B. Davidson Plastics, "Mini" (75 mm x 254 mm)

**CONCRETE BARRIER DELINEATORS, 400 mm**

(For use to the right of traffic. When mounted on top of barrier, places top of reflective element at 1200 mm)

A. Davidson Plastics, Model PCBM T-16
B. Safe-Hit, Model SH216RBM

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

A. Stinson Equipment Company "SaddleMarker"

**SOUND WALL DELINEATOR**

(Applied to a vertical surface. Top of reflective element at 1200 mm)

A. Davidson Plastics, PCBM S-36

**GUARD RAILING DELINEATOR**

(Top of reflective element at 1200 mm above plane of roadway)

**Wood Post Type, 686 mm**

A. Carsonite, Model 427
B. Davidson Plastics FG 427 and FG 527
C. FlexStake, Model 102 GR
D. GreenLine GRD 27
E. J.Miller Model JMI-375G
F. Safe-Hit, Model SH227GRD

**Steel Post Type**

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

**RETROREFLECTIVE SHEETING**

**Channelizers, Barrier Markers, and Delineators**

A. 3M, High Intensity
B. Reflexite, PC-1000 Metalized Polycarbonate
C. Reflexite, AC-1000 Acrylic
D. Reflexite, AP-1000 Metalized Polyester
E. Reflexite, AR-1000 Abrasion Resistant Coating
F. Stimsonite, Series 6200 (For rigid substrate devices only)

**Traffic Cones, 330 mm Sleeves**

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

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

A. 3M Series 3840
B. Reflexite Vinyl, "TR" (Semi-transparent) or "Conformalite"

**Barrels and Drums**

A. Reflexite, "Super High Intensity" or "High Impact Drum Sheeting"
B. 3M Series 3810

**Barricades: Type I, Engineer Grade**

A. American Decal, Adcolite
B. Avery Dennison, 1500 and 1600
C. 3M, Scotchlite, Series CW

**Barricades: Type II, Super Engineer Grade**

A. Avery Dennison, "Fasign" 2500 Series
B. Kiwalite Type II
C. Nikkalite 1800 Series

**Signs: Type II, Super Engineer Grade**

A. Avery Dennison, "Fasign" 2500 Series
B. Kiwalite, Type II
C. Nikkalite 1800 Series

**Signs: Type III, High-Intensity Grade**

A. 3M Series 3800
B. Nippon Carbide, Nikkalite Brand Ultralite Grade II

**Signs: Type IV, High-Intensity Prismatic Grade**

A. Stimsonite Series 6200

**Signs: Type VII, High-Intensity Prismatic Grade**

A. 3M Series 3900

**Signs: Type VI, Roll-Up Signs**

A. Reflexite, Vinyl (Orange), Reflexite "SuperBright" (Fluorescent orange)
B. 3M Series RS34 (Orange) and RS20 (Fluorescent orange)

**SIGN SUBSTRATE FOR CONSTRUCTION AREA SIGNS**

**Aluminum**

**Fiberglass Reinforced Plastic (FRP)**

A. Sequentia, "Polyplate"
B. Fiber-Brite

### 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:

FBA Pigtails
Seismic sensor mounting plates
Bishops hat

A. Sign panels for roadside signs and overhead sign structures.
B. Sign overlay panels for 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, nuts, and washers for mounting overhead formed panels.

E. Padlocks for backflow preventer assembly enclosures.
F. Lamps for vehicular traffic signal units, Type A pedestrian signals, and flashing beacon units.
G. Model 170 controller assembly, including controller unit, completely wired controller cabinet, and inductive loop detector sensor units.
H. Type 334 controller cabinet.

Completely wired controller cabinets, with auxiliary equipment but without controller unit, will be furnished to the Contractor at the Caltrans Maintenance Station, 30 Rickard Street, San Francisco, CA 94134.

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.

### 8-1.04 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.

Unless the use of a mineral admixture is prohibited, whenever the word "cement" is used in the Standard Specifications or the special provisions, it shall be understood to mean "cementitious material" when both of the following conditions are met:

A. The cement content of portland cement concrete is specified, and
B. Section 90, "Portland Cement Concrete," of the Standard Specifications is referenced.

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 for precast steam cured concrete members.

Section 90-1.01, "Description," of the Standard Specifications is amended to read:

#### 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.

· Unless otherwise specified, cementitious material to be used in portland cement concrete shall conform to the provisions for cement and mineral admixtures in Section 90-2, "Materials," and shall be either: 1) "Type IP (MS) Modified" cement or 2) a combination of "Type II Modified" portland cement and mineral admixture.

· Concrete for each portion of the work shall comply with the provisions for the Class, cementitious material content in kilograms per cubic meter, 28-day compressive strength, minor concrete or commercial quality concrete, as shown on the plans or specified in these specifications or the special provisions.

· 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 ($kg/m^3$) |
|---|---|
| Concrete which is 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 considered to be designated by compressive strength. If the plans show a 28-day compressive strength which is 31 MPa or greater, an additional 7 days will be allowed to obtain the specified strength. The 28-day compressive strengths shown on the plans which are 25 MPa or less are shown for design information only and are not to be considered a requirement for acceptance of the concrete.

· Concrete designated by compressive strength shall be proportioned such that the concrete will conform to the strength shown on the plans or specified in the special provisions.

· The Contractor shall determine the mix proportions for all concrete except pavement concrete. The Engineer will determine the mix proportions for pavement concrete.

· 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 used in the work has a cementitious material content, consisting of cement, mineral admixture, or cement plus mineral admixture, which is less than the minimum required for the work, 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 cement, mineral admixture, or cement plus mineral admixture which is less than the minimum required for the work. The Department may deduct the amount from 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 for cementitious material content 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.

· Concrete for which the mix proportions are determined either by the Contractor or the Engineer shall conform to the requirements of this Section 90.

The first paragraph in Section 90-2.01, "Portland Cement," of the Standard Specifications is amended to read:

**90-2.01 PORTLAND CEMENT**

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

· "Type IP (MS) Modified" cement shall conform to the specifications for Type IP (MS) cement in ASTM Designation: C 595, and shall be comprised of an intimate mixture of Type II cement and not more than 25 percent of a 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 Na2O plus 0.658 times the percentage of K2O, 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.
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.

The second paragraph in Section 90-2.01, "Portland Cement," of the Standard Specifications is amended to read:

· 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.

The third paragraph in Section 90-2.01, "Portland Cement," of the Standard Specifications is deleted.
The twelfth paragraph in Section 90-2.02, "Aggregates," of the Standard Specifications is deleted.
The first paragraph in Section 90-2.03, "Water," of the Standard Specifications is amended to read:.

**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 1,000 parts per million of chlorides as Cl, nor more than 1,300 parts per million of sulfates as SO4. 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, nor more than 1,300 parts per million of sulfates as SO4. 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.

The following section is added to Section 90-2, "Materials," of the Standard Specifications:

**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: C618. Silica fume conforming to the requirements in ASTM Designation: C1240, with reduction of mortar expansion of 80 percent, minimum, using the cement from the proposed mix design.

· Mineral admixtures shall be used in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."

Section 90-4.02, "Materials," of the Standard Specifications is amended to read:

**90-4.02 MATERIALS**

· Admixture materials shall conform to the provisions in Section 90–2.04, "Admixture Materials."

Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications is amended to read:

**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 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.
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.

Section 90-4.07, "Optional Use of Air-entraining Admixtures," of the Standard Specifications is amended to read:

**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."

Section 90-4.08, "Required Use of Mineral Admixtures," of the Standard Specifications is amended to read:

**90-4.08 REQUIRED USE OF MINERAL ADMIXTURES**

· Unless otherwise specified, mineral admixture shall be combined with cement to make cementitious material for use in portland cement concrete.

· 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: C618.

· The amounts of cement and mineral admixture used in cementitious material for portland cement concrete 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, as determined in conformance with the requirements in ASTM Designation: C618 and the provisions in Section 90-2.04, "Admixture Materials," 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, as determined in conformance with the requirements in ASTM Designation: C618 and the provisions in Section 90-2.04, "Admixture Materials," 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 is used, which conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," 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. If more than the required amount of cementitious material is used, the additional cementitious material in the mix may be either cement, a mineral admixture conforming to the provisions in Section 90-2.04, "Admixture Materials,"

or a combination of both; however, the maximum 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.

Section 90-4.09, "Optional Use of Mineral Admixtures," of the Standard Specifications is deleted.

Section 90-4.11, "Storage, Proportioning, and Dispensing of Mineral Admixtures," of the Standard Specifications is amended to read:

**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 interlocks are required for cement and mineral admixture charging mechanisms by Section 90-5.03A, "Proportioning for Pavement," 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."

· 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.

Section 90-5.02, "Proportioning Devices," of the Standard Specifications is amended to read:

**90-5.02 PROPORTIONING DEVICES**

· Weighing, measuring or metering devices used for proportioning materials shall conform to the provisions in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems used shall comply with the provisions for automatic proportioning devices in Section 90-5.03A, "Proportioning for Pavement." These 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 insure 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 a 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.
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.
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.

Section 90-5.03, "Proportioning," excluding Section 90-5.03A, "Proportioning for Pavement," of the Standard Specifications is amended to read:

**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 that conforms to the provisions in Section 90-2.01, "Portland 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 to be blended with mineral admixture for use in portland cement concrete for pavement and structures may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper with mineral admixture 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 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 scale and weigh hopper for bulk weighing cement, mineral admixture, and cement plus mineral admixture shall be separate and distinct from the aggregate weighing equipment.

· When the source of an aggregate is changed for concrete structures, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using such aggregates. When the source of an aggregate is changed for other concrete, the Engineer shall be allowed sufficient time to adjust the mix and such aggregates shall not be used until necessary adjustments are made.

· 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.

Section 90-5.03A, "Proportioning for Pavement," of the Standard Specifications is amended to read:

**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 the provisions in this Section 90-5.03A.

· The Contractor shall install and maintain in operating condition an electrically 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 which are 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 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.

The third paragraph in Section 90-6.01, "General," of the Standard Specifications is amended to read:

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

The third and fourth paragraphs in Section 90-6.02, "Machine Mixing," of the Standard Specifications are amended to read:

· 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, or in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions which reduce or vary the required quantity of cementitious material in the concrete mixture.

The sixth paragraph in Section 90-6.02, "Machine Mixing," of the Standard Specifications is amended to read:

· 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 seventh through tenth paragraphs in Section 90-6.03, "Transporting Mixed Concrete," of the Standard Specifications are amended to read:

· 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 comes 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, a time less than 1.5 hours may be required.

· 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 job site shall be accompanied by a weight 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 weight 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.

· Weight 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 90 mm diskette with a capacity of at least

1.4 megabytes. Captured data, for the ingredients represented by each batch shall be LFCR (one line, separate record) with allowances for sufficient fields to satisfy the amount of data required by these specifications.

· The Contractor may furnish a weight certificate that is accompanied by a separate certificate which lists the actual batch masses or measurements for a load of concrete provided that both certificates are 1) imprinted with the same non-repeating load number that is unique to the contract and 2) delivered to the job site with the load.

· Weight certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

Section 90-6.05, "Hand-Mixing," of the Standard Specifications is amended to read:

**90-6.05 HAND-MIXING**

· Hand-mixed concrete shall be made in batches not more than one-fourth cubic meter 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.

The table in the first paragraph in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications is replaced with the following table:

| Type of Work | Nominal Penetration (mm) | Maximum Penetration (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 | 75-100 | 115 |
| Cast-in-place concrete piles | 65-90 | 100 |

The first paragraph following the table of penetration ranges in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications is amended to read:

· The amount of free water used in concrete shall not exceed 183 kg/m3, plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m3.

The fourth paragraph in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications is amended to read:

· Where there are adverse or difficult conditions which 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.

Section 90-9.01, "General," of the Standard Specifications is amended to read:

**90-9.01 GENERAL**

· Concrete compressive strength requirements consist of a minimum strength which must 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 are shown on the plans.

· The compressive strength of concrete will be determined from test cylinders which have been fabricated from concrete sampled in conformance with California Test 539. Test cylinders will be molded and initial field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with 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 by 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 which 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 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 cubic meters.

· When a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders which 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.

· If concrete is specified by compressive strength, then materials, mix proportions, mixing equipment, and procedures proposed for use shall be prequalified 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, must 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, must 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 which 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 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 concrete cylinders tested.

· Certified test data and trial batch test reports shall be signed by an official of the firm which 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 which, in the judgment of the Engineer, could result in a lowering of the strength of the concrete below that specified.

· The Contractor's attention is directed to the time required to test trial batches. 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.

Section 90-10.02A, "Portland Cement," of the Standard Specifications is renamed "Cementitious Material" and is amended to read:

**90-10.02A CEMENTITIOUS MATERIAL**

· Cementitious material shall conform to the provisions in Section 90-1.01, "Description." Compressive strength requirements consist of a minimum strength which must 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 are shown on the plans.

The fifth paragraph in Section 90-10.02B, "Aggregate," of the Standard Specifications is deleted.

Section 90-10.03, "Production," of the Standard Specifications is amended to read:

**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, which will result in concrete that is thoroughly and uniformly mixed, which is suitable for the use intended, and which conforms to provisions specified herein. Recognized standards of good practice are outlined in various industry publications such as those issued by American Concrete Institute, AASHTO, or California Department of Transportation.

· 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 as 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 weight certificate which shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weight 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.

The third and fourth paragraphs in Section 90-11.02, "Payment," of the Standard Specifications are amended to read:

· Should the Engineer order the Contractor to incorporate admixtures into 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.

· 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 in the concrete at the Contractor's expense and no additional compensation will be allowed therefor.

### 8-2.02 CEMENT AND WATER CONTENT

The amount of free water used in concrete for deck slabs of bridges and structure approach slabs shall not exceed 195 $kg/m^3$, plus 20 kg for each required 100 kg of cementitious material in excess of 400 $kg/m^3$.

## SECTION 8-3. WELDING

### 8-3.01 WELDING ELECTRODES

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

### 8-3.02 WELDING QUALITY CONTROL

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

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.

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 | 1998 |
| D1.4 | 1992 |
| D1.5 | 1995 |
| D1.5 (metric only) | 1996 |

All 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.

The welding of all 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 all 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 nondestructive testing (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 facility which is certified under the AISC Quality Certification Program, Category Cbr, Major Steel Bridges.
B. The welding is performed at a permanent fabrication 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.

For welding performed at such certified facilities, the inspection personnel or NDT firms may be employed or compensated by the fabrication 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 welding subcontractors or entities hired by these subcontractors to be used in the work, shall be held to discuss the requirements for the WQCP.

Prior to performing any welding, 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. As a minimum, each WQCP shall include the following:

A. The name of the welding firm and the NDT firm to be used;
B. A manual prepared by the NDT firm that shall include equipment, testing procedures, code of safe practices, the Written Practice of the NDT 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 Quality Control (QC) Inspectors and Assistant Quality Control 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; and
    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 any 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 and 3) a method of reporting nonconforming welds to the Engineer;
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 welding procedure specification (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; and
J. One copy 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. Example forms to be used for Certificates of Compliance, daily production logs, and daily reports.

The Engineer shall have 10 working days to review the WQCP submittal after a complete plan has been received. No welding shall be performed until the WQCP is approved in writing by the Engineer. 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 WQCP, 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.

An amended WQCP or addendum shall be submitted to, and approved in writing by the Engineer, for any proposed revisions to the approved WQCP. An amended WQCP or addendum will be required for any 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 that is affected by any of the proposed revisions shall not be performed until the

amended WQCP or addendum has been approved. 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 amended WQCP or addendum, 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.

After final approval of the WQCP, amended WQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of each of these 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 conformity with the requirements of the plans and specifications. The Engineer's approval shall not constitute a waiver of any of the requirements 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, and 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 Quality Control 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:

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, corrected all rejectable deficiencies, and all repaired welds have been reexamined by the required NDT and found acceptable; and
D. Daily production log.

All 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.

All 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. Except for steel piling, the Engineer shall be allowed 7 days to review the report and respond in writing after a complete Welding Report has been received. The review time for steel piling shall be as specified in "Piling" of these special provisions. Prior to receiving notification from the Engineer of the Contractor's conformance with the WQCP, the Contractor may encase in concrete or cover any 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. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase or cover any welds 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.

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 prior to welding, during welding and after welding as specified in this section and additionally as necessary to ensure that materials and workmanship conform to the requirements of the contract documents.

The Quality Control (QC) Inspector shall be the duly designated person who performs inspection, testing, and quality 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.

All QC Inspectors shall be responsible for quality control acceptance or rejection of materials and workmanship, and shall be currently certified as AWS Certified Welding Inspectors (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 NDT shall be qualified in conformance with the requirements in the current edition 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 requirements of the current edition of the ASNT Recommended Practice No. SNT-TC-1A. Only individuals who are 1) qualified for NDT Level II, or 2) Level III technicians who have been directly certified by the ASNT and are authorized 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 the joint preparation, assembly practice, welding techniques, and 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.

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

The QC Inspector shall inspect and approve the joint preparation, assembly practice, welding techniques, and 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 section 3 and 9.21. The size and contour of 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.

The Engineer shall have the authority to verify the qualifications or certifications of any welder, Quality Control 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 all shifts when any welding is being performed, or (2) having a QC Inspector within such close proximity of all welding operations 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 the joint preparation, assembly practice, welding techniques, and 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 provide reports to the QCM on a daily basis for each day that welding is performed.

Except for noncritical weld repairs, base metal repairs, or any other type of repairs not submitted in the WQCP, the Engineer shall be notified immediately in writing when any welding problems or deficiencies are discovered and also of the proposed repair procedures to correct them. The Engineer shall have 5working days to review these procedures. No remedial work shall begin until the repair procedures are approved in writing 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 proposed repair procedures, 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.

When joint details that are not prequalified by the applicable AWS codes are proposed for use in the work, all 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.

All qualification tests for welders, welding operators, and WPSs used in welding operations will be witnessed 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 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 and shall be at the Contractor's expense.

All 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.

At the completion of all welding, 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 and the provisions of the Standard Specifications and these special provisions.

Full compensation for conforming to of 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 bridge work to be done consists, in general, of constructing bridges and retaining walls and removing bridges as shown on the plans and listed below:

Crockett Viaduct
(Bridge No. 28-0367L)

A cast-in-place, prestressed concrete box girder and welded steel box girder bridge.

Crockett Off -Ramp Westbound
(Bridge No. 28-0370K)

A cast-in-place, prestressed concrete box girder bridge.

Crockett Off-Ramp Eastbound
(Bridge No. 28-0369S)

A cast-in-place, prestressed concrete box girder bridge.

Crockett On -Ramp Westbound
(Bridge No. 28-0368K)

A cast-in-place, prestressed concrete box girder bridge.

Bent A4WB7 (Replace)
(Bridge No. 23-0015L)

Construct a reinforced concrete bent and remove existing concrete bent to accommodate construction of Crockett Off-Ramp Eastbound.

Retaining Wall (R1)

Construct soldier pile tieback retaining wall.

Retaining Wall (R2)
(Bridge No. 28-0279M)

Construct mechanically stabilized embankment retaining wall.

Retaining Wall (R3)

Construct soldier pile tieback retaining wall.

Retaining Wall (R4)

Construct soldier pile retaining wall.

Existing “B” Line (Remove)
(Bridge No. 23-0015)

Remove existing bridge

Existing “J” Line (Remove)
(Bridge No. 23-0015)

Remove existing bridge

Existing “S” Line (Remove)
(Bridge No. 23=0015)

Remove existing bridge

Crockett Viaduct
(Bridge No. 23-0015R)

Remove and replace existing concrete deck and retrofit existing steel superstructure.

## 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 2 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

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.

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 Environmentally Sensitive Area (ESA) and temporary fence (Type ESA) as specified in 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 placement of Temporary Fence (Type ESA) as shown on the plans.

As a first order of work, the Contractor shall install temporary creek diversion as shown on the plans and as specified in the Section "Temporary Creek Diversion System" elsewhere in these special provisions.

Construction activities on San Pablo Avenue, Pomona Street, Merchant Street, Wanda Street, Vista Del Rio, Carquinez Way, Columbus Avenue, Virginia Street, Kendall Ave and Dowrelio Drive shall be limited to weekdays only between 9:00 a.m and 3:00 p.m.

Cost reduction incentive proposals that change the bridge structure type from those shown on the plans will be rejected.

Bridge removal work at Bridge No. 23-0015R shall be performed only between the hours of 7 A.M and 6 P.M., Monday through Saturday.

The D-Line Eastbound On-Ramp shall be kept open for public traffic at all times during the contract, except for brief periods of up to 4 hours each while placing or removing temporary barrier railing while effecting construction stage changes, and for up to six hours for each closure slab concrete pour. These activities shall occur between the hours of 10 P.M. and 5 A.M., Monday evening through Friday morning.

The Contractor’s access to Crockett Viaduct Spans 6 and 7 is restricted due to the construction of the South Anchorage and cable system for the Carquinez Bridge and Bent 7 of the Crockett Viaduct by the adjacent contractor under contract no. 04-013014. The Contractor will not have access to this area prior to 180 days before the completion of Phase I work as indicated on the approved work schedule except during the removal of the Existing “B” Line structure. From 180 days prior to the completion of Phase I work as indicated on the approved work schedule to 14 days after completion of Phase I work and during the removal of the Existing “B” Line structure, the Contractor will not be permitted to work in the following areas:

1) The area bounded by the South Anchorage footing plus one meter all around the footing and the vertical projection of this area up to a height of 25 meters above finish grade.
2) The area within a 3 meter radius of the centerline of the suspension cable for the full length of the suspension cable from the South Anchorage to Pier P1.
3) The area beyond 28 meters both left and right of the centerline of the South Anchorage and the vertical projection of this area from Bent 6 of the Crockett Viaduct to Pier P1 of the Carquinez Bridge.

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.

No overhead sign panel shall be installed until the overhead sign lighting is completely operational.

No above ground electrical work shall be performed on any system within the project site until all Contractor-furnished electrical materials for that individual system have been tested and delivered to Contractor.

When Type 9A pull boxes and conduits in the concrete barrier rails are installed on the new Carquinez bridge (Bridge No. 28-0302) and Crockett Viaduct, the Contractor shall install callboxes, power conductors and communication cables for the southbound traffic during stage 3, phase 1A.

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

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

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

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

Before obliterating any pavement delineation 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 pavement delineation shall be considered as included in the contract prices paid for new pavement delineation and no additional compensation will be allowed therefor.

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

Some plants required for this project may not be readily available and may have to be grown specifically for this project. Within 30 days after the contract has been approved, the Contractor shall furnish the Engineer a statement from the vendor that the order for the plants to be grown for this contract, including inspection plants and replacement 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 dates of delivery. The Contractor shall notify the Engineer, in writing, when the vendor has started to grow the plants.

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.

Not less than 60 days prior to applying seeds, the Contractor shall furnish the Engineer a statement from the vendor that the order for the seed required for this contract has been received and accepted by the vendor. The statement from the vendor shall include the names and quantity of seed ordered and the anticipated date of delivery.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions, regarding restrictions for planting operations.

Unless otherwise shown on the plans or specified in these special provisions, conduits to be 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.

### 10-1.02 ENVIRONMENTALLY SENSITIVE AREA (GENERAL)

The Contractors attention is directed to the designated Environmentally Sensitive Area (ESA), shown on the plans. The exact location of the boundaries of environmentally sensitive area shall be established by the Engineer and clearly delineated by the placement of Temporary fence (Type ESA) as described in Section "Temporary Fence (Type ESA)" of these special provisions.

Within the boundaries of an ESA, no project related activities shall take place. This specifically prohibits vehicle access, storage or transport of any materials, including hydrocarbon and lead contaminated material, or any other project related activities.

### 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 shall conform to the requirements of General Construction Activity Storm Water Permit No. CAS000002 and Caltrans Statewide Storm Water Permit No. CAS000003 issued by the State Water Resources Control Board. These permits, hereafter referred to as the "Permit," regulates storm water discharges associated with construction activities.

Water pollution control work shall conform to the requirements in the Construction Contractor's Guide and Specifications of the Caltrans Storm Water Quality Handbooks, dated April 1997, and addenda thereto issued up to, and including, the date of advertisement of the project, hereafter referred to as the "Handbook." Copies of the Handbook and the General Permit 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. In addition, a Conceptual Storm Water Pollution Prevention Plan, hereafter referred to as the “CSWPPP” has been prepared for this project by the Department. The CSWPPP shall be used as a reference tool for developing the contract specific Storm Water Pollution Prevention Plan. This document is being provided for informational purposes only and shall be revised to correspond to the projects staging and the Contractor’s actual methods of construction.

Copies of the Handbook, CSWPPP, and the Permit are also available for review at 111 Grand Avenue, Oakland, California 94612-3731. Call the Toll Bridge Duty Senior, telephone number (510) 286-5549 to reserve a copy of the document at least 24 hours in advance.

The Contractor shall know and fully comply with the applicable provisions of the Handbook, Permit, and Federal, State, and local regulations that govern the Contractor's operations and storm water discharges from both the project site and areas of disturbance outside the project limits during construction. The Contractor shall maintain a copy of the Permit at the project site and shall make the Permit available during construction.

Unless arrangements for disturbance of areas outside the project limits are made by the Department and made part of the contract, it is expressly agreed that the Department assumes no responsibility whatsoever to the Contractor or property owner with respect to any arrangements made between the Contractor and property owner to allow disturbance of areas outside the project limits.

The Contractor shall be responsible for the costs and for liabilities imposed by law as a result of the Contractor's failure to comply with the provisions set forth in this section "Water Pollution Control", including but not limited to, compliance with the applicable provisions of the Handbook, Permit and Federal, State and local regulations. For the purposes of this paragraph, costs and liabilities include, but are not limited to, fines, penalties, and damages whether assessed against the State or the Contractor, including those levied under the Federal Clean Water Act and the State Porter Cologne Water Quality Act.

In addition to the remedies authorized by law, some of the money due the Contractor under the contract, as determined by the Department, may be retained by the State of California until disposition has been made of the costs and liabilities.

The retention of money due the Contractor shall be 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 costs and liabilities in connection with the matter for which the retention was made, the Department shall be liable for interest on the amount retained at the legal rate of interest for the period of the retention.

Conformance with the provisions of this section "Water Pollution Control" shall not relieve the Contractor from the Contractor's responsibilities, as provided in Section 7, "Legal Relations and Responsibilities," of the Standard Specifications.

At reasonable times and upon presentation of credentials and other documents as may be required by law, the Contractor shall allow authorized agents of the California Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency and the local storm water management agency to:

A. Enter upon the construction site and the Contractor's facilities pertinent to the work;
B. Have access to and copy records that must be kept as specified in the Permit;
C. Inspect the construction site and related soil stabilization practices and sediment control measures; and
D. Sample or monitor for the purpose of ensuring compliance with the Permit.

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.

**STORM WATER POLLUTION PREVENTION PLAN PREPARATION, APPROVAL AND AMENDMENTS**

As part of the water pollution control work, a Storm Water Pollution Prevention Plan, hereafter referred to as the "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 Handbook, the requirements of the Permit, and these special provisions. Upon the Engineer's approval of the SWPPP, the SWPPP shall be deemed to fulfill the provisions in Section 7-1.01G of the Standard Specifications for development and submittal of a Water Pollution Control Program. The requirement to waive the submission of a written program for control of water pollution as provided in Section 7-1.01G, "Water Pollution," of the Standard Specifications shall not be allowed.

No work having potential to cause water pollution, as determined by the Engineer, shall be performed until the SWPPP has been approved by the Engineer.

Within 30 days after the approval of the contract, the Contractor shall submit 4 copies of the SWPPP to the Engineer. The Engineer will have 15 days to review the SWPPP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the SWPPP 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 SWPPP, 4 additional 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.

The SWPPP shall identify pollution sources that may adversely affect the quality of storm water discharges associated with the project and shall identify water pollution control measures, hereafter referred to as control measures, to be constructed, implemented, and maintained in order to reduce to the extent feasible pollutants in storm water discharges from the construction site both during and after construction is completed under this contract. Throughout the duration of the project, the SWPPP shall be amended to reflect changes in field conditions which necessitates changes to the deployment of water pollution control measures as determined by the Engineer. At a minimum, the SWPPP shall be amended 30 days prior to the beginning of each winter season.

The SWPPP shall incorporate control measures in the following categories:

A. Soil stabilization practices;
B. Sediment control practices;
C. Sediment tracking control practices;
D. Wind erosion control practices; and
E. Non-storm water management and waste management and disposal control practices.

Specific objectives and minimum requirements for each category of control measures are contained in the Handbook.

The Contractor shall consider the objectives and minimum requirements presented in the Handbook for each of the above categories. The special minimum requirements listed below supersede the minimum requirements listed in the Handbook for the same category. When minimum requirements are listed for any category, the Contractor shall incorporate into the SWPPP, and implement on the project, the listed minimum controls required in order to meet the pollution control objectives for the category. In addition, the Contractor shall consider other control measures presented in the Handbook and shall incorporate into the SWPPP and implement on the project the control measures necessary to meet the objectives of the SWPPP. The Contractor shall document the selection process in conformance with the procedure specified in the Handbook. The following special minimum requirements are established:

| Category | Minimum Requirement(s) |
|---|---|
| Soil Stabilization Practices | CD22(2) Scheduling |
| | CD23(2) Preservation of Existing Vegetation, CD34(2) Check Dams, CD35(2) Slope Roughening/Terracing/Rounding , CD37(2) Straw Bale Barrier |
| | CD 26A(2) Soil Stabilizers |
| Sediment Control Practices | CD36(2) Silt Fences |
| Wind Erosion Control Practices | CD26B(2) Geotextiles, Mats/Plastic Covers & Erosion Control Blankets |
| Non-Storm Water and Waste Management and Disposal Control Practices | CD7(2) Dewatering |
| | CD8(2) Paving Operations |
| | CD10(2) Material Delivery and Storage |
| | CD13(2) Solid Waste Management |
| | CD14(2) Hazardous Waste Management |
| | CD16(2) Concrete Waste Management |
| | CD18(2) Vehicle and Equipment Cleaning |
| | CD19(2) Vehicle and Equipment Fueling |
| | CD20(2) Vehicle and Equipment Maintenance |
| | CD44(2) Illicit Discharge/Illegal Dumping Reporting |
| | CD46(2) Liquid Waste Management |

The following contract items of work, where shown on the project plans, shall be incorporated in the SWPPP as critical temporary control measures: Temporary Silt Fence, Temporary Fence (type ESA), Temporary Drainage Inlet Protection, Temporary Erosion Control, Temporary Rock Bag Check Dam, Temporary Concrete Washout, Temporary Cover, Temporary Construction Entrance, Temporary Stabilized Construction Roadway, and Temporary Creek Diversion. The Contractor shall consider other control measures to supplement the critical temporary control measures when necessary to meet the pollution control objectives of the SWPPP.

The following contract items of work, as shown on the project plans, shall be incorporated in the SWPPP as permanent post-construction control measures: Fiber Roll, Erosion Control (Type D), and Erosion Control (Blanket). These control measures shall be utilized as construction period control measures. Attention is directed to "Order of Work" of these special provisions. The Contractor shall consider other control measures to supplement these permanent, post-construction control measures when necessary to meet the pollution control objectives of the SWPPP. The Contractor shall maintain and protect the permanent control measures throughout the duration of the project and shall restore these controls to the lines and grades shown on the plans prior to acceptance of the project.

The SWPPP shall include, but not limited to, the following items as described in the Handbook and Permit:

A. Source Identification;
B. Erosion and Sediment Controls;
C. Non-Storm Water Management;
D. Waste Management and Disposal;
E. Maintenance, Inspection and Repair;
F. Training;
G. List of Contractors and Subcontractors;

H. Post-Construction Storm Water Management;
I. Preparer;
J. Copy of the Permit;
K. BMP Consideration Checklist;
L. SWPPP Checklist;
M. Schedule of Values; and
N. Water Pollution Control Drawings.

The Contractor shall amend the SWPPP, graphically and in narrative form, whenever there is a change in construction activities or operations which may affect the discharge of significant quantities of pollutants to surface waters, ground waters, municipal storm drain systems or when deemed necessary by the Engineer. The SWPPP shall be amended if the SWPPP is in violation of any condition of the Permit, or has not effectively achieved the objective of reducing pollutants in storm water discharges. Amendments shall show additional control measures or revised operations, including those in areas not shown in the initially approved SWPPP, which are required on the project to control water pollution effectively. Amendments to the SWPPP shall be submitted for review and approval by the Engineer in the same manner specified for the initially approved SWPPP. Approved amendments shall be dated and logged in the SWPPP. Upon approval of the amendment, the Contractor shall implement the additional control measures or revised operations.

The Contractor shall keep a copy of the SWPPP and approved amendments at the project site. The SWPPP shall be made available upon request of 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.

By June 15 of each year, the Contractor shall submit an annual certification to the Engineer stating conformance with the requirements governing the Permit. If the project is in non-compliance at any time, as determined by the Engineer, the Contractor shall submit a written report to the Engineer within 2 days of identification of non-compliance. The report shall specify the time and nature of non-compliance and include a course of action to correct the deficiency. Non-compliance shall include, but not be limited to, any of the following conditions:

A. Any written notices, violations, or orders presented by a regulatory agency.
B. Control measures in the field are not implemented or maintained as provided for in the approved Storm Water Pollution Prevention Plan and amendments.
C. The Contractor fails to respond to written requests for corrective actions.
D. The Contractor refuses to submit an annual certification.
E. Contractor discharges unauthorized materials, residues, or liquids to drainage conveyances or water bodies.

If the project is in non-compliance, the Engineer may impose one or more of the following actions:

A. Direct the Contractor to revise the operations and SWPPP;
B. A suspension of work on any contract item associated with the non-compliance, until both water pollution control measures and SWPPP are amended and approved by the Engineer;
C. Notification to the Regional Water Quality Control Board of the non-compliance status;
D. Deductions as provided for elsewhere in these special provisions.

**SCHEDULE OF VALUES**

The Contractor shall submit with the SWPPP, for approval by the Engineer, a schedule of values detailing the cost breakdown of the contract lump sum item for water pollution control. The cost breakdown shall include both the special minimum requirements required by the Department and those selected by the Contractor for this project. The combined requirements shall be considered as items of work as part of the lump sum bid. The schedule of values shall reflect the total items of work, including both those required by the Department and those selected by the Contractor. The contractor shall indicate quantities and costs for the control measures shown in the schedule of values, except for critical temporary controls and permanent control measures which are shown on the project plans and for which there is a contract item of work. Adjustments in the items of work and quantities listed in the schedule of values shall be made when required to address approved amendments to the SWPPP.

The sum of the amounts for the units of work listed in the schedule of values shall be equal to the contract lump sum price for water pollution control.

If approved in writing by the Engineer, the schedule of values will be used to determine progress payments for water pollution control during the progress of the work. The schedule of values will be used as the basis for calculating any adjustment in compensation for the contract item for water pollution control due to changes in the work ordered by the Engineer.

**SWPPP IMPLEMENTATION**

Upon approval of the SWPPP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, and maintaining the control measures included in the SWPPP and any amendments thereto and for removing and disposing of temporary control measures. Unless otherwise directed by the Engineer or specified in these special provisions, the Contractor's responsibility for SWPPP implementation shall continue throughout any temporary suspension of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. Requirements for installation, construction, inspection, maintenance, removal, and disposal of control measures are specified in the Handbook and these special provisions.

Soil stabilization practices and sediment control measures, including minimum requirements, shall be provided throughout the winter season, defined as between October 1 and May 1.

Implementation of soil stabilization practices and sediment control measures for soil-disturbed areas on the project site shall be completed, except as provided for below, not later than 20 days prior to the beginning of the winter season or upon start of applicable construction activities for projects which begin either during or within 20 days of the winter season.

Throughout the winter season, the active, soil-disturbed 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, soil-disturbed area limit. The Contractor shall demonstrate the ability and preparedness to fully deploy soil stabilization practices and sediment control measures to protect soil-disturbed areas on the project site before the onset of precipitation. A quantity of soil stabilization and sediment control materials shall be maintained on site equal to 125 percent of that sufficient to protect unprotected, soil-disturbed areas on the project site. A detailed plan for the mobilization of sufficient labor and equipment shall be maintained to fully deploy control measures required to protect unprotected, soil-disturbed areas on the project site prior to the onset of precipitation. A current inventory of control measure materials and the detailed mobilization plan shall be included as part of the SWPPP.

Throughout the winter season, soil-disturbed areas of the project site shall be considered to be nonactive whenever soil disturbing activities are expected to be discontinued for a period of 20 or more days and the areas are fully protected. Areas that will become nonactive either during the winter season or within 20 days thereof shall be fully protected with soil stabilization practices and sediment control measures within 10 days of the discontinuance of soil disturbing activities or prior to the onset of precipitation, whichever is first to occur.

Throughout the winter season, active soil-disturbed areas of the project site shall be fully protected at the end of each day with soil stabilization practices and sediment control measures unless fair weather is predicted through the following work day. The weather forecast shall be monitored by the Contractor on a daily basis. The National Weather Service forecast shall be used. An alternative weather forecast proposed by the Contractor may be used if approved by the Engineer. If precipitation is predicted prior to the end of the following work day, construction scheduling shall be modified, as required, and functioning control measures shall be deployed prior to the onset of the precipitation.

The Contractor shall implement, year-round and throughout the duration of the project, control measures included in the SWPPP for sediment tracking, wind erosion, non-storm water management and waste management and disposal.

**MAINTENANCE**

To ensure the proper implementation and functioning of control measures, the Contractor shall regularly inspect and maintain the construction site for the control measures identified in the SWPPP. The Contractor shall identify corrective actions and time needed to address any deficient measures or reinitiate any measures that have been discontinued.

The construction site inspection checklist provided in the CSWPPP shall be used to ensure that the necessary measures are being properly implemented, and to ensure that the control measures are functioning adequately. One copy of each site inspection record shall be submitted to the Engineer.

Inspections of the construction site shall be conducted by the Contractor to identify deficient measures, as follows:

A. Prior to a forecast storm;
B. After any precipitation which causes runoff;
C. At 24 hour intervals during extended precipitation events; and
D. Routinely, at a minimum of once every week.

If the Contractor or the Engineer identifies a deficiency in the deployment or functioning of an identified control measure, the deficiency shall be corrected immediately. The deficiency may be corrected at a later date and time if requested by the Contractor and approved by the Engineer in writing, but not later than the onset of subsequent precipitation. The correction of deficiencies shall be at no additional cost to the State. When any deficiency is not corrected within the timeframe prescribed by the Engineer, then the project shall be in non-compliance.

**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 shown on the plans, 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; and
B. After acceptance of the contract pursuant to Section 7-1.17, "Acceptance of Contract," 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, maintaining, removing, and disposing of control measures, except those shown on the plans and for which there is a contract item of work, and excluding developing, preparing, obtaining approval of, revising, and amending the SWPPP, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for changes in control measures required by an approved amendment to the SWPPP, except changes to those control measures shown on the plans and for which there is a contract item of work, shall be considered as included in the various items of work involved and no additional compensation will be allowed thereafter except changes to control measures required as a result of extra work as provided in Section 4-1.03D of the Standard Specifications and the following:

A. If the control measure is listed in the approved SWPPP schedule of values, an adjustment in compensation for the contract item for water pollution control will be made by applying the increase or decrease in quantities to the approved schedule of values. No adjustment of compensation will be made to the unit price listed for items in the schedule of values due to any increase or decrease in the quantities, 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 items listed in the schedule of values.
B. If the control measure is not listed in the approved SWPPP schedule of values, payment will be made by force account.

Those control measures which are shown on the plans and for which there is a contract item of work will be measured and paid for as that contract item of work.

The Engineer will retain an amount equal to 25 percent of the estimated value of the contract work performed during estimate periods in which the Contractor fails to conform to the provisions of this section "Water Pollution Control" or if the project is in non-compliance as determined by the Engineer.

Retentions for failure to conform to the provisions in this section "Water Pollution Control" shall be in addition to the other retentions provided for in the contract. The amounts retained for failure of the Contractor to conform to the provisions in this section will be released for payment on the next monthly estimate for partial payment following the date that an approved SWPPP has been implemented and maintained, and water pollution is adequately controlled, as determined by the Engineer.

**10-1.04 NON-STORM WATER DISCHARGES**

Non-storm water discharges shall conform to the requirements in Section 7-1.01G, "Water Pollution" of the Standard Specifications and these special provisions

Conformance with the requirements of this section shall in no way relieve the Contractor from the Contractor's responsibilities, as provided in Section 7-1.11, "Preservation of Property," and Section 7-1.12, "Responsibility for Damage," of the Standard Specifications.

**PILE & COFFER DAM DEWATER**

Suspended solids shall be removed during the dewatering operation for piles and cofferdams, as specified in these special provisions.

Suspended solids shall be removed to the extent that visible, floating products are not apparent within the discharge. Also, the discharge shall be of a purity such that turbidity and apparent color beyond present natural background levels are not apparent within the receiving water body. The turbidity, measured in Nephelometric Turbidity Units (NTU), of the

discharge shall not be greater than a 10 percent increase of the background turbidity. The point of effluent discharge shall not cause bottom sediments, aquatic vegetation, or surface soils to become dislodged or disturbed.

The Contractor shall graphically depict the dewatering process within the Storm Water Pollution Prevention Plan (SWPPP), as specified in "Water Pollution Control" of these special provisions. The graphic shall show both a sectional and plan view that details the removal techniques for suspended solids. The graphic shall define the flow path and placement of pipes, hoses, pumps, and other equipment used to convey the discharge. In addition, the contractor shall provide a sketch that depicts the general position of the apparatus relative to the pile(s) or cofferdam(s) undergoing dewatering and the point of effluent discharge.

The Contractor shall describe the dewatering apparatus within the appropriate sections of the SWPPP. The description shall include, but not be limited to, an estimate of the discharge volume, flow rate, and frequency; location of discharge; and the inspection and monitoring procedures related to the discharge.

The Contractor shall conduct a daily inspection of the dewatering equipment, when in use, to ensure that all components are functional and routinely maintained to prevent leakage prior to removal of suspended solids. Any component of the apparatus that is found to be damaged or to affect the performance of the apparatus shall be either immediately repaired or replaced.

The Contractor shall monitor both the discharge and the receiving water body. The observations made during monitoring shall include the color, size of affected area, presence of suspended material, presence of water fowl or aquatic wildlife, wind direction and velocity, tidal condition, atmospheric condition, time, and date. In addition, the Contractor shall supplement the observations with photographs. During monitoring events, the Contractor shall obtain NTU measurements for the discharge turbidity and the receiving water (background) turbidity. The Contractor shall conduct monitoring, at a minimum, one hour prior to discharge, during the first ten minutes of initiating discharge, every four hours during discharge, and upon cessation of discharge. The observations and turbidity measurements shall be recorded daily in a tabular format known as the monitoring report provided within the Conceptual Storm Water Pollution Prevention Plan, as described within "Water Pollution Control" of these special provisions. The monitoring report, including photographs, shall be provided weekly to the Engineer, or as directed by the Engineer.

Observations or measurements which indicate that the discharge is of a purity such that turbidity and apparent color are beyond the present natural background levels shall be immediately reported to the Engineer. The discharge activity shall immediately cease, so that corrective actions are undertaken to repair, modify, or replace the equipment. The commencement of discharge activities shall be allowed upon approval by the Engineer.

**STOCKPILE DEWATER**

The Contractor shall prevent the flow of water, including ground water, surface runoff and tidal flow from entering any temporary stockpiles on land.

The Contractor shall depict and describe within an amendment to the Storm Water Pollution Prevention Plan (SWPPP), as specified in "Water Pollution Control" of these special provisions, the methods and measures that will be used to dewater the temporary stockpiles, to seal the sides and bottom of the temporary stockpiles, and to prevent the flow of water into the stockpiles. The time to be provided for the Engineer's review and approval of the amendment shall be 10 working days prior to beginning temporary stockpile operations. Operations producing water will not be permitted until the plan has been approved by the Engineer.

All water removal from temporary stockpiles shall be handled in accordance with National Pollutant Discharge Elimination System (NPDES) Permits CAS000002 and CAS000003, issued by the State Water Resource Control Board. Copies of the permit and its amendments will be available for inspection and purchase at the Department of Transportation, Toll Bridge Duty Senior's Desk, 111 Grand Avenue, Oakland, California. Please call the Toll Bridge Duty Senior, telephone number (510) 286-5549 to reserve a copy of the document at least 24 hours in advance.

The Contractor is responsible for all work, records, reports, and costs involved in handling the water in accordance with the NPDES permit. The Contractor shall supply all analytical data, dewatering volume records, and written requests for discharge to the Engineer for approval prior to discharging any water. The Engineer shall have up to 7 calendar days for review and approval of discharge. Water that does not meet discharge permit requirements shall not be discharged on the site or to the storm drainage or to the sanitary sewer systems. The Contractor is responsible for either treating such water to meet the permit requirements for discharge or hauling such water off site to an appropriately licensed liquid disposal facility. Penalties assessed against the State for permit non-compliance by the Contractor will be borne by the Contractor. Such penalties will be deducted from the monthly progress payment.

However, nothing in this section, "Non-Storm Water Discharge," will be construed as relieving the Contractor of full responsibility of complying with Section 7-1.16 "Contractor's Responsibility for the Work and Materials" of the Standard Specifications.

**EXCAVATION DEWATER**

The contractor shall provide a sealed excavation and prevent the flow of ground water, surface runoff, and tidal flow from entering any excavation including, but not limited to, footing excavations, and excavations for retaining walls, storm drainage systems, sanitary sewer systems and their appurtenances. Well points and continuous pumping of excavations for dewatering purposes are not allowed. The Contractor may dewater an initial volume of water equivalent to the structure excavation pay limits for a particular excavation. The maximum seepage rate of the sealed excavation, after initial dewatering is complete, shall not exceed twenty-two liters per square meter of the excavation area per eight-hour period. The excavation area shall be measured at the top of the excavation as seen in plan view. A meter that has been approved by the Engineer shall be used to measure all excavation discharges.

The Contractor shall submit to the Engineer, as provided in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, a plan which details the methods and measures that will be used to seal the sides and bottom of excavations, prevent the flow of water into excavations, control seepage within the specified maximum seepage rate, and remove known ground water contaminants. The plan shall, at a minimum, contain a graphic for the dewatering operation showing both a sectional and plan view that details the removal techniques for suspended solids and known ground water contaminants. The graphic shall define the flow path and placement of pipes, hoses, pumps, and other equipment used to convey the discharge. In addition, the Contractor shall provide a drawing that depicts the general position of the dewatering measures relative to the excavations undergoing dewatering and the point of effluent discharge. The written descriptions of the dewatering operation shall include, but are not limited to, an estimate of the discharge volume, flow rate, and frequency; location of discharge; performance capabilities of treatment measures; and the inspection and monitoring procedures related to the discharge.

The plan shall be submitted, at least, 3 weeks prior to beginning excavation operations. The Contractor shall allow 10 days for the Engineer to review and approve the plan. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the plan within 5 days of receipt of the Engineer's comments and shall allow 5 days for the Engineer to review the revisions. Excavation operations shall not be allowed until the Engineer has approved the plan.

If the initial dewatering volume exceeds the volume of the structure excavation pay limits or the seepage rate exceeds the specified maximum rate, then the Contractor shall immediately stop all work within the excavation not related to the control of water and submit a plan of corrective measures. The Contractor may not resume operations in that excavation until the plan is approved by the Engineer.

Suspended solids shall be removed during the dewatering operation of any excavation, as specified in these special provisions.

Suspended solids shall be removed to the extent that visible, floating products are not apparent within the discharge. Also, the discharge shall be of a purity such that turbidity and color beyond present natural background levels are not apparent within the receiving water body. The turbidity, measured in Nephelometric Turbidity Units (NTU), of the discharge shall not be greater than a 10 percent increase of the background turbidity of the receiving water body. The point of effluent discharge shall not cause bottom sediments, aquatic vegetation, or surface soils to become dislodged or disturbed.

Petroleum hydrocarbons, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) shall be removed during the dewatering operation in conformance with these special provisions.

The discharge into the receiving water body shall not contain total petroleum hydrocarbons beyond a maximum allowable concentration of 50 ug/L. The discharge into the receiving water body shall not contain VOCs or SVOCs beyond a maximum allowable concentration of 5 ug/L. Samples obtained from the discharge shall be analyzed in accordance with EPA methods 8015M, 8260, and 8270. The detection limits for the analyses shall be equal to or less than the allowable discharge concentration.

The Contractor shall conduct a daily inspection of the dewatering equipment, when in use, to ensure that all components are functional and routinely maintained to prevent leakage prior to removal of suspended solids, petroleum hydrocarbons, VOCs, or SVOCs. Should any component of the dewatering equipment be damaged or affect the performance of the equipment, the dewatering operation shall be discontinued and the component shall be repaired or replaced with substitute equipment.

The Contractor shall monitor both the discharge and the receiving water body. The observations made during monitoring shall include the color, size of affected area, presence of suspended material, presence of water fowl or aquatic wildlife, wind direction and velocity, atmospheric condition, time, date, a turbidity measurement in NTU, and pH. The Contractor shall supplement the observations with photographs. The Contractor shall conduct monitoring, at a minimum of one hour prior to discharge, during the first 10 minutes of initiating discharge, and upon cessation of the discharge. The observations shall be recorded on the inspection forms to be provided by the Engineer. Completed inspection forms, including photographs, shall be provided to the Engineer, on a weekly basis or as directed by the Engineer.

Observations which indicate that the discharge is of a visible purity such that turbidity and apparent color are beyond the present natural background shall be immediately reported to the Engineer. The discharge activity shall cease so that corrective actions are undertaken to repair, modify or replace the equipment. The commencement of discharge activities shall be upon approval by the Engineer.

All water removed from excavations and dewatering operations shall be handled as provided in 'Effluent Treatment System' elsewhere in this specification and in accordance with the discharge permit for contaminated groundwater issued by the San Francisco Bay Regional Water Board. Copies of the permit are available for inspection and purchase at the Department of Transportation, Toll Bridge Duty Senior's Desk, 111 Grand Avenue, Oakland, California, telephone (510) 286-5549. Penalties assessed against the State for permit non-compliance by the Contractor shall be borne by the Contractor. The Department will deduct those penalty amounts from any moneys due, or that may become due, the Contractor under the contract.

**EFFLUENT TREATMENT SYSTEM**

An effluent treatment system shall be provided to treat all groundwater discharged from excavations or dewatering operations as shown on the plans and in accordance with these special provisions. Effluent shall be considered as the water and any other material discharged from the pumping operations.

The Contractor shall use the effluent treatment system to treat all groundwater prior to discharging into the approved dedicated discharge site. Protection shall be provided at the outlet of treated effluent into the receiving water body to ensure that bottom sediments, aquatic vegetation, or surface soils do not become dislodged or disturbed.

**Materials**

Materials shall conform to the provisions in Section 6, "Control of Materials," Section 7-1.16, "Contractor's Responsibility for the Work and Materials," and Section 74-2, "Drainage Pump Equipment" of the Standard Specifications and these special provisions.

Holding tanks shall be transportable, totally enclosed, with a minimum holding capacity to prevent delay of other work and capable of connecting multiple tanks in series. Holding tanks shall have an inlet and outlet capable of receiving and discharging minimum flows, at a rate of 318 L/min. Holding tanks shall be able to accommodate temporary installation of submersible pumps of such capability to discharge water at a rate of 318 L/min. All tanks shall be of the same make and manufacturer and shall remain on the jobsite until dewatering operations are no longer necessary as determined by the Engineer.

A granulated activated carbon (GAC) system shall be used to treat groundwater contaminated with petroleum hydrocarbons, especially petroleum hydrocarbons of the motor oil range. The GAC treatment system shall consist of at least two vessels having an inlet and outlet capable of receiving and discharging water at a flow rate of 318 L/min. The GAC treatment system shall be capable of treating total petroleum hydrocarbons at an inflow concentration of 10 mg/L, such that the outflow concentration is less than or equal to an allowable concentration of 50 μg/L. GAC treatment vessels shall be readily capable of removal and replacement or interchange when required. The GAC treatment system shall have appropriate fittings for pipe connections designed to accommodate the flow rate. The Contractor shall throughout the operation have one additional GAC vessel available for transport and use at the site within one hour after being directed by the Engineer.

Sampling ports shall be spigots attached to the piping system and capable of obtaining a representative sample of water at each location of the GAC treatment system, as shown on the plans. The GAC treatment system shall be capable of sustaining temporary fluctuations in water pressure due to monitoring activities.

Pumps shall be capable of being submerged in water and discharging water and other materials including, but not limited to small rocks, gravel, sand and sediments. 2 submersible pumps will be required for this project and shall be capable, at all times, of discharging at a flow rate of 318 L/min. In addition, a third submersible pump shall be provided by the Contractor that is capable of discharging treated effluent from the temporary holding container to the dedicated discharge location.

Plastic piping may be approved for use as determined by the Engineer in writing. If plastic piping is used, it shall conform to the provisions in section 20-5.03E, "Pipe" of the Standard Specifications. The Contractor shall be responsible for providing all piping required to circulate the effluent through the treatment system and all piping required to convey the treated effluent from the temporary holding container to the point of release at the dedicated discharge location.

A temporary holding container shall be provided with a minimum holding capacity of 1892 L. The holding container shall have an inlet and outlet capable of receiving and discharging minimum flows of 318 L/min. The holding container shall be open to the air and sealed on all sides and the bottom to prevent any leakage.

The Contractor shall be responsible for maintaining all of the equipment and materials outlined in this special provision to operational levels necessary to comply with provisions outlined in these special provisions and permits issued for this project. If the Contractor or the Engineer identifies a deficiency in the functioning of any equipment or material, the deficiency shall be immediately corrected by the Contractor.

**MONITORING**

Monitoring shall occur daily for the first 7 days of operating GAC treatment system, and then be reduced to a frequency of once every 7 days thereafter. Upon relocation replacement, interchange, or maintenance of the GAC vessels the Contractor shall conduct daily monitoring for the first 7 days of resuming treatment operation, and then reduce the monitoring frequency to once every 7 days thereafter. The Contractor shall collect water samples from each sampling port of

the GAC treatment system as depicted in the plans. A total of three samples shall be obtained from each sampling port during each monitoring event The first of the three samples shall be analyzed for total suspended solids (TSS) in accordance with EPA method 160.1. The detection limit for the TSS analysis shall be at a maximum of 1 mg/L. The second sample shall be analyzed for total metals in accordance with EPA method 6010, and the third sample shall be analyzed for total petroleum hydrocarbons in accordance with EPA method 8015. The detection limits for total metals and total petroleum hydrocarbons shall be consistent with those used for the site investigation described in "Aerially Deposited Lead, General" elsewhere in these special provisions. Furthermore, the quality assurance and quality control measures employed by the laboratory and personnel conducting sampling shall be consistent with those used for the site investigation described in "Aerially Deposited Lead, General" elsewhere in these special provisions. Analytical results for all samples shall be available to the Engineer within 24 hours of delivering the samples to the laboratory. The Contractor shall ensure that the laboratory responsible for the analysis of the samples has been properly certified by the California Department of Health Services for conducting the analyses described under these special provisions.

**SPILL CONTINGENCY**

The Contractor shall prepare and submit to the Engineer a contingency plan for the management of spills or leaks of any materials or wastes that may impact the water quality of the Carquinez Strait.

The spill contingency plan shall be incorporated within the Storm Water Pollution Prevention Plan (SWPPP), as specified in "Water Pollution Control" of these special provisions.

The contingency plan shall include instructions and procedures for reporting spills, and a list of spill containment and collection materials and equipment to be maintained onsite. The contingency plan shall be reviewed and updated at least every 90 calendar days.

**LIQUIDS, RESIDUES AND DEBRIS**

Attention is directed to "Remove Pavement Markers," "Temporary Pavement Delineation," "Remove Traffic Stripes and Pavement Markings," "Remove Drainage Facilities," "Remove Asphalt Concrete Dike," "Cold Plane Asphalt Concrete Pavement," "Cast in Drilled-Hole Concrete Piles," "Slurry," "Cast in Steel Shell Concrete Piling," "Clean and Paint Structural Steel," "Expansion Joint Assemblies," "Concrete Barrier," "Masonry Structures," "Asphalt Roofing," and "Piling," of these special provisions.

The control and disposal of liquids, residues, and debris associated with "Remove Pavement Markers," "Temporary Pavement Delineation," "Remove Traffic Stripes and Pavement Markings," "Remove Drainage Facilities," "Remove Asphalt Concrete Dike," "Cold Plane Asphalt Concrete Pavement," "Cast in Drilled-Hole Concrete Piles," "Slurry," "Cast in Steel Shell Concrete Piling," "Clean and Paint Structural Steel," "Falsework," "Expansion Joint Assemblies," "Concrete Barrier," "Masonry Structures," "Asphalt Roofing," and "Piling," shall be described within the SWPPP, as specified in "Water Pollution Control" of these special provisions. The SWPPP shall, at a minimum, depict and describe the procedural and structural methods of detaining, collecting, and disposing of all slurries, liquids, residues, and debris associated with the operations. Sufficient redundancy shall be incorporated into the procedural and structural methods such that the liquids, residues, and debris are not conveyed into or become present in drainage systems, the Carquinez Strait, or other water bodies.

**MEASUREMENT AND PAYMENT**

Full compensation for all cofferdam, excavation, and stockpile dewatering operations including, but not limited to, providing power to operate pumping equipment; furnishing, replenishing, profiling, and disposing of GAC treatment system; monitoring and inspection of treatment systems, discharges, and receiving water body; providing all necessary maintenance, labor, vehicles, equipment, and other incidentals; and removal and disposal of materials, groundwater, and treated effluent shall be considered as included in the contract lump sum paid for non-storm water discharges.

## 10-1.05 TEMPORARY CREEK DIVERSION SYSTEM

A temporary creek diversion system shall be furnished and installed, maintained and later removed as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

Attention is directed to "Relations with California Department of Fish and Game", elsewhere in these special provisions.

The temporary creek diversion system shall consist of a temporary diversion dam across the existing channel upstream from the proposed Bridge Replacement work, temporary culverts and rock bag anchors.

The temporary diversion dam and rock bag anchors shall consist of placing bags around the temporary culverts.

**MATERIALS**

Materials shall conform to Section 20-2, "Materials," of the Standard Specifications and the following:

A. Rock bags shall conform to the provisions set forth in Temporary Rock Bag Barrier of these special provisions.
B. Plastic sheet be commercial quality polyethylene with a minimum thickness of 0.25-mm.

An impermeable plastic sheet shall be placed in the temporary diversion dam as shown on the plans. All joints between the edges shall be lapped and joined with commercial quality waterproof tape. All joints between the plastic sheet and pipe shall be sealed with commercial quality waterproof tape. The Contractor shall be responsible for preventing, at his expense, any leakage in the temporary creek diversion system that may interfere with his work.

The type of temporary culverts to be installed shall be at the option of the Contractor, however, the culverts shall be capable of sustaining the intended load, and of discharging a quantity of water equivalent to the type and size of culvert shown on the plans and shall be subject to written approval by the Engineer.

Used materials may be used for the temporary culverts providing the used materials are good, sound, suitable for the purpose intended and approved, in writing, by the Engineer.

Any portion of the temporary creek diversion system that is damaged from any cause during the progress of the work shall be repaired or replaced by the Contractor at the Contractor's expense. During the course of work, minor repositioning of the diversion may be required. If repositioning of the diversion is required beyond 2 meters on either side of it's installed location, the work shall be paid for in accordance with Section 4-1.03D "Extra Work" of the Standard Specifications. Any minor repositioning within the 2 meter limit shall be done at the Contractors expense.

When no longer required for the work as determined by the Engineer, the temporary creek diversion system shall be removed in accordance with 7-1.13, "Disposal of Materials Outside the Highway Right of Way," of the Standard Specifications.

The contract lump sum price paid for temporary creek diversion system shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals, and for doing all work involved in constructing, maintaining, minor repositioning and removing the temporary creek diversion system, complete in place, as shown on the plans, as specified in the Standard Specification and these special provisions, and as directed by the Engineer.

## 10-1.06 TEMPORARY EROSION CONTROL

Temporary erosion control shall conform to the provisions for erosion control in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

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

Temporary erosion control work shall consist of applying erosion control materials to embankment slopes, excavation slopes and other areas. Temporary erosion control shall be applied to unfinished construction slopes and soil-disturbed areas in accordance with the specified allowable limit for soil-disturbed areas as provided for in "Water Pollution Control" of these special provisions.

### MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and the following:

#### Straw

Straw shall be derived from wheat or barley. Wheat and barley straw shall not be derived from dry farmed cereal crops.

#### Stabilizing Emulsion

Stabilizing emulsion shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions.

The requirement of an effective life of at least one year for stabilizing emulsion shall not apply.

Stabilizing emulsion shall be in a dry powder form, may be reemulsifiable, and shall be a processed organic adhesive derivative of Plantago insularis used as a soil tackifier.

### APPLICATION

Temporary erosion control materials shall be applied in 2 separate applications in the following sequence:

A. Straw shall be applied at the rate of 4 tonnes per hectare based on slope measurements. Incorporation of straw will not be required.
B. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment:

| Material | Kilograms Per Hectare (Slope Measurement) |
|---|---|
| Fiber | 1680 |
| Commercial Fertilizer | 135 |

C. The ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer.
D. Once straw work is started in an area, the remaining applications shall be completed in that area on the same working day.

**MEASUREMENT AND PAYMENT**

Temporary erosion control will be measured and paid for by the square meter in the same manner specified for erosion control in Sections 20-3.06 and 20-3.07 of the Standard Specifications.

Temporary erosion control placed at locations other than as shown on the project plans or directed by the Engineer, in conformance with the Contractor's Storm Water Pollution Prevention Plan, will not be measured and will be paid for as specified in "Water Pollution Control" of these special provisions.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary erosion control required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary erosion control.

## 10-1.07 TEMPORARY COVER

Temporary cover shall conform to the details shown on the plans. The minimum quantity of temporary cover required for this project shall be _1000_ square meters.

The Contractor shall use temporary cover as one of the various measures to prevent water pollution. The Storm Water Pollution Prevention Plan shall graphically show the use of temporary cover in relation to other water pollution control work specified elsewhere in these special provisions.

**MATERIALS**

Materials shall conform to the following for either plastic or fabric sheeting:

If fabric is used, the fabric shall be a minimum 115 g/m2 slit film woven fabric made of monofilaments of polypropylene. The fabric shall be non biodegradable, resistant to sunlight deterioration, inert to most soil chemicals and furnished with sealed edges on all sides to prevent unraveling. The fabric shall also conform to the following:

Properties

| | |
|---|---|
| Grab tensile strength | 0.85-0.95 kn |
| Elongation at break (minimum) | 15% |

If plastic sheeting is used, the sheeting shall be polyethylene, new and a minimum of 0.33 mm thickness.

**INSTALLATION**

Fabric or plastic sheeting shall be placed and anchored as shown on the plans. Abutting edges shall overlap a minimum of a 0.6m. A weight such as rock bags shall be placed on the overlap area at a maximum spacing of 2.4m. Anchoring temporary cover by using staples or wooden lath and anchors may be allowed in lieu of rock bags as determined by the Engineer. The Contractor shall submit details for any alternative anchoring system to the Engineer for approval prior to installation. Non-abutting edges shall be embedded a minimum of 150 mm in native soil.

Temporary cover damaged as a result of the Contractors operations shall be replaced by the Contractor at his expense.

**MEASUREMENT AND PAYMENT**

The contract lump sum price paid for temporary cover shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing, maintaining and removing temporary cover, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. If the Contractor removes the temporary cover in order to facilitate any other work, the temporary cover shall be replaced and secured by the contractor at no additional cost to the State.

## 10-1.08 TEMPORARY DRAINAGE INLET PROTECTION

Temporary drainage inlet protection shall be installed, maintained and later removed as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

Temporary drainage inlet protection shall be limited to those areas that are not adjacent to, nor drain toward, areas of active traffic.

The Contractor shall select the appropriate drainage inlet protection shown on the plans commensurate to the field condition around the drainage inlet. For all other drainage inlets within the project limits that do not conform to the details

shown on the plans, the Contractor shall submit to the Engineer for approval, provisions for providing temporary drainage inlet protection.

Throughout the duration of the Contract, the Contractor shall be required to provide protection commensurate with the changing condition of the drainage inlet. It is recognized that the drainage inlet changes during the course of construction and the actual protection provided may require selecting the appropriate type or types of drainage inlet protection as it changes during the course of construction.

Some conditions may require combining materials outlined in the special provision to address conditions that cannot be accounted for at this time.

The Contractor shall use temporary drainage inlet protection as one of the various measures to prevent water pollution. The Storm Water Pollution Prevention Plan shall graphically show the use of temporary drainage inlet protection in relation to other water pollution control work specified elsewhere in these special provisions.

**MATERIALS**

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

A. **SILT FENCE.—**Sedimentation control fabric for temporary silt fence shall be a prefabricated silt fence with a minimum woven polypropylene fabric width of 900 mm and a minimum tensile strength of 0.44-kN, conforming to ASTM Designation: D 4632.

B. **ROCK BAG.—**Rock bag fabric shall be woven polypropylene, polyethylene or polyamide with a minimum unit weight of 135 g/m$^2$. The fabric shall have a mullen burst strength of at least 2067 kPa, per ASTM Designation: D3786 and an ultraviolet (UV) stability exceeding 70 percent.

Rock bags shall have a length of 600 mm to 800 mm, width of 400 mm to 450 mm, thickness of 150 mm to 200 mm, and be capable of containing a weighted mass of 13 kg to 22 kg.

Rock bag fill material shall be non-cohesive gravel, free from deleterious material. Rock bags shall be filled and the opening secured such that rock shall not escape from the bag.

C. **EROSION CONTROL BLANKET.—**Erosion control blanket shall consist of straw and coconut or wood excelsior blanket secured in place with wire staples and shall conform to one of the following:

D. **EXCELSIOR BLANKET.—**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 an 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 -2440 mm in width, and shall have an average mass of 0.5-kg/m$^2$, ± 10 percent, at the time of manufacture.

E. **STRAW AND COCONUT BLANKET.—**Straw and coconut blanket shall be machine produced mats of straw and coconut with a light weight netting on top. The straw and coconut shall be adhered to the netting with biodegradable thread or glue strip. The straw and coconut erosion control blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the blanket. Straw and coconut erosion control blanket shall be furnished in rolled strips with a minimum width of 1.8 meters, minimum length of 20 meters (± 1 meter) and a minimum mass of 0.27-kg/m$^2$.

F. **STAPLES.—**Staples for erosion control blankets shall be made of 11-gage minimum steel wire and shall conform to the dimensions shown on the plans.

**INSTALLATION AND MAINTENANCE**

Temporary rock bag dike consisting of filled rock bags placed in multiple layers shall be installed as shown on the plans.

When no longer required for the purpose, as determined by the Engineer, temporary drainage inlet protection facilities shall be removed. Removed facilities shall become the property of the Contractor and shall be removed from the site of the work.

Temporary drainage inlet protection damaged due to storms or as a result of the Contractors operations shall be replaced at the Contractor’s at expense.

**MEASUREMENT AND PAYMENT**

The quantity of temporary drainage inlet protection to be paid for will be determined from each drainage inlet protected conforming to the details shown on the plans. The protection is measured one time only and no additional measurement is recognized, and no additional compensation made, if it changes during the course of construction.

The contract unit price paid for temporary drainage inlet protection shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary drainage inlet protection, complete in place, including excavation and backfill, all modifications occurring during the course of construction, and maintenance and removal of temporary drainage inlet protection, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Temporary drainage inlet protection for protection at drainage inlets other than as shown on the project plans or directed by the Engineer, in accordance with the Contractor's Storm Water Pollution Prevention Plan (SWPPP), will not be measured as temporary drainage inlet protection. Payment for drainage inlet protection that is required as part of the SWPPP, but is not shown on the project plans, will be paid for as specified in "Water Pollution Control" elsewhere in these special provisions.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary drainage inlet protection required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," shall not apply to temporary drainage inlet protection.

## 10-1.09 TEMPORARY CONCRETE WASHOUT FACILITY

Temporary concrete washout facilities shall be constructed, maintained, and later removed as shown on the plans, in conformance with these special provisions and as directed by the Engineer.

Temporary concrete washout facilities shall be installed prior to beginning any placement of concrete and located a minimum of 15 m from storm drain inlets, open drainage facilities, and watercourses, unless determined infeasible by the Engineer. Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.

A sign shall be installed as shown on the plans adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

Temporary concrete washout facilities shall be constructed above grade or below grade at the option of the Contractor. The minimum quantity of concrete washouts required for this project shall be 10.

Temporary concrete washout facilities shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations for all concrete wastes. These facilities shall be constructed to contain all liquid and concrete waste without seepage, spillage or overflow.

**MATERIALS**

Materials used in the construction of temporary concrete washout facility shall conform to the following:

A **PLASTIC SHEETING.—**Plastic sheeting shall be new and a minimum of 0.33 mm thick polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Plastic sheeting shall not have seems or overlapping joints.

B **ROCK BAG.—**Rock bag fabric shall be woven polypropylene, with a minimum unit weight of $250 g/m^2$. The fabric shall have a mullen burst strength of at least 2500 kPa, per ASTM Designation D3786 and an ultraviolet (UV) stability exceeding 70 percent at 500 hours. Rock bags shall have a length of 600 mm to 800 mm, width of 400 mm to 500 mm, thickness of 150 mm to 200 mm, and capable of containing a weighted mass of 13 kg to 22 kg. Rock bag fill material shall be non-cohesive, gravel, free from deleterious material. Rock bags shall be filled and the opening secured such that rock shall not escape from the bag.

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

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

Bales shall be bound by either wire, nylon or polypropylene string. Jute and cotton binding shall not be used. Wire shall be a minimum of 1.57 mm (16-gage) baling wire. Nylon or polypropylene string shall be approximately 2 mm in diameter with 360 N of breaking strength.

D **STAKES.—**Stakes shall be 50 mm x 50 mm wood posts. Each stake shall have a minimum length of one meter.

**TEMPORARY CONCRETE WASHOUT FACILITY (TYPE ABOVE GRADE)**

Temporary concrete washout facility (type above grade) shall be constructed as shown on the plans with a minimum length of 3 m and a minimum width of 3 m. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the Engineer.

**TEMPORARY CONCRETE WASHOUT FACILITY (TYPE BELOW GRADE)**

Temporary concrete washout facility (type below grade) shall be constructed as shown on the plans with a minimum length of 3 m and a minimum width of 3 m. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the Engineer.

**MAINTENANCE AND REMOVAL**

Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100mm for above grade facilities and 300mm for below grade facilities. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Minor holes and tears in the plastic sheeting may be taped as long as the repair does not compromise the impermeability of the material.

When temporary concrete washout facilities are no longer required for the work, as determined by the Engineer, the hardened concrete shall be removed and disposed of in conformance with the provisions in Section 15-3.02 of the Standard Specifications. Materials used to construct temporary concrete washout facilities shall become the property of the Contractor, shall be removed from the site of the work, and shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

**PAYMENT**

The contract lump sum price paid for temporary concrete washout shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing, maintaining and removing temporary concrete washout facilities, complete in place, including straw bales, plastic lining, sign, portable delineators, lath and flagging, and excavation and backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**10-1.10 TEMPORARY ROCK BAG BARRIER**

Temporary rock bag barrier shall conform to the details shown on the plans and these special provisions. Temporary rock bags shall be used in concrete drainage swales and lined ditches as barriers, and in association with creek diversion systems; attention is directed to Temporary Creek Diversion of these special provisions.

Temporary rock bag barrier shall be furnished, installed, maintained and removed at the locations shown on the plans.

Preparation shall conform to the provisions in Section 20-3.02, "Preparation," of the Standard Specifications.

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

**MATERIALS**

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications.

Rock bag fabric shall be nonwoven polypropylene, with a minimum unit weight of 250g/m$^2$. The fabric shall have a mullen burst strength of at least 2500 kPa, conforming to the requirements in ASTM Designation: D 3786 and an ultraviolet (UV) stability exceeding 70 percent @500 hours.

Rock bags shall have a length of 600 mm to 800 mm, width of 400 mm to 500 mm, thickness of 150 mm to 200 mm, and mass of 13 kg to 22 kg.

Rock bag fill material shall be non-cohesive, gravel, free from deleterious material.

**INSTALLATION**

Temporary rock bag barriers shall be maintained to provide for adequate sediment holding capacity. Sediment deposits shall be removed when the deposit reaches one-third of the temporary rock bag barriers height. Removed sediment shall be deposited within the project in such a way that the sediment is not subject to erosion by wind or water, or as directed by the Engineer.

When no longer required for the intended purpose, as determined by the Engineer, temporary rock bag barriers shall be removed from the site of the work.

**MEASUREMENT AND PAYMENT**

Temporary rock bag barriers will be measured by the meter as determined from actual measurements; the measurements to be made parallel with the ground slope along the line of the completed temporary rock bag barrier.

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

Temporary rock bag barriers placed at locations other than as shown on the project plans or directed by the Engineer, in accordance with the Contractor's Storm Water pollution Prevention Plan will not be measured and will be paid for as specified in "Water Pollution Control" of these special provisions.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary rock bag barriers required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary rock bag barriers.

## 10-1.11 TEMPORARY ENTRANCE/EXIT

Temporary entrance/exit and clean out sump shall conform to the details shown on the plans and these special provisions. The minimum quantity of temporary entrance/exit entrance/exit required for this project shall be 10.

Temporary entrance/exit (Type 1 or 2) shall be furnished, installed, maintained and removed at the locations shown on the plans.

The Contractor shall provide as many temporary construction entrance/exits and clean out sumps as required for the duration of the contract. Attention is directed to "Water Pollution Control" elsewhere in these special provisions.

The Contractor shall use temporary entrance/exit as one of the various measures to prevent water pollution. The Storm Water Pollution Prevention Plan shall graphically show the use of temporary entrance/exit in relation to other water pollution control work specified elsewhere in these special provisions.

**MATERIALS.—**Materials shall conform the following:

A. **Subgrade Enhancement Fabric**.--Subgrade enhancement fabric shall be placed where shown on the plans and at locations designated by the Engineer in accordance with this special provision.
Subgrade enhancement fabric shall be manufactured from one or more of the following materials: polyester, nylon or polypropylene. Subgrade enhancement fabric shall be, at the option of the contractor, either a woven filament or nonwoven type fabric conforming to the following:

| | Woven | Non-Woven |
|---|---|---|
| Weight, grams per Square Meter, Min.<br>ASTM Designation: D3776 | 205 | 205 |
| Grab Tensile Strength, Newtons (N), Min.<br>ASTM Designation: D4632 | 890 | 800 |
| Tensile Strength at 10% Elongation, N, Min.<br>ASTM Designation: D4632 | 490 | -- |
| Elongation at Break, Percent, Max.<br>ASTM Designation: D4632 | 35 Max. | 50 Min. |

Subgrade enhancement fabric shall be furnished in an appropriate protective cover which shall protect it from ultraviolet radiation and from abrasion due to shipping and handling, and shall remain covered until installation. Subgrade enhancement fabric shall be accompanied by a Certificate of Compliance conforming to the provision in Section 6-1.07, “Certificate of Compliance” of the Standard Specifications.

B. **Aggregate.--**Aggregate shall be uniformly graded angular rock or cobble ranging in size from 76.2mm-180mm. Rock shall be clean and free of organic matter and shall conform to the provisions in Section 26, “Aggregate Base, “ of the Standard Specifications and these special provisions.

C. **Steel Corrugated Panels.--**Manufactured steel corrugated panels with raised bars shall be provided in individual sections. Steel plate and raised bars shall be a minimum 12.7mm thick. Bars shall be a minimum of 38.1mm in

height and shall be uniformly distributed 190.5mm apart longitudinally throughout the full section of each panel. Raised bars shall be welded to the bottom plate and approximately 12.7mm thick at the base and tapering to 6.35mm thick at the top of the bar. Each panel shall have a nominal dimension of 3m X 2.43m with an approximate weight of 1454 kg for each panel. Each end of the panel shall have a slot or hooked section to facilitate coupling at the ends.

**INSTALLATION**

Temporary entrance/exit and clean out sump shall be installed as shown on the plans and as follows:

A. Prior to placing the subgrade enhancement fabric, the areas shall be cleared of all trash and debris. Weeds shall be removed to the ground level. Cleared trash, debris, and removed weeds shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13 of the Standard Specifications.
B. Subgrade enhancement fabric shall be handled and placed in accordance with the manufacturer's recommendation and shall be positioned longitudinally along the alignment, pulled taut to form a tight wrinkle-free mat. The subgrade to receive the fabric, immediately prior to placing, shall conform to the compaction and elevation tolerance specified in Section 25-1.03, "Subgrade", of the Standard Specifications and these special provisions and shall be free of loose or extraneous material and sharp objects that may damage the fabric during the installation.
   Adjacent borders of the fabric shall be overlapped a minimum of 450 mm.
   The amount of subgrade enhancement fabric placed shall be limited to that which can be covered with aggregate material within 72 hours.

Aggregate material to be placed directly over the subgrade enhancement fabric shall be spread in the direction of fabric overlaps. Stockpiling of materials directly on the subgrade enhancement fabric is not allowed. Once a sufficient working platform has been constructed, all remaining materials shall be uniformly placed and spread with 1:4 (V:H) tapers at the perimeter edges of the temporary entrance/exit where it conforms to existing roadway and in accordance with the applicable sections of the special provisions and the Standard Specifications.

During spreading of the aggregate material, vehicles or equipment shall not be driven directly on the fabric. A sufficient thickness of material shall be maintained between the fabric and the equipment to prevent damage to the fabric. Damage to the fabric resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

Should the fabric be damaged during placing, the damaged section shall be repaired by placing a new piece of fabric over the damaged area. Said piece of fabric shall be large enough to cover the damaged area and provide a minimum 900 mm overlay on all edges.

Steel corrugated panels shall be installed as shown on the plans. A minimum of 3 panel sections coupled to one another is required at each temporary entrance/exit. Prior to installing panels, the ground surface shall be cleared of all debris which may prevent uniform contact with the ground surface.

A clean out sump shall be installed as shown on the plans and located within 6m of the entrance/exit facility. The sump shall be sized sufficiently to hold soil removed from the surfacing of the entrance /exit facility in order to maintain efficiency.

**MAINTENANCE**

The Contractor shall maintain the temporary entrance/exit and clean out sump throughout the contract period. The Contractor shall prevent displacement or migration of the aggregate surfacing or steel corregated panels. Any significant depressions, as determined by the Engineer, which form due to settling or heavy traffic shall be repaired by the Contractor.

Sediment and soil built up in the temporary entrance/exit surface which compromises the efficiency for sediment and soil removing capability shall be removed as necessary or as determined by the Engineer. Removal and disposal of sediment and soils from the entrance/exit and the clean out sump shall be the responsibility of the Contractor.

Once the temporary entrance/exit and clean out sump is no longer needed, the aggregate, subgrade enhancement fabric and any soil and sediments shall be removed and disposed of as provided for in Section 7-1.13 'Disposal of Material Outside of the Highway Right of Way' of the Standard Specifications. Following removal of the temporary entrance/exit and clean out sump, the areas shall be graded smooth and compacted to conform with adjacent areas.

**PAYMENT**

At the option of the Contractor, temporary entrance/exit (Type 2) may be substituted for temporary entrance/exit (Type 1) at no additional cost to the State.

The contract lump sum price paid for temporary entrance/exit shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing, maintaining and removing temporary entrance/exit and clean out sump, complete in place, including transporting and disposing of soil and sediments removed from temporary entrance/exit and any incidental grading required to grade and compact areas within the limits of

temporary entrance/exit and clean out sump as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

### 10-1.12 TEMPORARY SILT FENCE

Temporary silt fence shall conform to the details shown on the plans and these special provisions.

Temporary silt fence shall be furnished, installed, maintained, and removed at the locations shown on the plans.

Preparation shall conform to the provisions in Section 20-3.02, "Preparation," of the Standard Specifications.

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

#### MATERIALS

Materials for temporary silt fence shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications.

Temporary silt fence shall be a prefabricated silt fence with a minimum woven polypropylene fabric width of 900 mm and a minimum tensile strength of 0.44-kN, conforming to the requirements of ASTM Designation: D 4632.

Temporary silt fence shall be a prefabricated silt fence with a minimum woven polypropylene fabric width of 900 mm and a minimum tensile strength of 0.44-kN, conforming to the requirements of ASTM Designation: D 4632 and having an integral reinforcement layer. The reinforcement layer shall be a polypropylene or equivalent net provided by the manufacturer.

Temporary silt fence shall be a prefabricated silt fence composed entirely of biodegradable materials, including filter, backing, binding and staking materials. The minimum fabric width shall be 900 mm. The silt fence shall maintain sediment removal characteristics for a period of at least one year.

#### INSTALLATION

Temporary silt fence shall be installed as shown on the plans and in conformance with Detail Sheets 1 and 2 in Appendix C, CD36(2) in the Construction Contractors Guide and Specifications of the Caltrans Storm Water Quality Handbooks.

When joints are necessary, the temporary silt fence shall overlap a minimum of 150 mm with both posts tied together.

Temporary silt fences shall be maintained to provide for adequate sediment holding capacity. Sediment deposits shall be removed when the sediment deposit reaches approximately one-third of the fence height. Removed sediment shall be deposited within the project in such a way that the sediment is not subject to erosion by wind or water, or as directed by the Engineer.

When no longer required for the intended purpose, as determined by the Engineer, temporary silt fence shall be removed from the site of the work.

Holes, depressions or any other ground disturbance caused by the removal of the temporary silt fence shall be backfilled and repaired in conformance with the provisions in the second paragraph of Section 15-1.02, "Preservation of Property," of the Standard Specifications.

#### MEASUREMENT AND PAYMENT

The quantity of temporary silt fence will be measured by the meter as determined from actual measurements, the measurements to be made parallel with the ground slope along the line of the completed temporary silt fence, deducting the widths of openings.

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

Temporary silt fence placed at location other than as shown on the project plans or directed by the Engineer, in conformance with the Contractor's Storm Water Pollution Prevention Plan, will not be measured and will be paid for as specified in "Water Pollution Control" of these special provisions.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary silt fence required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary silt fence.

### 10-1.13 TEMPORARY FENCE (TYPE ESA)

Temporary fence (Type ESA) 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.

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.

Temporary fence (Type ESA) shall be located so that it will be obvious to heavy equipment operators.

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. Fabric used for Temporary fence (Type ESA) shall also conform to the following:

| | |
|---|---|
| Material: | Polypropylene or Polyethylene |
| Color: | Orange |
| Mesh opening: | 50 mm x 50 mm |
| UV Resistance: | Fully Stabilized |
| Fabric Width, min.: | 1.22 m |

Posts shall be either metal or wood at the Contractor's option, and shall be suitable for the purpose intended. Metal posts shall have a minimum diameter of 21.5 mm x 1600 mm in length. Wood posts shall be fir or pine and shall be a minimum of 25 mm x 50 mm x 1600 mm in length. Posts shall be driven into the soil a minimum of 400 mm. Post spacing shall be adequate to completely support the fence fabric in an upright position.

Galvanizing and painting of steel items will not be required.

Treating wood with a wood preservative will not be required.

Concrete footings for posts will not be required.

Temporary fence (Type ESA) 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 (Type ESA) 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.

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.

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 installation, maintenance, removal and disposal of materials as specified in these special provisions and as directed by the Engineer.

### 10-1.14 PRESERVATION OF PROPERTY

Attention is directed to Section 7-1.11, "Preservation of Property," of the Standard Specifications and these special provisions.

Existing trees, shrubs and other plants, that are not to be removed as shown on the plans or specified in these special provisions, 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 No. 15 container and the minimum size of shrub replacement shall be No. 5 container. Replacement ground cover plants shall be from flats and shall be planted 300 mm on center. 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, shrubs, and other plants 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.

### 10-1.15 RELIEF FROM MAINTENANCE AND RESPONSIBILITY

The Contractor may be relieved of the duty of maintenance and protection for those items not directly connected with plant establishment work, except highway planting and irrigation systems in conformance with the provisions in Section 7-1.15, "Relief From Maintenance and Responsibility," of the Standard Specifications.

## 10-1.16 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.

In the event of a loss caused to the Contractor due to unnecessary delays or failure to finish the work within the time specified for completion caused by another contractor under contract with the Department performing work for the State, the State will reimburse the delayed contractor in conformance with the provisions in Section 8-1.09 "Right of Way Delays," of the Standard Specifications. Deductions will be made from moneys due or that may become due the contractor causing the loss or delay.

It is anticipated that work by another contractor (Contract No. 04 - 013014) to construct the Carquinez Bridge and Bent 7 Crockett Viaduct in Contra Costa and Solano Counties on Route 80 from Post kilometer 22.0 to 22.7 and 0.0 to 1.8 will be in progress adjacent to or within the limits of this project during progress of the work on this contract.

At least 6 months prior to the estimated date of completion of Phase I work, the Engineer will call a meeting of the Contractor and the contractor of the adjoining contract (Contract No. 04-013014) to discuss coordination of construction operations and accommodation of access to all common construction areas so that the work on both contracts can be completed expeditiously without undue delay and that both contracts be completed as close to the same completion date as the work constraints allow. The Contractor shall cooperate with the adjoining contractor and all other forces, in all respects, to insure that the objective of timely completion of both contracts is attained.

Progress schedules for Contract No. 04-013014, if available, may be inspected by the Contractor upon written request to the Engineer. Such progress schedules are tentative and cannot be guaranteed accurate.

## 10-1.17 PHOTOGRAPHY

The Contractor shall provide time-lapse video and still photography to document pre-construction conditions, and progress and completion of the work, as directed by the Engineer. Photography will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications, and will not be considered a special service as specified in Section 9-1.03B of the Standard Specifications.

## 10-1.18 PROGRESS SCHEDULE (CRITICAL PATH)

Progress schedules will be required for this contract. Progress schedules shall utilize the Critical Path Method (CPM).

### DEFINITIONS

The following definitions apply to this section "Progress Schedule (Critical Path)":

A. Activity: Any task, or portion of a project, which takes time to complete.
B. Baseline Schedule: The initial CPM schedule representing the Contractor's original work plan, as accepted by the Engineer.
C. Controlling Operation: The activity considered at the time by the Engineer, within that series of activities defined as the critical path, which if delayed or prolonged, will delay the time of completion of the contract.
D. Critical Path: The series of activities, which determines the earliest completion of the contract (Forecast Completion Date).
E. Critical Path Method: A mathematical calculation to determine the earliest completion of the contract represented by a graphic representation of the sequence of activities that shows the interrelationships and interdependencies of the elements composing a project.
F. Current Contract Completion Date: The extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer in accordance with Section 8-1.06, "Time of Completion," of the Standard Specifications.
G. Early Completion Time: The difference in time between the current contract completion date and the Contractor's scheduled early forecast completion date as shown on the accepted baseline schedule, or schedule updates and revisions.
H. Float: The amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any activity or group of activities in the network.
I. Forecast Completion Date: The completion date of the last scheduled work activity identified on the critical path.
J. Fragnet: A section or fragment of the network diagram comprised of a group of activities.
K. Free Float: The amount of time an activity can be delayed before affecting a subsequent activity.
L. Hammock Activity: An activity added to the network to span an existing group of activities for summarizing purposes.
M. Milestone: A marker in a network, which is typically used to mark a point in time or denote the beginning or end of a sequence of activities. A milestone has zero duration, but will otherwise function in the network as if it were an activity.

N. Revision: A change in the future portion of the schedule that modifies logic, adds or deletes activities, or alters activities, sequences, or durations.
O. Tabular Listing: A report showing schedule activities, their relationships, durations, scheduled and actual dates, and float.
P. Total Float: The amount of time that an activity may be delayed without affecting the total project duration of the critical path.
Q. Update: The modification of the CPM progress schedule through a regular review to incorporate actual progress to date by activity, approved time adjustments, and projected completion dates.
R. Time Scaled Logic Diagram: A schematic display of the logical relationships of project activities, drawn from left to right to reflect project chronology with the positioning and length of the activity representing its duration.
S. Bar Chart (Gantt Chart): A graphic display of scheduled-related information, activities or other project elements are listed down the left side of the chart, date are shown across the top, and activity durations are shown as date-placed horizontal bars.

**PRE-CONSTRUCTION SCHEDULING CONFERENCE**

The Engineer shall schedule and conduct a Preconstruction Scheduling Conference with the Contractor's Project Manager and Construction Scheduler within seven days after the bidder has received the contract for execution. At this meeting, the requirements of this section of the special provisions will be reviewed with the Contractor. The Contractor shall be prepared to discuss its schedule methodology, proposed sequence of operations, the activity identification system for labeling all work activities, the schedule file numbering system, and any deviations it proposes to make from the Stage Construction Plans. The Engineer shall submit a diskette of a scheduling shell project, displaying an activity code dictionary consisting of fields populated with the Caltrans Scope Breakdown Structure Code. The Contractor shall utilize these codes, and may add other codes as necessary, to group and organize the work activities. Periodically the Engineer may request the Contractor to utilize additional filters, layouts or activity codes to be able to further group or summarize work activities.

Also, the Engineer and the Contractor shall review the requirements for all submittals applicable to the contract and discuss their respective preparation and review durations. All submittals and reviews are to be reflected on the Interim Baseline Schedule and the Baseline Schedule.

**INTERIM BASELINE SCHEDULE**

Within 15 days after approval of the contract, the Contractor shall submit to the Engineer an Interim Baseline Project Schedule which will serve as the progress schedule for the first 120 days of the project, or until the Baseline Schedule is accepted, whichever is sooner. The Interim Baseline Schedule shall utilize the critical path method. The Interim Baseline Schedule shall depict how the Contractor plans to perform the work for the first 120 days of the contract. Additionally, the Interim Baseline Schedule shall show all submittals required early in the project, and shall provide for all permits, and other non-work activities necessary to begin the work. The Interim Baseline Schedule submittal shall include a 3 l/2 inch floppy diskette which contains the data files used to generate the schedule.

The Engineer shall be allowed 10 days to review the schedule and to provide comments, including the Contractor’s application of the supplied scope breakdown structure. The Interim Baseline Schedule does not require Caltrans approval but all comments are to be implemented into the Baseline Schedule. Re-submittal of the Interim Baseline Schedule is not required. Late review of the Interim Baseline Schedule shall not restrain the submittal of the Baseline Schedule.

**BASELINE SCHEDULE**

Within 30 days, after approval of the contract, the Contractor shall submit to the Engineer a Baseline Project Schedule including the incorporation of all comments provided to the Interim Baseline Schedule. The Baseline Schedule shall have a data date of the day prior to the first working day of the contract. The schedule shall not include any actual start dates, actual finish dates, or constraint dates. The Baseline Progress Schedule shall meet interim milestone dates, contract milestone dates, stage construction requirements, internal time constraints, show logical sequence of activities, and must not extend beyond the number of days originally provided for in the contract.

All task activities shall be assigned to a project calendar. Each calendar shall identify a workweek, and holidays. Use different calendars for work activities that occur on different work schedules.

The Contractor shall not add job inefficiencies or weather days to a project calendar without prior approval by the Engineer.

The Baseline CPM Schedule submitted by the Contractor shall have a sufficient number of activities to assure adequate planning of the project and to permit monitoring and evaluation of progress and the analysis of time impacts. The Baseline Schedule shall depict how the Contractor plans to complete the whole work involved, and shall show all activities that defines the critical path. Each construction activity shall have durations of not more than 20 working days, and not less than one working day unless permitted otherwise by the Engineer. All activities in the schedule, with the exception of the first and last activities, shall have a minimum of one predecessor and a minimum of one successor.

The Baseline Schedule shall not attribute negative float to any activity. Float shall not be considered as time for the exclusive use of or benefit of either the State or the Contractor but shall be considered as a jointly owned, expiring resource available to the project and shall not be used to the financial detriment of either party. Any accepted schedule, revision or update having an early completion date shall show the time between the early completion date and the current Contract Completion Date as "total float".

The Contractor shall be responsible for assuring that all work sequences are logical and the network shows a coordinated plan for complete performance of the work. Failure of the Contractor to include any element of work required for the performance of the contract in the network shall not relieve the Contractor from completing all work within the time limit specified for completion of the contract. If the Contractor fails to define any element of work, activity or logic, the Contractor in the next monthly update or revision of the schedule shall correct it.

The Baseline Progress Schedule shall be supplemented with resource allocations for every task activity to a level of detail that facilitates report generation based on labor craft and equipment class 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. Along with the baseline progress schedule, the Contractor shall also submit to the Engineer time-scaled resource histograms of the labor crafts and equipment classes to be utilized on the contract.

The Contractor shall not create hammock activities for the purpose of resources loading.

The Contractor shall require each subcontractor to submit in writing a statement certifying that the subcontractor has concurred with the Contractor's CPM, including major updates, and that the subcontractor's related schedule has been incorporated accurately, including the duration of activities, labor and equipment loading. Should the Baseline Schedule or schedule update, submitted for acceptance, show variances from the requirements of the contract, the Contractor shall make specific mention of the variations in the letter of transmittal, in order that, if accepted, proper adjustments to the project schedule can be made. The Contractor will not be relieved of the responsibility for executing the work in strict accordance with the requirements of the contract documents. In the event of a conflict between the requirements of the contract documents and the information provided or shown on an accepted schedule, the requirements of the contract documents shall take precedence.

Each schedule submitted to the Engineer shall comply with all limits imposed by the contract, with all specified intermediate milestone and contract completion dates, and with all constraints, restraints or sequences included in the contract. The degree of detail shall include factors including, but not limited to:

A. Physical breakdown of the project;
B. Contract milestones and completion dates, substantial completion dates, constraints, restraints, sequences of work shown in the contract, the planned substantial completion date, and the final completion date;
C. Type of work to be performed, the sequences, and the major subcontractors involved;
D. All purchases, submittals, submittal reviews, manufacture, fabrication, tests, delivery, and installation activities for all major materials and equipment.
E. Preparation, submittal and approval of shop and working drawings and material samples, showing time, as specified elsewhere, for the Engineer's review. The same time frame shall be allowed for at least one resubmittal on all major submittals so identified in the contract documents;
F. Identification of interfaces and dependencies with preceding, concurrent and follow-on contractors, railroads, and utilities as shown on the plans or specified in the specifications;
G. Identification of each and every utility relocation and interface as a separate activity, including activity description and responsibility coding that identifies the type of utility and the name of the utility company involved.
H. Actual tests, submission of test reports, and approval of test results;
I. All start-up, testing, training, and assistance required under the Contract;
J. Punchlist and final clean-up;
K. Identification of any manpower, material, or equipment restrictions, as well as any activity requiring unusual shift work, such as double shifts, 6-day weeks, specified overtime, or work at times other than regular days or hours; and
L. Identification of each and every ramp closing and opening event as a separate one-day activity, including designation by activity coding and description that it is a north-bound, south-bound, east-bound, west-bound, and entry or exit ramp activity.

The Baseline Schedule submittal shall include a 3 l/2 inch floppy diskette which contains the data files used to generate the schedule, a schedule narrative describing the critical path, and all schedule reports.

The Engineer shall be allowed 15 days to review and accept or reject the baseline project schedule submitted. Rejected schedules shall be resubmitted to the Engineer within 5 days, at which time a new 15 day review period by the Engineer will begin.

**PROJECT SCHEDULE REPORTS**

Schedules submitted to the Engineer including Interim Baseline, Baseline, and update schedules shall include time scaled network diagrams in a layout format requested by the Engineer. The network diagrams submitted to the Engineer shall also be accompanied by four computer-generated mathematical analysis tabular reports for each activity included in the project schedule. The reports (8 1/2" x 11" size) shall include a network diagram report showing the activity columns only, a predecessor and successor report, a resource report (Interim Baseline and Baseline Schedules), and a scheduling and leveling calculation report. The network diagram reports shall include, at a minimum, the following for each activity:

A. Activity number and description;
B. Activity codes;
C. Original, actual and remaining durations;
D. Early start date (by calendar date);
E. Early finish date (by calendar date);
F. Actual start date (by calendar date);
G. Actual finish date (by calendar date);
H. Late start date (by calendar date);
I. Late finish date (by calendar date);
J. Identify activity calendar ID;
K. Total Float and Free Float, in work days and;
L. Percentage complete.

Network diagrams shall be sorted and grouped in a format requested by the Engineer reflecting the project breakdown per the Caltrans scope breakdown structure codes. They shall show a continuous flow of information from left to right per the project sorting and grouping codes. E.g., project milestones, submittals sub-grouped by description, and the construction activities sub-grouped by the scope breakdown structure. The primary paths of criticality shall be clearly and graphically identified on the networks. The network diagram shall be prepared on E-size sheets (36" x 48"), shall have a title block in the lower right-hand corner, and a timeline on each page. Exceptions to the size of the network sheets and the use of computer graphics to generate the networks shall be subject to the approval of the Engineer.

Schedule network diagrams the tabular reports shall be submitted to the Engineer for acceptance in the following quantities:

A. 2 sets of the Network Diagrams;
B. 2 copies of the tabular reports (8 1/2" x 11" size); and
C. 3 computer diskettes.

**WEEKLY SCHEDULE MEETINGS**

The Engineer and the Contractor shall hold weekly scheduling meetings to discuss the near term schedule activities, to address any long-term schedule issues, and to discuss any relevant technical issues. The Contractor shall develop a rolling 4-week schedule identifying the previous week worked and a 3-week look ahead. It shall provide sufficient detail to address all activities to be performed and to identify issues requiring engineering action or input.

**MONTHLY UPDATE SCHEDULES**

The Contractor shall submit a Monthly Update Schedule to the Engineer once in each month within 5 days of the data date. The proposed update schedule prepared by the Contractor shall include all information available as of the 20th calendar day of the month, or other data date as established by the Engineer. A detailed list of all proposed schedule changes such as logic, duration, lead/lag, forecast completion date, additions and deletions shall be submitted with the update.

The monthly update of the schedule shall focus on the period from the last update to the current cut-off data date. Changes to activities or logic beyond the data date are classified as revisions and need to be addressed per the schedule revision section of this specification. Activities that have either started or finished shall be reported as they actually occurred and designated as complete, if actually completed. For activities in progress that are forecasted to complete longer than planned, the remaining durations shall be revised, not the original durations. All out of sequence activities are to be reviewed and their relationships either verified or changed.

The Monthly Update Schedule submitted to the Engineer shall be accompanied by a Schedule Narrative Report. The report shall describe the physical progress during the report period, plans for continuing the work during the forthcoming report period, actions planned to correct any negative float, and an explanation of potential delays or problems and their estimated impact on performance, milestone completion dates, forecast completion date, and the overall project completion date. In addition, alternatives for possible schedule recovery to mitigate any potential delay or cost increases shall be included for consideration by the Engineer. The report shall follow the outline set forth below:

Contractor's Schedule Narrative Report Outline:

A. Contractor's Transmittal Letter
B. Work completed during the period
C. Description of the current critical path
D. Description of problem areas
E. Current and anticipated delays
   1. Cause of the delay
   2. Corrective action and schedule adjustments to correct the delay
   3. Impact of the delay on other activities, milestones, and completion dates
F. Changes in construction sequences
G. Pending items and status thereof
   1. Permits
   2. Change Orders
   3. Time Extensions
   4. Non-Compliance Notices
H. Contract completion date(s) status
   1. Ahead of schedule and number of days
   2. Behind schedule and number of days
I. Include updated Network Diagram and Reports

The Contractor shall provide to the Engineer a 3 1/2" electronic disk of the schedule, together with printed copies of the network diagrams and tabular reports described under "Project Schedule Reports", and the Schedule Narrative Report.

Portions of the network diagram on which all activities are complete need not be reprinted and submitted in subsequent updates. However, the electronic disk file of the submitted schedule and the related reports shall constitute a clear record of progress of the work from award of contract to final completion.

On a date determined by the Engineer, the Contractor shall meet with the Engineer to review the monthly schedule update. At the monthly progress meeting, the Contractor and the Engineer shall review the updated schedule and shall discuss the content of the Narrative Report. The Engineer shall be allowed 10 days after the meeting to review and accept or reject the update schedule submitted. Rejected schedules shall be resubmitted to the Engineer within 5 days, at which time a new 5 day review period by the Engineer will begin. All efforts shall be made between the Engineer and the Contractor to complete the review and the approval process prior to the next update schedule cutoff date. To expedite the process a second meeting between the Engineer and the Contractor shall be held.

**SCHEDULE REVISIONS**

If the Contractor desires to make a change to the accepted schedule, the Contractor shall request permission from the Engineer in writing, stating the reasons for the change, and proposed revisions to activities, logic and duration. The Contractor shall submit for acceptance an analysis showing the effect of the revisions on the entire project. The analysis shall include:

A. An updated schedule not including the revisions. The schedule shall have a data date just prior to implementing the proposed revisions and include a project completion date;
B. A revised schedule that includes the proposed revisions. The schedule will have the same data date as the updated schedule and include a project completion date;
C. A narrative explanation of the revisions and their impact to the schedule; and
D. Computer files of the updated schedule and the revised schedule sequentially numbered or renamed for archive (record) purposes.

The Engineer will provide a response within 10 days. No revision to the accepted baseline schedule or the schedule updates shall be made without the prior written approval of the Engineer.

The Engineer will request the Contractor to submit a proposed revised schedule within 15 days when:

A. there is a significant change in the Contractor's operations that will affect the critical path;

B. the current updated schedule indicates that the contract progress is 30 days or more behind the planned schedule, as determined by the Engineer; or

C. the Engineer determines that an approved or anticipated change will impact the critical path, milestone or completion dates, contract progress, or work by other contractors.

The Engineer shall be allowed 10 days to review and accept or reject a schedule revision. Rejected schedule revisions shall be revised and resubmitted to the Engineer within 10 days, at which time a new 10 day review period by the Engineer will begin. Only upon approval of a change by the Engineer shall it be reflected in the next schedule update submitted by the Contractor.

**SCHEDULE TIME EXTENSION REQUESTS**

When the Contractor requests a time extension due to contract change orders or delays, the Contractor shall submit to the Engineer a written Time Impact Analysis illustrating the influence of each change or delay on the current contract completion date or milestone completion date, utilizing the current accepted schedule. Each Time Impact Analysis shall include a schedule revision demonstrating how the Contractor proposes to incorporate the Change Order or delay into the current schedule. The schedule shall include the sequence of activities and any revisions to the existing activities to demonstrate the influence of the delay, the proposed method for incorporating the delay, and its impact into the schedule.

Each Time Impact Analysis shall demonstrate the estimated time impact based on the events of delay, the anticipated or actual date of the contract change order work performance, the status of construction at that point in time, and the event time computation of all activities affected by the change or delay. The event times used in the analysis shall be those included in the latest update of the current schedule in effect at the time the change or delay was encountered.

Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the total or remaining float along the critical path of activities at the time of actual delay, or at the time the contract change order work is performed. Float time is not for the exclusive use or benefit of the Engineer or the Contractor, but is an expiring resource available to all parties as needed to meet contract milestones and the contract completion date. Time extensions will not be granted nor will delay damages be paid unless:

A. the delay is beyond the control and without the fault or negligence of the Contractor and its subcontractors or suppliers, at any tier; and,
B. the delay extends the actual performance of the work beyond the applicable current contract completion date and the most recent date predicted for completion of the project on the accepted schedule update current as of the time of the delay or as of the time of issuance of the contract change order.

Time Impact Analyses shall be submitted in triplicate within 15 days after the delay occurs or after issuance of the contract change order. A schedule file diskette is also to be submitted.

Acceptance or rejection of each Time Impact Analysis by the Engineer will be made within 15 days after receipt of the Time Impact Analysis, unless subsequent meetings and negotiations delay the review. A copy of the Time Impact Analysis accepted by the Engineer shall be returned to the Contractor and the accepted schedule revisions illustrating the influence of the contract change orders or delays shall be incorporated into the project schedule during the first update after acceptance.

**FINAL SCHEDULE UPDATE**

Within 15 days after the acceptance of the contract by the Director, the Contractor shall submit a final update of the schedule with actual start and actual finish dates for all activities. This schedule submission shall be accompanied by a certification, signed by an officer of the company and the Contractor's Project Manager stating "To the best of my knowledge, the enclosed final update of the project schedule reflects the actual start and completion dates of the activities contained herein."

**EQUIPMENT AND SOFTWARE**

The Contractor shall provide for the State's exclusive possession and use a complete computer system specifically capable of creating, storing, updating and producing CPM schedules. Before delivery and setup of the computer system, the Contractor shall submit to the Engineer for approval a detailed list of all computer hardware and software the Contractor proposes to furnish. The minimum computer system to be furnished shall include the following:

A. Complete computer system, including keyboard, mouse, 20 inch color SVGA monitor (1,024x768 pixels), Intel Pentium 350 MHz micro processor chip, or equivalent, or better;
B. Computer operating system software, compatible with the selected processing unit, for Windows 95 or later, or equivalent;
C. Minimum sixty-four (64) megabytes of random access memory (RAM);
D. A 3.2 gigabyte minimum hard disk drive, a 1.44 megabyte 3 l/2 inch floppy disk drive, 32x speed minimum CD-ROM drive, Ethernet card and 56k modem;
E. A color-ink-jet plotter with a minimum 36Megabytes RAM, capable of 300 dots per inch color, 600 dots per inch monochrome, or equivalent. Capable of printing fully legible, timescaled charts, and network diagrams, in four

colors, with a minimum size of 36 inches by 48 inches (E size) and is compatible with the selected system. Capable of plotting 3 E sized sheets within one hour. Plotter paper and ink cartridges throughout the contract.

F. CPM software shall be Primavera Project Planner, the latest version for Windows 95, or later;
G. Scheduler Analyzer Pro or equivalent – a suite of programs to assist in schedule analysis, the latest version for Windows 95, Windows NT or later and,
H. Microsoft Office software, the latest version for Windows 95, Windows NT or later, and McAfee Virus software or equivalent.

The computer hardware and software furnished shall be compatible with that used by the Contractor for the production of the CPM progress schedule required by the Contract, and shall include original instruction manuals and other documentation normally provided with the software.

The Contractor shall furnish, install, set up, maintain and repair the computer hardware and software ready for use at a location determined by the Engineer. The hardware and software shall be installed and ready for use by the first submission of the baseline schedule. The Contractor shall provide 24 hours of formal training for the Engineer, and three other agents of the department designated by the Engineer, in the use of the hardware and software to include schedule analysis, reporting, and resource and cost allocations. An authorized vendor of Project Primavera shall perform the training.

All computer hardware and software furnished shall remain the property of the Contractor and shall be removed by the Contractor upon acceptance of the contract when no claims involving contract progress are pending. When claims involving contract progress are pending, computer hardware or software shall not be removed until the final estimate has been submitted to the Contractor.

**PAYMENT**

Progress schedule (critical path) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path) shall include full compensation for furnishing all labor, materials (including computer hardware and software), tools, equipment, and incidentals; and for doing all the work involved in preparing, furnishing, updating and revising CPM progress schedules. Also for maintaining and repairing the computer hardware and training the Engineer in the use of the computer hardware and software as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for progress schedule (critical path) will be made as follows:

A. Interim baseline schedule accepted, then 10 percent payment for progress schedule (critical path) will be made.
B. Baseline schedule accepted, then 10 percent payment for progress schedule (critical path) will be made.
C. Monthly update schedules accepted, then 75 percent payment for progress schedule (critical path) will be made equally for each update.
D. Final schedule update accepted, then 5 percent payment for progress schedule (critical path) will be made.

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during the first estimate period in which the Contractor fails to submit an interim baseline, baseline, revised or updated CPM schedule conforming to the requirements of this section, as determined by the Engineer. Thereafter, on subsequent successive estimate periods the percentage the Department will retain will be increased at the rate of 25 percent per estimate period in which acceptable CPM progress schedules have not been submitted to the Engineer. Retention's for failure to submit acceptable CPM progress schedules shall be additional to all other retention's provided for in the contract. The retention for failure to submit acceptable CPM progress schedules will be released for payment on the next monthly estimate for partial payment following the date that acceptable CPM progress schedules are submitted to the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications, shall not apply to the item of progress schedule (critical path). Adjustments in compensation for the project schedule will not be made for any increased or decreased work ordered by the Engineer in furnishing project schedules.

## 10-1.19 OVERHEAD

The Contractor will be compensated for overhead in accordance with these special provisions.

Attention is directed to "Force Account Payment" and "Progress Schedule (Critical Path)" of these special provisions.

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 costs shall not include costs that are not related to time, including but not limited to mobilization, licenses, permits, and any other charges incurred only once during duration of the contract.

The contract lump sum price paid for time related overhead shall include full compensation for time related overhead incurred by the Contractor and by any joint venture partner, subcontractor, supplier or other party associated with the Contractor.

The contract lump sum price bid for time related overhead will be adjusted only as a result of suspensions and adjustments of time which revise the current contract completion date and which are also any of the following:

A. suspensions of work ordered in accordance with Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications, except:

    1. suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform any provision of the contract; and
    2. suspensions ordered due to unsuitable weather conditions;

B. extensions of time granted by the State in accordance with the provisions of the fifth paragraph of Section 8-1.07, "Liquidated Damages," of the Standard Specifications; or
C. reductions in contract time set forth in approved contract change orders, in accordance with Section 4-1.03, "Changes," of the Standard Specifications.

For each day the number of calendar days bid to complete the contract (days bid to complete Phase I plus 610 days), in conformance with the provisions in Section 4, "Beginning of Work, Time of Completion and Liquidated Damages," of these special provisions, is adjusted due to suspensions or adjustments as specified above, the lump sum price for time related overhead will be adjusted by an amount equal to the contract lump sum price bid for time related overhead divided by the number of calendar days bid to complete the contract. 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 time related overhead.

For the purpose of making partial payments pursuant to Section 9-1.06, “Partial Payments,” of the Standard Specifications, time related overhead to be paid in each monthly estimate will be based on the number of working days that occurred during that monthly estimate period. The amount earned per day for time related overhead shall be the lesser of the following amounts:

A. the contract lump sum price for time related overhead, divided by the number of calendar days bid to complete the contract (days bid to complete Phase I plus 610 days), in conformance with the provisions in Section 4, "Beginning Of Work, Time Of Completion And Liquidated Damages," of these special provisions; or
B. fifteen percent of the original contract amount, divided by the number of calendar days bid to complete the contract(days bid to complete Phase I plus 610 days), in conformance with the provisions in Section 4, "Beginning Of Work, Time Of Completion And Liquidated Damages," of these special provisions.

After acceptance of the contract pursuant to Section 7-1.17, “Acceptance of Contract,” of the Standard Specifications, the amount, if any, of the contract lump sum price for time related overhead not yet paid will be included for payment in the first estimate made after acceptance of the contract in accordance with Section 9-1.07, “Payment after Acceptance,” of the Standard Specifications.

Full compensation for all overhead costs, including overhead costs for increases in the quantity of contract items of work; other than time related overhead 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.

### 10-1.20 ELECTRONIC MOBILE DAILY DIARY SYSTEM DATA DELIVERY

Attention is directed to Sections 5-1.10, "Equipment and Plants," and 7-1.01A(3), "Payroll Records," of the Standard Specifications, and these special provisions.

The Contractor shall submit to the Engineer a list of each piece of equipment and its identifying number, type, make, model and rate code in accordance with the Department of Transportation publication entitled “Labor Surcharge and Equipment Rental Rate” which is in effect on the date the work is performed, and the names, labor rates and work classifications for all field personnel employed by the Contractor and all subcontractors in connection with the public work, together with such additional information as is identified below. This information shall be updated and submitted to the Engineer weekly through the life of the project.

This personnel information will only be used for this mobile daily diary computer system and it will not relieve the Contractor and subcontractors from all the payroll records requirements as required by Section 7-1.01A(3), "Payroll Records," of the Standard Specifications.

The Contractor shall provide the personnel and equipment information not later than 11 days after the contract award for its own personnel and equipment, and not later than 5 days before start of work by any subcontractor for the labor and equipment data of that subcontractor.

The minimum data to be furnished shall comply with the following specifications:

**DATA CONTENT REQUIREMENTS**

A. The Contractor shall provide the following basic information for itself and for each subcontractor that will be used on the contract:

| | |
|---|---|
| Caltrans contract ID | Alphanumeric; up to 15 characters. |
| Company name. | Alphanumeric; up to 30 characters. |
| Federal tax ID | Alphanumeric; up to 10 characters. |
| State contractor license | Alphanumeric; up to 20 characters. |
| Company type (prime or sub) | Alphanumeric; up to 10 characters. |
| Address (line 1). | Alphanumeric; up to 30 characters. |
| Address (line 2). | Alphanumeric; up to 30 characters. |
| Address (city). | Alphanumeric; up to 30 chars. |
| Address (2-letter state code). | Alphanumeric; up to 2 characters. |
| Address (zip code) | Alphanumeric; up to 14 characters. |
| Contact FirstNname. | Alphanumeric; up to 15 characters |
| Contact LastName | Alphanumeric; up to 20 characters |
| Telephone number (with area code). | Alphanumeric; up to 20 characters. |
| Company code: short company name. | Alphanumeric; up to 10 characters. |
| Type of work (Department-supplied codes) | Alphanumeric; up to 30 characters |
| DBE status (Department-supplied codes) | Alphanumeric; up to 20 characters. |
| Ethnicity for DBE status (Department-supplied codes). | Alphanumeric; up to 20 characters. |
| List of laborers to be used on this contract (detail specified below). | |
| List of equipment to be used on this contract (detail specified below). | |

For example, one such set of information for a company might be:
04-072359
XYZ CONSTRUCTION, INC.
94-2991040
AL1649T
SUB
1240 9TH STREET
SUITE 600
OAKLAND
CA
94612
JOHN
SMITH
(510) 834-9999
XYZ
PAVING
MBE
BLACK

B. The Contractor shall provide the following information for each laborer who will be used on the contract:

| | |
|---|---|
| Caltrans contract ID | Alphanumeric; up to 15 characters. |
| Company code (as defined above). | Alphanumeric; up to 10 characters. |
| Employee ID | Alphanumeric; up to 10 characters. |
| Last name. | Alphanumeric; up to 20 characters. |
| First name. | Alphanumeric; up to 15 characters. |
| Middle name. | Alphanumeric; up to 15 characters. |
| Suffix | Alphanumeric; up to 15 characters |
| Labor trade (Department-provided codes). | Alphanumeric; up to 10 characters. |
| Labor classification (Department-provided codes). | Alphanumeric; up to 10 characters. |
| Regular hourly rate. | Alphanumeric; up to (6,2) |
| Overtime hourly rate. | Alphanumeric; up to (6,2) |
| Doubletime hourly rate | Alphanumeric; up to (6,2) |
| Standby hourly rate. | Alphanumeric; up to (6,2) |
| Ethnicity (Department-provided codes). | Alphanumeric; up to 20 characters. |
| Gender. | Alphanumeric; up to 1 characters. |

For example, one such set of information might be:
04-072359
XYZ
1249
GONZALEZ
HECTOR
VINCENT
JR.
OPR
JNY
12.50
18.75
25.00
0.00
HISPANIC
M

C. The Contractor shall provide the following information for each piece of equipment that will be used on the contract:

| | |
|---|---|
| Caltrans contract ID | Alphanumeric; up to 15 characters. |
| Company code (as defined above). | Alphanumeric; up to 10 characters. |
| Company's equipment ID number. | Alphanumeric; up to 10 characters. |
| Company's equipment description. | Alphanumeric; up to 60 characters. |
| Equipment type (from Department ratebook). | Alphanumeric; up to 60 characters. |
| Equipment make (from Department ratebook). | Alphanumeric; up to 60 characters. |
| Equipment model (from Department ratebook). | Alphanumeric; up to 60 characters. |
| Equipment rate code (from Department ratebook). | Alphanumeric; up to 10 characters |
| Regular hourly rate. | Alphanumeric; up to (6,2) |
| Overtime hourly rate. | Alphanumeric; up to (6,2) |
| Standby hourly rate | Alphanumeric; up to (6,2) |
| Idle hourly rate. | Alphanumeric; up to (6,2) |
| Rental flag. | Alphanumeric; up to 1 character. |

For example, one such set of information might be:
04-072359
XYZ
B043
CAT TRACTOR D-6C
TRACC
CAT
D-6C
3645
75.00
75.00
0.00
0.00
N

**DATA DELIVERY REQUIREMENTS**

A. All data described in "Data Requirements" of this section shall be delivered to the Department electronically, on 3 1/2" floppy disks compatible with the Microsoft Windows operating system. The Contractor shall provide a weekly disk and hard copy of the required correct updated personnel and equipment information for the Contractor and all the subcontractors and verified correct by the Engineer.

B. Data of each type described in the previous section (contractor, labor, and equipment information) will be delivered separately, each type in one or more files on floppy disk. Any given file may contain information from one contractor or from multiple contractors, but only one type of data (contractor, labor, or equipment information).

C. The file format for all files delivered to Caltrans shall be standard comma-delimited, plain text files. This type of file (often called “CSV”) is the most standard type for interchange of formatted data; it can be created and read by all desktop spreadsheet and desktop database applications. Characteristics of this type of file are:

1. All data is in the form of plain ASCII characters.
2. Each row of data (company, person, equipment) is delimited by a carriage return character.
3. Within rows, each column (field) of data is delimited by a comma character.

D. The files shall have the following columns (i.e., each row shall have the following fields):

1. Contractor info: 17 columns (fields) as specified in "Data Requirements #1", above.
2. Labor info: 15 columns (fields) as specified in "Data Requirements #2", above.
3. Equipment info: 13 columns (fields) as specified in "Data Requirements #3", above.

For every one type of file, columns (fields) must be in the order specified under "Data Requirements", above. All columns (fields) described under "Data Requirements" must be present for all rows, even if some column (field) values are empty. The first row of each file must contain column headers (in plain text).

E. Column (field) contents must conform to the data type and length requirements described in the "Data Requirement" section, above. In addition, column (field) data must conform to the following restrictions:

1. All data shall be uppercase.
2. Company type shall be either “PRIME” or “SUB”.
3. Labor trade and classification codes must conform to a list of standard codes that will be supplied by Department.
4. Contractor type of work codes and DBE status codes must conform to a list of standard codes that will be supplied by Department.
5. Ethnicity codes must conform to standard codes that will be supplied by Department.
6. Data in the "gender" column must be either "M" or "F".
7. Data in the "rental equipment" column must be either "Y" or "N".
8. Equipment owner's description may not be omitted. (The description, together with the equipment number, is how the equipment will be identified in the field.) Include manufacturer, rated capacity & trade description
9. Equipment type, make, model, and ratebook code shall conform to the Department of Transportation Publication entitled “Labor Surcharge and Equipment Rental Rate”, which is in effect on the date the work is

performed. If the equipment in question does not have an entry in the book then alternate, descriptive entries may be made in these fields as directed by the Engineer.

F. The name of each file must indicate its contents, e.g., "labor.csv" for laborers, “equipment.csv” for equipment, and “contractor.csv” for contractors. Each floppy disk supplied to Caltrans must be accompanied by a printed list of the files it contains with a brief description of the contents of each file.

**PAYMENT**

Payment for providing electronic mobile daily diary computer system data delivery will be made on a lump sum basis. The lump sum bid price for electronic mobile daily diary computer system data delivery will be made according to the following schedule:

The Contractor will receive not more than 3.6 per cent per month of the total bid price for electronic mobile daily diary computer system data delivery.

After the completion of the work, 100 per cent payment will be made for electronic mobile daily diary computer system data delivery less the permanent deduction, if any, for failure to deliver complete weekly electronic mobile daily diary computer system data in each month.

The contract lump sum price paid for electronic mobile daily diary computer system data delivery shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in electronic mobile daily diary computer system data delivery as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The Department will retain an amount equal to 29 percent of the estimated value of the work performed during the first estimate period in which the Contractor fails to submit electronic mobile daily diary computer system data delivery conforming to the requirements of this section, as determined by the Engineer. Thereafter, on subsequent successive estimate periods the percentage the Department will retain will be increased at the rate of 29 percent per estimate period in which acceptable electronic mobile daily diary computer system data have not been submitted to the Engineer. Retentions for failure to submit acceptable electronic mobile daily diary computer system data shall be additional to all other retentions provided for in the contract. The retention for failure to submit acceptable electronic mobile daily diary computer system data will be released for payment on the next monthly estimate for partial payment following the date that acceptable electronic mobile daily diary computer system data is submitted to the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications, shall not apply to the item of electronic mobile daily diary computer system data delivery. Adjustments in compensation for electronic mobile daily diary computer system data delivery will not be made for any increased or decreased work ordered by the Engineer in furnishing electronic mobile daily diary computer system data.

**10-1.21 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 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 |

It is anticipated that the following utility facilities will be relocated prior to the dates shown:

| Utility | Location | Date |
|---|---|---|
| PG &E -76 mm Gas Line | Vista Del Rio | 11/27/00 |
| PG &E - 51 mm Gas Line | Virginia Street | 11/27/00 |
| PG &E - Underground Elect Line | Pomona Street | 11/27/00 |
| PG &E - Underground Elect Line | Vista Del Rio | 11/27/00 |
| Pacific Bell - Fiber Optic Cable | Wanda Street | 11/27/00 |
| Pacific Bell - Undergro Tele Line | Vista Del Rio | 11/27/00 |
| EBMUD - 635 mm water Line | Dowrelio Drive | 11/27/00 |
| EBMUD - 203 mm water Line | WB Off-Ramp Termini at Pomona St. | 11/27/00 |
| Crockett-Valona San Dist- 152 mm VCP | Virginia Street | 11/27/00 |
| Crockett-Valona San Dist- 203 mm VCP | Kendall Avenue | 11/27/00 |
| Crockett-Valona San Dist- 203 mm VCP | Vista Del Rio | 11/27/00 |
| Crockett-Valona San Dist- 152 mm VCP | Ceres Street | 11/27/00 |
| Crockett-Valona San Dist- 203 mm VCP | Wanda Street & Loop | 11/27/00 |
| Crockett-Valona San Dist- 152 mm VCP | Ceres Street & Wanda Street | 11/27/00 |
| Crockett-Valona San Dist- 203 mm VCP | Ceres Street & Wanda Street | 11/27/00 |
| AT&T - OH Cable TV Line | Wanda Street & Vista Del Rio | 11/27/00 |
| Contra Costa Co - Siren Pole | Wanda Street & Pomona Street | 11/27/00 |

Installation of the following utility facilities 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:

| Utility (address) | Location | Working Days |
|---|---|---|
| PG&E - OH Elect Line | Pomona St, Vista Del Rio, Kendall Ave, Wanda St & Dowrelio Dr | 120 |
| Pacific Bell - Fiber Optic Cable | 27 Bridge | 180 |
| EBMUD - 406 mm Water Line | Vista Del Rio | 90 |
| EBMUD - 406 mm Water Line | Vista Del Rio, Kendall Ave & Virginia St | 90 |

In the event that the utility facilities mentioned above are not removed or relocated 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 utility facilities not being removed or relocated 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, and not otherwise, except as provided in Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

### 10-1.22 MOBILIZATION

Mobilization shall conform to the provisions in Section 11, "Mobilization," of the Standard Specifications.

### 10-1.23 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 "Approved Traffic Products" 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 "Approved Traffic Products" of these special provisions.

**10-1.24 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.

Lane closures shall conform to the provisions in section "Traffic Control System for Lane Closure" of these special provisions.

At locations where falsework pavement lighting or pedestrian openings through falsework are designated, falsework lighting shall be installed in conformance with the provisions in Section 86-6.11, "Falsework Lighting," of the Standard Specifications.

Openings shall be provided through bridge falsework for the use of public traffic at each location where falsework is constructed over the streets or routes listed in the following table. The type, minimum width, height, and number of openings at each location, and the location and maximum spacing of falsework lighting, if required for each opening, shall conform to the requirements in the table. The width of vehicular openings shall be the clear width between temporary railings or other protective work. The spacing shown for falsework pavement lighting is the maximum distance center to center in meters between fixtures.

Wanda Street at "D" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 12 m | 4.6 m |
| | | | |

| | Location | Spacing |
|---|---|---|
| Falsework Pavement Lighting | R and L | 7 m |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Wanda Street at "G" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 12 m | 4.6 m |
| | | | |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 7 m | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Wanda Street at "M" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 7.2 m | 4.6 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 9 m staggered 1/2 space | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Pomona Street at "D" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 12.0 m | 5.1 m |
| Pedestrian Openings | 1 | 2.4 m | 2.4 m |
| | | | |
| | Location | Spacing | |
| Falsework Pavement Lighting | R and L | 7 m | |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Pomona Street at "G" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 12.0 m | 5.1 m |
| Pedestrian Openings | 1 | 2.4 m | 2.4 m |

| | Location | Spacing |
|---|---|---|
| Falsework Pavement Lighting | R and L | 7 m |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Pomona Street at "M" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 12.0 m | 5.1 m |
| Pedestrian Openings | 1 | 2.4 m | 2.4 m |

| | Location | Spacing |
|---|---|---|
| Falsework Pavement Lighting | R and L | 7 m |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Dowrelio Street at "D" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 10.8 m | 4.6 m |
| Pedestrian Openings | 1 | 1.2 m | 2.4 m |

| | Location | Spacing |
|---|---|---|
| Falsework Pavement Lighting | R and L | 7 m |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Dowrelio Street at "J" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 10.8 m | 4.6 m |
| Pedestrian Openings | 1 | 1.2 m | 2.4 m |

| | Location | Spacing |
|---|---|---|
| Falsework Pavement Lighting | R and L | 7 m |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Vista Del Rio Street at "D" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 9.6 m | 4.6 m |
| Pedestrian Openings | 1 | 1.5 m | 2.4 m |

| | Location | Spacing |
|---|---|---|
| Falsework Pavement Lighting | R and L | 9 m staggered 1/2 space |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

Vista Del Rio Street at "M" Line

| | Number | Width | Height |
|---|---|---|---|
| Vehicle Openings | 1 | 9.6 m | 4.6 m |
| Pedestrian Openings | 1 | 1.5 m | 2.4 m |

| | Location | Spacing |
|---|---|---|
| Falsework Pavement Lighting | R and L | 9 m staggered 1/2 space |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

The exact location of openings will be determined by the Engineer.

Personal vehicles of the Contractor's employees shall not be parked within the right of way.

The Contractor shall notify local authorities of the Contractor's intent to begin work at least 5 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.

Lanes shall be closed only during the hours shown on the charts included in this section "Maintaining Traffic" and as described in the paragraphs that follow. 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.

On San Pablo Avenue/Pomona Street, 2-way traffic shall be maintained at all times, except that Pomona Street may be close for one to two days at a time for no more than 10 times over the working days of the contract. When Pomona Street is open, one additional emergency access route parallel to Pomona Street shall also be open. When Pomona Street is closed, Wanda Street and Vista Del Rio shall be open.

During the hours of construction as described in the Section "Order of Work," elsewhere in these special provisions, a minimum of one traffic lane shall be open for public traffic on Vista Del Rio, Carquinez Way, Columbus Avenue, Virginia Street, Kendall Avenue, Dowrelio Drive, Wanda Street and Merchant Street.

The Contractor shall obtain a permit from the County of Contra Costa for all road closures.

The Route 80 eastbound on-ramp from Pomona Street shall be kept open for public traffic at all times during the contract, except for brief periods of up to 4 hours each while placing or removing temporary railing (type K), while effecting construction stage changes, and for up to six hours for each closure slab concrete pour.

Designated legal holidays are: January 1st, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, November 11th, Thanksgiving Day, and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When November 11th falls on a Saturday, the preceding Friday shall be a designated legal holiday.

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**
**Multilane Lane Requirements**

Location: WB Route 80. From Cummings Skyway OC to Crockett I/C.

| | 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 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | |
| Fridays | 1 | 1 | 1 | 1 | 2 | | | | | | | 2 | 2 | | | | | | | | 2 | 2 | 2 | 1 | |
| Saturdays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | 2 | |
| Sundays | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | 2 | 2 | 1 | |
| Day before designated legal holiday | 1 | 1 | 1 | 1 | 2 | | | | | | | 2 | 2 | | | | | | | | 2 | 2 | 2 | 1 | |
| Designated legal holidays | 1 | 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:

**Chart No. 2**
**Multilane Lane Requirements**

Location: EB Route 80. From Cummings Skyway OC to Crockett I/C.

| | 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 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | | | | | | 2 | 2 | 2 | 2 | |
| Fridays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | | | | | | | | | | 2 | 2 | 1 | |
| Saturdays | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | | | | | | | | | | | | 2 | 2 | 2 | 2 | |
| Sundays | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | | | | | | | | | 2 | 2 | 1 | |
| Day before designated legal holiday | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | | | | | | | | | | 2 | 2 | 1 | |
| Designated legal holidays | 1 | 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:

**Chart No. 3**
**Multilane Lane Requirements**

Location: EB Route 80. From Crockett I/C to Route 29 (Sonoma Blvd.) Off-Ramp.

| | 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 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | | | | | | | | 2 | 2 | 2 | |
| Fridays | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | |
| Saturdays | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | 2 | 2 | 2 | |
| Sundays | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | | | | | | | | | | | 2 | 2 | 2 | |
| Day before designated legal holiday | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | | | | | | | | | | | | | 2 | 2 | |
| Designated legal holidays | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | | | | | | | | | | | 2 | 2 | 2 | |

Legend:

| | |
|---|---|
| 1 | One lane open in direction of travel. Toll Booths 1 through 3 may be closed. |
| 2 | Two adjacent lanes open in direction of travel. Toll Booths 1 through 3 may be closed. |
| | No lane closure allowed |

REMARKS:

**Chart No. 4**
**Ramp Lane Requirements**

Location: EB Route 80. At the Crockett On-Ramp and Off-Ramp and the Commings Skyway On-Ramp.

| | 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 | x | x | x | x | | | | | | | x | x | x | x | |
| Fridays | x | x | x | x | x | x | x | x | x | x | x | x | x | | | | | | | | x | x | x | x | |
| Saturdays | x | x | x | x | x | x | x | x | x | x | x | 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 | x | x | x | x | x | x | x | x | x | x | |
| Day before designated legal holiday | x | x | x | x | x | x | x | x | x | x | x | x | x | | | | | | | | x | x | x | x | |
| Designated legal holidays | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |

Legend:

| | |
|---|---|
| x | Ramp may be closed. |
| | No ramp closure will be allowed. |

REMARKS: 1. See Detour Plan in Plans.
2. Simultaneous closure of two consecutive on-ramps or off-ramps shall not be permitted.
3. These ramps shall not be closed if they are part of a detour route while the associated detour is in effect.

**Chart No. 5**
**Ramp Lane Requirements**

Location: WB Route 80. At the Crockett Off-Ramp and the Commings Skyway Off-Ramp.

| | 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 | x | x | x | x | x | x | x | x | x | x | x | |
| Fridays | x | x | x | x | x | x | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |
| Saturdays | x | x | x | x | x | x | x | x | x | x | x | 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 | x | x | x | x | x | x | x | x | x | x | |
| Day before designated legal holiday | x | x | x | x | x | x | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |
| Designated legal holidays | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |

Legend:

| | |
|---|---|
| x | Ramp may be closed. |
| | No ramp closure will be allowed. |

REMARKS: 1. See Detour Plan in Plans.
2. Simultaneous closure of two consecutive off-ramps shall not be permitted.
3. These ramps shall not be closed if they are part of a detour route while the associated detour is in effect.

**Chart No. 6**
**Ramp Lane Requirements**

Location: WB Route 80. At the Crockett On-Ramp.

| | 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 | x | | | | | x | x | x | x | x | x | |
| Fridays | x | x | x | x | x | x | | | | | x | x | x | x | x | | | | x | x | x | x | x | x | |
| Saturdays | x | x | x | x | x | x | x | x | x | x | x | 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 | x | x | x | x | x | x | x | x | x | x | |
| Day before designated legal holiday | x | x | x | x | x | x | | | | | x | x | x | x | x | | | | x | x | x | x | x | x | |
| Designated legal holidays | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |

Legend:

| | |
|---|---|
| x | Ramp may be closed. |
| | No ramp closure will be allowed. |

REMARKS: 1. See Detour Plan in Plans.
2. Simultaneous closure of two consecutive on-ramps shall not be permitted.
3. This ramp shall not be closed if it is part of a detour route while the associated detour is in effect.

**Chart No. 7**
**Ramp Lane Requirements**

Location: WB Route 80. At the Cummings Skyway On-Ramp.

| | 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 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |
| Fridays | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |
| Saturdays | x | x | x | x | x | x | x | x | x | x | x | 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 | x | x | x | x | x | x | x | x | x | x | |
| Day before designated legal holiday | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |
| Designated legal holidays | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |

Legend:

| | |
|---|---|
| x | Ramp may be closed. |

REMARKS: 1. See Detour Plan in Plans.
2. Simultaneous closure of two consecutive on-ramps shall not be permitted.
3. This ramp shall not be closed if it is part of a detour route while the associated detour is in effect.

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 80 or within the right of way of local streets. 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 girders over Pomona Street, Vista Del Rio, Dowrelio Drive and Wanda Street 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 routed around the work area by means of a local detour as shown on the plans.

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.

Local detours shall be not less than 3.3m 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 girders and falsework shall be undertaken only between the hours of 9:00 a.m. and 3:00 p.m., Monday through Friday, except designated legal holidays and days preceding designated legal holidays, for the period necessary for erecting or removing the girders falsework.

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 girders and falsework prior to detouring public traffic, and shall erect or remove the girders and falsework in an expeditious manner in order that inconvenience to public traffic will be at a minimum.

The Contractor may occupy one 3-meter lane while placing or removing forms for the superstructure of bridges over Pomona Street, Vista Del Rio, Dowrelio Drive and Wanda Street which are to remain open. Occupation of a traffic lane because of form work at a location will be permitted only during such times as construction operations are actually in progress and between the hours of 9:00 a.m. and 3:00 p.m., Monday through Friday, except during hours shown on the charts included in this section "Maintaining Traffic," designated legal holidays and days preceding designated legal holidays, or when necessary for the safety of public traffic.

## 10-1.25 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 10-minute interval, or fraction thereof past the time specified to reopen the closure, the Department will deduct $2333 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.

**10-1.26 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.

**MOVING LANE CLOSURE**

Flashing arrow signs used in moving lane closures shall be truck-mounted. Changeable message signs used in moving lane closure operations shall conform to the provisions in Section 12-3.12, "Portable Changeable Message Signs," of the Standard Specifications, except the signs shall be truck-mounted and the full operation height of the bottom of the sign may be less than 2.1 m above the ground, but should be as high as practicable.

Truck-mounted attenuators (TMA) for use in moving lane closures shall be any of the following approved models, or equal:

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.

## 10-1.27 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 "Approved Traffic Products" 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.

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 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 "Approved Traffic Products" of these special provisions.

Traffic stripe (100-mm wide) placed as temporary edgeline delineation which will require removal shall conform to the provisions of "Temporary Traffic Stripe (Tape)" of these special provisions. Where removal of the 100-mm wide traffic stripe will not be required, painted traffic stripe conforming to the provisions of "Temporary Traffic Stripe (Paint)" of these

special provisions may be used. The quantity of temporary traffic stripe (tape) or temporary traffic stripe (paint) used for this temporary edgeline delineation will not be included in the quantities of tape or paint to be paid for.

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 "Approved Traffic Products" 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 not be required.

Temporary painted traffic stripe shall conform to the provisions in "Paint Traffic Stripes and Pavement Markings" of these special provisions, Section 84-3, "Painted Traffic Stripes And Pavement Markings," of the Standard Specifications, 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 "Approved Traffic Products" 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 "Approved Traffic Products" 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 "Approved Traffic Products" 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 "Approved Traffic Products" 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.

## 10-1.28 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 "Approved Traffic Products" of these special provisions regarding retroreflective sheeting for barricades.

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.

## 10-1.29 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.

Portable changeable message signs shall be on the project at all times and available, in addition to detours at locations shown on the plans, for public awareness information purposes as directed by the Engineer.

Placement, operation, maintaining and removal of portable changeable message signs for public awareness information purposes will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

## 10-1.30 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 "Approved Traffic Products" of these special provisions.

Temporary railing (Type K) shall conform to the details shown on Standard Plan T3. 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.

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.

## 10-1.31 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 "Approved Traffic Products" 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.

## 10-1.32 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", and "Order of Work" of these special provisions.

### GENERAL

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.

### MATERIALS

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 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 (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX 1-916-387-9734
   2. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274, FAX 1-714-937-1070.

B. Fitch Inertial Modules, manufactured by Roadway Safety Service, Inc., 1050 North Rand Road, Wauconda, IL 60084, Telephone 1-800-426-0839, FAX 1-847-487-9820.

   1. Distributor (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX 1-916-387-9734
   2. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274, FAX 1-714-937-1070.

C. 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. Russ Enterprises, Inc., 1533 Berger Drive, San Jose, CA 95112, Telephone 1-408-287-4303, FAX 1-408-287-1929.
   2. Statewide Safety, 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.

**INSTALLATION**

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.

**MEASUREMENT AND PAYMENT**

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.

## 10-1.33 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 materials to be salvaged shall remain the property of the State, and shall be cleaned, packaged, bundled, tagged, and hauled to the District Recycle Center at the San Francisco-Oakland Bay Bridge warehouse supply area adjacent to the San Francisco-Oakland Bay Bridge Toll Plaza and stockpiled.

The Contractor shall notify the Engineer and the District Recycle Coordinator, telephone (510) 286-6111 a minimum of 48 hours prior to hauling salvaged material to the Recycle Center.

The recycle center is open from 8:00 AM to 12 Noon and from 1:00 PM to 2:30 PM on Mondays through Fridays, except legal holidays when it is closed.

Plans of the existing bridges may be requested by fax from the Office of Structure Maintenance and Investigations, 1801 30th Street, Sacramento, CA, Fax (916) 227-8357.

Plans of the existing bridge, pertaining to the work required by this contract and available to the Contractor, are reproductions of the original contract plans 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 existing bridges, the Contractor shall verify field dimensions for all members prior to submitting working drawings and

ordering, fabricating or installing material. The Contractor shall be responsible for adjusting dimensions of the work to fit existing conditions.

The Contractor shall certify in writing that field dimensions have been verified and shall include the certification with the working drawing submittal. 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.

The existing paint systems on Bridge Numbers 23-0015R, 23-0015L, Existing “B” Line, Existing “J” Line and Existing “S” Line consist of red lead, zinc and chlorinated rubber undercoats and phenolic aluminum finish coat. 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.

**WORK AREA MONITORING**

Work Area Monitoring (Location A)
Crockett Viaduct
(Bridge No. 23-0015R)

Work Area Monitoring (Location B)
Bent A4WB7
(Bridge No. 28-0015L)

The Contractor shall perform work area monitoring of the ambient air and soil in and around the work area at the bridge site to verify the effectiveness of the containment system. The work area monitoring shall consist of collecting, analyzing, and reporting air and soil test results and recommending the required corrective action when specified exposure levels are exceeded. The work area monitoring shall be carried out under the direction of a CIH. The samples shall be collected at locations designated by the Engineer.

Air samples shall be collected and analyzed in conformance with National Institute for Occupational Safety and Health (NIOSH) methods. Air samples for lead detection shall be collected and analyzed in conformance with NIOSH Method 7082, with a limit of detection of at least 0.5 $\mu g/m^3$. Air samples for detection of other metals shall be collected and analyzed in conformance with NIOSH Method 7300, with a limit of detection of at least one percent of the appropriate Permissible Exposure Limits (PELs) specified by the California/Occupational Safety and Health Administration (Cal/OSHA). Alternative methods of sample collection and analysis, with equivalent limits of detection, may be used at the option of the Contractor.

The airborne metals exposure, outside either the containment system or work areas, shall not exceed the lower of either: (1) 10 percent of the Action Level specified for lead by Section 1532.1, "Lead," of the Construction Safety Orders, or (2) 10 percent of the appropriate PELs specified for other metals by Cal/OSHA.

The air samples shall be collected at least once per week during progress of work that disturbs the existing paint system. All air samples shall be analyzed within 48 hours at a facility accredited by the Environmental Lead Laboratory Accreditation Program of the American Industrial Hygiene Association (AIHA). When corrective action is recommended by the CIH, additional samples may be required by the Engineer to be taken, at the Contractor's expense.

Ten soil samples shall be collected prior to the start of work, and 10 soil samples shall be collected within 36 hours following completion of cleaning operations of existing steel. Where the cleaning operations extend over large areas of soil or many separate areas of soil at each bridge site, the samples shall be collected at various times during the contract when determined by the Engineer. A soil sample shall consist of 5 plugs, each 19 mm in diameter and 13 mm deep, taken at each corner and center of a one square meter area. Soil samples shall be analyzed for total lead and zinc in conformance with

Method 3050 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846 published by the United States Environmental Protection Agency.

There shall be no increase in the concentrations of heavy metal in the soil in the area affected when the existing paint system is disturbed. When soil sampling, after completion of work that disturbs the existing paint system, shows an increase in the concentrations of heavy metal, the area affected shall be cleaned and resampled at the Contractor's expense until soil sampling and testing shows concentrations of heavy metal less than or equal to the concentrations collected prior to the start of work.

In areas where there is no exposed soil, there shall be no visible increase in the concentrations of heavy metal on the area affected when the existing paint system is disturbed. Any visible increase in the concentrations of heavy metal, after completion of work that disturbs the existing paint system, shall be removed at the Contractor's expense.

Air and soil sample laboratory analysis results, including results of additional samples taken after corrective action as recommended by the CIH, shall be submitted to the Engineer. The results shall be submitted both verbally within 48 hours after sampling and in writing with a copy to the Contractor, within 5 days after sampling. Sample analysis reports shall be prepared by the CIH as follows:

A. For both air and soil sample laboratory analysis results, the date and location of sample collection, sample number, contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post will be required.
B. For air sample laboratory analysis results, the following will be required:

    1. List of emission control measures in place when air samples were taken.
    2. Air sample results shall be compared to the appropriate PELs.
    3. Chain of custody forms.
    4. Corrective action recommended by the CIH to ensure airborne metals exposure, outside either the containment system or work areas, is within specified limits.

C. For soil sample laboratory analysis results, the concentrations of heavy metal expressed as parts per million will be required.

Work area monitoring will be paid for on the basis of a lump sum price.

The contract lump sum price paid for work area monitoring for the locations shown 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 collecting and analyzing samples of ambient air and soil for heavy metals, complete in place, including reporting the test results, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**CONTAINMENT SYSTEM**

At the option of the Contractor, the containment system shall consist of either (1) a ventilated containment structure, (2) vacuum shrouded surface preparation equipment and drapes, tarps, or other materials, or (3) an equivalent containment system. The containment system shall contain all water, resulting debris, and visible dust produced when the existing paint system is disturbed.

The containment system shall provide the clearances specified under "Maintaining Traffic" of these special provisions, except that when no clearances are specified a vertical clearance of 4.6 m and a horizontal clearance of 9.8 m shall be provided for the passage of public traffic.

Falsework or supports for the ventilated containment structure shall not extend below the vertical clearance level nor to the ground line at locations within the roadbed.

The containment system shall provide the minimum clearances as required under "Relations with Railroad Company" of these special provisions for the passage of railroad traffic.

The ventilated containment structure shall conform to the provisions for falsework in Section 51-1.06, "Falsework," of the Standard Specifications.

The minimum total design load of the ventilated containment structure shall consist of the sum of the dead and live vertical loads. Dead load shall consist of the actual load of the ventilated containment structure. Live loads shall consist of a uniform load of not less than 2160 Pa, which includes 960 Pa of sand load, applied over the area supported, and in addition, a moving 4.5 kN concentrated load shall be applied to produce maximum stress in the main supporting elements. Assumed horizontal loads need not be included in the design of the ventilated containment structure.

The ventilated containment structure shall be supported with either rigid or flexible supports. The rigid or flexible containment materials on the containment structure shall retain airborne particles but may allow airflow through the

containment materials. Flexible materials shall be supported and fastened to prevent escape of abrasive and blast materials due to whipping from traffic or wind and to maintain the clearances.

All mating joints between the ventilated containment structure and the bridge shall be sealed. Sealing may be by overlapping of seams when using flexible materials or by using tape, caulking, or other sealing measures.

Multiple flap overlapping door tarps shall be used at entry ways to the ventilated containment structure to prevent dust or debris from escaping.

Baffles, louvers, flapper seals, or ducts shall be used at make-up air entry points to the ventilated containment structure to prevent escape of abrasives and resulting surface preparation debris.

The ventilated containment structure shall be properly maintained while work is in progress and shall not be changed from the approved working drawings without prior approval of the Engineer.

The ventilation system in the ventilated containment structure shall be of the forced input airflow type with fans or blowers.

Negative air pressure shall be employed within the ventilated containment structure and will be verified by visual methods by observing the concave nature of the containment materials while taking into account wind effects or by using smoke or other visible means to observe airflow. The input airflow shall be properly balanced with the exhaust capacity throughout the range of operations.

The exhaust airflow of the ventilation system in the ventilated containment structure shall be forced into dust collectors (wet or dry) or bag houses.

Full compensation for the containment system 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.

**PROTECTIVE WORK CLOTHING AND HYGIENE FACILITIES**

Wherever there is exposure or possible exposure to heavy metals or silica dust at the bridge site, the Contractor shall, for State personnel: (1) furnish, clean, and replace protective work clothing and (2) provide access to hygiene facilities. The furnishing, cleaning, and replacement of protective work clothing and providing access to hygiene facilities shall conform to the provisions of subsections (g), "Protective work clothing and equipment," and (i), "Hygiene facilities and practices," of Section 1532.1, "Lead," of the Construction Safety Orders, and will be required for no more than 3 people.

The protective work clothing and access to hygiene facilities shall be provided during exposure or possible exposure to heavy metals or silica dust at the bridge site and during the application of the undercoats of paint.

Protective work clothing and hygiene facilities shall be inspected and approved by the Engineer before being used by State personnel.

The protective work clothing shall remain the property of the Contractor at the completion of the contract.

Full compensation for protective work clothing and access to hygiene facilities for State personnel shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

**ABANDON CULVERT**

Existing culverts, where shown on the plans to be abandoned, shall be abandoned in place or, at the option of the Contractor, the culverts 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 culverts in place shall conform to the following:

A. Culverts that intersect the side slopes shall be removed to a depth of not less than one meter measured normal to the plane of the finished side slope, before being abandoned.
B. Culverts 300 mm in diameter and larger, shall, at the Contractor's option, be backfilled with either sand, controlled low strength material or slurry cement backfill conforming to the provisions in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications by any method acceptable to the Engineer that completely fills the pipe. Sand backfill material shall be clean, free draining, and free from roots and other deleterious substances.
C. The ends of culverts shall be securely closed by a 150 mm thick tight fitting plug or wall of commercial quality concrete.

Culverts shall not be abandoned until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended culvert abandonment.

If the Contractor elects to remove and dispose of a culvert which is specified to be abandoned, as provided herein, backfill specified for the pipe will be measured and paid for in the same manner as if the culvert has been abandoned in place.

Backfill will be measured by the cubic meter determined from the dimensions of the culverts to be abandoned.

The contract price paid per cubic meter for sand backfill shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in backfilling culverts with sand, complete in

place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Controlled low strength material and slurry cement backfill, if used at the Contractor's option, will be measured and paid for by the cubic meter as sand backfill.

Full compensation for concrete plugs, pipe removal, structure excavation, and backfill shall be considered as included in the contract unit price paid for abandon culvert and no additional compensation will be allowed therefor.

**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.

**SALVAGE FENCE**

Existing chain link fence, where shown on the plans to be salvaged, shall be removed and salvaged.

**SALVAGE CRASH CUSHION**

Existing crash cushions, where shown on the plans to be salvaged, shall be removed and salvaged.

**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 DOUBLE METAL BEAM BARRIER**

Existing metal beam barrier, where shown on the plans to be removed, shall be removed and disposed of.

Any type of existing anchor assembly shall be completely removed and disposed of. Full compensation for removing anchor assemblies shall be considered as included in the contract price paid per meter for remove double metal beam barrier and no separate payment will be made therefor.

**REMOVE CRASH CUSHION**

Existing crash cushions, where shown on the plans to be removed, shall be removed and disposed of.

**REMOVE SIGN STRUCTURE**

Existing sign structures, where shown on the plans to be removed, shall be removed and disposed of.

Overhead sign structure removal shall consist of removing posts, frames, portions of foundations, sign panels, walkways with safety railings, and sign lighting electrical equipment.

Bridge mounted sign structure removal shall consist of removing sign panels and frames, sign lighting electrical equipment, walkways with safety railings, structural braces and supports, and hardware.

A sign structure shall not be removed until the structure is no longer required for the direction of public traffic.

Concrete foundations may be abandoned in place, except that the top portion, including anchor bolts, reinforcing steel, and conduits shall be removed to a depth of not less than 1 m below the adjacent finished grade. The resulting holes shall be backfilled and compacted with material equivalent to the surrounding material.

Electrical wiring shall be removed to the nearest pull box. Fuses within spliced connections in the pull box shall be removed and disposed of.

Electrical equipment, where shown on the plans, shall be salvaged.

**REMOVE PAVEMENT MARKER**

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

**REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING**

Thermoplastic traffic stripes and pavement markings and painted traffic stripe to be removed shall be removed at the locations shown on the plans and at the locations designated by the Engineer.

Nothing in these special provisions shall relieve the Contractor from the Contractor's responsibilities as provided in Section 7-1.09, "Public Safety," of the Standard Specifications.

**REMOVE YELLOW TRAFFIC STRIPE**

Traffic stripes to be removed shall be removed at the locations shown on the plans and at the locations designated by the Engineer.

Yellow thermoplastic and yellow painted traffic stripes may contain lead and chromium. Residue produced when yellow thermoplastic and yellow paint are removed may contain heavy metals in concentrations that exceed hazardous waste thresholds established by the California Code of Regulations and may produce toxic fumes when heated.

The removed yellow thermoplastic and yellow paint material shall be disposed of at a Class 1 disposal facility in conformance with the requirements of the disposal facility operator within 90 days after accumulating 100 kg of residue and dust. The Contractor shall make all arrangements with the operator of the disposal facility and perform all testing of the yellow thermoplastic and yellow paint residue required by the operator. The Contractor shall submit the name and location of the facility along with testing requirements to the Engineer no less than 21 days prior to removal of yellow thermoplastic and yellow painted traffic stripes.

The Contractor or subcontractor removing the yellow thermoplastic and yellow paint shall submit the written compliance programs required in Subsection (e)(2), "Compliance Program," of Section 1532.1, "Lead," of the Construction Safety Orders to the Engineer not less than 21 days prior to start of removal operations. The compliance programs shall be prepared by an industrial hygienist certified by the American Board of Industrial Hygiene and shall cover all Contractor or subcontractor employees removing or handling the yellow thermoplastic and yellow paint residue. Inspection reports shall be made in conformance with Section 1532.1, "Lead," and shall be submitted to the Engineer.

Prior to performing any removal, personnel who have no prior lead training, including State personnel, shall complete a safety training class provided by the Contractor, which meets the requirements of Title 8, Section 1532.1. State personnel to be trained shall be 3.

Where grinding or other methods approved by the Engineer are used to remove yellow thermoplastic and yellow painted traffic stripes, the residue, including dust, shall be contained and collected immediately. Sweeping shall not be allowed. Collection shall be by HEPA vacuum attachment operated concurrently, or other equally effective method, with removal operations. The Contractor shall submit a removal, storage, and disposal workplan in writing to the Engineer for approval not less than 21 days prior to start of removal operations.

The collected residue shall be stored in properly labeled and covered containers approved by the United States Department of Transportation for transportation and temporary storage. The containers shall be handled in such a manner that no spillage will occur. The containers shall be stored in a secured enclosure at a location within the project limits approved by the Engineer while awaiting test results required by the operators of the disposal facility.

Attention is directed to "Water Pollution Control" elsewhere in these special provisions.

Removed yellow thermoplastic and yellow paint material shall remain the property of the State.

The removed material shall be transported to the Class 1 disposal facility by a transporter currently registered with the California Department of Toxic Substance Control using current manifesting procedures. The Engineer will obtain the United States Environmental Protection Agency Identification Number and sign all manifests as the generator. The California Board of Equalization Number (State Generator's ID) for this project is HY HQ 36-020676.

The Contractor shall assume that the yellow thermoplastic and yellow paint residue is not regulated under the Federal Resource Conservation and Recovery Act (RCRA). Additional disposal costs for residue regulated under RCRA, as determined by test results, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Except as otherwise provided above for possible additional costs to be paid for as extra work, full compensation for submitting the required compliance programs, making arrangements with the Class 1 disposal facility operator, providing for the temporary storage of the residue within a secured area, testing the residue as required by the disposal facility operator, transportation of the residue to the Class 1 disposal facility, and disposal of the residue, all as specified herein, shall be considered as included in the contract prices paid per meter for remove yellow thermoplastic traffic stripes and yellow painted traffic stripes and no additional compensation will be allowed therefor.

Nothing in these special provisions shall relieve the Contractor from the Contractor's responsibilities as provided in Section 7-1.09, "Public Safety," of the Standard Specifications.

**REMOVE DRAINAGE FACILITIES**

Existing culverts and inlets where shown on the plans to be removed, shall be completely removed and disposed of.

**REMOVE ROADSIDE SIGN**

Existing roadside signs, at those locations shown on the plans to be removed, shall be removed and disposed of.

Sign panels shown on the plans shall be salvaged.

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

Full compensation for salvaging sign panels shall be considered as included in the contract unit price paid for remove roadside sign and no separate payment will be made therefor.

**SALVAGE ROADSIDE SIGN**

Existing roadside signs, at those locations shown on the plans to be salvaged, shall be removed and salvaged.

Existing roadside signs shall not be removed and salvaged 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.

**RELOCATE SIGN STRUCTURE**

Relocating sign structures shall consist of removing and relocating existing sign structures as shown on the plans.

Each existing concrete foundation, including anchor bolts, reinforcing steel, and conduit shall be removed to a depth of not less than 1 m below the adjacent finished grade. Electrical wiring, if any, shall be removed to the nearest pull box. Removed portions of the concrete foundations 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.

New foundation work for relocated sign structures shall conform to the provisions in Section 56-1, "Overhead Sign Structures," of the Standard Specifications, except that full compensation for furnishing and installing a new anchor bolt assembly on each new foundation shall be considered as included in the contract price paid per meter for the size of cast-in-drilled-hole concrete pile (sign foundation) involved and no separate payment will be made therefor.

Sign lighting electrical work is provided for in Section 10-3, "Signals, Lighting And Electrical Systems," of these special provisions.

**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 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.

**ADJUST FRAME AND COVER TO GRADE**

Frames and covers of existing manholes and monuments shall be adjusted to grade in conformance with the provisions in Section 15-2.05, "Reconstruction," of the Standard Specifications.

**REMOVE PORTLAND CEMENT CONCRETE PAVEMENT**

Removing portland cement concrete pavement shall conform to the provisions in Section 15-3, "Removing Concrete," of the Standard Specifications.

Where no joint exists in the pavement on the line at which concrete is to be removed, a straight, neat cut with a power driven saw shall be made along the line to a minimum depth of 50 mm before removing the concrete.

The quantities of portland cement concrete pavement removed will be measured and paid for by the cubic meter.

No deduction will be made from any excavation quantities for the quantity of portland cement concrete pavement removed.

Full compensation for removing bituminous or other overlying material and sawing joints at removal lines, as required, shall be considered as included in the contract price paid per cubic meter for remove concrete pavement and no additional compensation will be allowed therefor.

**REMOVE ASPHALT CONCRETE SURFACING**

Existing bituminous surfacing shown on the plans to be removed, shall be removed to the depth of the existing asphalt concrete surfacing.

The material removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 15-2.03, "Disposal," of the Standard Specifications.

Removing asphalt concrete surfacing will be measured by the cubic meter in the same manner specified for roadway excavation in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications and will be paid for at the contract price per cubic meter for remove asphalt concrete surfacing.

**REMOVE BASE AND SURFACING**

Existing base and bituminous surfacing shown on the plans to be removed, shall be removed to the depth shown on the plans. Resulting holes and depressions shall be backfilled with earthy material selected from excavation to the lines and grade established by the Engineer.

The material removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 15-2.03, "Disposal," of the Standard Specifications.

Removing base and surfacing will be measured by the cubic meter in the same manner specified for roadway excavation in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications and will be paid for at the contract price per cubic meter for remove base and surfacing.

**PLANE ASPHALT CONCRETE PAVEMENT**

Existing asphalt concrete pavement shall be planed at the locations and to the dimensions shown on the plans.

Except as provided herein, planing asphalt concrete pavement shall be performed, at the option of the Contractor, either by the cold planing or heater planing method. The use of the heater planing method shall be subject to approval of the local Air Pollution Control Officer.

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.

Heater planing machines shall have, in combination or separately, a means for heating and cutting the asphalt concrete surface and blading the displaced material into windrows in one continuous forward motion. Heat shall be applied uniformly to the area to be planed and shall be accurately controlled according to conditions and the road surfacing being planed. The cutting width of the blade shall be not less than 900 mm.

Heater planing operations shall not be performed at times where there is danger of igniting entrapped gases from sewers or gas mains, if an open flame is used in the heater. The heater planing method shall not be used in areas where the heat generated by the heater planing equipment may damage adjacent shrubs or the foliage on overhanging tree limbs.

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 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. Removal operations of planed material shall be concurrent with planing operations and follow within 15 m of the planer, unless otherwise directed by the Engineer.

Plane asphalt concrete pavement will be measured by the square meter for the depth (maximum) designated in the Engineer's Estimate. The quantity to be paid for will be the actual area of surface planed for the depth (maximum) designated in the Engineer's Estimate, irrespective of the number of passes required to obtain the depth shown on the plans.

The contract price paid per square meter for plane asphalt concrete pavement for the depth (maximum) designated in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in 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 Standards Specifications and these special provisions, and as directed by the Engineer.

**CAP INLET**

Existing 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.

**10-1.34 BRIDGE REMOVAL**

Removing portions of bridges shall conform to the provisions in Section 15-4, "Bridge Removal," of the Standard Specifications, the details shown on the plans and these special provisions.

Bridge Removal (Location A)
Existing “B” Line
(Bridge No. 23-0015)

Remove existing bridge.

Bridge Removal (Location B)
Existing “J” Line
(Bridge No. 23-0015)

Remove existing bridge.

Bridge Removal (Location C)
Existing “S” Line
(Bridge No. 23-0015)

Remove existing bridge.

Bridge Removal Portion (Location D)
Bent A4WB7
(Bridge No. 28-0015L)

Remove existing concrete bent.

Bridge Removal Portion (Location E)
Crockett Viaduct
(Bridge No. 23-0015R)

Remove existing reinforced concrete deck and associated barrier railings, median slab, sidewalks, metal beam barrier, concrete nose structures and associated backwall, attenuator assembly, rivets and bolts.

All removed materials that are not to be salvaged or used in the reconstruction shall become the property of the Contractor and shall be disposed 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.

Removal of existing piles at existing “B” line as shown on the plans, will be paid for as extra work as specified in Section 4-1.03D, Extra Work, of the Standard Specifications.

Concrete for tower anchors at Existing “B” Line shall conform to “Concrete Structures” of these special provisions. Bar reinforcing shall conform to “Reinforcement” of these special provisions. Wire rope and metal components shall conform to “Miscellaneous Metal (Bridge)” of these special provisions. Bracing shall conform to “Falsework” of these special provisions. Earthwork shall conform to “Earthwork” of these special provisions.

Full compensation for tower anchor system including concrete, reinforcement, wire rope and metal components, and earthwork, complete in place, shall be considered as included in the contract lump sum price paid for Bridge Removal (Location A) and no separate payment will be made therefor.

The Contractor shall submit a complete bridge removal plan to the Engineer detailing procedures and sequence for removing portions of bridge, including all features necessary to remove the bridges in a safe and controlled manner.

The bridge removal plan shall be furnished for Existing “B” Line, Existing “J” Line, Existing “S” Line and Approach Spans Deck Replacement (Bridge no 23-0015R) shall include the following:

A. The bridge removal sequence for the entire structure, including staging of bridge removal;
B. Equipment locations on the structure during removal operations;
C. Temporary support shoring or temporary bracing;
D. Locations where work is to be performed over traffic or railroad property; and
E. Details and locations of protective covers or other measures to assure that people, property, and improvements will not be endangered.

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 following additional requirements apply to the removal of portions of bridges that are over or adjacent to roadways that may be closed to public traffic for only brief periods of time:

A. The closure of roadways to public traffic shall conform to the provisions in "Order of Work" and "Maintaining Traffic" of these special provisions.
B. Prior to closing a roadway to traffic to accommodate bridge removal operations, the Contractor shall have all necessary workers, materials, and equipment at the site as needed to proceed with the removal work in an expeditious manner. While the roadway is closed to public traffic, work shall be pursued promptly and without interruption until the roadway is reopened to public traffic.
C. All removal operations shall be performed during periods of time that the roadway is closed to public traffic except as specified herein for preliminary work.
D. Preliminary work shall be limited to operations that will not reduce the structural strength or stability of the bridge, or any element thereof, to a level that in the judgment of the Engineer would constitute a hazard to the public. Such preliminary work shall also be limited to operations that cannot cause debris or any other material to fall onto the roadway. Protective covers may be used to perform preliminary work such as chipping or cutting the superstructure into segments, provided the covers are of sufficient strength to support all loads and are sufficiently tight to prevent dust and fine material from sifting down onto the traveled way. Protective covers shall extend at least 1.2 m beyond the limit of the work underway. Bottom slabs of box girders may be considered to be protective covers for preliminary work performed on the top slab inside the limits of the exterior girders.
E. Temporary support shoring, 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.

F. 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.
G. 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.
H. For Bridge No. 23-0015R, sections of deck slab and barrier railing shall be removed intact to minimize concrete and reinforcing steel falling onto the protective cover or the ground below. Existing shear studs on the floor beams and on the splice plates shall not be damaged by removal operations. Areas where the removed concrete is allowed to fall to the ground shall be secured by fencing as approved by the Engineer. The fencing shall be removed when the removal operation is completed and debris has been removed. Concrete or other debris shall be prevented from entering the existing deck drain pipes. Debris from removal operations shall not be allowed to accumulate on the steel superstructure. Existing reinforcing steel left exposed from removal operations, that is not incorporated in new concrete, shall be removed to 25 mm below the concrete surface and the resulting cavity patched with concrete.
Surfaces of existing steel to receive new concrete shall be blast cleaned in accordance with the provisions in “Clean and Paint Structural Steel” elsewhere in these special provisions.

The following additional requirements apply to the removal of portions of bridges whenever the removal work is to be performed over public traffic or railroad property:

A. A protective cover supported by falsework or members of the existing structure shall be constructed before beginning bridge removal work.
B. The construction and removal of the protective cover, and the installation and removal of temporary railings shall conform to the provisions in "Order of Work," "Maintaining Traffic," and "Temporary Railings" of these special provisions.
C. 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.
D. The protective cover shall extend at least 3 m beyond the outside face of the bridge railing, except that, at locations where the bridge railing is to be removed and new girders are not constructed, the protective cover shall extend from, face of 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.
E. During the removal of bridge segments, and when portions of the bridge, such as deck slabs or box girder slabs, comply with the requirements for the protective cover, a separate protective cover need not be constructed.
F. Before removal, the protective cover shall be cleaned of all debris and fine material.
G. The protective cover shall provide the openings specified under "Maintaining Traffic" of these special provisions, except that when no openings are specified for bridge removal, a vertical opening of 4.6 m and a horizontal opening of 9.8 m shall be provided for the passage of public traffic.
H. The protective cover shall be in conformance with the 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.
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. No removal operations including sawcutting, shall be under way at Bridge No 23-15R, Span A12E while trains are passing under the span.

The Contractor shall submit working drawings, with design calculations, to the Engineer for the proposed bridge removal plan. The bridge removal plan shall be prepared 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.

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 and design calculations and times for review for any 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 working drawings for removing specific structures, or portions thereof, shall be as follows:

| Structure or Portion of Structure | Review Time - Weeks |
|---|---|
| Existing “B” Line | 6 |
| Existing “J” Line | 5 |
| Existing “S” Line | 5 |
| Bridge No 23-0015R | 10 |

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.

Prior to proceeding with bridge removal where a bridge removal plan is required, an engineer for the Contractor who is registered as a Civil Engineer in the State of California shall inspect the temporary support shoring, including temporary bracing and protective coverings, for conformity with the working drawings. The Contractor's registered engineer shall certify in writing that the temporary support shoring, including temporary bracing and protective coverings, substantially conform to the details on 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.

At a bridge site where a bridge removal plan is required, 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, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure of operation proposed to correct or remedy the occurrence.

**REMOVE CONCRETE DECK SURFACE**

This work shall consist of removing portions of the portland cement concrete deck surface to a depth shown on the plans, abrasive blasting and blowing clean the deck surface as shown on the plans 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 of 6 mm, 2) follow the contour of the deck, 3) irregular cut to 6 mm tolerance, 4) maintain a 4 mm grade tolerance; and shall have the following features:

A. 4 riding tracks.
B. An automatic grade control system with an electric averaging system with 3 sonar sensors on each side of each track.
C. Front loading conveyer system.
D. A drum that operates in an up-milling direction.
E. Bullet teeth with tungsten carbide steel cutting tips. The tungsten cylinder shall be embedded in a cylindrical trough.
F. 6 mm tool spacing.
G. Maximum operating weight of 25,400 kilograms.

The cold milling equipment shall have new teeth at the beginning of the job, and the teeth shall be replaced every 8 hours of 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. Such removal shall be by a vacuum attachment operating concurrently with the abrasive blasting operation.

Nothing in these special provisions shall relieve the Contractor from his responsibilities in conformance with 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, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**TEMPORARY DECK BRIDGING**

Temporary deck bridging for bridging deck gap at Bridge No. 23-0015R during deck reconstruction work shall be designed, constructed, monitored, maintained and removed as specified in these special provisions.

The temporary bridging shown on the plans has been designed to support the loads shown on the plans. The Contractor shall design temporary bridging to support loads that exceed the loads shown on the plans.

Attention is directed to "Maintaining Traffic" of these special provisions.

Asphalt concrete shall conform to the provisions in Section “Asphalt Concrete” of these special provisions.

**DESIGN AND WORKING DRAWINGS**

The Contractor shall submit to the Engineer working drawings and design calculations for the temporary deck bridging. The drawings and design calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. Five sets of the drawings and one copy of the design calculations shall be furnished.

The temporary deck bridging working drawings shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Working drawings for any part of the temporary deck bridging shall include, but not be limited to, connection details, modifications to existing bridge members, shop details, erection and removal plans, and equipment lists.

The working drawings shall include descriptions and values of all loads, including construction equipment and vehicular live loads, descriptions of equipment to be used, and complete details and calculations for supporting all loads imposed.

The Contractor shall allow 4 weeks for the review of any temporary deck bridging working drawings after complete drawings, calculations and all support data have been submitted to the Engineer.

Should the Engineer fail to complete the review within the time allowed and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in temporary deck bridging working drawing review, 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 temporary deck bridging shall be mechanically connected to the existing structure while subjected to vehicular loads and shall not overstress, induce permanent forces into or produce cracking in the existing structure.

The temporary deck bridging shall support the vehicular live loads shown on the plans, dead loads, 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.

The temporary deck bridging shall have a uniform surface texture that provides a coefficient of friction of not less than 0.35.

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.

**CONSTRUCTION**

Temporary deck bridging construction shall conform provisions for falsework in the first paragraph of Section 51-1.06B, "Falsework Construction," of the Standard Specifications.

Welding, welder qualification, and inspection of welding shall conform to the requirements of ANSI/AASHTO/AWS D1.5.

Should unanticipated displacements, cracking or other damage occur to the existing structure, 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.

When temporary deck bridging is no longer needed to bridge the gap, all temporary deck bridging and connections shall be removed from the existing structure.

**PAYMENT**

Full compensation for temporary bridging, including furnishing, placing and removing asphalt concrete shall be considered as included in the contract price paid per cubic meter for lightweight concrete (bridge) and no separate payment will be allowed therefor.

## 10-1.35 RAISE BRIDGE

The work shall conform to the details shown on the plans and the requirements in these special provisions.

The work includes raising the superstructure of Bridge No. 23-0015L at Bent A4WB7 as shown on the plans.

**GENERAL**--Attention is directed to "Maintaining Traffic" of the special provisions.

The various items of work listed below in connection with raise bridge are covered under other sections of these special provisions:

Removing portions of the existing bridge shall conform to the requirements in "Bridge Removal" of these special provisions.

Earthwork shall conform to the provisions in "Earthwork" of these special provisions.

Concrete construction shall conform to the provisions in "Concrete Structures" of these special provisions.

Reinforcement shall conform to the provisions in "Bar Reinforcing Steel" of these special provisions.

Steel construction shall conform to the provisions in "Steel Structures" of these special provisions.

The Contractor shall be responsible for the methods and equipment used to raise the superstructure and for the design of temporary supports.

At least 15 days before starting the work the Contractor shall submit to the Engineer complete details and working drawings of the methods and equipment he proposes to use in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

Temporary supports for the structure shall conform to the provisions in "Falsework," "in Concrete Structures" of these special provisions. Adequate means shall be employed to prevent unplanned lateral and longitudinal movement of the superstructure. The falsework, jacks, and the superstructure shall be stable during all phases of the operation.

Temporary supports, and jacking assemblies shall remain in place as required to support the structure until the substructure or other supports, shown on the plans, have been completed and have attained the specified strength at the transfer of the superstructure load to the said substructure or supports.

Additions or modifications to the structure, in connection with jacking, and the jacking assemblies shall conform to the details shown on the plans, except that the Contractor may submit alternative details to the Engineer for approval.

The Contractor shall design and construct suitable strengthening and stiffening members for the superstructure to permit jacking operations without damage to the superstructure.

Jacking operations shall be carried out in a uniform manner so that no distortion that would cause damage will be jacked into the superstructure.

Damage to the structure as a result of the Contractor's operations shall be repaired or replaced in accordance with the requirements for new work of similar character by the Contractor at his expense.

When raising operations have been completed, all strengthening and stiffening members installed on the superstructure for jacking operations shall be removed and the superstructure restored substantially to the condition existing at the time of beginning work under this contract, except where permanent alterations are shown on the contract plans, or where the Contractor's working drawings detailing permanent strengthening or stiffening members have been approved by the Engineer.

When raising operations have been completed, all temporary supports, cribbing and blocking, jacking assemblies, strengthening members shall be removed. All such material shall be disposed of in conformance with the requirements in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

**RAISING OPERATIONS**.--The superstructure shall be raised while new supports are constructed, and then lowered onto the said supports.

When public traffic will be carried over the bridge during raising operations or when specified herein, the Contractor's jacking methods shall include provisions for blocking up the superstructure from the supports such that there will be a gap of less than 25 mm between the supports and the superstructure during all phases of the raising operation.

The superstructure shall be jacked and adjusted to grade uniformly and in such a manner that a roadway satisfactory for the use of public traffic is provided in conformance with the provisions in Section 7-1.08, "Public Convenience," of the Standard Specifications.

Full compensation for raise bridge shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be allowed therefor.

**REMOVE CONCRETE**

Concrete, where shown on the plans to be removed, shall be removed.

The pay quantities of concrete to be removed will be measured by the cubic 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.

Where no joint exists between concrete to be removed and concrete to remain in place, the concrete shall be cut on a neat line to a minimum depth of 50 mm with a power driven saw before the concrete is removed.

Where concrete has been removed outside the roadway prism, the backfilled areas shall be graded to drain and blend in with the surrounding terrain.

Concrete to be removed which has portions of the same structure both above and below ground will be considered as concrete above ground for compensation.

**REMOVE CONCRETE BARRIER (TYPE K)**

Existing concrete barrier (Type K), where shown on the plans to be removed, shall be removed. Removing concrete barrier (Type K) shall conform to the provisions in Section 15-3, "Remove Concrete," of the Standard Specifications and these special provisions.

Remove concrete barrier (Type K) will be measured and paid for by the meter.

**REMOVE RETAINING WALL**

Removing retaining wall shall conform to the provisions in Section 15-3, "Remove Concrete," of the Standard Specifications and these special provisions.

The pay quantities of retaining wall to be removed will be measured by the cubic 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.

The contract price paid per cubic meter for remove retaining wall shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing retaining wall, including removal of the foundation, as specified in the Standards Specifications and these special provisions, and as directed by the Engineer.

## 10-1.37 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 "Hazardous and Non-Hazardous Material, General" elsewhere in these special provisions.

Clearing and grubbing operations shall result in no visible dust. No material containing hazardous or non-hazardous materials shall be deposited on public roads. The Contractor shall indemnify the State from any costs due to spillage of hazardous or non-hazardous material during transport.

The Contractor shall separate soil from vegetation, and the soils will remain on the site.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines areas indicated on the plans, and as directed by the Engineer. Attention is directed to “Preservation of Property” and “Temporary Creek Diversion” of these special provisions.

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.

## 10-1.38 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

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.

Any material used as fill, either native on-site or imported shall have an Expansion Index (EI) of 51 or less. Fill materials shall be tested for Expansion Index in conformance with ASTM D 4829 latest revision. The materials to be used as fill shall be tested by the Contractor and the test results submitted to the Engineer. Tests shall be performed for every 1-meter of vertical fill. The Engineer shall approve the fill material prior to its use as fill.

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.

**HAZARDOUS AND NON-HAZARDOUS MATERIAL EXCAVATION**

All hazardous material excavated as shown on the plans and as described in these special provisions shall be transported to a disposal facility permitted to accept such material. All surplus non-hazardous material excavated as shown on the plans and as described in these special provisions shall be transported to a disposal facility permitted to accept such material.

Attention is directed to "Hazardous and Non-Hazardous Material, General" elsewhere in these special provisions regarding handling of hazardous material.

Attention is directed to the plans that delineates the vertical extent of hazardous and non-hazardous material in the areas to be excavated. Attention is directed to the site investigation report for information on the concentration of other contaminants found in the areas to excavated.

Upon completion of hazardous material excavation, personal protective equipment, when no longer required, as determined by the Engineer, shall be removed from the job site.

The Contractor shall prevent the flow of surface water and groundwater from entering any excavation in accordance with “Non-Storm Water Discharges” of these special provisions. The Contractor shall treat all water removed from the excavations in accordance with “Non-Storm Water Discharges” of these special provisions.

**MEASUREMENT AND PAYMENT**

Full compensation for loading, transporting, and disposing of hazardous material shall be considered as included in the contract price paid per cubic meter for structure excavation (Type H) or roadway excavation (Type A) and no additional compensation will be allowed therefor. Full compensation for loading, transporting, and disposing of non-hazardous material shall be considered as included in the contract price paid per cubic meter for structure excavation (bridge)or roadway excavation and no additional compensation will be allowed therefor.

**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: C 6024.

Controlled low strength material used as structure backfill for pipe culverts will be considered structure backfill for compensation purposes.

**10-1.39 SHOULDER BACKING**

This work shall consist of constructing shoulder backing adjacent to the edge of the new surfacing in conformance with the details shown on the plans and these special provisions.

The material for shoulder backing shall be imported material conforming to the following grading and quality requirements:

| Grading Requirements | | Quality Requirements |
|---|---|---|
| Sieve Sizes | Percentage Passing | Plasticity Index |
| 25-mm | 100 | |
| 19-mm | 87 - 100 | 10 Min. |
| 4.75-mm | 30 - 74 | |
| 75-µm | 7- 23 | |

The areas where shoulder backing is to be constructed shall be cleared of weeds, grass and debris. Removed weeds and grass shall be disposed of uniformly over adjacent slope areas and removed debris 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.

Shoulder backing material shall be watered and rolled to form a smooth, firmly compacted surface. Watering shall conform to the provisions in Section 17, "Watering," of the Standard Specifications.

Shoulder backing material shall not be deposited on the new surfacing prior to placing the material in the final position nor shall the material be deposited onto the new surfacing during mixing, watering, and blading operations.

Shoulder backing construction shall be completed along the edges of a portion of new surfacing within 5 days after completion of that portion of the new surfacing. Prior to opening a lane, adjacent to uncompleted shoulder backing, to uncontrolled public traffic, the Contractor shall furnish, place, and maintain portable delineators and C31 (Low Shoulder) signs off of and adjacent to the new surfacing. Portable delineators shall be placed at the beginning and along the drop-off of the edge of pavement, in the direction of travel, at successive maximum intervals of 150 m on tangents and 60 m on curves. C31 signs shall be placed at the beginning and along the drop-off at successive maximum intervals of 600 m. The portable delineators and C31 signs shall be maintained in place at each location until shoulder backing is completed at that location. Portable delineators and signs shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, except the signs may be set on temporary portable supports or on barricades.

Shoulder backing will be measured by the station along each edge of surfacing where shoulder backing is constructed. A station shall be considered to be 100 meters. The length of shoulder backing to be paid for will be determined from actual measurement or calculated from centerline stationing or kilometer post distance determined by the Engineer.

The contract price paid per station for shoulder backing shall include full compensation for furnishing all labor, materials (except imported material), tools, equipment, and incidentals, and for doing all the work involved in constructing shoulder backing, complete in place, including furnishing, placing, maintaining, and removing portable delineators, C31 signs, and temporary supports or barricades for the signs, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Quantities of imported material (shoulder backing) will be measured in the vehicle by the cubic meter as provided in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

The contract price paid per cubic meter for imported material (shoulder backing) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, hauling, and depositing imported material for shoulder backing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## SOLDIER PILE WALL EARTHWORK

### General

Cross sections of the site in the vicinity of the soldier pile wall 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.

The Contractor shall submit to the Engineer working drawings and a construction sequence for the proposed method of soldier pile wall construction for the site. The drawings shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California. One set of the drawings and construction sequence, and one copy of the design calculations, shall be furnished to the Engineer. The working drawings and construction sequence shall include, but not be limited to, defining order of work, traffic control, method of installation of soldier piles, method of placing lagging, limits of structure excavation lifts, and type of drilling and excavation equipment to be used. The Contractor shall allow one week after complete drawings and all support data are submitted for the review and approval of the proposed method of soldier pile wall construction.

Should the Engineer fail to complete the review and approval 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 working drawings and construction sequence plan review and approval for the soldier pile wall, 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.

### Structure Excavation (Soldier Pile Wall)

Excavation and construction of the soldier wall shall proceed from the top down in lifts.

Care shall be taken in performing structure excavation (soldier pile wall) for placement of lagging such that a minimal void behind the lagging is required to be backfilled.

Excavation in front of the wall shall not extend more than 600 mm below the level of the tiebacks prior to successful testing, stressing and lockoff of the tiebacks.

The Engineer will determine whether boulders or portions of boulders that interfere with the placement of the lagging shall be removed. The additional earthwork involved in removing boulders or portions of boulders shall be performed by the Contractor as directed by the Engineer, and such additional work will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

At the end of the work shift, lagging shall be in place the full height of the exposed excavation face.

### Structure Backfill (Soldier Pile Wall)

Material for structure backfill behind lagging shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications. Structure backfill behind lagging shall be compacted by hand tamping, mechanical compaction or other means approved by the Engineer.

Structure backfill in fill areas behind the lagging shall be keyed into the existing or excavated back slope.

Backfill behind the lagging shall be in place and compacted to at least 1 m above the level of the tiebacks prior to drilling for the tiebacks. The remainder of the backfill behind the lagging shall be placed and compacted after tiebacks are drilled, stressed and grouted.

### Lean Concrete Backfill

Lean concrete backfill shall conform to the provisions for slurry cement backfill in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications, except that aggregate shall be sand suitable for making commercial quality concrete.

Lean concrete backfill in the portions of the drilled holes occupied by lagging and in front of the soldier pile flanges shall be removed as necessary to install lagging.

### Concrete Backfill

Class 1 formed concrete and concrete backfill encasing the steel soldier piles below the lagging shall be Class 1 concrete conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

### MEASUREMENT AND PAYMENT (EARTHWORK)

Measurement and payment for earthwork shall conform to all provisions for "Measurement" and "Payment" in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Pervious backfill material in connection with bridge work will be measured and paid for by the cubic meter as structure backfill (bridge).

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 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).

Lean concrete backfill will be measured and paid for by the cubic meter as lean 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.

Concrete backfill encasing steel soldier piles below the lagging and Class 1 formed concrete will be measured and paid for by the cubic meter as 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.

Full compensation for removing lean concrete backfill shall be considered as included in the contract price paid per cubic meter for structure excavation (soldier pile wall) and no additional compensation will be allowed therefor.

Full compensation for working drawings and construction sequence, and temporary supports and shoring, if required, for soldier pile wall construction shall be considered as included in the contract price paid per cubic meter for structure excavation (soldier pile wall) and no additional compensation will be allowed therefor.

Full compensation for filter fabric and geocomposite drain shall be considered as included in the contract price paid per cubic meter for structure backfill (soldier pile wall) and no additional compensation will be allowed therefor.

Roadway excavation (Type A) will be measured by the cubic meter in the same manner specified for roadway excavation in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications and will be paid for at the contract price per cubic meter for roadway excavation (Type A).

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in performing roadway excavation (Type A) completely as shown on the plans, as specified in the Standards Specifications and these special provisions, and as directed by the Engineer shall be considered as included in the contract price paid per cubic meter for roadway excavation (Type A).

## 10-1.40 EARTH RETAINING STRUCTURES

Earth retaining structures shall be constructed at the locations and in conformance with the details shown on the plans and these special provisions.

The earth retaining structure to be constructed shall be mechanically stabilized embankment (MSE) wall as shown on the plans.

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 | The Reinforced Earth Company<br>25651 Atlantic Ocean Drive, Suite A-13<br>Lake Forest, CA 92630<br>(949) 587-3060 |
| 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 |
| Port-O-Wall Precast Concrete Retaining Wall System | Porto-O-Wall Enterprises<br>P.O. Box 3326<br>Chico, CA 95927<br>(530) 342-1615 |
| Welded Wire Wall | Hilfiker Retaining Walls<br>P.O. Box 2012<br>Eureka, CA 95502-2012<br>(707) 443-5093 |
| Criblock | Retaining Walls Company<br>P.O. Box 1036<br>Orinda, CA 94563<br>(510) 254-4446 |
| MSE Plus | SSL<br>4740 Scotts Valley Drive, Suite "E"<br>Scotts Valley, CA 95066<br>(831)430-9300 |
| Evergreen Retaining Wall System | The Quickset Corporation<br>17791 Fitch Avenue<br>Irvine, CA 92714<br>(949) 250-8700 |

Attention is directed to the section, "Engineering Fabrics" of these special provisions.

Only one type of earth retaining system shall be used.

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, 1801 30th Street, Sacramento, CA 95816.

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 be supplemented as necessary with calculations for the particular installation. The working drawings and calculations 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.

One set of the corrected prints on 90-g/m$^2$ (minimum) bond paper, 279 mm x 432 mm in size, of all working drawings prepared by the Contractor for each earth retaining structure shall be furnished to OSD within 3 weeks after final working drawing approval.

The top of wall profile of alternative earth retaining systems shall conform to that of MSE wall shown on the plans. The bottom of the MSE wall elevations and face panels 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.

**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.

Structure backfill for earth retaining structures with metallic soil reinforcement shall consist of material free from organic material and substantially free of shale or other soft, poor durability particles; 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 shall meet 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 max. | 422 |
| Sulfates | 2000 ppm max. | 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 max. | 422 |
| Sulfates | 2000 ppm max. | 417 |
| pH | 5.5 to 10.0 | 643 |

Structure backfill for earth retaining structures with soil reinforcement shall be compacted to a relative compaction of not less than 90 percent except that 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.

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.

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.

Water used for earthwork or dust control within 150 meters of any portion of earth retaining structures with metallic soil reinforcement shall conform to the provisions for water in conventionally reinforced concrete work 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 shall conform to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. Concrete for the leveling pads shall be placed at least 24 hours prior to erecting face panels.

**REINFORCEMENT**

Reinforcing steel shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and to the provisions in "Reinforcement" of 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 detailed for the Mechanically Stabilized Embankment.

The threaded end 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 with a die before painting. There shall be no damage to the unthreaded portion of the galvanized inspection wire.

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 grout 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.

**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.

Permeable material shall be Class 1, Type B, conforming to the provisions in Section 68-1.025, "Permeable Material," of the Standard Specifications and these special provisions.

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.

Filter fabric shall conform to the provisions for fabric for underdrains in Section 88-1.03, "Filter Fabric," of the Standard Specifications and shall be placed at the locations and in conformance with the details shown on the plans and these special provisions.

Immediately prior to placing, 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.

The fabric shall be stretched, aligned, and placed in a wrinkle-free manner.

Adjacent borders of the fabric shall be overlapped from 300 mm 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 stitches shall number 2 to 3 per centimeter of seam.

Should the fabric be damaged during placing, the torn or punctured section shall be repaired by placing a piece of 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 fabric and the Contractor's equipment. Where structure backfill material is to be placed on the filter fabric, a minimum of 450 mm of structure backfill material shall be maintained between the fabric and the Contractor's equipment. Equipment or vehicles shall not be operated or driven directly on the filter fabric.

Adhesive for bonding filter fabric to concrete panels shall conform to the requirements in Federal Specification MMM-A-121.

Concrete panel surfaces which are to receive filter fabric shall be dry and thoroughly cleaned of dust and deleterious materials.

**STATE-DESIGNED EARTH RETAINING STRUCTURES**

If the Contractor elects to construct the earth retaining structure shown on the plans, the structure shall be constructed to the lines and grades and the details shown on the plans, in conformance with these special provisions and the following:

**MECHANICALLY STABILIZED EMBANKMENT**

This work shall consist of constructing earth retaining structures of mechanically stabilized embankments with concrete face panels in conformance with the details shown on the plans and these special provisions.

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 show less than 550 g.

The button on the 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 mm.

Splicing of the welded wire mat along its length shall be by a mechanical coupler which will develop the minimum tensile strength of the wire. The mechanical coupler shall be approved by the Engineer.

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 497.

**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. The construction shall include a drainage system as shown on the plans, and conform to the details shown on the approved working drawings, these special provisions, approved proprietary system details and special provisions, and the following:

The location of the top level of soil reinforcement, assuming no leveling pad settlement, shall be placed parallel to the top of wall and at a distance below the top of wall as shown on the plans within a maximum tolerance of plus 40 mm.

The top of top face panels, assuming no leveling pad settlement, shall be parallel to the top of the wall at the distance below the top of wall as shown on the plans within a maximum tolerance of plus 40 mm.

**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 vertical height and length of each section of the mechanically stabilized embankment wall 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 bottom of the lowermost face element 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 and inspection elements, including earthwork, leveling pad, barrier slab, concrete pedestal 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.

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.

**10-1.41 GEOGRID**

Geogrid shall be placed where shown on the plans and at locations designated by the Engineer in accordance with these special provisions.

Geogrid shall be a single-layer biaxial grid manufactured from polypropylene material, be resistant to ultraviolet degradation, and conform to the following physical and mechanical property requirements in the weakest principal direction:

| Property & Test Method | Value (English) | Value (Metric) |
|---|---|---|
| Aperture size range | 1.0-2.0 in. | 25-50 mm |
| Mass per unit area, minimum (ASTM D-5261) | 8.8 oz/yd$^2$ | 300 g/m$^2$ |
| Tensile Strength and Modulus (ASTM D-4595):<br>Wide Width Tensile strength at 5%, minimum, OR<br>Wide Width Ultimate tensile strength, minimum, OR<br>Tensile Modulus @ 2%, minimum | <br>600 lb./ft<br>1,100 lb./ft<br>15,000 lb./ft | <br>8.7 kN/m<br>16.0 kN/m<br>219 kN/m |
| Flexural rigidity, minimum (ASTM D-1388) | 220 lb.-mil | 250,000 mg-cm |

Prior to installation, geogrid shall be protected from ultraviolet radiation and from abrasion due to shipping and handling. Defective or damaged geogrids shall not be used.

A Certificate of Compliance conforming to the provisions in Section 6-1.07 “Certificate of Compliance” of the Standard Specifications shall accompany Geogrid.

The surface to receive the geogrid shall be brought to the required lines and dimensions as shown on the plan or as directed by the Engineer. The surface shall be smooth and shaped to eliminate clods, rocks, roots, or other deleterious items which may cause damage to the geogrid.

Geogrid shall be rolled out along the alignment on prepared surface in the direction of advancing construction on all the locations and to the limits shown on plan or as ordered by the Engineer. The deployed geogrid shall be pulled taut to from a tight wrinkle-free mat and shall be secured, as necessary and directed by the Engineer, to prevent displacement or movement. If pins or clips are to be used to fasten the geogrid, the Contractor shall demonstrate that these will not cause damage to any fabric to be placed directly above the geogrid.

The adjacent borders of parallel strips or roll ends of the geogrid shall be overlapped a minimum of 600 mm. The overlap shall be in the direction that the fill material will be spread. Placement of geogrid around corners shall be performed by cutting of geogrid product and diagonal overlapping such that the minimum of 600 mm overlap is always insured at all locations.

Should the geogrid be damaged during placement, the damaged section shall be repaired by placing a new piece of geogrid over the damaged area. Said piece of geogrid shall be large enough to cover the damaged area and provide a minimum 1 meter overlap on all edges.

The amount of geogrid (or fabric) placed shall be limited to that which can be covered with aggregate base material within 72 hours.

No vehicles or equipment shall be driven directly on the laid geogrid or fabric. Also, during spreading and compaction of the aggregate material, a sufficient thickness of the material shall always be maintained between the geogrid or fabric and the equipment to prevent damage to the geogrid or the fabric. Placing, spreading, and compaction operations over the geogrid or the fabric shall be conducted in such a manner that minimizes wrinkles development and/or damage or displacement of the geogrid or the fabric. Care shall be taken to ensure that the geogrid and fabric sections do not separate at overlaps during placement of the aggregate material.

Displaced geogrid shall be fixed and repaired at the Contractor's expense and so shall any damage of the geogrid resulting from the Contractor's vehicles, equipment, or operations.

As ordered by the Engineer, geogrid shall be sampled during placement for subsequent testing to verify conformance with the physical and mechanical requirements of this special provision.

The quantity of geogrid to be paid for will be measured by the square meter of the surface area upon which the geogrid has been placed and accepted by the Engineer. No compensation shall be paid for additional geogrid used for overlap or cut off or wasted.

The contract price paid per square meter for geogrid shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing the geogrid complete in place, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

## 10-1.42 EROSION CONTROL (BLANKET)

Erosion control (blanket) shall conform to the details shown on the plans, the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Erosion control (blanket) work shall consist of installing erosion control blanket to embankment slopes, excavation slopes, as shown on the plans, and other areas designated by the Engineer.

### MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

#### Seed

Seed for erosion control (blanket) shall conform to the provisions specified for seed under "Erosion Control (Type D)" with Seed (Type 2) of these special provisions.

#### Erosion Control Blanket

Erosion control blanket shall consist of 100 percent spun coil fiber and shall conform to the following:

Properties

| | |
|---|---|
| ASTM 3776C Weight | 400 g/m2 |
| Roll Width (minimum | 2 m |
| Area/roll (minimum) | 200 m2 |
| Open Area (maximum) | 63-70% |
| D4595-86 Minimum tensile Strength | 0.23/0.14 KN (dry)<br>0.17/0.11 KN (wet) |

Staples for erosion control blankets shall be made of 11-gage minimum steel wire and shall be U-shaped with 150-mm legs and 25-mm crown or 200-mm legs and 50-mm crown.

### APPLICATION

Erosion control blanket strips shall be placed loosely on the slope with the longitudinal joints perpendicular to the slope contour lines. Longitudinal and transverse joints of blankets shall be butted snugly against adjacent strips or overlapped according to the manufacturer's recommendations and stapled. Staples shall be driven perpendicular to the slopes, and shall be located and spaced in conformance with the manufacturer's instructions. Ends of the blankets shall be secured in place in conformance with the manufacturer's instructions.

### MEASUREMENT AND PAYMENT

The quantity of erosion control (blanket) will be determined by the square meter from actual slope measurement of the area covered by the erosion control blanket.

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

## 10-1.43 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.

Erosion control (Type D) work shall consist of applying erosion control materials to embankment and excavation slopes and other areas disturbed by construction activities. Erosion control (Type D) shall be applied during the period starting September 1 and ending October 31; or, if the slope on which the erosion control is to be placed is finished during the winter season as specified in "Water Pollution Control" of these special provisions, the erosion control shall be applied immediately; or, if the slope on which the erosion control is to be placed is finished outside both specified periods and the contract work will be completed before September 1, the erosion control shall be applied as a last item of work.

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.

Erosion Control (Type D) shall be identified as Erosion Control (Type D) with Seed (Type 1) or Erosion Control (Type D) with Seed (Type 2), as shown on the plans and as indicated in this special provision. Additional non-legume seed species have been added to Erosion Control (Type D) with Seed(Type 2), as indicated in the seed tables within this special provision; all other materials and application methods shall be the same for both types of Erosion Control (Type D)

### 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) |
|---|---|---|
| Lupinus succulentus (Arroyo Lupine) | 35 | 6.0 |
| Lupinus nanus (Sky Lupine) | 35 | 6.0 |

**Non-Legume Seed**

Non-legume seed shall consist of the following:

NON-LEGUME SEED (TYPE 1)

| Botanical Name (Common Name) | Percent Germination (Minimum) | Kilograms Pure Live Seed Per Hectare (Slope Measurement) |
|---|---|---|
| Eschscholzia californica (California Poppy) | 35 | 1.5 |
| Achillea millefolia (White Yarrow) | 30 | 1.0 |
| Bromus carinatus* (California Brome) | 40 | 10.0 |
| Hordeum vulgare 'UC 603' (Cereal Barley) | 40 | 60.0 |
| Eriogonum fasciculatum (California Buckwheat) | 10 | 1.0 |
| Elymus glaucus 'Berkeley' (Blue Wildrye) | 40 | 8.0 |
| Vulpia myuros microstachys (Three Weeks Fescue) | 35 | 4.0 |

NON-LEGUME SEED (TYPE 2)

| Botanical Name (Common Name) | Percent Germination (Minimum) | Kilograms Pure Live Seed Per Hectare (Slope Measurement) |
|---|---|---|
| Eschscholzia californica (California Poppy) | 35 | 1.5 |
| Achillea millefolia (White Yarrow) | 30 | 1.0 |
| Bromus carinatus* (California Brome) | 40 | 10.0 |
| Hordeum vulgare (UC 603 Barley) | 40 | 60.0 |
| Eriogonum fasciculatum (California Buckwheat) | 10 | 1.0 |
| Elymus glaucus 'Berkeley' (Blue Wildrye) | 40 | 8.0 |
| Salvia mellifera (Black Sage) | 35 | 1.0 |
| Mimulus aurantiacus (Bush Monkey Flower) | 25 | .5 |
| Vulpia myuros microstachys (3 Weeks Fescue) | 35 | 4.0 |

Seed (Type 1) shall consist of legume seed and non-legume seed (Type 1). Seed (Type 2) shall consist of legume seed and non-legume seed (Type 2).

**Commercial Fertilizer**

Commercial fertilizer shall conform to the provisions in Section 20-2.02, "Commercial Fertilizer," of the Standard Specifications and shall have a guaranteed chemical analysis of 6 percent nitrogen, 20 percent phosphoric acid and 20 percent water soluble potash.

**Straw**

Straw shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications and these special provisions.

Wheat and barley straw shall be derived from irrigated crops.

Prior to delivery of wheat or barley straw to the project site, the Contractor shall provide the date of harvest and the name, address and telephone number of the grower.

**Compost**

Compost shall be derived from green material consisting of chipped, shredded or ground vegetation or clean processed recycled wood products or a Class A, exceptional quality biosolids composts, as required by the United States Environmental Protection Agency (EPA), 40 CFR, Part 503c regulations or a combination of green material and biosolids compost. The compost shall be processed or completed to reduce weed seeds, pathogens and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides or other chemical residues that would be harmful to plant or animal life. Other deleterious material, plastic, glass, metal or rocks shall not exceed 0.1 percent by weight or volume. A minimum internal temperature of 57˚C shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum of 5 times during the composting process and shall go through a minimum 90-day curing period after the 15-day thermophilic compost process has been completed. Compost shall be screened through a maximum 6 mm screen. The moisture content of the compost shall not exceed 35 percent. Moisture content shall be determined by California Test 226. Compost products with a higher moisture content may be used provided the weight of the compost is increased to equal the compost with a moisture content of 35 percent. Compost will be tested for maturity and stability with a solvita test kit. The compost shall measure a minimum of 6 on the maturity and stability scale.

**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 nonflammable and shall have an effective life of at least one year.

Stabilizing emulsion shall be in a dry powder form, may be reemulsifiable, and shall be a processed organic adhesive derivative of Plantago insularis used as a soil tackifier.

**APPLICATION**

Erosion control materials shall be applied in 3 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:

TYPE 1

| Material | Kilograms Per Hectare (Slope Measurement) |
|---|---|
| Fiber | 170 |
| Compost | 400 |
| Non-Legume Seed | 84.5 |
| Legume Seed | 12 |
| Stabilizing Emulsion | 150 |

TYPE 2

| Material | Kilograms Per Hectare (Slope Measurement) |
|---|---|
| Fiber | 170 |
| Compost | 400 |
| Non-Legume Seed | 86.0 |
| Legume Seed | 12 |
| Stabilizing Emulsion | 150 |

B. Straw shall be applied at the rate of 4.0 tonnes per hectare based on slope measurements. Incorporation of straw will not be required.

C. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment:

| Material | Kilograms Per Hectare (Slope Measurement) |
|---|---|
| Fiber | 170 |
| Compost | 400 |
| Commercial Fertilizer | 120 |
| Stabilizing Emulsion (Solids) | 150 |

D. 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.

**MEASUREMENT AND PAYMENT**

The contract price paid per kilogram for compost (erosion control) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying compost for erosion control, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**10-1.44 FIBER ROLLS**

Fiber rolls shall conform to the details shown on the plans and these special provisions.

Fiber rolls shall be furnished and installed at the locations shown on the plans, and at the base of all graded and/or disturbed slopes with a finished grade of 1:2.5 (V:H) or steeper.

**MATERIALS**

Fiber rolls shall consist of one of the following:

A. Fiber rolls shall be constructed on the project site with manufactured blankets consisting of one or a combination of wood excelsior, rice, wheat or coconut fibers. The blanket shall measure approximately 3.5 m wide by 26 m to 29 m in length. Wood excelsior material shall have individual fibers, 80 percent of which shall be 150 mm or longer in fiber length. The blanket shall have a photodegradable plastic netting. The blanket shall be rolled on the blanket's width and secured with jute twine spaced 2 m apart along the roll for the full length and 150 mm from each end of the individual rolls. The blanket shall be rolled so that the netting is on the outside of the finished roll. The finished roll diameter shall be a minimum of 175 mm and a maximum of 225 mm and shall weigh not less than 1.3 kg/m.
B. Fiber rolls shall be pre-manufactured rice or wheat straw, wood excelsior or coconut fiber rolls encapsulated within a photodegradable plastic netting. Each roll shall be a minimum of 175 mm and a maximum of 225 mm in diameter and 7 m to 9 m in length and shall weigh not less than 1.3 kg/m. The netting shall be ultraviolet (UV) degradable plastic. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the individual rolls.

Fiber rolls installation materials shall consist of the following:

A. Rope shall be manila, biodegradable, with a diameter of no less than 6.35 mm.
B. Stakes shall be fir or pine and shall be fabricated as shown on the plans.

**INSTALLATION**

Fiber rolls shall be installed approximately parallel to the slope contour. Fiber rolls shall be overlapped and secured as shown on the plans. The overlap shall be between 0.5 meter and 1.0 meter in length. Fiber rolls shall be installed prior to the application of other erosion control materials.

The bedding area for the fiber roll shall be cleared of obstructions including, but not limited to, rocks, clods and debris greater than 25 mm in diameter prior to installation. Furrows shall not be required.

Rolls shall be installed at contour intervals of 8m of elevation in the furrows with the first row installed 1.5 m above the toe of slope.—Stakes shall be installed 1.2 m apart along the total length of the rolls and 125 mm from the end of each individual roll. Stakes shall be placed on either side of the fiber roll as shown on the plans. The stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between the stakes as shown on the plans. After installation of the rope, the stakes shall be driven into the slope such that the rope holds the fiber roll snug to the slope face.

**MEASUREMENT AND PAYMENT**

Fiber rolls will be measured by the meter from end to end along the centerline of the installed rolls deducting the widths of overlaps.

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

## 10-1.45 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 high density polyethylene (CHDPE) pipe. Corrugated high density polyethylene pipe shall conform to the requirements in ASTM Designation: F 405 or F 667, or AASHTO Designation: M 252 or M 294 and shall be Type S. Couplings and fittings shall be as recommended by the pipe manufacturer.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers," of the Standard Specifications.

Sprinkler control crossovers shall conform to the provisions in Section 20-5.027D, "Sprinkler Control Crossovers," of the Standard Specifications.

Installation of pull boxes shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduit and Pull Boxes," of the Standard Specifications. When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

## 10-1.46 IMPORTED TOPSOIL

Imported topsoil shall conform to the provisions in Section 20-2, "Materials," and Section 20-3, "Erosion Control," of the Standard Specifications.

## 10-1.47 AGGREGATE SUBBASE

Aggregate subbase shall be Class 4 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 4 aggregate subbase not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 4 aggregate subbase may include reclaimed glass. Aggregate subbase incorporating reclaimed glass shall not be placed at locations where surfacing will not be placed over the aggregate subbase.

The percentage composition by mass of Class 4 aggregate subbase shall conform to the following grading requirements:

Grading Requirements (Percentage Passing)

| Sieve Sizes | Operating Range | Contract Compliance |
|---|---|---|
| 63 mm | 100 | 100 |
| 4.75-mm | 30-65 | 25-70 |
| 75-µm | 0-15 | 0-18 |

Class 4 aggregate subbase shall also conform to the following quality requirements:

Quality Requirements

| Test | Operating Range | Contract Compliance |
|---|---|---|
| Sand Equivalent | 21 Min. | 18 Min. |
| Resistance (R-value) | ---- | 50 Min. |

The provisions of the last 4 paragraphs in Section 25-1.02A, "Class 1, Class 2, and Class 3 Aggregate Subbases," of the Standard Specifications shall apply to Class 4 aggregate subbase.

At the option of the Contractor, Class 1 aggregate subbase conforming to the grading and quality requirements in Section 25-1.02A, may be used in place of Class 4 aggregate subbase. The restriction that the amount of reclaimed material included in Class 1 aggregate 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 surfacing will not be placed over the aggregate subbase. Once a class of aggregate subbase is selected, the class shall not be changed without written approval of the Engineer.

Regardless of the class of aggregate subbase supplied under the provisions of this section, payment for all aggregate subbase will be made as Class 4 aggregate subbase.

### 10-1.48 AGGREGATE BASE

Aggregate base shall be Class 3 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 3 aggregate base not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 3 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.

Aggregate for Class 3 aggregate base shall conform to the following requirements:

Grading Requirements (Percentage Passing)

| Sieve Sizes | 19 mm Maximum | |
|---|---|---|
| | Operating Range | Contract Compliance |
| 50-mm | 100 | 100 |
| 37.5-mm | 90-100 | 87-100 |
| 25-mm | ------ | ------ |
| 19-mm | 50-85 | 45-90 |
| 4.75-mm | 25-45 | 20-50 |
| 600-µm | 10-25 | 6-29 |
| 75-µm | 2-11 | 0-14 |

Quality Requirements

| Tests | Operating Range | Contract Compliance |
|---|---|---|
| Sand Equivalent | 25 Min. | 22 Min. |
| Resistance (R-value) | ------- | 78 Min. |
| Durability Index | ------- | 35 Min. |

The aggregate shall not be treated with lime, cement or other chemical material before the Durability Index test is performed. Untreated reclaimed asphalt concrete and portland cement concrete will not be considered to be treated with lime, cement or other chemical material for purposes of performing the Durability Index test.

### 10-1.49 LEAN CONCRETE BASE

Lean concrete base shall conform to the provisions in Section 28, "Lean Concrete Base," of the Standard Specifications.

### 10-1.50 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.

### 10-1.51 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 and 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 aggregate for Type A asphalt concrete shall conform to the 12.5 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 for aggregate in Section 11-1, "Quality Control / Quality Assurance," of these special provisions, the combined aggregates shall conform to the following quality requirement when mixed with paving asphalt Grade AR-4000 in the amount of asphalt determined to be optimum by California Test 367:

Quality Requirement

| Test | California Test | Requirement |
|---|---|---|
| Surface Abrasion | 360 (July 1998) | Loss not to exceed 0.40 grams/cm$^2$ |

If the finished surface of the asphalt concrete on Route 80 and local street traffic lanes does not meet the specified surface tolerances, the finished surface shall be brought within tolerance by either (1) abrasive grinding (with fog seal coat applied on the areas which have been ground), (2) removal and replacement, or (3) placing an overlay of asphalt concrete. The method will be selected by the Engineer. The corrective work shall be at the Contractor's expense.

If abrasive grinding is used to bring the finished surface to specified surface tolerances, additional 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 to 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. 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.

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.

A drop-off of more than 46 mm will not be allowed at any time between adjacent lanes open to public traffic.

Shoulders or median borders adjacent to a lane being paved shall be surfaced prior to opening the lane to public traffic.

**10-1.52 REPLACE ASPHALT CONCRETE SURFACING**

This work shall consist of removing existing asphalt concrete surfacing and underlying base and replacing the removed surfacing and base with new asphalt concrete as shown on the plans and in conformance with these special provisions.

The exact limits of asphalt concrete surfacing to be removed and replaced will be determined by the Engineer.

Existing asphalt concrete surfacing and underlying base material removed during a work period shall be replaced before the time the lane is to be opened to public traffic as designated in "Maintaining Traffic" of these special provisions.

The outline of the asphalt concrete surfacing to be removed shall be cut with a power-driven saw to a depth of not less than 46 mm before removing the surfacing. Surfacing and base shall be removed without damage to surfacing that is to remain in place. 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 if ordered by the Engineer. Repairing or removing and replacing pavement damaged outside the limits of pavement to be replaced shall be at the Contractor's expense and will not be measured or paid for.

Removed materials 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.

The material remaining in place, after removing asphalt concrete surfacing and base to the required depth, shall be graded to a plane, watered, and compacted. The finished surface of the remaining material shall not extend above the grade established by the Engineer.

Areas of the base material which are low as a result of over excavation shall be filled, at the Contractor's expense, with asphalt concrete.

Asphalt concrete used for replace asphalt concrete surfacing shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications.

At the Contractor's option, asphalt concrete used for replace asphalt concrete surfacing may be produced in conformance with the provisions for asphalt concrete placed on the traveled way in Section 11-1, "Quality Control / Quality Assurance," of these special provisions.

The quantity of replace asphalt concrete surfacing to be paid for will be measured by the cubic meter. The volume to be paid for will be calculated on the basis of the dimensions shown on the plans adjusted by the amount of any change ordered by the Engineer.

The contract price paid per cubic meter for replace asphalt concrete surfacing shall include full compensation for furnishing all labor, materials (including asphalt concrete), tools, equipment, and incidentals, and for doing all the work involved in replacing asphalt concrete surfacing, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**10-1.53 CONCRETE PAVEMENT**

Portland cement concrete pavement shall conform to the provisions in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions.

Transverse weakened plane joints across portland cement concrete shoulders shall be continuous with such joints across the traveled way. Longitudinal joints shall be constructed between portland cement concrete shoulders and adjacent traffic lanes and tie bars shall be installed at such joints as provided herein.

Tie bars shall be installed at longitudinal joints between portland cement concrete shoulders and adjacent traffic lanes and at transverse contact joints, as shown on the plans. Tie bars shall be deformed reinforcing steel bars conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 300 or 400, 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 provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications.

Full compensation for furnishing and placing reinforcement shall be considered as included in the contract price paid per cubic meter for concrete pavement, and no additional compensation will be allowed.

**10-1.54 GRIND EXISTING CONCRETE PAVEMENT**

Grinding existing portland cement concrete and asphalt concrete pavement and bridge decks shall conform to the provisions in Section 42-2, "Grinding," of the Standard Specifications and these special provisions.

Grinding shall be performed at the following locations:

A. EB I-80 D3 39+72 to D3 40+06
B. EB I-80 D3 46+63 to D3 47+00

**10-1.55 PILING**

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

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 Quality Control" of these special provisions.

Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended by adding the following paragraph after the seventh paragraph:

- 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.

At the option of the Contractor, vibratory hammers may be used to install temporary casings and to install piles or permanent casings at the locations listed and to the elevations shown in the following table:

| Bridge Name or Number | Abutment Number | Bent Number | Elevation |
|---|---|---|---|
| 28-0367L | | 6 | -7.6 m |
| 28-0370K | | 2 | 8.2 m |
| 28-0370K | | 3 | -1.8 m |
| 28-0370K | | 4 | -2.1 m |
| 28-0370K | | 5 | -3.0 m |

Difficult pile installation is anticipated due to the presence of soft to stiff clays overlying weathered bedrock, hard rock, hazardous and contaminated materials, high ground water, cobbles and boulders, subsurface concrete debris, abandoned underground and overhead utilities, low overhead clearance, underground utilities, overhead utilities, and the requirements of pile embedment into rock.

**STEEL PIPE PILING**

**General**

Steel pipe piling shall consist of unfilled steel pipe piling and steel shells for open and closed ended cast-in-steel-shell concrete piling.

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 Codes | Year of Adoption |
|---|---|
| API 2B | 1990 |
| API 5L | 1995 |

Only steel pipe pile seam welds may be made by the electric resistance welding method. Such welds shall be welded in conformance with the requirements in API 5L and any amendments to API 5L in the Standard Specifications or these special provisions.

Seams in steel pipe piles made by submerged arc welding may be welded in conformance with the requirements in API 5L and any amendments to API 5L in the Standard Specifications or these special provisions.

Handling devices may be attached to steel pipe piling. Welds attaching these devices shall be aligned parallel to the axis of the pile and shall conform to the requirements for field welding specified herein. Permanent bolted connections shall be corrosion resistant. Prior to making attachments, the Contractor shall submit a plan to the Engineer that includes the locations, handling and fitting device details, and connection details. Attachments shall not be made to the steel pipe piling until the plan is approved in writing by the Engineer. The Engineer shall have 7 days to review the plan. Should the Engineer fail to complete the review within 7 days, 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 plan, 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.

Each length of steel pipe piling shall be marked in conformance with the requirements in ASTM Designation: A 252.

For steel pipe piling, including bar reinforcement in the piling, the Engineer shall be allowed 48 hours to review the "Welding Report," specified in "Welding Quality Control" of these special provisions, and respond in writing after the required items have been received. No field welded steel pipe piling shall be installed, and no reinforcement in the piling shall be encased in concrete until the Engineer has approved the above requirements in writing. 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.

At the Contractor's option, a steel pipe pile may be re-tapped to prevent pile set-up; however, the field welded splice shall remain at least one meter above the work platform until that splice is approved in writing by the Engineer.

**Manufactured Steel Pipe**

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 in conformance with ASTM Designations: A 252, A 53, A 135, A 139, API 5L, or AWWA C200; where this steel pipe can be produced in lengths at least 9 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.)

Manufactured steel pipe used for steel pipe piling shall conform to the following requirements:

A. The outside circumference of the steel pipe piling end shall not vary by more than 10 mm from that corresponding to the diameter shown on the plans.
B. The maximum allowable misalignment for adjacent steel pipe pile edges to be welded shall be 0.1875 times the wall thickness, but not more than 1.6 mm.
C. Steel pipe pile straightness shall conform to the requirements in API 5L, Section 7.6, "Straightness."
D. Welds made at a permanent manufacturing facility shall be made by either an automatic welding process or an electric resistance welding process.

**Fabricated Steel Pipe**

Fabricated steel pipe is defined as pipe produced at a permanent facility where a variety of steel fabrication including roll forming and welding steel plate into pipe is performed, where this pipe is at least 19 mm in wall thickness, where this pipe is produced in conformance with API 2B, and where this fabrication can be done on a daily basis. Fabricated steel pipe is a specifically engineered product. (i.e. Fabricated steel pipe is engineered for a specific project.)

Fabricated steel pipe used for steel pipe piling shall conform to API 2B and the following requirements:

A. An API site license and API monogram are not required.
B. Weld filler metal shall conform to the requirements of AWS D1.5 for the welding of ASTM Designation: A 709, Grade 50 steel, except that the qualification, pretest, and verification test requirements need not be conducted if certified test reports are provided for the consumables to be used.

**Field Welding**

Field welding of steel piling is defined as welding performed after the certificate of compliance has been furnished by the manufacturer or fabricator and shall conform to the following requirements:

A. Match marking of pipe ends at the manufacturing or fabrication facility is recommended for piling to ensure weld joint fit-up. Prior to positioning any 2 sections of steel pipe to be spliced by field welding, including those that have been match marked at the manufacturing or fabrication facility, the Contractor shall equalize the offsets of the pipe ends to be joined and match mark the pipe ends.
B. Welds made in the flat position or vertical position (where the longitudinal pipe axis is horizontal) shall be single-vee groove welds. Welds made in the horizontal position (where the longitudinal pipe axis is vertical) shall be single-bevel groove welds. Joint fit-ups shall conform to the requirements for tubular sections in AWS D1.1 and these special provisions.
C. The minimum thickness of the backing ring shall be 6 mm, and the ring shall be continuous. Splices in the backing ring shall be made by complete penetration welds. These welds shall be completed and inspected prior to final insertion into a pipe end. Attachment of backing rings to pipe ends shall be done using the minimum size and spacing of tack welds that will securely hold the backing ring in place. Tack welding shall be done in the root area of the weld splice. Cracked tack welds shall be removed and replaced prior to subsequent weld passes. The gap between the backing ring and the steel pipe piling wall shall be no greater than 2 mm. One localized portion of the splice, that is equal to or less than a length that is 20 percent of the outside circumference of the pipe, as determined by the Engineer, may be offset by a gap equal to or less than 6 mm provided that this localized portion is first seal welded using shielded metal arc E7016 or E7018 electrodes. The Contractor shall mark this localized portion so that it can be referenced during any required nondestructive testing (NDT). Backing rings shall have a minimum width of 1 1/2 times the thickness of the pile to be welded so that they will not interfere with the interpretation of the NDT.
D. For steel pipe with an outside diameter greater than 1.1 m, and with a wall thickness greater than 25.4 mm, the root opening tolerances may be increased to a maximum of 5 mm over the specified tolerances.
E. Weld filler metal shall conform to the requirements shown in AWS D1.5 for the welding of ASTM Designation: A 709, Grade 50 steel, except that the qualification, pretest, and verification test requirements need not be conducted if certified test reports are provided for the consumables to be used.
F. For field welding, including attaching backing rings and making repairs, the preheat and interpass temperature shall be in conformance with AWS D1.1, Section 3.5, "Minimum Preheat and Interpass Temperature Requirements," and with Table 3.2, Category C; and the minimum preheat and interpass temperature shall be 66°C, regardless of the pipe pile wall thickness or steel grade. In the event welding is disrupted, preheating to 66°C must occur before welding is resumed.
G. Welds shall not be water quenched. Welds shall be allowed to cool unassisted.

At locations where field welding of steel shells for cast-in-steel-shell concrete piling is not permitted, as shown on the plans, but additional pile length is required below the specified tip elevation in order to reach bearing, field welding will be allowed and nondestructive testing will be required. In addition, nondestructive testing will be required for shop welds in the no filed splice zone as shown on the plans. Nondestructive testing shall conform to the provisions in “Nondestructive Testing”.

**NONDESTRUCTIVE TESTING**

Where required, steel shells for open ended cast-in-steel-shell concrete piling shall receive nondestructive testing (NDT) in conformance with these special provisions.

**Nondestructive Testing of Welds made at a Manufacturing or Fabrication Facility**

Twenty-five percent of each longitudinal, circumferential, or spiral weld made at a permanent manufacturing or fabrication facility shall receive NDT. If repairs are required in a portion of the weld, additional NDT shall be performed. The additional NDT shall be made on both sides of the repair for a length equal to 10 percent of the length of the pipe outside circumference. After the additional NDT is performed, and if more repairs are required that have a cumulative weld length equal to or more than 10 percent of the length of the pipe outside circumference, then the entire weld shall receive NDT.

Circumferential or spiral welds shall receive NDT by either radiographic, radioscopic, real time imaging systems, or ultrasonic methods that are in conformance with the requirements in AWS D1.1. When a radioscopic or real time imaging method is used for inspection of these welds, the fluoroscope shall be evaluated in conformance with the requirements in API 5L, Section 9.7.3.8, "Procedure for Evaluating In-Motion Operation of a Fluoroscope."

At the option of the Contractor, seam welds made by the submerged arc welding process may receive NDT in conformance with the requirements in API 5L or in AWS D1.1.

The acceptance and repair criteria for NDT performed in conformance with the requirements in AWS D1.1 shall conform to the requirements in Section 6 of that code, for cyclically loaded nontubular connections subject to tensile stress.

Welds made by electric resistance welding shall receive ultrasonic testing (UT) in conformance with the requirements in API 5L

When radiological inspection is performed in conformance with the requirements in API 5L, the testing shall also conform to the following additional provisions:

A. Image quality indicators (IQI) shall conform to AWS D1.1, Section 6.17.1.
B. IQI placement shall conform to AWS D1.1, Section 6.35.5.
C. IQIs shall be positioned on the base metal.
D. Procedures shall be qualified in conformance with the requirements in AWS D1.1, Section 6.35.3.
E. Personnel shall be qualified in conformance with the requirements in AWS D1.1, Section 6.35.4.
F. Film radiography shall be performed in conformance with the requirements in AWS D1.1, Section 6, Part E.

When UT is performed in conformance with the requirements in API 5L, the testing shall also conform to the following additional provisions:

A. For electric resistance welds, the acceptance limits of Section 9.7.4.3 shall be based on only a type V10 notch or a type P notch at 10% t or less.
B. For seam welds made by the submerged arc welding process, the acceptance limits of Section 9.7.4.3 shall be based on only a type N5 notch. Reinspection of indicated imperfections by film radiological methods will not be allowed.
C. The ultrasonic instrument shall be suitable for use with transducers oscillating at frequencies between 2.25 and 5 megahertz.

**Nondestructive Testing of Field Welds**

Personnel performing ultrasonic testing (UT) for field welds will be required to verify their qualifications prior to performing nondestructive testing by both written and practical exams. Information regarding these exams is available at the Transportation Laboratory.

At the option of the Contractor, either ultrasonic testing (UT) or radiographic testing (RT) shall be used as the method of NDT for splices made by field welding steel pipe piling. This NDT shall be used for each field weld, including welds that are made onto a portion of the steel pipe piling that has been installed and any repair made to a splice weld. Testing shall be done at locations selected by the Engineer. The length of a splice weld, not including repairs, where NDT is to be performed, shall have a cumulative weld length that is equal to 25 percent of the pipe outside circumference. The Engineer may select several locations on a given splice for NDT. 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. The additional NDT shall be made on both sides of the repair for a length equal to 10 percent of the length of the pipe outside circumference. After the additional NDT is performed, and if more repairs are required that have a cumulative weld length equal to or more than 10 percent of the length of the pipe outside circumference, then the entire splice weld shall be ultrasonically tested.

Radiographic, magnetic particle, or ultrasonic testing shall be used to assure soundness of backing rings in conformance with the requirements in AWS D1.1, Section 6.

Full compensation for nondestructive testing of shop welds, as specified herein, shall be considered as included in the contract price paid per meter for furnish cast-in-steel shell concrete piling and no additional compensation will be allowed therefor.

Nondestructive testing of field welds, as specified herein, will be paid for as extra work as specified in Section 4-1.03D, Extra Work, of the Standard Specifications.

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.

**OPEN ENDED CAST-IN-STEEL-SHELL CONCRETE PILING**

Cast-in-steel-shell concrete piling shall consist of driven open ended steel shells filled with reinforced cast-in-place concrete and shall conform to the provisions in Section 49-4, "Cast-in-Place Concrete Piles," of the Standard Specifications and these special provisions.

In addition to driving, it is anticipated that drilling through the center of open ended steel shells to obtain the specified penetration may be necessary. The diameter of the drilled hole shall be less than the inside diameter of the piling. Equipment or methods used for drilling holes shall not cause quick soil conditions or cause scouring or caving of the hole. Drilling to assist driving shall not extend more than 1 meter beyond the pile tip during installation. Drilling shall not be used within 5 meters of the specified tip elevation.

The piles shall be installed open ended and no internal plates shall be used.

**Materials**

At the Contractor's option, the Contractor may use either the 12.5-mm maximum combined aggregate grading or the 9.5-mm maximum combined aggregate grading. The grading requirements for the 12.5-mm maximum coarse aggregate and the 9.5-mm maximum coarse aggregate are shown in the following table:

| Sieve Sizes | Percentage Passing Primary Aggregate Nominal Size | | | |
|---|---|---|---|---|
| | 12.5 mm x 4.75 mm | | 9.5 mm x 2.36 mm | |
| | Operating Range | Contract Compliance | Operating Range | Contract Compliance |
| 19 mm | 100 | 100 | | |
| 12.5 mm | 82 - 100 | 80 - 100 | 100 | |
| 9.5 mm | X ± 15 | X ± 22 | X ± 15 | X ± 20 |
| 4.75 mm | 0 - 15 | 0 - 18 | 0 - 25 | 0 - 28 |
| 2.36 mm | 0 - 6 | 0 - 7 | 0 - 6 | 0 - 7 |

In the table above, the symbol X is the gradation which the Contractor proposes to furnish for the 9.5-mm sieve size.

The gradation proposed by the Contractor for the 12.5-mm x 4.75-mm primary aggregate or for the 9.5-mm x 2.36-mm primary aggregate shall be within the following percentage passing limits:

| Primary Aggregate Nominal Size | Sieve Sizes | Limits of Proposed Gradation |
|---|---|---|
| 12.5 mm x 4.75 mm | 9.5 mm | 40 - 78 |
| 9.5 mm x 2.36 mm | 9.5 mm | 50 - 85 |

The combined aggregate grading for the 12.5-mm x 4.75-mm primary aggregate nominal size or for the 9.5-mm x 2.36-mm primary aggregate nominal size shall be within the following limits:

| Grading Limits of Combined Aggregate | | |
|---|---|---|
| Sieve Sizes | Percentage Passing | |
| | 12.5-mm Max. | 9.5-mm Max. |
| 19 mm | 100 | 100 |
| 12.5 mm | 90 - 100 | 90 - 100 |
| 9.5 mm | 55 - 86 | 55 - 86 |
| 4.75 mm | 45 - 63 | 45 - 63 |
| 2.36 mm | 35 - 49 | 35 - 49 |
| 1.18 mm | 25 - 37 | 25 - 37 |
| 600 µm | 15 - 25 | 15 - 25 |
| 300 µm | 5 - 15 | 5 - 15 |
| 150 µm | 1 - 8 | 1 - 8 |
| 75 µm | 0 - 4 | 0 - 4 |

**Construction**

The Contractor shall submit to the Engineer for approval, a cleanout method for open ended cast-in-steel-shell concrete piling. Care shall be taken during cleaning out of open ended steel shells to prevent disturbing the foundation material surrounding the pile. The bottom 5 meters of the pile shall not be cleaned out. Equipment or methods used for cleaning out steel shells shall not cause quick soil conditions or cause scouring or caving around or below the piles. Open ended steel shells shall be free of any soil, rock or other material deleterious to the bond between concrete and steel prior to placing reinforcement and concrete.

After the steel shells have been cleaned out, the pile shall be constructed expeditiously in order to prevent deterioration of the surrounding foundation material from the presence of water. Deteriorated foundation materials, including materials that have softened, swollen or degraded, shall be removed from the bottom of the steel shells and shall be disposed of.

Material resulting from cleaning out the steel shells 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, unless otherwise

specified or permitted by the Engineer. Attention is directed to “Contaminated and Hazardous Materials” elsewhere in these special provisions.

Reinforcement shall be placed and secured symmetrically about the axis of the pile and shall be securely blocked to clear the sides of the steel shell.

If conditions render it impossible or inadvisable in the opinion of the Engineer to dewater the open ended cast-in-steel-shell concrete piling prior to placing reinforcement and concrete, then the bottom of the shell shall be sealed in conformance with the provisions in Section 51-1.10, "Concrete Deposited Under Water," of the Standard Specifications. The sealed shell shall then be dewatered and cleaned out as specified herein.

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.

**JETTING AND DRILLING**

Jetting or drilling to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications shall not be used for driven type piles.

**PREDRILLED HOLES**

Piles shall be driven in oversized drilled holes in conformance with the provisions in Section 49-1.06, "Predrilled Holes," of the Standard Specifications at the locations and to the corresponding bottom of hole elevations listed in the following table:

| Bridge Name or Number | Abutment Number | Bent Number | Elevation of Bottom of Hole |
|---|---|---|---|
| 28-0369S | 12 | | 12 m |
| 28-0368K | 9 | | 12 m |

**LOAD TEST PILES**

The Contractor shall notify the Engineer, in writing, not less than 10 days in advance of drilling or driving the piles to be load tested.

The pile load test shall be performed on the steel shell after cleanout and prior to placement of reinforcement and concrete therein.

Before the remaining piles at the control locations listed in the following table are drilled, cast, cut to length or driven, load testing of each load test pile shown on the plans for the corresponding control location shall be completed:

| Bridge | Load Test Pile Location | Control Locations |
|---|---|---|
| 28-0367L | Bent 4 | Bent 2, 3 and 4 |
| 28-0367L | Bent 5 | Bent 5 |
| 28-0367L | Bent 6 | Bent 6 |
| 28-0368K | Bent 3 | Bent 3 |
| 28-0368K | Bent 2 | Bent 2, 4 and 5 |
| 28-0369S | Bent 2 | Bents 2, 3 and 4 |
| 28-0369S<br>28-0368K | Bent 10 | Bents 9, 10 and 11<br>Bents 6, 7 and 8 |
| 28-0370K | Bent 4 | Bents 3, 4 and 5 |

The bottom of footing excavation shall be dewatered and made level before pile load testing. The excavation shall be kept dewatered during load testing.

Unless otherwise specified or shown on the plans, steel plates welded to the load test and anchor piling shall conform to the requirements in ASTM Designation: A 709/A 709M, Grade 50, and shall be welded to the piling in conformance with the requirements in AWS D1.1.

Pipe, couplings and fittings shall be commercially available materials of the types and ratings shown on the plans.

Extensometer conduit shall be installed on straight alignment and at the location shown on the plans. The conduit shall be blocked and tied to the reinforcement to prevent displacement of the conduit while placing pile concrete. The spacing of conduit blocking and ties shall not exceed 2 m.

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” of the Standard Specifications and the remaining holes shall be backfilled with earth or other suitable material approved by the Engineer.

**DYNAMIC MONITORING**

Driven test piles, anchor piles and the first pile installed at the locations shown in the table below will be monitored during the final 8 m of driving for dynamic response to the driving equipment. Monitoring will be done by State forces using State-furnished dynamic pile analyzer monitoring instruments.

| Bridge | Location of piles to be dynamically monitored (does not include test and anchor pile locations) |
|---|---|
| 28-0370K | Bents 2 and 3 |

The Engineer will determine which piles will receive dynamic monitoring from each control location. Piles to be dynamically monitored shall be made available to State forces 2 working days prior to driving. The piles shall be safely supported a minimum of 150 mm off the ground in a horizontal position on at least 2 support blocks. The pile shall be positioned so that State forces have safe access to the entire pile length and circumference for the installation of anchorages and control marks for monitoring. The Contractor shall rotate the piles on the blocks as directed by the Engineer.

Piles to be dynamically monitored shall be prepared and driven in the following sequence:

A. Prior to driving, the Contractor shall rotate and align the pile in the driving leads as directed by the Engineer
B. The Contractor shall temporarily suspend driving operations for approximately 15 minutes when the pile tip is 8 m above the elevation to which the tip is required to be finally driven.
C. During the 15 minute suspension, the Contractor shall bolt the 0.5-kg instrument package securely to plugs or expansion anchors previously installed in the pile by the State. The Contractor shall connect electrical cables to the instrument package as directed by the Engineer.
D. Driving operations shall resume as directed by the Engineer. Driving operations shall be suspended approximately 0.5-m above the required tip elevation, as directed by the Engineer.
E. The Contractor shall remove the cables and instrument package from the pile and deliver them to the Engineer.
F. The following work day, the Contractor shall install the instrument package on the pile and attach the cables and resume driving the pile to the required tip elevation, as directed by the Engineer.
G. The Contractor shall remove the cables and instruments from the monitored pile and deliver them to the Engineer.

The Contractor shall be responsible for damage to the State's cables and instruments caused by the Contractor's operations, and shall replace damaged cables or instruments in kind.

**WAVE EQUATION**

The second paragraph of Section 49-1.03, "Determination of Length," and paragraphs 3 and 4 of Section 49-1.08, "Bearing Value and Penetration," of the Standard Specifications shall not apply to the pile types at the control locations listed herein. The Engineer will conduct a penetration and bearing analysis in conjunction with pile load testing and dynamic monitoring of the piles at these locations and develop bearing acceptance criteria curves for these piles. Penetration and bearing analyses will be based on a wave equation analysis.

The Engineer shall be allowed 28 working days to perform the load test, complete dynamic monitoring, revise specified tip elevations, and to provide the bearing acceptance criteria curves for a given control location. Day one of 28 shall be the first day after the load test and anchor piles have been installed at that same control location.

Should the Engineer fail to provide the bearing acceptance criteria curves for production piles 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 providing the bearing acceptance criteria curves, 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 piles, other than load test and anchor piles, shall not be installed until the bearing acceptance criteria curves for piles within the corresponding control location have been provided by the Engineer.

**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.

Within a support location, no pile shall be constructed immediately adjacent to recently constructed piles until the adjacent piles have cured for a minimum of 48 hours.

**Materials**

Cast-in-drilled-hole concrete piles 600 mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

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 cement per cubic meter.

For cast-in-drilled-hole concrete piling, the following gradation is added to the table in the third paragraph in Section 90-3.01, "General," of the Standard Specifications:

| Primary Aggregate Nominal Size | Sieve Sizes | Limits of Proposed Gradation |
|---|---|---|
| 12.5 mm x 4.75 mm | 9.5 mm | 40 - 78 |
| 9.5 mm x 2.36 mm | 9.5 mm | 50 - 85 |

At the Contractor's option, the Contractor may use either the 12.5-mm maximum combined aggregate grading or the 9.5-mm maximum combined aggregate grading. For cast-in-drilled-hole concrete piling, the following table is added to the first paragraph in Section 90-3.02, "Coarse Aggregate Grading," of the Standard Specifications:

| Sieve Sizes | Percentage Passing Primary Aggregate Nominal Sizes | | | |
|---|---|---|---|---|
| | 12.5 mm x 4.75 mm | | 9.5 mm x 2.36 mm | |
| | Operating Range | Contract Compliance | Operating Range | Contract Compliance |
| 19 mm | 100 | 100 | | |
| 12.5 mm | 82 - 100 | 80 - 100 | 100 | |
| 9.5 mm | X ± 15 | X ± 22 | X ± 15 | X ± 20 |
| 4.75 mm | 0 - 15 | 0 - 18 | 0 - 25 | 0 - 28 |
| 2.36 mm | 0 - 6 | 0 - 7 | 0 - 6 | 0 - 7 |

For cast-in-drilled-hole concrete piling, the following grading limits of combined aggregates for the 12.5-mm x 4.75-mm primary aggregate nominal size or for the 9.5-mm x 2.36-mm primary aggregate nominal are added to the table in Section 90-3.04, "Combined Aggregate Gradings," of the Standard Specifications:

| Grading Limits of Combined Aggregate | | |
|---|---|---|
| Sieve Sizes | Percentage Passing | |
| | 12.5-mm Max. | 9.5-mm Max. |
| 19 mm | 100 | 100 |
| 12.5 mm | 90 - 100 | 100 |
| 9.5 mm | 55 - 86 | 50 - 100 |
| 4.75 mm | 45 - 63 | 45 - 63 |
| 2.36 mm | 35 - 49 | 35 - 49 |
| 1.18 mm | 25 - 37 | 25 - 37 |
| 600 µm | 15 - 25 | 15 - 25 |
| 300 µm | 5 - 15 | 5 - 15 |
| 150 µm | 1 - 8 | 1 - 8 |
| 75 µm | 0 - 4 | 0 - 4 |

**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 description, 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 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.

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. Removal and disposal of excavation, slurry, and contaminated concrete, including methods and rates of removal.
6. Slurry agitating, recirculating, and cleaning methods and equipment.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before 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 concrete in the piles. Concrete 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. Depositing of test batch concrete under slurry will not be required. The test batch shall demonstrate that the proposed concrete mix design achieves both the specified nominal penetration and a penetration of at least 50 mm after twice the time required for each concrete placing operation at each pile, as submitted in the placing plan, has elapsed. The time period shall begin at the start of placement. The concrete shall not be vibrated or agitated during the test period. 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.

Concrete deposited under slurry shall not be vibrated until all temporary casing is removed and concrete contaminated with soil, slurry, or other materials is removed. Concrete deposited under slurry shall be vibrated in the upper 2 m of the pile.

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. 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 water tight 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 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, the slurry level shall be maintained within 300 mm of the top of the drilled hole.

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.

A log of the placing of the concrete in 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 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. Attention is directed to “Contaminated and Hazardous Materials” elsewhere in these special provisions.

Any pile which has been increased in diameter as provided above will be paid for at the contract price per meter for the size of cast-in-drilled-hole concrete piling shown on the plans at that location.

**Inspection Pipes for Acceptance Testing**

Vertical inspection pipes 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 the groundwater.

Inspection pipes shall be Schedule 40 polyvinyl chloride pipe 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.

If the Contractor drills the hole below the specified tip elevation, the reinforcement and the inspection pipes shall be extended to 75 mm clear of the bottom of the drilled hole.

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, no more than 150 mm inside the reinforcement, and 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 said piling, the Contractor shall allow 20 working days for the Engineer to conduct these tests if the 48.3-mm diameter cylinder passed all inspection pipes, and 28 working days if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete such 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 Contractors 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 pile does not require mitigation due to structural, geotechnical, or corrosion concerns, the Contractor may elect to not repair anomalies found during acceptance testing of that pile. For the unrepaired pile, no payment will be made for the length of pile affected by the anomaly, as determined by the Engineer.

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 21 working days 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 shall 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.

**SLURRY**

Slurry shall be commercial quality synthetic drilling slurry and shall conform to the requirements of these special provisions. Mineral slurry shall not be used.

Slurry shall be premixed prior to placement in the cast-in-drilled-hole concrete piling.

Water used for mixing slurry shall conform to the provisions in Section 90-2.03, "Water," of the Standard Specifications and these special provisions. Water mixed with salt shall be used for mixing slurry. Salt content shall be 6 percent minimum. Seawater mixed with salt so that salt content is 6 percent minimum may be used for mixing slurry when approved by the Engineer. Slurry mixing sequence shall conform to the requirements of these special provisions, and the recommendations of the slurry manufacturer.

Slurry shall not weaken the bond between the concrete and both the reinforcement and the foundation material at the sides of the excavation.

The Contractor shall sample and test all slurry in the presence of the Engineer, unless otherwise directed. The date, time, names of the persons sampling and testing the slurry, and results of the tests shall be recorded and shall be approved by the Engineer before concrete is placed. A copy of slurry test results shall be delivered to the Engineer at the completion of each pile.

**Synthetic**

Synthetic slurries shall be used and mixed in conformance with the manufacturer’s recommendations and these special provisions. The following synthetic slurries may be used:

| PRODUCT | MANUFACTURER |
|---|---|
| SlurryPro CDP | KB Technologies Ltd.<br>Suite 216<br>735 Broad Street<br>Chattanooga, TN 37402<br>(800) 525-5237 |
| Super Mud | PDS Company<br>c/o Champion Equipment Company<br>8140 East Rosecrans Ave.<br>Paramount, CA 90723<br>(800) 782-3222 |
| 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.

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 with steel reinforcement in place and just prior to placing concrete.

SlurryPro CDP synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| SLURRYPRO CDP<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>38 to 127<br><br>less than or equal to 74 | Marsh Funnel and Cup<br>API 13B-1<br>Section 2.2 |
| pH | 10 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 |
| *Salt content shall be a minimum of 6 percent by weight, and the allowable densities shall be increased by a minimum of 65 $kg/m^3$.<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 |
| *Salt content shall be a minimum of 6 percent by weight, and the allowable densities shall be increased by a minimum of 65 $kg/m^3$.<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 |
| *Salt content shall be a minimum of 6 percent by weight, and the allowable densities shall be increased by a minimum of 65 $kg/m^3$.<br>Slurry temperature shall be at least 4 degrees Celsius when tested. | | |

The viscosity of slurry shall be maintained during drilling, and during final cleaning. Any fresh slurry to be added to the slurry in the cast-in-drilled-hole concrete pile shall have a salt content of 6 percent minimum.

Slurry viscosity and salt content shall be regularly monitored and as determined necessary by the Engineer. Dissolved salt probes may be used. The accuracy of said probes shall be tested to ensure that slurry mixed with drill cuttings will not give erroneous results.

## 10-1.56 STEEL SOLDIER PILING

This work at Retaining Wall (R1), Retaining Wall (R3) and Retaining Wall (R4) shall consist of furnishing and installing steel piling; cleaning and preparing portions of the pile for splicing; splicing steel piles; securing the piling prior to and during concrete encasement; shaping the tops of the piles; cleaning and preparing portions of the pile for welding concrete anchors; and furnishing, cleaning and welding concrete anchors to piling in accordance with the details shown on the plans, and these special provisions.

### Materials

Concrete anchors shall conform to the provisions for stud connectors in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

Stud connectors shall be Type B as defined in AWS D1.5, Section 7.

### Construction

Steel soldier piles shall be placed in a drilled hole and shall be plumbed and aligned before placing concrete backfill and lean concrete backfill. Alignment shall be maintained while placing backfill material in the drilled holes.

Cleaning and preparing the pile shall be performed in heat affected areas before splicing steel piles or welding stud type shear connectors.

**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.

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

- Timber, steel, and precast prestressed concrete piles, and cast-in-place concrete piles consisting of driven shells filled with concrete, will be paid for at the contract price per meter for furnish piling and the contract unit price for drive pile.

Payment for cast-in-place concrete piling shall conform to the provisions in Section 49-6.02, "Payment," of the Standard Specifications 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 furnishing and placing additional testing reinforcement, load test anchorages, and for cutting off test piles as specified, 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.

The seventh paragraph of 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 bearing and penetration as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

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 sizes listed in the Engineer's Estimate, and no additional compensation will be allowed therefor.

Full compensation for cleaning out the open ended steel shells prior to installing reinforcement and filling with concrete, for disposing of materials removed from the inside of the pile, and for placing seal course concrete and dewatering the open ended steel shells, as shown on the plans, as specified in these special provisions, and as directed by the Engineer, shall be considered as included in the contract unit price paid for drive pile, and no additional compensation will be allowed therefor.

Full compensation for conforming to the provisions in "Steel Pipe Piling" except "Nondestructive Testing" of these special provisions 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.

Full compensation for redriving monitored piles, for providing access for the Engineer, for dewatering during monitoring, and for installing and removing the instruments from the pile, shall be considered as included in the contract unit price paid for drive pile, and no separate payment will be made therefor. The length of piling to be paid for as furnish piling of the classes listed in the Engineer's Estimate shall include the lengths that monitored piles are redriven.

Full compensation for removal of anchor piles that are not incorporated in the completed structure and for backfilling hole shall be considered as included in the contract unit price paid for drive pile, and no additional compensation will be allowed therefor.

The contract price paid per meter for furnish steel pile at Retaining Wall (R1), Retaining Wall (R3) and Retaining Wall (R4) of the type shown in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the steel piles at the site to the required penetration, including securing the piling to maintain accurate alignment prior to and during encasing the pile with concrete, shaping pile tops, cutting holes for pile anchors, cleaning and preparing heat affected areas of piles for splicing and welding concrete anchors to the piles, splicing steel piles, furnishing pile anchors, and furnishing, cleaning, and welding concrete anchors and stay plates to the piles as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.57 DRILLED HOLES

Holes for steel soldier piles shall be drilled into natural foundation materials at the location shown on the plans and shall conform to the provisions in Section 49, "Piling," of the Standard Specifications and these special provisions.

Foundation recommendations are included in the "Materials Information" 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.

Drilled holes shall be accurately located and shall be straight and true. When the piles are plumbed and aligned, the steel piles shall be at least 25 mm clear of the sides of the hole for the full length of the hole to be filled with concrete backfill and lean concrete backfill. Holes which do not provide the clearance around steel piles shall be reamed or enlarged at the Contractor's expense.

Temporary casings or tremie seals shall be furnished and placed where necessary to control water or to prevent caving of the hole.

Difficult pile installation is anticipated due to the presence of soft to stiff clays overlying weathered bedrock, hard rock, hazardous and contaminated materials, high ground water, cobbles and boulders, subsurface concrete debris, abandoned underground and overhead utilities, low overhead clearance, underground utilities, and overhead utilities.

Attention is directed to rock subsurface foundation material at the soldier pile retaining wall site. Conventional drilling equipment for drilling in soils may not be suitable for drilling piling for the soldier pile retaining wall.

Loose materials existing at the bottom of the hole after drilling operations have been completed shall be removed before placing the pile.

Materials resulting from drilling holes shall be disposed of in conformance with the provisions in Section 19-2.06, "Surplus Material," of the Standard Specifications.

Drilling mud or chemical stabilizers shall not be used. Surface water shall not be permitted to enter the hole and all water in the hole shall be removed before placing concrete therein.

Casing, if used in drilling operations, shall be removed from the hole as concrete is placed therein. The bottom of the casing shall be maintained not more than 1500 mm nor less than 300 mm below the top of the concrete during casing withdrawal and concrete placing operations. Separation of the concrete during withdrawal operations shall be avoided by hammering or otherwise vibrating the casing. The methods used to withdraw temporary casings shall preclude contamination of the concrete and commingling of the soil and concrete or of any ground water and concrete.

The contract price paid per meter for drilled hole of the diameter shown on the plans shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in drilling holes for soldier piles, including disposing of the material resulting from drilled holes, dewatering, casing holes and removing casing, and providing tremie seals, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.58 PRESTRESSING CONCRETE

Prestressing concrete shall conform to the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

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

- Prestressing steel for post-tensioning which is installed in members prior to placing and curing of the concrete, shall be continuously protected against rust or other 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 in Section 50-1.05, "Prestressing Steel," of the Standard Specifications.

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

- Working force and working stress will be considered as the force and stress remaining in the prestressing steel after all losses, including creep and shrinkage of concrete, elastic compression of concrete, creep of steel, losses in post-tensioned prestressing steel due to sequence of stressing, friction and take up of anchorages, and all other losses peculiar to the method or system of prestressing have taken place or have been provided for.

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.

**10-1.59 TIEBACK ANCHORS**

Anchors at Retaining Wall (R1) and Retaining Wall (R3), consisting of holes drilled in foundation material, grouted 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, hazardous and contaminated materials, high ground water, cobbles and boulders, subsurface concrete debris, low overhead clearance, underground utilities, overhead utilities, and the requirements of tieback embedment into rock.

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.

The Contractor may submit, for approval by the Engineer and in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, calculations and details for furnishing an alternative number of tiebacks that provides the same horizontal component and distribution of the design force as provided by the planned tiebacks. Alternative wall details shall be furnished, for approval by the Engineer, if the number of tiebacks is reduced. Alternative design calculations and details shall be signed by an engineer who is licensed as a Civil Engineer in the State of California.

**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, support plate and the anchorage enclosure. The anchorage assembly and the anchorage enclosure shall be galvanized as indicated on the plans. The support plate shall be cleaned and painted in accordance with the provisions in “Clean and Paint Steel Soldier Piling” of these special provisions. 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.

Cleaning and painting structural steel for tieback retaining walls shall conform to the provisions in "Clean and Paint Steel Soldier Piling" of these special provisions.

The permanent bearing plate of the tieback anchor shall effectively distribute the design force (T), such that 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.

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 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.
B. 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.
C. 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 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 a temporary waler which bears against existing soil or soldier piles. Temporary walers shall remain the property of the Contractor. 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 20 tiebacks at Retaining Wall R1 and 8 tiebacks at Retaining Wall R3 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 0.75T. The lock-off force is the load on the jacks which is maintained while the anchor head or anchor nuts on the tieback 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.

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.

The tieback anchor head or anchor nuts shall be enclosed with a grouted anchorage enclosure device. After grouting the steel tube, the bearing plate surface shall be cleaned, silicon sealant placed, and the anchorage enclosure bolted in place. After bolting the anchorage enclosure in place the void in the anchorage enclosure shall be filled with grout by injecting grout at the low end of the void and venting at the high end. Any holes in the top of the anchorage enclosure used for grout placement shall be cleaned and sealed with silicon sealant.

**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. No change in the number of tieback anchors to be paid for will be made because of the use by the Contractor of an alternative number of tiebacks.

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, furnishing and installing anchorage assemblies, and cleaning and painting support plate, 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.

## 10-1.60 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

**GENERAL**

Cementitious material used in reinforced concrete in contact with soil or water shall consist of 75% by weight Type II modified cement and 25% by weight mineral admixture. Mineral admixture shall conform to ASTM Designation: C618 Type F or N. The maximum water to cementitious material ratio shall not exceed 0.40. These requirements shall apply to footings, walls, columns and cast-in-drilled-hole concrete piles without permanent steel casing.

Concrete for concrete gutter shall conform to the provisions in Section 90-10, “Minor Concrete” of the Standard Specifications.

At the Contractor’s option, for Retaining Wall (R3), the alternative lagging and facing details shown on the plans may be used in lieu of the timber lagging and facing details shown on the plans. No change to contract items or quantities will be made because of the use by the Contractor of the alternative lagging and facing details.

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 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 at abutment backwall and deck joint protection in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

Furnishing and installing neoprene strip shall conform to the requirements for strip waterstops as provided in Section 51-1.145, "Strip Waterstops," of the Standard Specifications, except that the protective board will not be required.

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.

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.

The first paragraph of Section 51-1.20, "Sidewalks, Curbs and Stairways on Structures," of the Standard Specifications is amended to read:

- The concrete shall be finished in conformance with the provisions for finishing surfaces in Section 73-1.06, "Sidewalk, Gutter Depression, Island Paving, Curb Ramp (Wheelchair Ramp), and Driveway Construction," except that surfaces shall not be marked.

For Bridge No 23-0015R, each deck concrete pour shall extend from bent to bent and, except at stage construction at spans A11E through A13E, the pour shall extend for the full width of the structure.

Concrete spillage on the steel structure and concrete pier bents shall be removed at the Contractor's expense. Damage to the existing paint system caused by spillage removal shall be repaired as approved by the Engineer at the Contractor's expense.

**PRESSURE GROUTING**

Pressure grouting of structural tubing and of concrete blockout for structural tubing shall conform to the following:

Grout shall conform to the requirements of either ASTM Designation: C 1107, Grade B, or ASTM Designation: C 845, Type K, and shall provide a minimum compressive strength of 34.5 MPa at 28 days when tested by California Test 551. The grout shall be mixed in accordance with the manufacturer's recommendations. Water shall conform to the provisions for water for prestressed concrete work in Section 90-2.03, "Water," of the Standard Specifications.

Admixtures shall not contain more than 500 parts per million of chlorides as Cl, when tested by California Test 422, and shall not contain more than 2500 parts per million of sulfates as $SO_4$, when tested by California Test 417.

The ends of the tubing shall be sealed. A vent tube shall be placed at one end and one injection feed tube at the other end. The tubes shall be placed in the hole in a manner which will allow the air to vent and the annular space to be completely filled with grout. Sufficient pressure shall be achieved to ensure that the annular space is free of voids. Grout shall be pumped into the annular space and continually wasted until no visible slugs or other visible evidence of water or air are ejected. The concrete blockout shall be pressure grouted in a similar manner.

Grout or water shall not be permitted to flow into any waterway, on to public traffic, across shoulders or lanes occupied by public traffic, or into gutters or other drainage facilities.

**LIGHTWEIGHT CONCRETE**

Lightweight concrete shall be composed of portland cement, lightweight coarse and fine aggregates, admixtures if used, and water, proportioned and mixed as specified in these special provisions.

Portions of concrete for Bridge No. 23-0015R shall be lightweight concrete, as shown on the plans.

The fine aggregate portion of the lightweight concrete mix shall consist of lightweight fine aggregate, natural sand or manufactured sand fine aggregate, or a combination thereof, as required to comply with the air-dry unit mass requirements of these special provisions.

Lightweight concrete shall have not less than the 28-day compressive strength shown on the plans. Compressive strength shall be determined from test cylinders sampled, molded, cured, and tested in conformance with the provisions in Section 90-9, "Compressive Strength," of the Standard Specifications.

Prequalification by the submission of certified test data or trial batch test reports in conformance with the provisions in Section 90-9, "Compressive Strength," of the Standard Specifications will be required for lightweight concrete.

The prequalification data or reports required herein and the proposed mix design, based on the recommendations of the lightweight aggregate manufacturer, shall be furnished to the Engineer, in writing, not less than 42 days in advance of placing lightweight concrete. The mix design shall list the type, brand, mass, and absolute volume of each ingredient for each type and strength of concrete proposed for use. The mass for each aggregate shall be reported in a surface dry condition, including moisture absorbed in the aggregate, or oven-dry condition, or for the condition proposed for use, and shall be adjusted at the time of batching to compensate for surface moisture and for absorbed moisture. The batching equipment shall be subject to approval by the Engineer. The mix design shall be accompanied by written verification that arrangements have been made for the Engineer to obtain samples as required for testing purposes. Samples of lightweight aggregates will not exceed 230 kg for each separate grading.

The absolute volume of coarse aggregate shall be limited to that volume which permits the mixing, transporting, placing, consolidating, and finishing of the concrete without segregation. For site-cast concrete, the absolute volume of coarse aggregate shall not exceed 0.37-cubic meter per cubic meter of concrete.

The air-dry unit mass of lightweight concrete furnished for each mix design used shall be a single mass, selected by the Contractor, within the limits of 1750 kg to 1840 kg per cubic meter for concrete which is to be prestressed, and within the limits of 1670 kg to 1760 kg per cubic meter for non-prestressed concrete. The Contractor shall furnish certified copies of the manufacturer's test reports showing the fresh concrete unit mass that is anticipated to result in the air-dry unit mass selected by the Contractor. The unit mass of fresh concrete produced for use in the work shall not vary from the mass shown in the test report by more than 65 kg per cubic meter. The unit mass of fresh concrete shall be determined in conformance with the requirements in California Test 518. The air-dry unit mass shall be determined in conformance with the requirements in ASTM Designation: C 567, except that the drying time shall be 90 days.

Lightweight aggregates shall conform to the requirements in ASTM Designation: C 330, and the following requirements:

A. Lightweight aggregates shall be rotary kiln expanded shale or clay having a surface sealed by firing. The coarse aggregate shall not be crushed after firing except that aggregate that is 19 mm in size and smaller may be crushed to the extent necessary to produce the required coarse aggregate grading. The final coarse aggregate size shall not exceed 19 mm.
B. The splitting tensile strength and the drying shrinkage requirements of ASTM Designation: C 330 shall not apply.
C. The shrinkage characteristics of lightweight aggregates shall be such that the drying shrinkage of lightweight concrete produced therefrom, when tested in conformance with the requirements in California Test 537, shall be not more than 0.040-percent after 14 days of drying.
D. Lightweight aggregates shall have not more than 5 percent loss when tested for soundness in conformance with the requirements in California Test 214.
E. Natural sand and manufactured sand fine aggregates, portland cement, water, and admixtures shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications.

Proportioning of lightweight concrete shall conform to the provisions in Section 90-5, "Proportioning," of the Standard Specifications and to these special provisions.

Lightweight concrete shall have good workability and other properties such that proper placement, consolidation, and finishing are obtained.

The aggregates shall be uniformly pre-wetted or presaturated in such a manner that uniform penetration of the concrete will be maintained. Presaturation by thermal, vacuum, or equivalent methods will be required for lightweight aggregate in concrete which is to be pumped.

Portland cement, aggregates, water, and admixtures shall be proportioned to produce lightweight concrete containing not less than 350 kg nor more than 500 kg of cement per cubic meter, except that concrete used in roadway deck slabs and slab spans for highway bridges shall contain not less than 400 kg per cubic meter. Penetration of lightweight concrete produced for use in the work shall conform to the provisions in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications. The use of admixtures shall conform to the provisions in Section 90-4, "Admixtures," of the Standard Specifications, except that the Contractor may provide for a total air content of freshly mixed concrete of not more than 6 percent. The proportions shall be such that the concrete will conform to the strength shown on the plans or specified in these special provisions.

Penetration measurements will be made by a lightweight ball penetrator in conformance with the requirements in California Test 533.

The air content of the freshly mixed lightweight concrete will be determined in conformance with the requirements in ASTM Designation: C173.

Lightweight fine aggregate and natural sand shall be batched by mass. Lightweight coarse aggregate shall be batched either by mass or by volumetric methods. If volumetric methods are used, the batching equipment shall include provisions whereby the Engineer may check the mass of each size of aggregate in the batch.

When lightweight concrete is to be finished in conformance with the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications, the mix shall be designed to result in the required deck finish.

After acceptance by the Engineer, materials and batch proportions shall not be altered during the work, except as necessary to maintain the approved cement factor and unit mass. The cement content of individual batches for use in the work shall be not more than 9 kg per cubic meter less than, nor more than 15 kg per cubic meter greater than the approved cement factor.

Mixing and transporting lightweight concrete shall conform to the provisions in Section 90-6, "Mixing and Transporting," of the Standard Specifications.

Lightweight concrete shall be placed, finished, cured, and protected in conformance with the provisions in Section 51, "Concrete Structures," and Section 90, "Portland Cement Concrete," of the Standard Specifications.

Each trial batch 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. The quantities of trial batch lightweight concrete 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 for the item of lightweight concrete involved, and no additional compensation will be allowed therefor.

Lightweight concrete will be measured and paid for in conformance with the provisions in Section 90-11, "Measurement and Payment," of the Standard Specifications.

Unless otherwise paid for, standard weight concrete for Bridge No. 23-0015R will be paid for as lightweight concrete (bridge).

**FALSEWORK**

Falsework shall be designed and constructed in conformance with the requirements in Section 51-1.06, "Falsework," of the Standard Specifications and these special provisions.

At locations where the height of any portion of the falsework, as measured from the ground line to the soffit of the superstructure, exceeds 30 meters, the assumed horizontal load to be resisted by the falsework bracing system shall be no less than 5 percent of the total dead load.

Attention is directed to "Railroad Relations and Insurance" of these special provisions for additional requirements for falsework over railroads.

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

**51-1.06A Falsework Design and Drawings**

- 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.
- Attention is directed to Section 5-1.02, "Plans and Working Drawings."
- For falsework over railroads, approval by the Engineer of the falsework drawings will be contingent upon the drawings being satisfactory to the railroad company involved.
- Except for placement of foundation pads and piles, the construction of any unit of falsework shall not start until the Engineer has reviewed and approved the drawings for that unit.
- Except as otherwise provided in the special provisions, the Contractor shall allow 3 weeks after complete drawings and all support data are submitted, for the review of any falsework plan.
- 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, or a single frame of a multi-frame bridge.
- 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 falsework plan review, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays."
- The Contractor may revise approved falsework drawings provided sufficient time is allowed for the Engineer's review and approval before construction is started on the revised portions. The additional time will not be more than that which was originally allowed.
- 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.
- The falsework drawings shall include a superstructure placing diagram showing the concrete placing sequence and construction joint locations. When a schedule for placing concrete is shown on the contract plans, no deviation will be permitted.
- The maximum length of falsework spans used to support T-beam girder bridges shall not exceed 4.3 m plus 8.5 times the depth of the T-beam girder.
- 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 falsework on the falsework drawings.
- When pile type foundations are to be used, the falsework drawings shall show the maximum horizontal distance that the top of a falsework pile may be pulled in order to position the falsework pile under its cap. The falsework plans 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.

- 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.
- Anticipated total settlements of falsework and forms shall be shown on the falsework drawings. These should include falsework footing settlement and joint take-up. Anticipated settlements shall not exceed 25 mm. Falsework supporting deck slabs and overhangs on girder bridges shall be designed so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.
- Falsework footings shall be designed to carry the load imposed upon the footings without exceeding the estimated soil bearing values and anticipated settlements.
- Foundations for individual steel towers where the maximum leg load exceeds 130 kN shall be designed and constructed to provide uniform settlement under all legs of each tower under all loading conditions.
- The support systems for form panels supporting concrete deck slabs and overhangs on girder bridges shall also be considered to be falsework and designed as such.
- Temporary bracing shall be provided, as necessary, to withstand all imposed loads during erection, construction, and removal of any falsework. The falsework drawings shall show provisions for the temporary bracing, or methods to be used to conform to this requirement during each phase of erection and removal. Wind loads shall be included in the design of the bracing or methods.
- The falsework design calculations shall show the stresses and deflections in load supporting members.
- The design of falsework will not be approved unless it is based on the use of loads and conditions which are no less severe than those described in Section 51-1.06A(1), "Design Loads," and based on the use of stresses and deflections which are no greater than those described in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections." The Contractor is responsible for the proper evaluation of the falsework materials and design of the falsework to safely carry the actual loads imposed.

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

**51-1.06A(1) Design Loads**

- 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.
- Dead loads shall include the loads due to the mass of concrete, reinforcing steel, forms, and falsework. The loads due to the mass of concrete, reinforcing steel, and forms shall be assumed to be not less than 25 $kN/m^3$ for normal concrete and not less than 20 $kN/m^3$ for lightweight concrete.
- Live loads shall consist of the actual load of any equipment to be supported by falsework applied as concentrated loads at the points of contact, and a uniform load of not less than 960 $N/m^2$ applied over the area supported, plus 1100 N/m applied at the outside edge of deck overhangs.
- The assumed horizontal load to be resisted by the falsework bracing system 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 2 percent of the total dead load. The falsework shall be designed so that it will have sufficient rigidity to resist the assumed horizontal load without considering the load due to the concrete.
- The minimum horizontal load to be allowed for wind on heavy-duty steel shoring or steel pipe column falsework having a vertical load carrying capacity exceeding 130 kN per leg or column shall be the sum of the products of the wind impact area, shape factor, and applicable wind pressure value for each height zone. The wind impact area is the total projected area of all the elements in the tower face or falsework bent normal to the direction of the applied wind. The shape factor shall be taken as 2.2 for heavy-duty shoring and 1.0 for pipe column falsework. Wind pressure values shall be determined from the following table:

| Height Zone (Meters above ground) | Wind Pressure Value (Pa) | |
|---|---|---|
| | Shores or Columns Adjacent to Traffic | At Other Locations |
| 0-9 | 960 | 720 |
| 9-15 | 1200 | 960 |
| 15-30 | 1440 | 1200 |
| over 30 | 1675 | 1440 |

• The minimum horizontal load to be allowed for wind on all other types of falsework, including falsework supported on heavy-duty shoring or pipe column falsework, shall be the sum of the products of the wind impact area and applicable wind pressure value for each height zone. The wind impact area is the gross projected area of the falsework and any unrestrained portion of the permanent structure, excluding the areas between falsework bents or towers where diagonal bracing is not used. Wind pressure values shall be determined from the following table:

| Height Zone (Meters above ground) | Wind Pressure Value (Pa) | |
|---|---|---|
| | For Members Over and Bents Adjacent to Traffic Opening | At Other Locations |
| 0 to 9 | 2.0 Q | 1.5 Q |
| 9 to 15 | 2.5 Q | 2.0 Q |
| 15 to 30 | 3.0 Q | 2.5 Q |
| Over 30 | 3.5 Q | 3.0 Q |

Q = 48 + 31.4 W; but shall not be more than 479 Pa.
W = width of the falsework system, in meters, measured in the direction of the wind force being considered.

• The entire superstructure cross-section, except railing, shall be considered to be placed at one time except as provided herein. Girder stems and connected bottom slabs, if placed more than 5 days prior to the top slab, may be considered to be self supporting between falsework posts at the time the top slab is placed provided that the distance between falsework posts does not exceed 4 times the depth of the portion of the girder placed in the first pour.

• 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.

• If the concrete is to be prestressed, the falsework shall be designed to support any increased or readjusted loads caused by the prestressing forces.

Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications is amended to read:

**51-1.06A(2) Design Stresses, Loadings, and Deflections**

• The maximum allowable design stresses and loadings listed in this Section 51-1.06A(2), are based on the use of undamaged, high-quality materials, and such stresses and loadings shall be reduced by the Contractor if lesser quality materials are to be used.

• The maximum allowable stresses, loadings, and deflections used in the design of the falsework shall be as follows:

**Timber:**

| | |
|---|---|
| Compression perpendicular to the grain | 3.1 MPa |
| Compression parallel to the grain | $3310 \div (L/d)^2$ MPa; not to exceed 11 MPa |
| Flexural stress | 12.4 MPa; 10.3 MPa for members with a nominal depth of 205 mm or less |
| Horizontal shear | 1.0 MPa |
| Axial tension | 8.3 MPa |
| Deflection due to concrete loading only | 0.0042 of the span, irrespective of deflection compensated for by camber strips |
| Modulus of elasticity (E) | $11 \times 10^3$ MPa |
| Timber piles | 400 kN |

L = unsupported length (mm).
d = least dimension of a square or rectangular column, or the width of a square of equivalent cross-sectional area for round columns (mm).

• Timber connections shall be designed in conformance with the procedures, stresses, and loads permitted in the Falsework Manual as published by the Department of Transportation.

**Steel:**

- For identified grades of steel, design stresses, except stresses due to flexural compression, shall not exceed those specified in the Manual of Steel Construction as published by the AISC.
- When the grade of steel cannot be positively identified, design stresses, except stresses due to flexural compression, shall not exceed either those specified in the AISC Manual for ASTM Designation: A 36/A 36M steel or the following:

| | |
|---|---|
| Tension, axial and flexural | 152 MPa |
| Compression, axial | 110 300-2.62$(L/r)^2$ kPa; except L/r shall not exceed 120 |
| Shear on gross section of web of rolled shapes | 100 MPa |
| Web crippling for rolled shapes | 186 MPa |

- For all grades of steel, design stresses and deflections shall not exceed the following:

| | |
|---|---|
| Compression, flexural | $\frac{83\,000}{Ld/bt}$ MPa, but not to exceed 152 MPa for unidentified steel or steel conforming to the requirements in ASTM Designation: A 36/A 36M nor $0.6F_y$ for other identified steel |
| Deflection due to concrete loading only | 0.0042 of the span, irrespective of deflection compensated for by camber strips |

- In the foregoing formulas, L is the unsupported length; d is the least dimension of rectangular columns, or the width of a square of equivalent cross-sectional area for round columns, or the depth of beams; b is the width and t is the thickness of the compression flange; and r is the radius of gyration of the member. All dimensions are expressed in millimeters. $F_y$ is the specified minimum yield stress, in MPa, for the grade of steel used.
- The modulus of elasticity (E) used for steel shall be 20.7 x $10^4$ MPa.

**Manufactured Assemblies:**

- The maximum loadings and deflections used on jacks, brackets, columns, joists, and other manufactured devices shall not exceed the manufacturer's recommendations except that the dead load deflection of the joists used at locations other than under deck slabs between girders shall not exceed 0.0042 of their spans. If requested by the Engineer, the Contractor shall furnish engineering data from the manufacturer verifying the manufacturer's recommendations, or shall perform tests as necessary to demonstrate the adequacy of the devices proposed for use.

**Welding and Nondestructive Testing**

Welding of steel members, 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.

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 and previously 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. The 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.

Section 51-1.06A(3), "Special Locations," of the Standard Specifications is amended to read:

**51-1.06A(3) Special Locations**

• In addition to the minimum requirements specified in this Section 51-1.06A, falsework over or adjacent to roadways or railroads which are open to traffic shall be designed and constructed so that the falsework will be stable if subjected to impact by vehicles. Falsework posts which support members that cross over a roadway or railroad shall be considered as adjacent to roadways or railroads. Other falsework posts shall be considered as adjacent to roadways or railroads only if they are located in the row of falsework posts nearest to the roadway or railroad, and the horizontal distance from the traffic side of the falsework to the edge of pavement, or to a point 3 m from the centerline of track, is less than the total height of the falsework and forms. The Contractor shall provide any additional features for the work needed to ensure that falsework will be stable if subjected to impact by vehicles and to comply with the provisions in Section 7-1.09, "Public Safety." The falsework design at these locations shall include, but not be limited to, the following minimum provisions:

The vertical load used for the design of falsework posts and towers, but not footings, which support the portion of the falsework over openings, shall be the greater of the following:

(1) 150 percent of the design load calculated in conformance with the provisions for design load previously specified but not including any increased or readjusted loads caused by the prestressing forces, or
(2) the increased or readjusted loads caused by the prestressing forces.

Falsework posts adjacent to roadways or railroads shall consist of either steel with a minimum section modulus about each axis of $156 \times 10^3$ $mm^3$, or sound timbers with a minimum section modulus about each axis of $4.1 \times 10^6$ $mm^3$.

Each falsework post adjacent to roadways or railroads shall be mechanically connected to its supporting footing at its base, or otherwise laterally restrained, so as to withstand a force of not less than 9 kN applied at the base of the post in any direction except toward the roadway or railroad track. The posts also shall be mechanically connected to the falsework cap or stringer. The mechanical connection shall be capable of resisting a load in any horizontal direction of not less than 4.5 kN.

For falsework spans over roadways, all exterior falsework stringers, and stringers adjacent to the ends of discontinuous caps, the stringer or stringers over points of minimum vertical clearance and every fifth remaining stringer, shall be mechanically connected to the falsework cap or framing. The mechanical connections shall be capable of resisting a load in any direction, including uplift on the stringer, of not less than 2.2 kN. The connections shall be installed before traffic is allowed to pass beneath the span. For falsework spans over railroads, all falsework stringers shall be so connected to caps.

When timber members are used to brace falsework bents which are located adjacent to roadways or railroads, all connections for the timber bracing shall be of the bolted type using 16-mm diameter or larger bolts.

The falsework shall be located so that falsework footings or piles are at least 75 mm clear of railing posts and barriers, and all other falsework members are at least 0.3-m clear of railing members and barriers.

Falsework bents within 6 m of the center line of a railroad track shall be sheathed solid in the area between 1 m and 5 m above the track elevation on the side facing the track. Sheathing shall consist of plywood not less than 16-mm thick or lumber not less than 19-mm thick. Bracing on these bents shall be adequate so that the bent will resist the required assumed horizontal load or 22 kN, whichever is greater.

The dimensions of the clear openings to be provided through falsework for roadways shall be as specified in "Maintaining Traffic," of the special provisions.

The dimensions of clear openings to be provided through the falsework for railroads shall be as specified in "Railroad Relations and Insurance," of the special provisions.

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

**51-1.06B Falsework Construction**

• The falsework shall be constructed to substantially conform to the falsework drawings. The materials used in the falsework construction shall be of the quality necessary to sustain the stresses required by the falsework design. When manufactured assemblies are used in falsework, the Contractor shall furnish to the Engineer a letter of certification which certifies that all components of these manufactured assemblies are used in conformance with the manufacturer's recommendations. The workmanship used in falsework construction shall be of such quality that the

falsework will support the loads imposed on the falsework without excessive settlement or take-up beyond that shown on the falsework drawings.

- Falsework shall be founded on a solid footing safe against undermining, protected from softening, and capable of supporting the loads imposed on the falsework. When requested by the Engineer, the Contractor shall demonstrate by suitable load tests that the soil bearing values assumed for the design of the falsework do not exceed the supporting capacity of the soil.
- When falsework is supported on piles, the piles shall be driven and the actual bearing value assessed in conformance with the provisions in Section 49, "Piling."
- For falsework piles with a calculated loading capacity greater than 900 kN, the Contractor shall conduct dynamic monitoring of pile driving and conduct penetration and bearing analyses 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.
- When falsework is over or adjacent to roadways or railroads, all details of the falsework system which contribute to horizontal stability and resistance to impact, except for bolts in bracing, shall be installed at the time each element of the falsework is erected and shall remain in place until the falsework is removed.
- Prior to the placement of falsework members above the stringers, the final bracing system for the falsework shall be installed.
- Temporary railing (Type K), conforming to the provisions in Section 12-3, "Traffic-Handling Equipment and Devices," shall be installed on both sides of all vehicular openings through falsework and, when ordered by the Engineer, at all other falsework less than 3.6 m from the edge of a traffic lane. Temporary railings shall begin approximately 46 m in advance of the falsework and shall extend past the falsework, in the direction of adjacent traffic flow. For 2-way traffic openings, the temporary railing shall extend at least 18 m past the falsework, in the direction of adjacent traffic flow. The location and length of railing and the type of flare to be used shall be as ordered by the Engineer. The clear vehicular opening between temporary railings shall be not less than that specified in the special provisions.
- The installation of temporary railing shall be complete before falsework erection is begun. Temporary railing at falsework shall not be removed until the removal is approved by the Engineer.
- Temporary railing (Type K) installed as specified above will be measured and paid for as provided in Section 12-4, "Measurement and Payment," except that when the Engineer's Estimate does not include a contract item for temporary railing (Type K), full compensation for furnishing, placing, maintaining, repairing, replacing, and removing the temporary railing at falsework locations as specified in this Section 51-1.06B, shall be considered as included in the contract prices paid for the various items of work requiring falsework, and no separate payment will be made therefor.
- Camber strips shall be used where directed by the Engineer to compensate for falsework deflection, vertical alignment, and anticipated structure deflection. The Engineer will furnish to the Contractor the amount of camber to be used in constructing the falsework.
- The Contractor shall provide tell-tales attached to the soffit forms and readable from the ground in enough systematically placed locations to determine the total settlement of the entire portion of the structure where concrete is being placed.
- Deck slab forms between girders shall be constructed with no allowance for settlement relative to the girders.
- Dead loads, other than those due to forms and reinforcing steel, shall not be applied to any falsework until authorized by the Engineer.
- Should unanticipated events occur, including settlements that deviate by more than ±10 mm from those indicated on the falsework drawings, which in the opinion of the Engineer would prevent obtaining a structure conforming to the requirements of these specifications, the placing of concrete shall be discontinued until corrective measures satisfactory to the Engineer are provided. In the event satisfactory measures are not provided prior to initial set of the concrete in the affected area, the placing of concrete shall be discontinued at a location determined by the Engineer. All unacceptable concrete shall be removed.

Section 51-1.06C, "Removing Falsework," of the Standard Specifications is amended to read:

**51-1.06C Removing Falsework**

- Falsework supporting any span of a simple span bridge shall not be released before 10 days after the last concrete, excluding concrete above the bridge deck, has been placed. Unless otherwise permitted by the Engineer, falsework supporting any span of a continuous or rigid frame bridge shall not be released before 10 days after the last concrete, excluding concrete above the bridge deck, has been placed in that span and in the adjacent portions of each adjoining span for a length equal to at least one-half the length of the span where falsework is to be released.
- Falsework for cast-in-place prestressed portions of structures shall not be released until after the prestressing steel has been tensioned.

- Falsework supporting any span of a continuous or rigid frame bridge shall not be removed until all required prestressing has been completed in that span and in the adjacent portions of each adjoining span for a length equal to at least one-half the length of the span where falsework is to be released.
- Falsework for arch bridges shall be removed uniformly and gradually, beginning at the crown and working toward the springing, to permit the arch to take its load slowly and evenly. Falsework for adjacent arch spans shall be struck simultaneously.
- Falsework supporting overhangs, deck slabs between girders, and girder stems which slope 45 degrees or more off vertical shall not be released before 7 days after the deck concrete has been placed.
- Falsework supporting the sides of the girder stems which slope less than 45 degrees off vertical may be removed prior to placing deck slab concrete, providing a reshoring system is installed. The reshoring system shall consist of lateral supports which are designed to resist all rotational forces acting on the stem, including those caused by the placement of deck slab concrete. The lateral supports shall be installed immediately after each form panel is removed and prior to the release of supports for the adjacent form panel.
- Falsework for bent caps which will support steel or precast concrete girders shall not be released before 7 days after the cap concrete has been placed. Girders shall not be erected onto the bent caps until the concrete in the cap has attained a compressive strength of 18 MPa or 80 percent of the specified strength, whichever is higher.
- Unless otherwise specified, removing falsework supporting any span of structural members subject to bending, shall conform to the requirements for removing falsework supporting any span of a simple span bridge.
- In addition to the above requirements, no falsework for bridge spans shall be released until the supported concrete has attained a compressive strength of 18 MPa or 80 percent of the specified strength, whichever is higher.
- Falsework for box culverts and other structures with decks lower than the roadway pavement and with span lengths of 4.25 m or less shall not be released until the last placed concrete has attained a compressive strength of 11 MPa, provided that curing of the concrete is not interrupted. Falsework removal for other box culverts shall conform to the requirements for release of bridge falsework.
- Falsework for arch culverts shall not be released before 40 hours after the supported concrete has been placed.
- 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.
- All falsework materials shall be completely removed. Falsework piling shall be removed at least 0.6-m below the surface of the original ground or original streambed. When falsework piling is driven within the limits of ditch or channel excavation areas, the falsework piling within those areas shall be removed to at least 0.6-m below the bottom and side slopes of the excavated areas.
- All debris and refuse resulting from the work shall be removed and the premises left in a neat and presentable condition.

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 |
|---|---|
| Crockett Viaduct (Span 6) | 10 |
| Crockett Viaduct (Span 7) | 12 |
| Crockett Viaduct (All other spans) | 5 |
| Crockett Off-Ramp Westbound | 5 |
| Crockett Off-Ramp Eastbound | 5 |
| Crockett On-Ramp Westbound | 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.

**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.

**PERMANENT STEEL DECK FORMS**

Forms for the deck slabs between girders shall be constructed and left in place at those locations shown on the plans in conformance with these special provisions.

Permanent steel deck forms and supports shall be steel conforming to the requirements in ASTM Designation: A653/A653M (Designation SS, Grades 33 through 80) having a coating designation G165. The forms shall be mortar-tight, true to line and grade, and of sufficient strength to support the loads applied.

Detailed working drawings for forms shall be submitted to the Engineer for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Three sets of drawings shall be submitted. These drawings shall show the grade of steel, the physical and section properties for all deck members, the method of support and grade adjustment, accommodation for skew, and methods of sealing against grout leaks.

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. Such time shall be proportional to the complexity of the work but in no case shall such time be less than 3 weeks after complete drawings and all support data are submitted.

The design of permanent steel deck forms shall be based on the combined dead load of the forms, reinforcement, and plastic concrete plus an allowance for all anticipated construction loads. The allowance for construction loads shall be not less than 2400 Pa. The combined dead load shall be assumed to be not less than 2560 kg/m$^3$ for normal concrete and not less than 2080 kg/m$^3$ for lightweight concrete.

Physical design properties shall be computed in conformance with the requirements of the AISI specification for the "Design of Cold Formed Steel Structural Members."

The maximum allowable stresses and deflections used in the design of steel forms shall be as follows:

A. Tensile stress shall not exceed 0.725 of the specified yield strength of the material furnished or 250 MPa.
B. Deflection due to dead load shall not exceed 0.0056 of form span or 13 mm, whichever is less. In no case shall the dead load for deflection calculations be less than 5750 Pa total.
C. Form camber, used at the option of the Contractor, shall be based on the actual dead load condition. Camber shall not be used to compensate for deflection in excess of the allowable limits.
D. The design span of the form sheets shall be the clear span of the form plus 50 mm measured parallel to the form flutes.

Permanent steel deck forms shall not be used for those sections of deck slabs that contain a longitudinal expansion joint unless additional supports are placed under the joint.

Permanent steel deck forms shall not be welded to the flanges of girders.

Permanent steel deck forms shall not interfere with the movement at deck expansion joints.

The clearance between the surface of permanent forms and any bar reinforcement shall be not less than 25 mm. The configuration of the forms shall be such that the mass of deck slab is not more than 110 percent of the mass of the total deck slab as dimensioned on the plans.

Permanent steel deck forms shall be installed in conformance with the approved working drawings.

Form sheets shall not rest directly on the top of the girder flanges. Sheets shall be securely fastened to form supports and shall have a minimum bearing length of 25 mm at each end. Form supports shall be placed in direct contact with the flange of the girder. Attachment of supports shall be made by bolts, clips or other approved means.

Transverse deck construction joints shall be located at the bottom of a flute and 6-mm weep holes shall be field drilled at not less than 300 mm on center along the line of the joint.

Permanently exposed galvanized form surfaces that are abraded or damaged prior to installation shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with 2 applications of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," of the Standard Specifications. Aerosol cans shall not be used. Minor heat discoloration in area of welds need not be repaired.

**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.

**ELASTOMERIC BEARING PADS**

Elastomeric bearing pads shall conform to the provisions in Section 51-1.12H, "Elastomeric Bearing Pads," of the Standard Specifications and these special provisions.

**10-1.61 PTFE BEARING**

PTFE bearings, consisting of steel reinforced elastomeric bearing pads, polytetrafluoroethylene (PTFE) surfacing, and stainless and steel plates, 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.

The Contractor shall submit to the Office of Structures Design, (OSD) for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," working drawings of the PTFE bearings. For initial review, 4 sets of such 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 for use during construction.

Working drawings shall be 279 mm x 432 mm or 559 mm x 864 mm in size and each drawing and calculation sheet shall include the job site 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. Such time shall be proportional to the complexity of the work but in no case shall such time be less than 6 weeks after complete drawings and all support data are submitted. The location of match marks on plate edges shall be shown on the working drawings.

At the completion of each structure on the contract, one set of 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.

The manufacturer shall furnish certificates of compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the PTFE bearings.

The shear modulus of the elastomer in the elastomeric bearing pads shall be 760±76 kPa.

PTFE sheet shall be made from unfilled PTFE resin and shall conform to the following requirements:

| Test | Test Method | Requirements |
|---|---|---|
| Tensile strength (Minimum) | ASTM D 1457 | 19.3 MPa |
| Elongation (Minimum) | ASTM D 1457 | 200 % |

The PTFE resin shall be virgin material (not reprocessed) meeting the requirements of ASTM Designation: D 1457. Specific gravity shall be from 2.13 to 2.19. Melting point shall be 327±10°C.

The PTFE sliding surface shall be provided with lubricant dimples with a maximum diameter of 8 mm, a minimum depth of 2 mm and a maximum depth of one half of the PTFE sheet thickness. The dimples shall be uniformly distributed within the area 6 mm from the edges of the PTFE sheet and occupy between 20 percent and 30 percent of the PTFE sheet area.

Stainless steel plates shall conform to the requirements of ASTM Designation: A 240, Type 304.

Steel plates, except stainless steel, shall conform to the requirements of ASTM Designation: A 36/A 36M.

Welding of structural steel shall conform to the requirements of AWS D1.1.

The PTFE sheet shall be adhesive bonded in the recess of steel plate under controlled factory conditions. The adhesive material shall be an epoxy resin conforming to the requirements of Federal Specification: MMM-A-134.

Contact surfaces of PTFE sheet and steel plate to be bonded shall be uniformly roughened to a minimum roughness height value of 6.3 µm.

The side of the PTFE sheet to be bonded shall be factory treated by the sodium naphthalene or sodium ammonia process, after the contact surface is roughened.

After completion of the bonding operation the PTFE surface shall be smooth and free from bubbles. The PTFE sheet shall show no signs of delamination and shall be fully bonded in the recess.

The stainless steel plate shall be bonded to the steel sole plate under pressure using epoxy resin adhesive and then mechanically connected with 18-8 stainless steel cap screws. At the Contractor's option, the stainless steel plate may be perimeter welded to the sole plate. Stainless steel electrodes shall be used in accordance with the requirements of the electrode manufacturer.

After completion of the mechanical connection or weld operation, the stainless steel plate shall be smooth and free from waves.

The flatness of the bearing elements shall be controlled such that upon completion of the bearing assembly the PTFE/stainless steel sliding interface shall be in full bearing.

The mating surface of the stainless steel plate with the PTFE surfacing shall have a surface finish of less than 0.25 µm root-mean-square (rms), determined according to ANSI Standard B46.1. The sliding element of the production bearings shall have a first movement static coefficient of friction not exceeding 0.06 when tested without the coating of silicone grease.

Steel reinforced elastomeric bearing pads shall be fully vulcanized to the steel plates under factory controlled conditions and the bond shall have a peel-strength of at least 5.3 Newtons per millimeter as determined by California Test 663.

Metal surfaces of bearings exposed to the atmosphere in 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.

Conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors" (SSPC-QP 1); Qualification Procedure No. 2, "Standard Procedure For Evaluating The Qualifications of Painting Contractors To Remove Hazardous Paint" (SSPC-QP 2); and Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Contractors" (SSPC-QP 3) of the Steel Structures Painting Council (SSPC): The Society for Protective Coatings, will not be required for PTFE bearings.

Finish coats will not be required on the bearings.

After installation the top of the assembly shall be removed and a 1.5 mm thick coating of silicone grease shall be applied to the entire PTFE surface and the bearing reassembled without damage to the mating sliding surfaces. Silicone grease shall conform to the requirements in Military Specification: MIL-S-8660.

Damaged bearings and bearings with scratched mating surfaces shall be returned to the factory for replacement or resurfacing.

Prior to proof testing, all individual components shall be permanently die-stamped on 2 of 4 sides with markings consisting of bearing number and contract number. Each bearing shall have a unique bearing number and match marks on plate edges to insure correct assembly at the job site.

Full sized PTFE bearings shall be proof tested and evaluated for compression and coefficient of initial static friction in the presence of the Engineer, unless otherwise directed. 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 are not performed at the specified load, the Contractor shall perform additional physical tests in the presence of the Engineer, unless otherwise directed, to demonstrate that the requirements for proof testing at the specified load are satisfied. The Contractor shall give the Engineer at least 7 days notice before beginning proof testing. Proof testing of PTFE bearings shall conform to the following requirements:

A. One bearing per lot of production PTFE bearings shall be proof tested. A lot is defined as 25 PTFE bearings or fraction thereof of the number of PTFE bearings shown on the contract plans.
B. Proof tests for compression: The bearing shall be held for one hour at 1.5 times the maximum vertical load shown on the plans for the bearing.
C. Proof tests for coefficient of friction: The tests shall be performed at the minimum dead load shown on the plans for the bearing with the test load applied for 12 hours 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 millimeter 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 millimeter per minute. After cycling, the first movement static and dynamic coefficients of friction shall be measured again at a sliding speed not exceeding 25 millimeter per minute and shall not exceed the specified coefficient of initial static friction.

D. The bearing surfaces shall be cleaned prior to testing.
E. Proof testing of bearings shall be done after conditioning specimens for 12 hours at 24°±3°C.
F. 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.
G. Proof test results shall be certified correct and signed by the testing laboratory personnel who conducted the test and interpreted the test results. Proof test results shall include the bearing numbers of the bearings tested.

One sample of elastomeric bearing, 57±3 mm high and not less than 200 mm x 300 mm in plan, shall be cut by the manufacturer from one of the thickest production elastomeric bearings, as directed by the Engineer, and furnished to the Transportation Laboratory. The Contractor shall allow 3 weeks for testing and obtaining satisfactory results after sample bearing has been received.

A test specimen taken from the sample furnished to the Transportation Laboratory will be tested in conformance with the requirements in California Test 663 for 10,000 cycles at the design load and 1/2 T (T = total thickness of elastomer) translation. The testing speed shall not exceed 115 millimeters per minute. Specimens tested shall show no indication of deterioration of elastomer or loss of bond between the elastomer and steel laminates.

PTFE bearing sole plates shall be temporarily supported during concrete placement. Temporary supports shall prevent the rotation or displacement of the bearings during concrete placing operations. Temporary supports shall not inhibit the functioning of the PTFE bearings after concrete is placed. Temporary supports shall not restrict the movement at bridge joints due to temperature changes and shortening from prestress forces. Materials for temporary supports within the limits for placing concrete shall conform to the requirements for form fasteners.

PTFE and stainless steel surfaces shall be protected from contamination and weather damage.

Quantities of PTFE bearings will be determined as units from actual count in the completed work. A PTFE bearing with more than one disc shall be considered a single PTFE bearing.

The contract unit price paid for PTFE bearing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the bearing, complete in place, including temporary supports, proof testing, and cleaning and painting of PTFE bearings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for the sample of elastomeric bearing shall be considered as included in the contract unit price paid for PTFE bearing and no separate payment will be made therefor.

If a portion or all of PTFE bearings are either fabricated or tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Payment to the Contractor for PTFE bearings will be reduced $5,000 for any fabrication or testing site located more than 480 air line kilometers from both Sacramento and Los Angeles, or in the case where a fabrication or testing site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced $15,000.

**10-1.62 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 to the Office of Structure Design (OSD) for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," working drawings of the PTFE spherical bearings. For initial review, 4 sets of such 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 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 and details of temporary support 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. Such time shall be proportional to the complexity of the work but in no case shall such time be less than 6 weeks 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 1457.

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 1.5 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.

Structural 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 shall conform to the requirements of ANSI/AASHTO/AWS D1.5.

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 stainless steel with the PTFE surfacing shall have a polished surface finish of less than 0.5 µm root-mean-square (rms), determined in conformance with the requirements in ANSI Standard B46.1.

Metal surfaces of bearings exposed to the atmosphere in 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.

Conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors" (SSPC-QP 1); Qualification Procedure No. 2, "Standard Procedure For Evaluating The Qualifications of Painting Contractors To Remove Hazardous Paint" (SSPC-QP 2); and Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Contractors" (SSPC-QP 3) of the Steel Structures Painting Council (SSPC): The Society for Protective Coatings, will not be required for 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 replaced or resurfaced.

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, unless otherwise directed. 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 are not performed at the specified load, the Contractor shall perform additional physical tests in the presence of the Engineer, unless otherwise directed, to 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.
B. The bearing types and proof tests required for each type 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 maximum 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 millimeter 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 millimeter per minute. After cycling, the first movement static and dynamic coefficients of friction shall be measured again at a sliding speed not exceeding 25 millimeter 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. Payment to the Contractor for furnishing PTFE spherical bearings will be reduced $5,000 for any fabrication and testing site located more than 480 air line kilometers from both Sacramento and Los Angeles, or in the case where a fabrication or testing site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced $15,000.

**10-1.63 CLOSURE WALLS**

Concrete closure walls used to curtain off open areas at bridges 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.

The closure walls shall be constructed in conformance with either Alternative 1, 2 or 3 as shown on the plans, at the option of the Contractor.

For prestressed concrete closure wall panels, the provisions in Section 5-1.02, “Drawings,” of the Standard Specifications shall not apply. The Contractor shall submit 2 sets of working drawings for the prestressed concrete panels to the Engineer for use in administering the contract. The drawings shall show the panel dimensions, materials, prestressing methods, tendon arrangement and working stresses, including any addition or rearrangement of reinforcing steel from that shown on the plans. Prestressing steel shall be placed not more than 150 mm from the edges of the panel and spaced at not more than 450-mm on center between the edge tendons.

Anchorage details consisting of bars and bolts shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. The bolt holes shall conform to the provisions in Section 55-3.14A, "Bolt Holes," of the Standard Specifications, except that the holes shall not be punched to full size and the finished hole sizes shall be as shown on the plans.

Precast panels shall have an exposed surface matching the adjacent cast-in-place concrete.

The quantity of concrete closure wall will be measured by the square meter on the outside surface of the completed panels.

The contract price paid per square meter for concrete closure wall shall include full compensation for furnishing all labor, materials (including reinforcement, prestressing steel, and anchorages), tools, equipment, and incidentals, and for doing all the work involved in constructing the closure wall, complete in place, including erecting precast panels, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.64 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 texture listed below is required at concrete surfaces shown on the plans:

A. Fractured rib 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.

### TEST PANEL

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural textures. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing the architectural texture. 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 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.

## TEMPORARY HINGE TIEDOWNS

Temporary hinge tiedowns, complete with anchorages, shall be installed and tensioned as shown on the plans within 10 days after completion of longitudinal post-tensioning and before releasing bridge falsework in the hinge span and adjoining span.

Working drawings and calculations for temporary hinge tiedowns shall be submitted in conformance with the provisions for working drawings for prestressing systems in Section 50-1.02, "Drawings," of the Standard Specifications. The working drawings and calculations shall be signed by a civil engineer registered in the State of California. Working drawings shall include details of the procedures and methods for the gradual tensioning and detensioning of the hinge tiedowns. The Contractor shall allow 3 weeks after complete drawings and all support data are submitted for the review of working drawings.

Hinge tiedowns and anchorages shall be made from materials that do not yield during an extended period of time under sustained loading. The hinge tiedowns shall provide for checking and simple adjustment of the force during their service life using commonly available equipment and tools. The hinge tiedowns shall provide for easy and gradual detensioning, simple removal and a minimal amount of repair to the bridge surfaces after removal. The tiedowns shall be cased for a height of 3 m above the ground surface with plastic pipe or steel pipe held in place with vandal resistant retaining devices. Anchorages shall be covered and protected from vandalism.

Metal exposed to the atmosphere shall be protected from corrosion at least equivalent to the protection afforded by cleaning and priming with inorganic zinc primer.

The hinge tiedowns shall not impair the structural integrity of the bridge or its foundation. The design of hinge tiedown anchorages shall include any strengthening of bridge components and foundation material necessary to support the hinge tiedown anchorages, including providing for the moments and loads induced into the substructure and foundations. Additional concrete, reinforcement and other materials necessary to accommodate the hinge tiedowns shall be provided. Such additions shall conform to the provisions for similar work in these special provisions and the Standard Specifications. Rearrangement of reinforcing steel, prestressing steel and other bridge materials necessary to accommodate the hinge tiedowns shall be shown on the working drawings.

Hinge tiedowns shall not be attached to the bridge columns unless otherwise shown on the plans.

Stressing of high-tensile wire, strand or bars shall conform to the provisions in Section 50-1.08, "Prestressing," of the Standard Specifications.

Hinge tiedowns shall be tensioned after prestressing the concrete and before releasing the falsework in the supporting hinge span and adjoining span. The tension force shall be as shown on the plans.

Unless otherwise shown on the plans, the tension force for the entire hinge shall be distributed to a minimum of 2 tiedowns with an approximately equal amount in each tiedown and shall be placed symmetrically about the centerline of the structure. No more than one-half of the tension force at a tiedown shall be applied before an equal force is applied at the adjacent tiedowns. At no time during the tensioning operations shall more than one-sixth of the tension force for the entire hinge be applied eccentrically about the centerline of the structure.

The hinge tiedowns shall remain fully tensioned while constructing the supported span in the adjoining frame.

All the concrete at the hinge, except concrete above the bridge deck, shall be in place for a period of at least 10 days before detensioning tiedowns that are to be removed on this project. The hinge tiedowns that are to be removed shall be gradually detensioned and removed before releasing superstructure falsework in the supported span.

Detensioning of each tiedown shall be in increments such that not more than one-half of the total tension force at the tiedown is released before releasing an equal force at the adjacent tiedowns. At no time during detensioning operations shall more than one-sixth of the tension force for the entire hinge be applied eccentrically about the centerline of the structure. Wires, strands, or bars shall be detensioned before cutting or removing them or their anchorages.

Blockouts and recesses remaining in the structure after removal of the tiedowns shall be filled with concrete and finished to match the surrounding surfaces. Embedded fasteners and metal parts shall be removed in conformance with the provisions for form bolts in Section 51-1.18A, "Ordinary Surface Finish," of the Standard Specifications. Buried portions of tiedowns and anchorages shall be removed to a depth of one meter below finished grade except that the limits for removal shall be as specified for embedded fasteners and metal parts when the tiedowns or anchorages are attached to bridge footings or other buried structures shown on the plans.

Full compensation for temporary hinge tiedowns, including furnishing, installing, maintaining and removing the tiedowns, and including additional concrete, reinforcement, earthwork, and any materials to be left in place 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.

## DRILL AND BOND DOWEL (EPOXY CARTRIDGE)

Drilling and bonding dowels with epoxy cartridges shall conform to the details shown on the plans and these special provisions.

Reinforcing steel dowels shall conform to the provisions in "Reinforcement" of these special provisions.

The Contractor shall select an epoxy cartridge system which has passed the testing requirements of the International Conference of Building Officials (ICBO) document - AC58 and additional test requirements as specified in the Caltrans Augmentation/Revisions to ICBO AC58. Testing shall be performed by an independent testing facility and the results will be reviewed and approved by the Transportation Laboratory. The Caltrans Augmentation/Revisions to ICBO AC58 document may be obtained by contacting the Transportation Laboratory, telephone: (916) 227-7000.

The epoxy cartridge system used shall be appropriate for the ambient concrete temperature and installation conditions at the time of installation in conformance with the manufacturer's specifications.

Epoxy cartridges shall be accompanied by a Certificate of Compliance as provided in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall state that the material complies in all respects to the requirements of ICBO AC58 and Caltrans Augmentation/Revisions to ICBO AC58.

Each epoxy cartridge shall be clearly and permanently marked with the manufacturer's name, model number of the epoxy cartridge system, manufacturing date, and lot number. Each carton of epoxy cartridges shall contain the manufacturer's recommended installation procedures, minimum cure time, and such warning or precautions concerning the contents as may be required by State or Federal Laws and Regulations.

The holes shall be drilled by methods that will not shatter or damage the concrete adjacent to the holes. If reinforcement is encountered during drilling, before the specified depth is attained, the Engineer shall be notified. Unless the Engineer approves, in writing, 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 recommended by the manufacturer.

The drilled holes shall be cleaned in conformance with the manufacturer's instructions and shall be dry at the time of placing the epoxy cartridge bonding material and the steel dowels. The bonding material shall be a 2-component epoxy system contained in a cartridge having 2 separate chambers and shall be inserted into the hole using a dispensing gun and replaceable mixing nozzle approved by the manufacturer. Unless otherwise specified, the depth of hole and the installation procedure shall be as recommended by the manufacturer. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 2 days prior to the start of work.

Immediately after inserting the dowels into the epoxy, the dowels shall be supported as necessary to prevent movement during curing and shall remain undisturbed until the epoxy has cured a minimum time as specified by the manufacturer. Dowels that are improperly bonded, as determined by the Engineer, will be rejected. Adjacent new holes shall be drilled, and new dowels shall be placed and securely bonded to the concrete. All work necessary to correct improperly bonded dowels shall be performed at the Contractor's expense.

Full compensation for drilling holes, including coring through reinforcement when approved by the Engineer, and bonding dowels with epoxy cartridges shall be considered as included in the contract price paid per kilogram for isolation casing and no additional compensation will be allowed therefor.

**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.

Concrete for concrete pedestal for pedestrian railing on bridges will be paid for as structural concrete, bridge.

Concrete for concrete collar around cast-in-steel-shell concrete piles will be paid for as structural concrete, bridge footing.

Full compensation for roughening 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 constructing permanent steel deck forms shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no additional compensation will be allowed therefor.

Full compensation for anchor bolts and concrete anchorages at sidewalk and for polyurethane joint seal including cleaning the joint at Bridge No. 23-0015R shall be considered as included in the contract price paid per cubic meter for lightweight concrete (bridge) and no additional compensation will be allowed therefor.

## 10-1.65 ARCHITECTURAL SURFACE TREATMENT

Shotcrete surfaces at Retaining Wall R4 designated on the plans to receive architectural surface treatment shall conform to the details shown on the plans, the provisions in Section 53, "Shotcrete," and Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

At least 30 days prior to beginning work on the architectural surface treatment, the Contractor shall provide a test panel to match the referee sample for this project. The referee sample is a recently constructed sculpted face shotcrete wall and is

located in Contra Costa County, in San Pablo, on the east side of Route 80 at the north end of the San Pablo Dam Road Eastbound On-Ramp.

The referee sample illustrates the desired sculpting detail, staining technique and finish coloring pattern.

The test panel submitted by the Contractor shall conform to the details shown on the plans and shall closely match the stone face texture and coloring pattern provided for in the referee sample. The advance submittal of this test panel will allow sufficient time for the Contractor to correct any differences between the test panel and referee samples. The Contractor shall submit one free standing test panel approximately 2 m x 2 m to be designated as the job specific test panel. The test panel shall be prepared and finished by the same contractor that will be sculpting and coloring the wall for the project. The shotcrete shall be placed in the test panel, sculpted, finished and colored until a final texture and color is produced that complies with the referee sample. The completed test panel following review and acceptance by the District Landscape Architect will be approved in writing by the Engineer and shall be supported in a vertical position and left at the construction site for viewing.

The layout of primary and secondary lines throughout the retaining wall shall be performed in two stages. The first stage shall consist of applying high visibility paint to the wall face to illustrate the line patterns as shown on the plans. The Contractor shall notify the Engineer 3 days in advance of the first stage of line layout in writing to coordinate review and approval of the layout in a timely manner. Once this has been accomplished, the Engineer and District Landscape Architect shall review the layout in the field for approval. If the first stage is approved, the second stage shall consist of installing primary and secondary line support (metal armatures, etc.) parallel to the high visibility lines. The layout of the primary and secondary lines shall be performed by the same persons who will sculpt the wall face.

The final textured surface shall be prepared for staining by removing all loose material, laitance, efflorescence, sheen, and other foreign materials. Areas to receive surface texture that do not exhibit the surface specified shall be replaced so as to exhibit the specified texture. The Engineer will determine acceptability.

The finished work shall be protected during the remainder of the construction process. Damaged areas shall be replaced.

Coloring shall conform to the provisions in "Shotcrete Staining" elsewhere in these specifications. Coloring shall be applied after pressure washing with water to remove laitence and provide a clean surface. Sandblasting will not be allowed. Color shall be obtained by applying a minimum of 2 multiple stain colors so that the sculpted face demonstrate individual color variations to match the referee sample. Application of the shotcrete stain base shall be by air or airless sprayer; highlight coloration shall be by staining or other suitable antiquating method.

The quantity of sculpted face texture will be measured by the square meter on the surface of the completed textured surface.

Sculpted face texture will be measured and paid for as Architectural Surface Treatment.

The contract price paid per square meter for architectural surface treatment shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in providing architectural surface treatment and shotcrete staining complete in place, including the test panel, line layout and all supporting metal bracing and support as shown on the plans, and as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

**10-1.66 SHOTCRETE STAINING**

Shotcrete staining shall consist of applying a minimum of two (2) separate applications of at least two (2) multiple stain colors to all sculpted face textured shotcrete surfaces (architectural surface treatment) such that the sculpted wall face demonstrates individual color variations and character to match that of the existing field conditions. Staining shall only be performed once the wall has been completely sculpted and shall not be performed as the wall is being constructed in sections. The test panel shall reflect the color variations and patterns of natural rock formations.

Staining shall be performed on all portions of the wall once it is completed. If the Contractor elects to stain the wall in sections, primary lines and wall perimeter shall define each staining section.

The stains shall consist of a base and accent stain material. The base stain shall be an organic based non toxic iron oxide derivative that provides a spectrum of earthtones. The first application shall consist of applying a 60% strength mixture throughout the wall. The second application shall consist of applying a 100% strength mixture on portions of the wall to create darker tones and for highlighting.

The accent stain shall be a Hydrochloric acid with Chromic, Cupric, Ferrous, Ferric and Manganese Chloride stain with Sodium Dichromate. The stain shall be applied in accordance with the printed instructions of the stain material manufacturer. Caution shall be exercised to provide all necessary protection to the body during application as recommended by the manufacturer. A copy of such printed material shall be furnished to the Engineer prior to application of the material. The stain material shall produce a spectrum of brown earth tone colors. Color hardeners shall be used to achieve a wider variety of earth tones. Colors shall be such that alteration of the color and further color development after initial application can be accomplished.

Before applying stain material to shotcrete surfaces, the stain shall be applied to a minimum of two (2) 2 m x 2 m test locations designated by the Engineer. The Contractor shall notify the Engineer not less than 5 working days prior to applying the stain material to the test area.

After the District Landscape Architect has reviewed and accepted the stain test results, the Engineer will approve the staining test locations in writing and the stain material shall be applied to finished shotcrete surfaces. The accent stain shall be used to provide further accent and highlighting of the wall to blend it into the adjacent surroundings. The test panel and final review by the Engineer and District Landscape Architect shall serve as the basis for staining acceptability.

Prior to applying the stain, all shotcrete surfaces shall be cleaned by high pressure washing with water.

## 10-1.67 STRUCTURE APPROACH SLABS (Type N)

This work shall consist of constructing reinforced concrete approach slabs, structure approach drainage system, and treated permeable base at structure approaches in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

### GENERAL

Attention is directed to the section "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.

#### Drainage Pads

Concrete for use in drainage pads shall be minor concrete, except the concrete shall contain not less than 300 kilograms of cement per cubic meter.

#### Treated Permeable Base At Bottom Of Geocomposite Drains

Treated permeable base to be placed around the slotted plastic pipe at the bottom of geocomposite drains shall conform to the provisions in "Treated Permeable Base Under Approach 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 stitches shall number 5 to 7 per 25 mm of seam.

Equipment or vehicles shall not be operated or driven directly on the filter fabric.

Woven tape fabric shall be treated to provide a minimum of 70 percent breaking strength retention after 500 hours exposure when tested in conformance with the requirements in ASTM Designation: D 4355. The Contractor shall notify the Engineer, in writing, of the source of woven tape fabric at least 45 days prior to use.

**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.

Not less than 30 days prior to the start of placing the treated permeable base, the Contractor shall notify the Engineer, in writing, 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 not less than 1.3 tonnes nor 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 not less than 1.3 tonnes nor 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 cement per cubic meter.

Miscellaneous steel parts and all 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.

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, "Portland 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 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 |

**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, drainage pads, treated permeable base, filter fabric, miscellaneous metal, pourable seals, shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab of the type shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

## 10-1.68 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.

At Bridge No. 23-0015R full compensation for drilling holes, including coring through reinforcement when approved by the Engineer, and bonding dowels shall be considered as included in the contract price paid per cubic meter for lightweight concrete, bridge, and no separate payment will be made therefor.

## 10-1.69 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 Section 59-2, "Painting Structural Steel," and Section 91, "Paint," of the Standard Specifications, and "Clean and Paint Structural Steel" of these special provisions.

Conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors" (SSPC-QP 1); Qualification Procedure No. 2, "Standard Procedure For Evaluating The Qualifications of Painting Contractors To Remove Hazardous Paint" (SSPC-QP 2); and Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Contractors" (SSPC-QP 3) of the Steel Structures Painting Council (SSPC): The Society for Protective Coatings, will not be required for 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 Office of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall show complete details of the joint seal assembly and anchorage components and the method of installation to be followed, including concrete blockout details and 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 OSD 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 OSD.

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 depth of the recess at abutments and at hinges shall be 250 mm. The maximum width of the recess on each side of the expansion joint shall be 300 mm.

N. All reinforcement other than the primary reinforcement shall continue through the recess construction joint into the recess and engage the anchorage components of the assembly.

O. Horizontal angle points and vertical corners at curbs in assemblies shall consist of either pre-molded sections or standard sections of the joint seal assembly that have been specially miter cut or bent to fit the structure.

P. The elastomer portion of the assembly shall be installed in conformance with the manufacturer's recommendations at such time and in such a manner that the elastomer portion will not be damaged by construction operations. The joint and blockout shall be cleaned of all dirt, debris and other foreign material immediately prior to the installation of the elastomer.

Full compensation for additional materials or work required because of the application of the optional cleaning and painting or the use of an alternative type joint seal assembly, shall be considered as included in the contract price paid per meter for the joint seal assembly involved and no additional compensation will be allowed therefor.

### 10-1.70 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 Office of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall show complete details of the joint seal assembly and anchorage components and the method of installation to be followed, including concrete blockout details and any additions or rearrangements of the reinforcing steel from that shown on the plans. For initial review, 5 sets of drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to OSD 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.

Conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors" (SSPC-QP 1); Qualification Procedure No. 2, "Standard Procedure For Evaluating The Qualifications of Painting Contractors To Remove Hazardous Paint" (SSPC-QP 2); and Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Contractors" (SSPC-QP 3) of the Steel Structures Painting Council (SSPC): The Society for Protective Coatings, will not be required for 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 depth of the recess at abutments and at hinges shall be 350 mm. The maximum width of recess on each side of the expansion joint shall be 600 mm.

All reinforcement other than primary reinforcement shall continue through the recess construction joint into the recess and engage the anchorage components of the assembly.

The vertical expansion joint in barrier shall be available for inspection after placement of the recess concrete around the anchorage components of the assembly.

The assembly shall make a watertight, continuous return 150 mm up into the barrier at the low side of the deck joint. Neoprene glands shall be continuous without field splices or joints, including the return up into 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.

**10-1.71 REINFORCEMENT**

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

Attention is directed to “Welded Headed Bar Reinforcement” of these special provisions.

Service splices shown on the plans shall conform to the requirements for butt welded splices and mechanical butt splices of Section 52, "Reinforcement," of the Standard Specifications. Lap splicing of these bars will not be allowed.

The third paragraph of 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," of the Standard Specifications 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 Bar Reinforcement," of the Standard Specifications. 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 of 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 of 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.

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.

**EPOXY-COATED PREFABRICATED REINFORCEMENT**

Bar reinforcement to be epoxy-coated shall conform to the ASTM Designation and grade required or permitted by Section 52-1.02A, "Bar Reinforcement," of the Standard Specifications, for the location or type of structure involved. The coated bar reinforcement shall conform to the requirements in ASTM Designation: A 934/A 934M except as provided herein.

Wire reinforcement to be epoxy-coated shall conform to the ASTM Designation and grade required or permitted by Section 52-1.02D, "Reinforcing Wire and Plain Bars," of the Standard Specifications, for the location or type of structure involved. The coated wire reinforcement shall conform to the requirements for Class A, Type 2 coating of ASTM Designation: A 884/A 884M except as provided herein.

Appendices X1 and X2, "Guidelines For Job-Site Practices," of ASTM Designation: A 884/A 884M and A 934/A 934M, respectively, shall apply except as provided herein. The term "shall" shall replace the term "should" in these appendices. Section X1.2 of Appendix X1 and Section X2.2 of Appendix X2 shall not apply.

All coatings shall be purple or gray in color.

Except for field welding of butt splices, all welding of reinforcement shall be complete prior to epoxy coating the reinforcement.

Prior to epoxy coating, all resistance butt welds shall have the weld flash removed to produce a smooth profile free of any sharp edges that would prevent proper coating of the bar. The flash shall be removed such that the ultimate tensile strength and elongation properties of the bar are not reduced, and the outside radius of the flash, at any point along the circumference of the bar, is 1) not less than the nominal radius of the bar, nor 2) greater than 5 mm beyond the nominal radius of the bar.

A proposed weld flash removal process shall be submitted to and approved by the Engineer in writing, prior to performing any removal work. The submittal shall demonstrate that the proposed flash removal process produces a smooth profile that can be successfully epoxy-coated in conformance with the requirements specified herein.

Bending of epoxy-coated reinforcement after the coating has been applied will not be allowed.

When any portion of a reinforcing bar or wire requires epoxy coating, the entire bar or wire shall be coated, except, when the bar or wire is spliced outside of the limits of epoxy coating shown on the plans, epoxy coating will not be required on the portion of bar or wire beyond the splice.

Within areas where epoxy-coated reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be plastic-coated or epoxy-coated to prevent corrosion of the devices or damage to the coated reinforcement.

Prior to coating, the Contractor shall furnish to the Transportation Laboratory a representative 110 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.

Two 700-mm long samples of coated bar or wire reinforcement from each size and from each load shipped to the jobsite shall be furnished to the Engineer for testing. These samples shall be representative of the material furnished. These samples, as well as any additional random samples taken by the Engineer, may be tested for specification compliance. Additional sampling, and all tests performed by the Engineer, may be performed at any location deemed appropriate by the Engineer. Failure of any sample to meet the requirements of the specifications will be cause for rejection.

If any bar tested for coating thickness or for adhesion of coating fails to meet the requirements for coated bars in Section 9 of ASTM Designation: A 934/A 934M, 2 retests on random samples taken from bars represented by the failed test will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated bars represented by the samples may be certified as meeting the test requirements.

If any wire reinforcement tested for coating thickness or for flexibility fails to meet the requirements for coated wire in Section 8 of ASTM Designation: A 884/A 884M, 2 retests on random samples taken from wire represented by the failed test will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated wire represented by the samples may be certified as meeting the test requirements.

Epoxy-coated reinforcement shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the reinforcement from exposure to sunlight, salt spray, and weather. For stacked bundles, 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 reinforcement to prevent condensation under the covering. Epoxy-coated reinforcement shall not be stored within 300 m of ocean or tidal water for more than 2 months.

All visible damage to coatings caused by shipping, handling, or installation shall be repaired as required for repairing coating damaged prior to shipment conforming to the requirements in ASTM Designation: A 934/A 934M for bar reinforcement or ASTM Designation: A 884/A 884M for wire reinforcement. When the extent of coating damage prior to repair exceeds 2 percent of the bar or wire surface area in any 300-mm length, repair of the bar or wire will not be allowed, and the coated bar or wire will be rejected.

The patching material and process shall be suitable for field application. The patching material shall be prequalified as required for the coating material and shall be either identified on the container as a material compatible with the reinforcement coating, or shall be accompanied by a Certificate of Compliance certifying that the material is compatible with the reinforcement coating. Damaged areas shall be patched in conformance with the patching material manufacturer's recommendations.

Except for lap splices, all splices for epoxy-coated reinforcement shall be coated with a corrosion protection covering that is on the Department's list of approved products. The covering shall be installed in conformance with the manufacturer's recommendations and as directed by the Engineer. The list is available from the Transportation Laboratory.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, shall be furnished for each shipment of epoxy-coated bar or wire reinforcement certifying that the coated bars or wire conform to the requirements in ASTM Designation: A 934/A 934M for bars or A 884/A 884M for wire and Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications. This Certificate of Compliance shall include all the certifications specified in ASTM Designation: A 934/A 934M for bars or ASTM Designation: A 884/A 884M for wire and a statement that the coating material has been prequalified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Any portion of bar or wire reinforcement extending beyond the limits for epoxy-coated reinforcement shown on the plans will be measured and paid for as bar reinforcing steel (bridge).

## 10-1.72 WELDED HEADED BAR REINFORCEMENT

Welded headed bar reinforcement, consisting of furnishing and friction welding heads onto one or both ends of bar reinforcement, shall conform to the details shown on the plans, the provisions of Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

### GENERAL

Prior to performing any manufacturing, the Contractor shall submit to the Engineer the manufacturer’s Quality Control Manual (QCM) for the fabrication of welded headed bar reinforcement. As a minimum, the manual shall include the following:

A. The pre-production procedures for the qualification of materials and equipment;
B. The methods and frequencies for performing all quality control procedures during production;
C. The calibration procedures and calibration frequency for all equipment;

D. A system for the identification and tracking of all welds. The system shall have provisions for permanently identifying each weld and the parameters used to perform it;
E. The welding procedure specification (WPS); and
F. A system for marking welded headed bar reinforcement.

A daily production log for the manufacture of welded headed bar reinforcement shall be kept by the manufacturer for each day of production. The log shall clearly indicate the production lot numbers, the heats of bar material and head material used in the manufacture of each production lot, the number of bars in each production lot, welding records, including tracking and production parameters for all welds, and results of all tests performed. A test report shall be furnished by the manufacturer containing, on a per heat basis, the chemical analysis of the bar and of the head material, including all elements represented in the carbon equivalent formula in ASTM Designation: A 706/A 706M, in addition to phosphorus and sulfur.

A production lot of welded headed bar reinforcement is defined as 150 reinforcing bars, or fraction thereof, of the same bar size, with welded heads of the same size and type, produced from bar material of a single heat number and head material of a single heat number. A new production lot shall be started if the heat number of either the bar material or the head material changes before the maximum production lot size of 150 is reached.

The daily production log shall be submitted in writing to the Engineer within 7 calendar days following the manufacture of any welded headed bar reinforcement.

The manufacturer shall furnish certificates of compliance to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," for all material used in the manufacture of welded headed bar reinforcement.

**MATERIALS AND MANUFACTURE**

All bar reinforcement to be used in the fabrication of welded headed bar reinforcement shall conform to the provisions of "Reinforcement" of these special provisions.

Heads to be used in the fabrication of welded headed bar reinforcement shall be forge formed or cut from properly identified heats of mold cast or strand cast steel using the open-hearth, basic oxygen or electric-furnace process. The chemical composition of the heads shall conform to the requirements in ASTM Designation: A 29/A 29M, A 36/A 36M, A 108 Grade 1018, A 304, A 572/A 572M, or A 706/A 706M. Forging of heads shall conform to the requirements in ASTM Designation: A 788. Heads cut from plate shall conform to the provisions of Section 55, "Steel Structures," of the Standard Specifications.

Welding, welder qualifications, and inspection of welding shall conform to the requirements for friction welding in ANSI/AWS C6.1.

All welding shall be performed at an established and permanent fabrication facility.

All equipment used to perform friction welding shall be fitted with an effective in-process monitoring system to record essential production parameters that describe the process of welding the head onto the bar reinforcement. As a minimum, the parameters to be recorded shall include friction welding force, forge force, rotational speed, friction upset distance and time, forge upset distance and time, and other elements of the production process. The data from this in-process monitoring shall be recorded and preserved by the manufacturer and shall be provided to the Engineer upon request.

Heads shall be forge formed or cut from plate into a round, elliptical, or rectangular shape. Nominal head dimensions to be used for standard bar sizes shall conform to the following:

| Nominal Head Dimensions | | | |
|---|---|---|---|
| Standard Bar Designation No. | Min. thickness mm | Min. cross-sectional area $mm^2$ | Min. width mm |
| 10 | 10 | 710 | 19 |
| 13 | 11 | 1 290 | 22 |
| 16 | 12 | 2 000 | 25 |
| 19 | 14 | 2 840 | 35 |
| 22 | 16 | 3 870 | 37 |
| 25 | 16 | 5 100 | 40 |
| 29 | 18 | 6 450 | 43 |
| 32 | 20 | 8 200 | 51 |
| 36 | 22 | 9 700 | 55 |
| 43 | 32 | 14 500 | 65 |
| 57 | 40 | 25 800 | 80 |
| Notes: (1) These head dimensions are based on concrete compressive strength of 30 MPa. (2) The head thickness shall be measured parallel to the reinforcing bar longitudinal axis, and the head width shall be measured perpendicular to the reinforcing bar axis. (3) The cross-sectional area of the head shall be the projected area measured perpendicular to the axis of the bar. | | | |

The Contractor may request, in writing, to use alternative head dimensions to those specified herein. The alternative head dimensions shall be designed using the concrete compressive strength shown on the plans. Alternative head dimensions will not be considered for approval unless it can be proven by the Contractor that the alternative heads have been successfully produced and have had at least 2 years of satisfactory service in conditions similar to this application. The Contractor shall furnish, at the Contractor's expense, documentation satisfactory to the Engineer that the alternative head dimensions are suitable for the intended application. The documentation shall include, but not be limited to, calculations and test reports showing the following:

A. The alternative head is capable of resisting the nominal tensile strength of the reinforcing bar when the bar reinforcement with welded head is embedded in concrete; and
B. Shear or bending forces do not cause premature failure of the alternative head or crushing failure of the concrete under the alternative head.

Quality Control (QC) is the responsibility of the Contractor. As a minimum, the Contractor shall perform inspection and testing prior to welding, during welding and after welding and as necessary to ensure that materials and workmanship conform to the requirements of the specifications.

All equipment and materials for performing all pre-production and production testing shall be furnished by the Contractor at the Contractor's expense. All testing shall be performed 1) at the manufacturer's plant or at an approved laboratory, 2) in the presence of the Engineer, unless otherwise directed in writing, and 3) at the Contractor's expense.

**TENSILE TEST CRITERIA**

Tensile testing of the welded headed bar reinforcement shall be performed in conformance with the requirements described in ASTM Designation: A 370.

Tensile test specimens shall be the full cross-section of the bar as rolled with a head attached to one end of the reinforcing bar. A specimen with a head welded to one end shall be placed in the testing machine with the head supported by a steel plate or other fixture to prevent movement and bending of the head. The fixture shall be placed concentrically with the longitudinal axis of the reinforcing bar directly against the flat inner surface of the head. The fixture shall provide clearance between the head support and the head-to-bar connection. Provisions shall be made for clearance between the support and any weld or forming material on the reinforcing bar-to-head connection. The free end of the bar, without a head attached, shall be gripped by the test machine.

All tensile test specimens for welded headed bar reinforcement shall conform to the following requirements:

A. The tensile strength, yield strength and elongation shall conform to the requirements in Table 2, "Tensile Requirements," in ASTM Designation: A 706/A 706M;
B. At rupture, there shall be no observed partial or total fracture of the head, the head-to-bar connection or the reinforcing bar within one bar diameter of the head-to-bar connection; and
C. At rupture, there shall be visible signs of necking in the reinforcing bar, at a minimum distance of one bar diameter away from the head-to-bar connection.

**PRE-PRODUCTION TESTING**

Prior to production, successful test results from 3 tensile tests and 3 bend tests shall be furnished by the Contractor for each combination of 1) reinforcing bar size, 2) head size, 3) head type and, 4) head material specification to be used in the work. Bend tests will not be required for reinforcing bars Nos. 43 and 57.

Tensile tests shall conform to the requirements of "Tensile Test Criteria" of this section.

The bend tests shall be performed in conformance with the requirements described in ASTM Designation: A 706/A 706M, except that the test specimen shall be bent around a test mandrel to an angle of at least 90-degrees.

The mandrel shall be placed so as to directly bend the welded region. The mandrel dimensions for bend testing shall conform to the requirements for mandrel (pin) diameters in ASTM Designation: A 706/A 706M. The centerline of the bend test mandrel shall be placed at the intersection of the reinforcing bar and the weld.

Bend test specimens shall be the full cross-section of the bar as rolled with a head attached to one end of the reinforcing bar. For welded heads directly attached to the end of the reinforcing bar where the head interferes with placement of the bend test mandrel, sufficient head material and any excess material associated with the welding process shall be removed along one edge of the reinforcing bar to provide a flat surface on the specimen for the bend mandrel. For welded headed bar reinforcement where the head does not interfere with the positioning of the bend test mandrel, no specimen preparation shall be performed.

All welded headed bar reinforcement bend test specimens shall conform to the following requirements:

A. There shall be no observed partial or total fracture of the head, the head-to-bar connection or the bar within one bar diameter of the head-to-bar connection; and
B. There shall be no cracking on the outside of the bent portion.

**PRODUCTION TESTING**

Production testing shall be performed using samples that have been randomly selected by the Engineer from each production lot of welded headed bar reinforcement which is ready for shipment to the job site. The Engineer shall be notified in writing at least 7 days prior to conducting any tests.

A minimum of 3 samples of welded headed bar reinforcement from each production lot shall be tested. One tensile test shall be conducted on each sample.

All tensile test specimens shall conform to the requirements of "Tensile Test Criteria" of this section, except that if one of the test specimens fails to meet said requirements, one retest may be performed on one additional sample, selected by the Engineer, from the same production lot. Should this additional test specimen, or should more than one of the original test specimens, fail to meet said requirements, all welded headed bar reinforcement represented by the tests will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

All welded headed bar reinforcement of each bar size from each production lot to be shipped to the site shall be tagged in such a manner that each such production lot can be accurately identified at the job site. All unidentified welded headed bar reinforcement received at the job site will be rejected.

**Marking**

All welded headed bar reinforcement shall be identified by a distinguishing set of marks legibly stamped onto the flat outer side of the head, away from the bar, to denote the following:

A. Point of Origin--Letter or symbol established as the manufacturer's designation.
B. Type of Welded Headed Reinforcing Bar--Letter T indicating that the welded headed bar reinforcement was produced to this specification.

**MEASUREMENT AND PAYMENT**

Quantities of welded headed bar reinforcement will be measured as units determined from the number of welded heads shown on the plans or as directed by the Engineer.

The contract unit price paid for welded headed bar reinforcement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing heads and friction welding heads to bar reinforcement, including conforming to all testing requirements, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Bar reinforcement to be used in the manufacture of welded headed bar reinforcement will be measured and paid for as specified in Section 52, "Reinforcement," of the Standard Specifications, except that the lengths to be used in the computation of calculated weights of the bar reinforcement shall be the entire length of the welded headed bar, including heads.

Full compensation for placing the completed welded headed bar reinforcement into the work shall be considered as included in the contract price paid per kilogram for the bar reinforcement involved and no additional compensation will be allowed therefor.

**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.

**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.

## 10-1.73 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.

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.

The requirements for constructing preconstruction shotcrete test panels may be eliminated, when approved by the Engineer, if a test panel report and certified compressive strength test data are furnished from a State highway project with a similar application of approximately equal thickness, including similar amounts and placement of reinforcement or other obstructions. The nozzle person, proposed to be used, shall have constructed the test panel described in the test panel report. The test panel report shall list the names of the application crew, equipment used, materials, mixing proportions, ambient temperatures and procedures used to make the test panels. The certified compressive strength test data shall be for cores taken from the same test panels.

**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.

## 10-1.74 STEEL STRUCTURES

Construction of steel structures shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

The second paragraph of Section 55-1.01, "Description," of the Standard Specifications is amended to read:

- The Contractor shall furnish, fabricate, and erect the structural steel or metalwork, construct and remove the temporary construction, and do all work required to complete the bridge or bridges.

Attention is directed to "Welding Quality Control" of these special provisions.

The following substitutions of high-strength steel fasteners shall be made:

| METRIC SIZE SHOWN ON THE PLANS | IMPERIAL SIZE TO BE SUBSTITUTED |
|---|---|
| ASTM Designation: A 325M<br>(Nominal bolt diameter and thread pitch (mm)) | ASTM Designation: A 325<br>(Nominal bolt diameter (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 |

Steel for members, shown on the plans as fracture critical members, shall conform to the requirements in ANSI/AASHTO/AWS D1.5, Section 12, "AASHTO/AWS Fracture Control Plan (FCP) for Non-Redundant Members." Charpy V-notch (CVN) impact values for fracture critical members shall conform to the requirements for Zone 2.

**MATERIALS**

High-strength fastener assemblies, and other bolts attached to structural steel with nuts and washers shall be zinc-coated. When direct tension indicators are used in these assemblies, the direct tension indicator and all components of the fastener assembly shall be zinc-coated by the mechanical deposition process.

**CHECK TESTING**

Structural steel shall conform to the designated ASTM Standard and the check testing requirements of this section.

Check samples shall be furnished for each heat of maximum thickness of:

Tension flanges and webs of fracture critical members.

Steel plates, shapes or bars containing check samples shall be furnished from the mill with extra length in order to provide for removal of material for check samples at the point of fabrication. Check samples may be cut from either end of the designated plate, shape or bar.

At the option of the Contractor, check samples may be removed at the rolling mill rather than at the point of fabrication. The sample will be removed from the mill plate that will be stripped by the fabricator to produce the designated plate and may be taken from any location within that plate. The mill plate from which samples are removed shall be marked with the same identifying numbers as are used on the samples.

Unless otherwise directed, material for check samples shall be removed by the Contractor in the presence of the Engineer. Check samples for plates wider than 610 mm shall be 355 mm wide and 460 mm long with the long dimension transverse to the direction of rolling. Check samples for all other products shall be 460 mm long, taken in the direction of rolling, and the width shall be the product width. Check samples shall be removed and delivered to the Engineer before the material is fabricated into components and preferably when it is still being prepared for fabrication. The direction of rolling,

heat numbers, and plate numbers shall be marked on the samples with paint or other indelible marking material or may be steel stamped in one corner of the plate.

Unless otherwise directed, check samples shall be delivered to the Transportation Laboratory at the Contractor's expense. The check samples will be tested by the Transportation Laboratory for compliance with the requirements specified in ASTM and these special provisions. Check sample test results will be reported to the Contractor within 10 working days of delivery to the Transportation Laboratory. In the event several samples are submitted on the same day, an additional day will be added for each 2 samples submitted. The test report will be made for the group of samples.

The results of the tensile and impact tests shall not vary more than 5 percent below the specified minimum or 5 percent above the specified maximum requirements except that if the initial check test results vary more than 5 percent but not more than 10 percent from the specified requirements, a retest may be performed on another sample from the same heat and thickness. The results of the retest shall not vary more than 5 percent from the original specified requirements. If the results of check tests exceed these permissible variations, material planned for use from the heat represented by said check samples shall be subject to rejection.

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.

**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.<br>(b) Applicable only to connections in which all material within grip of the bolt is steel.<br>(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 and Tightening," of the RCSC Specification. For short bolts, Section 8(d), "Joint Assembly and Tightening of Slip-Critical and Direct Tension Connections," 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.

**SURFACE PREPARATION**

For all bolted connections, the 1) contact surfaces, 2) surfaces of outside existing members within the grip under bolt heads, nuts and washers and 3) inside surfaces of bolt holes shall be cleaned and coated before assembly in conformance with the provisions for cleaning and painting structural steel of these special provisions.

**SEALING**

The perimeter around all direct tension indicator gaps shall be completely sealed with non-silicone type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be gray in color and have a minimum thickness of 1.3 mm. If painting is required, the sealing compound shall be applied prior to painting.

When zinc-coated tension control bolts are used, the sheared end of each fastener shall be completely sealed with non-silicone type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be gray in color and shall have a minimum thickness of 1.3 mm. The sealant shall be applied to a clean sheared surface on the same day that the splined end is sheared off.

Shimming between the new stringer seat bracket and the existing stringer bottom flange will not be allowed. Brackets that are not in full contact with the existing stringers when installed, as determined by the Engineer, will be rejected.

Where corrosion has caused pitting of the existing surfaces to receive shear studs, the Contractor shall spot grind the steel surface to provide a suitable welding surface as directed by the Engineer. Spot grinding as directed by the Engineer will be paid for as extra work as specified in Section 4-1.03D, “Extra Work” of the Standard Specifications.

The Contractor shall inspect all existing clip angles connecting the stringers to the floor beams for visible cracks. Where cracks are found, a 5 mm diameter hole shall be drilled at each crack termination, as determined by the Engineer. The holes and cracks shall be painted as provided in “Clean and Paint Structural Steel” of these special provisions. At each seat bracket location, this work shall be done following the installation of the new stringer seat bracket and backing members and before forming begins for the new deck at that location. Drilling of holes at crack terminations as directed by the Engineer will be paid for as extra work as specified in Section 4-1.03D, “Extra Work,” of the Standard Specifications.

At each location, debris from field-drilling, cleaning or other operations that has accumulated on the structure shall be removed, and painting completed, prior to placing forms for the new deck.

**MEASUREMENT AND PAYMENT**

If a portion of or all check samples are removed at a mill more than 480 air line kilometers from both Sacramento and Los Angeles, shop inspection expenses will be sustained by the State which are in addition to expenses incurred for fabrication site inspection. Payment to the Contractor for furnishing structural steel will be reduced $2,000 for each mill located more than 480 air line kilometers from both Sacramento and Los Angeles.

Full compensation for furnishing, installing and removing temporary cross-bracing at Bridge No 28-0367L shall be considered as included in the contract price paid per kilogram for erect structural steel, bridge and no additional compensation will be allowed therefor.

Structural steel at Bridge No. 23-0015R and Bridge No. 23-0015L will be measured and paid for as structural steel, bridge. The contract price paid per kilogram for structural steel (bridge) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in furnishing and erecting structural steel, 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 inspecting existing clip angles connecting the stringers to the floor beams for visible cracks shall be considered as included in the contract price paid per kilogram for structural steel, bridge and no additional compensation will be allowed therefor.

## 10-1.75 ISOLATION CASINGS

Isolation casings shall consist of galvanized, corrugated structural steel plate pipe with steel angles and neoprene strip as shown on the plans and conforming to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

Concrete and drilling and bonding dowels, epoxy cartridge shall conform to the provisions in “Concrete Structures” of these special provisions.

Structural steel for isolation casings shall conform to the requirements in ASTM Designation: A 36/A 36M, or at the Contractor's option, ASTM Designation: A 709/A 709M, Grade 36.

New metal surfaces shall be galvanized.

**MEASUREMENT AND PAYMENT**

Isolation casings will be measured and paid for in conformance with the provisions in Section 55-4.01, "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 isolation casings, complete in place, including concrete cap, concrete collar, reinforcement, steel angles, neoprene strip, drill and bond dowels, epoxy cartridge and resin capsules, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**10-1.76 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." 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."

The third paragraph of Section 56-1.01, "Description," of the Standard Specifications shall not apply.

A permanent steel template shall be used to maintain the proper anchor bolt spacing.

One top nut, one leveling nut, and 2 washers shall be provided for the upper threaded portion of each anchor bolt.

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.

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.

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.

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 (truss) and no additional compensation will be allowed therefor.

**10-1.77 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.

The roadside signs that are barrier mounted, as shown on the plans, will be measured by the kilogram as metal (barrier mounted sign).

The contract price paid per kilogram for metal (barrier mounted sign) shall include full compensation for furnishing all labor, materials (except State furnished materials), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing barrier mounted signs, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.78 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 salvaged 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.

## 10-1.79 INSTALL SIGN OVERLAY

Sign overlays shall be installed on existing signs as shown on the plans and in conformance with these special provisions.

Sign overlay panels will be furnished by the State as provided under "Materials" of these special provisions.

Self plugging blind rivets for installing sign overlays shall have a 4.8-mm x 15.9-mm shank. A No. 10 drill shall be used for drilling the rivet holes. If the overlay is not pre-punched, maximum rivet spacing shall be 400 mm.

Installing sign overlays will be measured by the square meter.

The contract price paid per square meter for install sign overlay shall include full compensation for furnishing all labor, materials (except sign overlays), tools, equipment, and incidentals, and for doing all the work involved in installing sign overlay panels on existing signs (including fastening hardware), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.80 TIMBER LAGGING

Timber lagging shall conform to the details shown on the plans and the provisions in Sections 57, "Timber Structures," and 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and these special provisions.

All timber members shall be preservative treated Douglas fir of the grades shown on the plans. Timber members shall be full sawn to the dimensions shown on the plans.

Preservative treatment shall be with creosote, creosote-coal tar solution, creosote-petroleum solution (50-50), or pentachlorophenol (Type A) preservative. Preservative treatment shall be for below ground use.

Timbers shall be installed with mortar-tight joints.

## 10-1.81 CLEAN AND PAINT STRUCTURAL STEEL

Exposed new metal surfaces, connections to existing steel, and existing steel surfaces in contact with new concrete at Bridge No. 23-0015R, except for connections to existing steel at Bridge No. 23-0015R and 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. Existing steel contact surfaces with new steel at Bridge No. 23-0015R shall be hand cleaned without disturbing the existing paint as specified in these special provisions. Existing galvanized shear studs in contact with new concrete need not be cleaned and painted.

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

- Unless otherwise specified, painting Contractors or subcontractors shall be required to have the following certifications from the "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council), prior to performing the work:

A. For cleaning and painting of structural steel in the field, certification in conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors" (SSPC-QP 1).
B. For the removal of paint from structural steel, certification in conformance with the requirements in Qualification Procedure No. 2, "Standard Procedure For Evaluating The Qualifications of Painting Contractors To Remove Hazardous Paint" (SSPC-QP 2).
C. For cleaning and painting of 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 Contractors" (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."

The existing paint systems consist of materials listed in "Existing Highway Facilities" of these special provisions.

**CLEANING**

Exposed new metal surfaces and areas of connections to existing steel and existing steel surfaces in contact with new concrete at Bridge No. 23-0015R, except where galvanized, shall be dry blast cleaned and dry spot blast cleaned, respectively, 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 no less than 40 µm nor more than 86 µm as measured in conformance with the requirements in ASTM Designation: D 4417.

Except where other methods of cleaning are specified, the areas of connections to existing steel to be dry spot blast cleaned shall consist of, as a minimum: (1) new and existing contact surfaces and existing member surfaces under bolt heads, nuts or washers of high-strength bolted connections, (2) exposed bare surfaces of existing steel remaining after trimming, cutting, drilling or reaming, and (3) areas of existing steel within a 100-mm radius measured in any direction from the point of application of heat for welding or flame cutting.

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 existing steel.

The inside surfaces of bolt holes shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 1, "Solvent Cleaning," of the "SSPC: The Society for Protective Coatings," and visible rust shall be removed.

**PAINTING**

Blast cleaned surfaces shall receive a single undercoat 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 inside surfaces of bolt holes shall be painted with one application of a zinc rich primer (organic vehicle type) after the application of the undercoat of inorganic zinc on adjacent steel. The steel surfaces adjacent to the bolt holes shall be kept clean and protected from drippings during the application of the primer.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Application of inorganic zinc coating shall conform to 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 nor 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, except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25 µm and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc coatings used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating he has chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

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 span on each girder, at no more than 6 locations per bearing and at no more than 6 locations per joint 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 surface pH of the inorganic zinc primer shall be checked in conformance with ASTM Designation: D4262 by wetting the surface with deionized water and applying pH paper with a capability of measuring in increments of 0.5 pH units. Application of finish coats will not be permitted until the surface pH is less than 8.

Except as approved by the Engineer, a minimum curing time of 72 hours shall be allowed between application of inorganic zinc coating and water rinsing.

Exposed areas of inorganic zinc coating shall be thoroughly water rinsed.

Exposed areas of inorganic zinc coating shall receive a minimum of 2 finish coats of an exterior grade latex paint supplied by the manufacturer of the inorganic zinc coating.

The first finish coat shall be applied within 48 hours following the water rinsing.

The finish coat paint shall be formulated for application to inorganic zinc coating and shall conform to the following provisions:

A.

| Property | Value | ASTM Designation |
|---|---|---|
| Pigment content, percent | 24 max. | D 3723 |
| Nonvolatile content, mass percent | 49 min. | D 2369 |
| Viscosity, KU | 75 min. to 90 max. | D 562 |
| Fineness of dispersion, Hegman | 6 min. | D 1210 |
| Drying time at 25°C, 50% RH, 100-µm wet film<br>Set to touch, minutes<br>Dry through, hours | <br>30 max.<br>1 max. | D 1640 |
| Adhesion | 4A | D 3359, Procedure A |

B. No visible color change in the finish coats shall occur when tested in conformance with the requirements in ASTM Designation: G 53 using FS 40 UV-B bulbs for a minimum of 38 cycles. The cycle shall be 4 hours of ultraviolet (UV) exposure at 60°C and 4 hours of condensate exposure at 40°C.

C. The vehicle shall be an acrylic or modified acrylic copolymer with a minimum of necessary additives.

The first finish coat shall be applied in 2 applications. The first application shall consist of a spray applied mist application. The second application shall be applied after the mist application has dried to a set to touch condition as determined by the procedure described in Section 7 of ASTM Designation: D1640. The first finish coat color shall match Federal Standard 595B No. 34272. The total dry film thickness of both applications of the first finish coat shall be not less than 50 µm.

Except as approved by the Engineer, a minimum drying time of 12 hours shall be allowed between finish coats.

The second finish coat color shall match Federal Standard 595B, No. 14090. The total dry film thickness of all applications of the second finish coat shall be not less than 50 µm.

The 2 finish coats shall be applied in 3 or more applications to a total dry film thickness of not less than 100 µm nor more than 200 µm.

The total dry film thickness of all applications of inorganic zinc coating and finish coat paint shall be not less than 200 µm nor more than 350 µm.

Cleaning and painting of existing contact surfaces of high strength bolted connections that contain rust, loose paint or other foreign substances, except loose dirt and dust, will be considered as extra work as specified in Section 4-1.03D, of the Standard Specifications. Cost of repair of damage to existing paint caused by the Contractor's operations shall be borne by the Contractor.

Existing contact surfaces at seat brackets and backing members at Bridge No 23-0015R shall be hand washed to remove dirt, dust or other foreign material without disturbing the existing paint.

Holes drilled in existing floor beams and holes exposed by bolt and rivet removal and holes drilled at termination of cracks shall be cleaned in accordance with the provisions in Section 59-2.06, “Hand Cleaning” of the Standard Specifications and painted with one coat of phenolic primer (PB-201B).

When the installation of a backing member requires that all bolts or rivets securing an existing clip angle to the floor beam be removed, the clip angle shall be maintained in position, without breaking the paint bond between the clip angle and the floor beam, until the new bolts have been installed.

The contact surfaces on the galvanized stringer seat brackets and backing members shall be free of spurs, protrusions or other impediments to proper bearing.

Except at locations where replacement of bolt and rivet is not required, existing high strength bolts and rivets removed from connections shall be replaced by new high strength bolts as shown on the plans. New high strength bolts, once tensioned to their specified values, and then removed or loosened for any reason, shall not be used in the work.

Field-drilled holes in galvanized stringer seat brackets or backing members shall be cleaned and painted with 2 applications of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, “Paint,” of the Standard Specifications.

**MEASUREMENT AND PAYMENT**

Dry spot blast cleaning and undercoat painting of blast cleaned areas of existing surfaces will be measured by the square meter of spot blast cleaned areas, and will be paid for as spot blast clean and paint undercoat.

The contract price paid per square meter for spot blast clean and paint undercoat shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in dry spot blast cleaning and painting undercoat on the existing surfaces 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 clean and paint structural steel shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cleaning and painting the exposed

surfaces of the new structural steel and finish coat on undercoated areas of existing metal, complete in place, including water rinsing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for hand washing the existing surfaces at seat brackets and backing members shall be considered as included in the contract price paid per square meter for spot blast clean and paint undercoat and no additional compensation will be allowed therefor.

Full compensation for hand cleaning and painting surfaces of holes drilled in floor beams and holes exposed after bolt and rivet removal shall be considered as included in the contract price paid per kilogram for structural steel, bridge and no additional compensation will be allowed therefor.

Cleaning and painting of holes drilled at termination of cracks as directed by the Engineer will be paid for as extra work as specified in Section 4-1.03D, Extra Work, of the Standard Specifications.

**10.1.82 CLEAN AND PAINT STEEL SOLDIER PILING**

Steel piling 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 these special provisions. Limits of the steel soldier pile surfaces to be dry blast cleaned and shop primed with the inorganic zinc coating shall be as shown on the plans.

Clean and paint steel soldier piling shall consist of dry blast cleaning and painting a portion of steel soldier piles with an inorganic zinc undercoat prior to pile installation, and field painting with finish coats after pile installation and soldier pile wall excavation.

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

- Unless otherwise specified, painting Contractors or subcontractors shall be required to have the following certifications from the "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council), prior to performing the work:

A. For cleaning and painting of structural steel in the field, certification in conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors" (SSPC-QP 1).
B. For the removal of paint from structural steel, certification in conformance with the requirements in Qualification Procedure No. 2, "Standard Procedure For Evaluating The Qualifications of Painting Contractors To Remove Hazardous Paint" (SSPC-QP 2).
C. For cleaning and painting of 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 Contractors" (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."

Open joints between concrete and painted or galvanized metal surfaces shall be caulked with non-silicone type sealing compound conforming to the requirements in Federal Specification TT-S-230, Type II, or other approved material. The sealing compound shall be applied no sooner than 24 hours after the high pressure cleaning has been applied. The sealing

compound shall be allowed to cure as recommended by the manufacturer prior to the water rinsing and application of the first finish coat. When no finish coats are applied, the sealing compound shall be gray in color.

**CLEANING**

All designated piling surfaces to be blast cleaned shall be dry blast cleaned in conformance with the requirements of Surface Preparation Specification No. 10, "Near White 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 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 to be used on steel.

**PAINTING**

Blast cleaned surfaces shall receive a single undercoat and a minimum of 2 finish coats of an exterior grade latex paint supplied by the manufacturer of the inorganic zinc coating.

The single undercoat shall consist 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.

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 nor 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 inorganic zinc coating, where finish coats are specified, 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 rinsing and 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 3 locations on each pile 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 surface pH of the inorganic zinc primer shall be checked in conformance with ASTM Designation: D4262 by wetting the surface with deionized water and applying pH paper with a capability of measuring in increments of 0.5 pH units. Application of finish coats will not be permitted until the surface pH is less than 8. Surfaces that do not reach a pH of less than 8 within one week of application, shall be repaired by the Contractor, at the Contractor's expense.

Except as approved by the Engineer, a minimum curing time of 72 hours shall be allowed between applications of inorganic zinc coating and water rinsing.

Exposed areas of inorganic zinc coating at locations to receive finish coats, as shown on the plans, shall be water rinsed. Areas of the coating that are removed by the water rinsing shall be reapplied in conformance with the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications and the provisions specified herein.

After installation of the piling, surfaces of steel piling shall receive a minimum of 2 finish coats of an exterior grade latex paint supplied by the manufacturer of the inorganic zinc coating at the locations and to the limits shown on the plans.

The first finish coat shall be applied within 48 hours following water rinsing.

The finish coat paint shall be formulated for application to inorganic zinc coating and shall conform to the following:

| Property | Value | ASTM Designation |
|---|---|---|
| Pigment content, percent | 24 max. | D 3723 |
| Nonvolatile content, mass percent | 49 min. | D 2369 |
| Viscosity, KU | 75 min. to 90 max. | D 562 |
| Fineness of dispersion, Hegman | 6 min. | D 1210 |
| Drying time at 25°C, 50% RH, 100-µm wet film<br>Set to touch, minutes<br>Dry through, hours | <br>30 max.<br>1 max. | D 1640 |
| Adhesion | 4A | D 3359, Procedure A |

A. No visible color change in the finish coats shall occur when tested in conformance with the requirements of ASTM Designation: G 53 using FS 40 UV-B bulbs for a minimum of 38 cycles. The cycle shall be 4 hours of ultraviolet (UV) exposure at 60°C and 4 hours of condensate exposure at 40°C.
B. The vehicle shall be an acrylic or modified acrylic copolymer with a minimum of necessary additives.

The first finish coat shall be applied in 2 applications. The first application shall consist of a spray applied mist application. The second application shall be applied after the mist application has dried to a set to touch condition. The first finish coat color shall match Federal Standard 595B No. 36628. The total dry film thickness of both applications of the first finish coat shall be not less than 50 µm.

Except as approved by the Engineer, a minimum drying time of 12 hours shall be allowed between finish coats.

The second finish coat color shall match Federal Standard 595B, No. 26408. The total dry film thickness of the applications of the second finish coat shall be not less than 50 µm.

The 2 finish coats shall be applied in 3 or more applications to a total dry film thickness of not less than 100 µm nor more than 200 µm.

The total dry film thickness of all applications of inorganic zinc coating and finish coat paint shall be not less than 200 µm nor more than 350 µm.

**REPAIR**

Shop waterborne inorganic zinc coated surfaces of piling that are abraded or damaged at any time after the application of the shop coat shall be repaired prior to installation. If the repair area exceeds 1 percent of the total coated surface as determined by the Engineer, the Contractor shall repair the surface by blast cleaning and painting the surface with waterborne inorganic zinc coating as previously specified. If the repair area is less than 1 percent of the total coated surface, the Contractor will be permitted to repair the area by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with 2 applications of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," of the Standard Specifications. Repair of abraded or damaged surfaces shall be at the Contractor's expense. Aerosol cans shall not be used.

The Contractor shall take precautions in order to protect the exposed exterior flange and flange edges of the soldier piles from the lean concrete and other surface contamination in order to minimize the work required to prepare the surface for the finish coats.

After pile installation and after the removal of lean concrete from the exposed surfaces, areas where the inorganic zinc coating has been damaged or has deteriorated shall be thoroughly cleaned, foreign substances shall be removed, and surfaces shall be spot painted with the same inorganic zinc coating to the specified thickness. Damaged areas of inorganic zinc coating shall be blast cleaned and painted as specified in these special provisions.

**PAYMENT**

The contract lump sum price paid for clean and paint steel soldier piling shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cleaning and painting piling, complete in place, including water rinsing, adhesion testing of inorganic zinc coating, and the protecting, cleaning and repair of surfaces prior to and after pile installation, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### 10-1.83 ALTERNATIVE PIPE

Alternative pipe culverts shall conform to the provisions in Section 62, "Alternative Culverts," of the Standard Specifications.

### 10-1.84 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.

Except as otherwise designated by classification on the plans or in the specifications, joints for culvert and drainage pipes shall conform to the plans or specifications for standard joints.

When reinforced concrete pipe is installed in conformance with the details shown on Standard Plan A62DA, the fifth paragraph of Section 19-3.04, "Water Control and Foundation Treatment," of the Standard Specifications shall not apply.

When solid rock or other unyielding material is encountered at the planned elevation of the bottom of the bedding, 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 of the Standard Specifications.

The Outer Bedding shown on Standard Plan A62DA shall not be compacted prior to placement of the pipe.

Portland cement for concrete backfill shall be Type III conforming to the provisions in Section 90-2.01, "Portland Cement," of the Standard Specifications. A Type C accelerating admixture conforming to the requirements in ASTM Designation: C 494 shall be added to the concrete mix for concrete backfill. The admixture shall be used at the rate recommended by the manufacturer of the admixture. The admixture shall not contain chlorides as Cl in excess of one percent by mass as determined by California Test 415.

### 10-1.85 CORRUGATED METAL PIPE

Corrugated steel pipe culverts shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications.

### 10-1.86 ALTERNATIVE PIPE UNDERDRAIN

Alternative pipe underdrains shall conform to the provisions in Section 68-1, "Underdrains," of the Standard Specifications for the kind of alternative pipe underdrain installed.

### 10-1.87 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.

**10-1.88 PERMEABLE MATERIAL (BLANKET)**

Permeable material blanket shall be constructed in conformance with the details shown on the plans and these special provisions.

Permeable material for permeable material blanket shall be Class 3 and shall conform to the provisions in Section 68-1, "Underdrains," of the Standard Specifications, except for payment.

The percentage composition by mass of Class 3 permeable material in place shall conform to the following grading:

| Sieve Sizes | Percentage Passing |
|---|---|
| 37.5-mm | 100 |
| 25-mm | 90-100 |
| 19-mm | 40-100 |
| 9.5-mm | 0-50 |
| 4.75-mm | 0-15 |
| 2.36-mm | 0-5 |

Class 3 permeable material shall have a Durability Index of not less than 40.

Not less than 90 percent by mass of Class 3 permeable material shall be crushed particles as determined by California Test 205.

Filter fabric for use with permeable material blanket shall conform to the provisions for filter fabric for underdrain trenches in Section 88, "Engineering Fabrics," of the Standard Specifications and the following:

A. The subgrade to receive the filter fabric, immediately prior to placing, shall conform to the compaction and elevation tolerance specified for the material involved.
B. Filter fabric shall be handled and placed in conformance with the manufacturer's recommendations.
C. The fabric shall be aligned and placed in a wrinkle-free manner.
D. Adjacent borders of the fabric shall be overlapped from 300 mm 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, the fabric 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 stitches shall number 5 to 7 per 25 mm of seam.
E. Within 24 hours after the filter fabric has been placed, the fabric shall be covered with the planned thickness of permeable material or aggregate subbase material as shown on the plans.
F. During spreading and compaction of the permeable material and aggregate subbase material, a minimum of 150 mm of the material shall be maintained between the fabric and the Contractor's equipment. Where embankment material is to be placed on the filter fabric, a minimum of 450 mm of embankment material shall be maintained between the fabric and the Contractor's equipment. Equipment or vehicles shall not be operated or driven directly on the filter fabric.

Driving or operating vehicles directly on top of permeable material (blanket) shall be kept to the absolute minimum necessary to place, grade, and compact the permeable material.

Surfaces to receive permeable material which are lower than the grade established by the Engineer may be filled with permeable material. Volumes of permeable material so placed will not be included in the volume calculated for payment.

Permeable material for permeable material (blanket) shall be delivered as uniform mixtures and shall be deposited in layers or windrows.

Segregation shall be avoided and the permeable material shall be free from pockets of coarse or fine material. The permeable material, after spreading, shall be shaped to such thickness that after compaction, the completed permeable material (blanket) shall conform to the required cross section and grade for thickness within the tolerance herein specified.

The thickness of permeable material (blanket) shall be not less than the planned thickness and shall not exceed the planned thickness by more than 30 mm.

Permeable material (blanket) shall be compacted using a 2-axle, steel-tired tandem roller weighing not less than 7.3 tonnes. At least one coverage shall be made with the roller. A pass shall be one movement of a roller in either direction. A coverage shall be as many passes as are necessary to cover the entire width of the place permeable material.

During periods of inclement weather or when conditions are such that contamination of the permeable material could occur, as determined by the Engineer, permeable material (blanket) shall be covered and there shall be no further placement of the permeable material until conditions are such that proper placement of permeable material (blanket) can be resumed.

Permeable material (blanket) will be measured by the cubic meter. Quantities of permeable material to be paid for as permeable material (blanket) will be determined from the dimensions shown on the plans or such other dimensions as may be ordered in writing by the Engineer. Permeable material blanket constructed in excess of these dimensions will not be paid for.

The contract price paid per cubic meter for permeable material (blanket) shall include full compensation for furnishing all labor, materials (including filter fabric), tools, equipment, and incidentals, and for doing all the work involved in constructing a permeable material (blanket) and placing filter fabric, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**10-1.89 MISCELLANEOUS FACILITIES**

Alternative flared end sections and corrugated steel pipe risers shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications.

**10-1.90 WELDED STEEL PIPE**

Welded steel pipe shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

Coating and wrapping will not be required.

**10-1.91 TRENCH DRAIN**

This work shall consist of installing a cast in place radius bottom trench drain with necessary fittings, frames, grates and associated items as shown on the plans and as specified in these special provisions.

Prior to placement, the Contractor shall submit shop drawings indicating the layout of the system and provide flow calculations that demonstrate that the trench drain installation will meet project requirements. The Contractor shall furnish the Engineer a Certificate of Compliance for the trench drain frame and grate in conformance with the provisions in Section 6-1.07, “Certificate of Compliance,” of the Standard Specifications.

Trench drain frames shall be made of either galvanized structural steel or plated steel conforming to the provisions in Section 75-1.02, “Miscellaneous Iron and Steel,” of the Standard Specifications. Trench drain grates shall be either cast iron or ductile iron conforming to the provisions in Section 75-1.02, “Miscellaneous Iron and Steel,” of the Standard Specifications. Bolts, nuts, frame anchors and other connecting hardware shall conform to the provisions in Section 75-1.02, “Miscellaneous Iron and Steel,” of the Standard Specifications.

Frames and grates, when installed in conformance with the manufacturer’s recommendations and these special provisions, shall be capable of withstanding load testing conforming to the requirements of Federal Specification RR-F621E for “Frames, Covers, Gratings, Steps, Manhole Sump and Catch Basin.” Grates shall be fit into frames without rocking.

Frames shall be secured to the surrounding concrete with steel anchoring rods as shown on the plans. Other methods of securing the frame to the concrete are acceptable provided that a minimum pullout resistance of 10kN per meter of length of frame is assured.

Grates shall be removable. Removable grates shall be held in place by locking devices that are tamper resistant.

Grates shall accept inflow of runoff through openings which consist of a minimum of 50 percent of the total top surface area of the grate, with individual openings or slots having a dimension not greater than 50mm measured in the direction of the trench drain flow line.

The trench drain with radius bottom shall be cast in place monolithically to the dimensions and grades as shown on the plans.

Reinforcing steel for the trench drains with radius bottoms shall be placed as shown on the plans and shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications.

Excavation and backfill shall conform to the provisions in Section 19.3, “Structure Excavation and Backfill,” of the Standard Specifications.

Concrete for the cast in place trench shall be minor concrete conforming to the provisions in Section 90, “Portland Cement Concrete,” of the Standard Specifications, except that minor concrete shall not contain less than 300kg of cement per cubic meter.

Minor concrete shall be placed in the excavated trench against undisturbed material at the sides and bottom of the trench in a manner that will prevent voids or segregation of the concrete and floating or shifting of the frame and grate. 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 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 trench drain frame and grate shall not extend above the level of the surrounding finished concrete.

The trench drain shall be connected to the drainage facilities as shown on the plans.

The length of trench 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 trench drain placed in excess of the length designated.

The contract price paid per meter for trench drain of the sizes listed in the Engineer's Estimate 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 the trench drain, complete in place, including excavation, placing concrete backfill, reinforcement, connecting the trench drain to new facilities and removal and disposal of trench drain forming materials.

### 10-1.92 SLOPE PROTECTION

Slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications and these special provisions.

Rock slope protection fabric shall be woven or nonwoven type fabric, Type B.

### 10-1.93 SACKED CONCRETE SLOPE PROTECTION

Sacked concrete slope protection shall conform to the provisions in Section 72, "Slope Protection" of the Standard Specifications and these special provisions. The work shall consist of placing sacked portland cement concrete on the slopes.

**Materials.—**The portland cement and mixing shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

The aggregate used may be pit-run material, at least 80 percent of which shall pass a 50-mm sieve. The aggregates need not be separated into primary sizes before batching. Washing will be required only to provide that the cleanness value of the portion passing a 25-mm sieve and retained on a 4.75-mm sieve shall not be less than 50 and the Sand Equivalent of the portion passing a 4.75-mm sieve shall not be less than 50. The relative mortar strength of the portion passing a 4.75-mm sieve shall not be less than 85 percent of the strength developed by Ottawa sand.

The mixed concrete shall contain not less than 300 Kg of portland cement per cubic meter. The amount of water added at the time of mixing shall be such as will produce a mixture with a penetration of from 38-mm to 64-mm when tested in accordance with the method described in Section 90, "Portland Cement Concrete," of the Standard Specifications.

Sacks for concrete shall be made of at least 300-gram burlap and shall be approximately 500-mm x 910-mm measured inside the seams when the sack is laid flat. The capacity of each sack shall be approximately .04 cubic meter. Sound reclaimed sacks may be used. The sacks shall be filled with approximately .03 cubic meter of plastic concrete loosely placed so as to leave room for folding at the top. The fold shall be just enough to retain the concrete at the time of placing. Immediately after being filled with concrete, the sacks shall be placed and lightly trampled to cause them to conform with the slope and with adjacent sacks in place.

**Placing.—**The sacks shall be placed so that the face coverage per cubic meter of sacked concrete slope protection measured on the slope shall not be more than 2.5 square meters nor less than 2.4 square meters, exclusive of foundations, cut-off stubs, and end returns. The slopes on which the sacked concrete is to be placed shall be finished within 60-mm of the grade established by the Engineer. The first course shall consist of a double row of stretchers laid in a neatly trimmed trench. The second course shall consist of a single row of headers. The third and remaining courses shall consist of stretchers or headers as shown on the plans and shall be placed in such a manner that joints in succeeding courses are staggered. All dirt and debris shall be removed from the top of the sacks before the next course is laid thereon. Stretchers shall be placed so that the folded ends will not be adjacent. Headers shall be placed with the folds in toward the bank. Not more than 4 vertical courses of sacks shall be placed in any tier until initial set has taken place in the first course of any such tier.

When, in the opinion of the Engineer, there will not be proper bearing or bond for the concrete due to delays in placing succeeding layers of sacks or due to the work having been hampered by storms, or mud, or for any cause, a trench shall be excavated back of the row of sacks already in place, which trench shall be filled with fresh concrete before the next layer of sacks is laid. Excavating these trenches will be paid for as structure excavation and concrete placed in the trenches will be paid for at the price per cubic meter for sacked concrete slope protection.

Sacked concrete slope protection shall be cured as provided in Section 90-7, "Curing Concrete," of the Standard Specifications.

At the completion of slope protection work, the footing trench shall be filled with excavated material and compaction will not be required.

**Measurement.—**Sacked concrete for slope protection work will be measured at the mixer as provided in Section 90-11, "Measurement and Payment," of the Standard Specifications and will be paid for by the cubic meter.

**Payment.—**The contract price paid per cubic meter for sacked concrete slope protection shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing the sacked concrete slope protection, complete in place, including excavation, and backfill, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

## 10-1.94 MISCELLANEOUS CONCRETE CONSTRUCTION

Curbs, sidewalks, island paving, driveways and curb ramps 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 conform to the details shown on the plans and shall not be constructed or installed on curb ramps with a slope that exceeds 6.67 percent. The finished surfaces of the detectable warning surface shall be free from blemishes.

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps. Detectable warning surface, at the option of the Contractor, shall be either cast-in-place or stamped into the surface of the curb ramp, or shall be a prefabricated surface installed on the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard No. 595B, Color No. 33538. Detectable warning surface, either cast-in-place or stamped into the surface of the curb ramp, shall be painted yellow in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

Prior to constructing curb ramps with a cast-in-place or stamped detectable warning surface, a test panel shall be constructed on the project site and shall be of a size not less than 600 mm by 600 mm. The test panel shall be constructed, finished and cured with the same materials, tools, equipment, and methods to be used in constructing the proposed permanent work. Additional test panels shall be constructed as necessary until a panel is produced which demonstrates, to the satisfaction of the Engineer, the ability of the selected procedure to produce a detectable warning surface that meets all of the specified requirements.

Full compensation for constructing or installing a curb ramp detectable warning surface shall be considered as included in the contract price paid per cubic meter for minor concrete (miscellaneous construction) and no separate payment will be made therefor.

## 10-1.95 MINOR CONCRETE (GUTTER)

The gutter behind the retaining wall shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

Minor concrete (gutter) will be measured and paid for by the linear meter.

The contract price paid per linear meter for minor concrete (gutter) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the gutter, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## 10-1.96 MISCELLANEOUS IRON AND STEEL

Miscellaneous iron and steel shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

## 10-1.97 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. Shear key assembly--structural tubing, shear studs and endplate
B. Utility supports
C. Checker plate for sidewalk expansion joint

Pressure grouting of structural tubing shall conform to the provisions in “Concrete Structures” elsewhere in these special provisions.

Full compensation for pressure grouting structural tubing shall be considered as included in the contract price paid per kilogram for miscellaneous metal (bridge) and no additional compensation will be allowed therefor.

## 10-1.98 BRIDGE DECK DRAINAGE SYSTEM

This work shall consist of furnishing and installing bridge deck drainage system as shown on the plans, in accordance with the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications, and these special provisions.

Attention is directed to “Welding Quality Control” of these special provisions.

**MEASUREMENT AND PAYMENT.—**Bridge deck drainage system will be measured and paid for by the kilogram.

The contract price paid per kilogram for bridge deck drainage system shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing and installing bridge deck drainage system, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### 10-1.99 CHAIN LINK FENCE

Chain link fence shall be Types CL-1.2, CL-1.2, vinyl-clad and CL-1.8 and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications.

Vinyl-clad chain link fence shall conform to the following:

1. Chain link fabric shall be vinyl coated in accordance with the provisions in Section 83-1.02I, "Chain Link Railing," of the Standard Specifications. The color shall be black.
2. Tension wires, tie wires, and post clips shall be vinyl coated as specified for fabric. The color shall be black.
3. Posts, braces, fittings and appurtenances shall be vinyl coated. The color shall be black.
4. Where necessary to conform to curvature, either horizontal or vertical, the fabric shall be reworked and fitted so as to present a smooth, neat, and workmanlike appearance.

### 10-1.100 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 "Approved Traffic Products" 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 "Approved Traffic Products" of these special provisions.

Concrete barrier markers shall be as specified in "Approved Traffic Products," elsewhere in these special provisions. They shall be installed on the barrier in accordance with the manufacturer's recommendations.

Quantities of concrete barrier markers to be paid for will be determined as units from actual count in place.

The contract unit price paid for concrete barrier markers shall include full compensation for furnishing all labor, materials (including the materials for attaching the markers to the barrier), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the concrete barrier markers complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### 10-1.101 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.

Delete the ninth and eleventh paragraphs in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications.

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.

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.

Metal beam guard railing elements and required backup plates, terminal sections, end sections, and return sections shall conform to the requirements of Type 2 W-Beam as shown in AASHTO Designation: M 180.

**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 (4-tube system) extruder terminal as manufactured by Syro, Inc., a Trinity Industries Company, 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 (4-tube system) extruder terminal from the manufacturer, Syro, Inc., a Trinity Industries Company, 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 (4-tube system) extruder terminal, FOB Centerville, Utah is $1305.00, not including sales tax.

The above price will be firm for orders placed on or before December 31, 2000, 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. At the Contractor's option, steel foundation tubes with soil plates attached, shall be 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 as manufactured by Syro, Inc., a Trinity Industries Company, and shall include all the items detailed for terminal system (Type SRT) shown on the plans.

Arrangements have been made to insure that any successful bidder can obtain the SRT-350 Slotted Rail Terminal from the manufacturer, Syro, Inc., a Trinity Industries Company, 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, FOB Centerville, Utah is $865.00, not including sales tax.

The above price will be firm for orders placed on or before December 31, 2000, 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. At the Contractor's option, steel foundation tubes with soil plates attached, shall be 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.

**10-1.102 CHAIN LINK RAILING**

Chain link railing shall conform to the provisions in Section 83-l, "Railings," of the Standard Specifications and these special provisions.

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.

**10-1.103 METAL BRIDGE RAILING**

Metal railing of the types shown in the Engineer's Estimate shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

**10-1.104 CONCRETE BARRIER**

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

The provisions of the third paragraph in Section 83-2.02D(4), "Finishing," of the Standard Specifications shall not apply.

Concrete barrier markers shall conform to the provisions in "Markers and Delineators" elsewhere in these special provisions. Full compensation for placing scuppers in concrete barrier as shown on the plans shall be considered as included in the contract price paid per meter for concrete barrier (type 60) and no additional compensation will be allowed therefor.

Type 25A concrete barrier will be measured and paid for as concrete barrier (Type 25).

Type 25 modified, Type 25 barrier transition and Type 2 modified concrete barriers will be measured and paid for as concrete barrier (Type 25).

Type 41 modified concrete barrier will be measured and paid for as concrete barrier (Type 41).

Concrete barrier transition and concrete nose adjacent to type 25 barrier will be paid for as concrete barrier (Type 25).

Concrete barrier transition and concrete nose adjacent to type 27 modified barrier will be paid for as concrete barrier (Type 27 modified).

Bar reinforcing steel for use in concrete barriers shall conform to the provisions in "Epoxy-coated Prefabricated Reinforcement," of these special provisions.

At the Contractor's option, epoxy-coated bar reinforcement for use in concrete barriers may be used in conformance with the following provisions:

A. Bar reinforcement to be epoxy-coated shall conform to the ASTM Designation and grade required or permitted by Section 52-1.02A, "Bar Reinforcement," for the location or type of structure involved. The epoxy-coated bar reinforcement shall conform to the requirements in ASTM Designation: A 775/A 775M, except as provided herein. Fabrication and project site handling of the epoxy-coated bar reinforcement shall conform to the requirements in ASTM Designation: D 3963/D 3963M, except as provided herein.
B. Appendix X1, "Guidelines For Job-Site Practices," of ASTM Designation: A 775/A 775M shall apply except as provided herein. The term "shall" shall replace the term "should" in this appendix. Section X1.2 shall not apply.
C. Coatings shall be light green in color.
D. Except for field welding of butt splices, all welding of reinforcement shall be complete prior to epoxy coating the reinforcement.
E. When any portion of a reinforcing bar requires epoxy coating, the entire bar shall be coated.
F. Within areas where epoxy-coated reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be plastic-coated or epoxy-coated to prevent corrosion of the devices or damage to the coated reinforcement.
G. Prior to coating, the Contractor shall furnish to the Transportation Laboratory, a representative 110 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.
H. Two 700-mm long samples of coated bar reinforcement from each size and from each load shipped to the project site shall be furnished to the Engineer for testing. These samples shall be representative of the material furnished. These samples, as well as any additional random samples taken by the Engineer, may be tested for specification compliance. Additional sampling, and all tests performed by the Engineer, may be performed at any location deemed appropriate by the Engineer. Failure of any sample to meet the requirements of the specifications will be cause for rejection.
I. If any bar tested for coating thickness or for flexibility of coating fails to meet the requirements for coated bars in Section 8 of ASTM Designation: A 775/A 775M, 2 retests on random samples taken from bars represented by the failed test will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated bars represented by the samples may be certified as meeting the test requirements.
J. Epoxy-coated reinforcement shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the reinforcement from exposure to sunlight, salt spray and weather. For stacked bundles, 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 reinforcement to prevent condensation under the covering. Epoxy-coated reinforcement shall not be stored within 300 meters of ocean or tidal water for more than 60 days.

K. All visible damage to the coatings caused by shipping, handling or installation shall be repaired as required for repairing coating damaged prior to shipment as specified in ASTM Designation: A 775/A 775M. When the extent of coating damage prior to repair exceeds 2 percent of the bar surface area in any 300-mm length, repair of the bar will not be allowed and the coated bar will be rejected.

L. The patching material and process shall be suitable for field application. The patching material shall be prequalified as required for the coating material and shall be either identified on the container as a material compatible with the bar reinforcement coating, or shall be accompanied by a Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications certifying that the material is compatible with the bar reinforcement coating. Damaged areas shall be patched in conformance with the patching material manufacturer's recommendations. If damage to a bar occurs during field bending, the area shall be patched immediately with the prequalified patching material.

M. Except for lap splices, splices for epoxy-coated bar reinforcement shall be coated with a corrosion protection covering that is on the Department's list of approved products. The covering shall be installed in conformance with the manufacturer's recommendations and as directed by the Engineer. The list is available from the Transportation Laboratory.

N. 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 bar reinforcement certifying that the coated bars conform to the requirements of ASTM Designation: A 775/A 775M and Section 52-1.02B, "Epoxy-coated Bar Reinforcement." The Certificate of Compliance shall include all the certifications specified in ASTM Designation: A 775/A 775M and a statement that the coating material has been prequalified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Full compensation for epoxy-coated bar reinforcement 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.

**10-1.105 CRASH CUSHION, SAND FILLED**

Sand filled crash cushions shall be furnished and installed as shown on the plans and in conformance with these special provisions.

A sand filled crash cushion shall consist of a grouping of sand filled modules.

Crash cushions shall be installed at the following locations:

G 17+10.
G 16+80.

At the Contractor's option, modules for use in sand filled crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or TrafFix Sand Barrels manufactured after March 31, 1997, or equal:

Energite III 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.

A. Distributor (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX 1-916-387-9734
B. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274, FAX 1-714-937-1070.

Fitch Inertial Modules, manufactured by Roadway Safety Service, Inc., 1050 North Rand Road, Wauconda, IL 60084, Telephone 1-800-426-0839, FAX 1-847-487-9820.

A. Distributor (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX 1-916-387-9734
B. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274, FAX 1-714-937-1070.

TrafFix Sand Barrels, manufactured by TrafFix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672, Telephone (949) 361–5663, FAX (949) 361–9205.

A. Russ Enterprises, Inc., 1533 Berger Drive, San Jose, CA 95112, Telephone (408) 287–4303, FAX (408) 287–1929.
B. Statewide Safety, P.O. Box 1440, Pismo Beach, CA 93448, Telephone 1-800-559-7080, FAX (805) 929-5786.

Modules contained in the 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 exterior components of the modules shall be formulated or processed to resist deterioration from ambient ultraviolet rays. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects.

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 cushions comply with the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

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 placed on bridge decks shall be provided with positioning blocks fastened to the deck surface. Positioning blocks shall be shaped as segments of a ring and placed along the inner or outer periphery of the module wall. A minimum of 2 blocks, a minimum of one-sixth of a ring in length shall be provided for each module. Positioning blocks and fasteners shall be of a material that is corrosion and water resistant.

Module cylinders 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.

Lids shall be securely attached as recommended by the manufacturer.

A Type R or Type 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 approved by the Engineer.

Sand filled crash cushions, regardless of the number of modules required in each sand filled crash cushion, will be measured and paid for by the unit as crash cushion, sand filled. The quantity to be paid for will be determined from actual count of the units in place in the completed work.

The contract unit price paid for crash cushion, sand filled shall include full compensation for furnishing all labor, materials (including sand and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing crash cushions, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### 10-1.106 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING

Thermoplastic 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.

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.

Thermoplastic material shall conform to the requirements in State Specification 8010-19A.

At the option of the Contractor, permanent striping tape as specified in "Approved Traffic Products" of these special provisions, may be placed instead of the thermoplastic traffic stripes and pavement markings specified herein, except that 3M, "Stamark" Series A320 Bisymetric Grade, manufactured by the 3M Company, shall not be used. Pavement tape, if used, shall be installed in conformance with the manufacturer's specifications. If pavement tape is placed instead of thermoplastic traffic stripes and pavement markings, the pavement tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

### 10-1.107 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.

Retroreflective pavement markers shall comply with the specific intensity provisions for reflectance after abrading the lens surface in conformance with the "Steel Wool Abrasion Procedure" specified for pavement markers placed in pavement recesses in Section 85-1.05, "Retroreflective Pavement Markers," of the Standard Specifications.

## 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.

When fluctuations of water pressure and water supply are encountered during normal working hours, plants shall be watered at other times, as often, and in sufficient amounts as conditions may require to keep the soil and plant roots moist during the life of the contract.

Full compensation for watering plants outside normal working hours shall be considered as included in the contract unit prices paid for the plants involved and the contract lump sum price paid for plant establishment work and no additional compensation will be allowed therefor.

#### 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-downs shall be completed and furnished in the format shown in the samples of the cost break-downs included in this section. Unit descriptions of work shown in the samples are the minimum to be submitted. Additional unit descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional unit descriptions of work, the quantity, value and amount for those units shall be completed in the same manner as for the unit descriptions shown in the samples. The units 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.

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.

The sum of the amounts for the units of work listed in each cost break-down for highway planting and irrigation system work shall be equal to the contract lump sum price bid for the work. Overhead and profit shall be included in each individual unit listed in each cost break-down. Cost break-downs shall be submitted to the Engineer for approval within 15 working days after the contract has been approved. Cost break-downs shall be approved, in writing, by the Engineer before a partial payment for the items of highway planting and irrigation system will be made.

Approved cost break-downs will be used to determine partial payments during the progress of the work and as the basis of calculating the adjustment in compensation for the items of highway planting and irrigation system due to changes ordered by the Engineer. When an ordered change increases or decreases the quantities of an approved cost break-down, 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.

**HIGHWAY PLANTING COST BREAK-DOWN**

**Contract No. 04-013054**

| UNIT DESCRIPTION | UNIT | APPROXIMATE QUANTITY | VALUE | AMOUNT |
|---|---|---|---|---|
| Roadside Clearing | LS | Lump sum | | |
| Mulch | M3 | 14 | | |
| Prepare Hole (Soil Amendment) | EA | 122 | | |
| Plants (Group K) | EA | 23 | | |
| Plants (Group U) | EA | 99 | | |
| Commercial Fertilizer (Tablet) | TAB | 580 | | |
| | | | | |
| | | | | |
| | | | | |

**TOTAL _____**

**IRRIGATION SYSTEM COST BREAK-DOWN**

**Contract No. 04-013054**

| UNIT DESCRIPTION | UNIT | APPROXIMATE QUANTITY | VALUE | AMOUNT |
|---|---|---|---|---|
| 75 mm Pressure Reducing Valve | EA | 1 | | |
| 25 mm Pressure Reducing Valve | EA | 3 | | |
| Flush Valve | EA | 4 | | |
| 20 mm Plastic Pipe (Supply Line)(PR200) | M | 323 | | |
| 25 mm Plastic Pipe (Supply Line)(PR200) | M | 308 | | |
| 40 mm Plastic Pipe (Supply Line)(PR200) | M | 185 | | |
| 75 mm Plastic Pipe (Supply Line)(PR200) | M | 196 | | |
| 40 mm Wye Strainer | EA | 1 | | |
| 75 mm Gate Valve | EA | 1 | | |
| 25 mm Electric Remote Control Valve | EA | 1 | | |
| 40 mm Electric Remote Control Valve | EA | 2 | | |
| 50 mm Electric Remote Control Valve (Master) | EA | 1 | | |
| 4-Station Irrigation Controller (Battery) | EA | 1 | | |
| 50 mm Backflow Preventer Assembly | EA | 1 | | |
| Backflow Preventer Assembly Enclosure | EA | 1 | | |
| Sprinkler (Type C-2) | EA | 145 | | |
| Control and Neutral Conductors | LS | Lump Sum | | |
| | | | | |
| | | | | |
| | | | | |

**TOTAL** _____

**10-2.02 (BLANK)**

**10-2.03 (BLANK)**

**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 consist of either wood chips or tree bark or a combination of both.

**Commercial Fertilizer**

Commercial fertilizer (slow release) shall be a pelleted or granular form, shall be slow release, and shall fall within the following guaranteed chemical analysis range:

| Ingredient | Percentage Range |
|---|---|
| Nitrogen | 16 |
| Phosphoric Acid | 8 |
| Water Soluble Potash | 8 |

Commercial fertilizer (tablet) shall be slow release and shall be in tablet form. Each tablet, as shown in the Plant List of the plans, shall have a mass of 21 g ± 1 g, and shall have the following guaranteed chemical analysis:

| Ingredient | Percentage |
|---|---|
| Nitrogen | 20 |
| Phosphoric Acid | 10 |
| Water Soluble Potash | 5 |

At the option of the Contractor, two 10.5-g tablets may be used in place of each 21-g tablet designated on the plans or specified in these special provisions. Regardless of the tablet size used, each tablet shall be the slow release type and shall have the same guaranteed chemical analysis as specified for the 21-g tablets. Each 10.5-g tablet shall have a mass of 10.5 g ± 0.5-g.

**ROADSIDE CLEARING**

Prior to preparing planting areas or commencing irrigation trenching operations for planting areas, trash and debris shall be removed from these areas and a distance of 3 m beyond the edges of those areas. At locations where proposed planting areas are 3.6 m or more from the edges of dikes, curbs, sidewalks, fences, walls, and paved shoulders, the clearing limit shall be 2 m beyond the outer limits of the proposed planting area.

In addition to removing trash and debris, the project area shall be cleared as specified herein:

Weeds shall be killed and removed within an area 1.2 m in diameter centered at each plant location.

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. Rodents shall be controlled.
C. Weed growth shall be killed before the weeds reach the seed stage of growth or exceed 150 mm in length.
D. Weeds in plant basins, including basin walls, shall be removed by hand pulling, after the plants have been planted.

**Weed Control**

Weed control shall also conform to the following:

A. Stolon type weeds shall be killed with glyphosate.
B. 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:

Diquat
Fluazifop-butyl
Glyphosate

Glyphosate shall be used to kill stolon type weeds.

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 10 working 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.

Pesticides shall not be applied within the limits of the plant basins. 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.

**PREPARING PLANTING AREAS**

Plants adjacent to drainage ditches shall be located so that after construction of the basins, no portion of the basin walls shall be less than the minimum distance shown on the plans for each plant involved.

**PREPARE HOLES**

Holes for plants shall be excavated to the minimum dimensions shown on the plans.

Backfill material for plant holes shall be a mixture of soil and other materials shown on the Plant List. Backfill material shall be thoroughly mixed and uniformly distributed throughout the entire depth of the plant hole without clods and lumps.

**PLANTING**

Commercial fertilizer shall be applied or placed at the time of planting and at the rates shown on the plans.

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.

**PLANT ESTABLISHMENT WORK**

The plant establishment period shall be Type 2 and shall be not less than 750 working days.

Attention is directed to "Relief From Maintenance and Responsibility" in these special provisions regarding relief from maintenance and protection.

Commercial fertilizer (slow release) shall be applied to trees and shrubs during the first week of February of each year. Commercial fertilizer shall be applied at the rates shown on the plans and shall be spread with a mechanical spreader wherever possible.

Weeds within plant basins, including basin walls and ground cover, shall be controlled by hand pulling.

Weeds outside of plant basins and paved areas shall be controlled by mowing. At locations where proposed planting areas are 3.6 m or more from the edges of existing plantings to remain and from shoulders, dikes, curbs, sidewalks, fences, and walls, the mowing limit shall be 2 m beyond the outer limits of the proposed planting area.

The seeding area bound by Carquinez Way, Vista Del Rio, and Kendall Avenue shall be mowed once each year after the plants have gone to seed.

Weeds within pavement, curbs, sidewalk, and other surfaced areas shall be controlled by killing.

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.

After 125 working days of the plant establishment period have been completed, replacement of plants shall be the same size as originally specified.

Wye strainers shall be cleaned at least 15 days prior to the completion of the plant establishment period.

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.

## 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.

Attention is directed to the provisions in "Obstructions" of these special provisions, regarding work over or adjacent to existing underground facilities. Excavation for proposed irrigation facilities shall not be started until the existing underground facilities have been located.

Gate valves, 75 mm and larger in size, shall be furnished with a square lug and shall be operated by use of long shank keys. Prior to acceptance of the contract, 3 long shank keys shall be delivered to the Engineer.

### 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 concrete.

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 polyurethane.

### ELECTRIC AUTOMATIC IRRIGATION COMPONENTS

#### Irrigation Controllers (Battery)

Irrigation controllers (Battery) shall consist of a field transmitter and a watertight control module located in a valve box and shall conform to the following:

A. The field transmitter shall have three independent programs, with eight start times per program, per day. Independent station operation shall allow simultaneous start times or sequential start times. The field transmitter shall have an external optical connector that plugs into an unlimited number of control modules for programming. The field transmitter shall operate up to one year on a single 9V alkaline battery.
B. The control module shall have a waterproof case and battery compartment and be capable of operating up to 4 stations and shall be installed on the underside of the valve box cover. The control module shall operate up to a year on a single 9V battery.

#### 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. Valves shall be brass or cast iron construction.
B. Brass valves shall be angle pattern (bottom inlet) or straight pattern (side inlet) as shown on the plans.
C. Cast iron valves shall be combination angle pattern (bottom inlet and side inlet) installed as an angle pattern (bottom inlet), as shown on the plans.
D. Valve solenoids for (battery) controller shall be DC latching and operate on 3.5 V.

#### 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.

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.
B. Non-spliced conductors in pull boxes and valve boxes shall be marked with clip-on, "C" shaped, white extruded polyvinyl chloride sleeves. Marker sleeves shall have black, indented legends of uniform depth with transparent overlays over the legends and "chevron" cuts for alignment of 2 or more sleeves.

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, except for the striped portions, 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.

At the option of the Contractor, other types of splice sealing materials and methods may be used provided other materials and methods have been approved in writing by the Engineer prior to installation of the connectors.

Prior to granting relief from maintenance and responsibility, as provided in these special provisions, the functional test, in conformance with the provisions in Section 20-5.027J, "Testing," of the Standard Specifications, shall be satisfactorily completed, and instruction shall be given to the Engineer on the use and adjustment of the installed irrigation controllers.

**ARMOR-CLAD CONDUCTORS**

Armor-clad conductors shall be used in direct burial applications from pull boxes adjacent to irrigation controller enclosure cabinets to the 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 of not less than 90 percent of the AWG diameter required.
B. Conductor insulation coverings shall be manufactured of 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 at any one point.
C. Armor shall be a minimum of 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 any one point.

**IRRIGATION SYSTEMS FUNCTIONAL TEST**

Functional tests for the 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 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.

## 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 with the minimum pressure rating (PR) shown on the plans.

Plastic pipe supply lines less than 100 mm in diameter shall have solvent cemented type joints. Primers shall be used on the solvent cemented type joints.

Plastic pipe supply lines (main) shall have a minimum cover of 0.45 m.

Plastic pipe supply lines downstream from the remote control valves for Type C sprinklers shall have a minimum cover of 150 mm.

Fittings for plastic pipe supply lines with a pressure rating (PR) of 315 shall be Schedule 80.

## 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 | 210 | 86 |

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 in conformance with the details shown on the plans. There shall be 50 mm minimum clearance between the backflow preventer assembly and the backflow preventer assembly enclosure. 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 as specified in 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 enclosures.

Enclosure door handles shall have provisions for padlocking in the latched position. Padlocks will be State-furnished as provided under "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.

Portland cement concrete for the concrete pad shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications.

Hold down bolt assemblies shall be galvanized and shall be installed when the portland cement concrete pad is still plastic. Nuts shall be hexagonal and washers shall be the lock type.

Enclosures shall be painted with one application of a commercial quality pre-treatment, vinyl wash primer and a minimum of one application of a commercial quality, exterior enamel for metal. The finish color shall be light brown.

## TESTING BACKFLOW PREVENTERS

New backflow preventers installed by the Contractor 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. New backflow preventers shall be retested one year after the satisfactory completion of the previous test or 10 days prior to completion of the plant establishment period, whichever occurs first.

**SPRINKLERS**

Sprinklers shall conform to the type, pattern, material, and operating characteristics listed in the "Sprinkler Schedule" shown on the plans.

Flexible risers shall be ultraviolet (UV) resistant, brown in color and shall conform to the details shown on the plans.

When required, risers for sprinklers shall contain a device that will automatically and instantly stop the flow of water from a riser when the riser is broken on the downstream side of the device. The device shall be installed as recommended by the manufacturer of the device.

**WYE STRAINERS**

Wye strainers shall be installed on the upstream side of the electric remote control valves as shown on the plans.

When garden valves are opened, discharge shall be up and out of the valve box.

**FLUSH VALVES**

Flush valves shall consist of a garden valve, riser and a plastic pipe (locator). Flush valves shall be installed at the ends of supply lines for Type C sprinklers as shown on the plans.

A total of 3 loose keys for the garden valves, as specified herein, shall be furnished to the Engineer prior to completion of the project.

Pipe supply line (locator) shall conform to the provisions in Section 20-2.20, "Plastic Pipe (Locator)," of the Standard Specifications.

**PRESSURE REDUCING VALVE**

Pressure reducing valves shall consist of pressure reducing valves, pressure gages, valve boxes with wire mesh and gravel or crushed rock, fittings, and pipe as shown on plans.

Pressure reducing valves shall be the spring diaphragm type, manufactured of bronze or cast iron construction, hydraulically operated and pilot controlled, and shall have flanged or threaded pipe connections. Pressure reducing valves with threaded connections shall be installed with unions on the inlet side of the valves. Pressure reducing valves shall not have internal filter screens.

Pressure gages for pressure reducing valves shall be hermetically sealed with neoprene and shall have watertight polycarbonate cases and covers with molded clear polycarbonate windows. Gages shall be 50 mm in diameter, calibrated from 0 kPa to 1103 kPa, and have black aluminum pointers that contrast with gage faces and have brass stems. Internal gage parts shall be brass and phosphor bronze.

Pressure reducing valves shall have an adjustable discharge pressure range of 172 kPa to 517 kPa and shall be factory set at 344 kPa.

**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.

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. SEISMIC MONITORING

### 10-3.01 INSTALL SEISMIC MONITORING CASING

Installation of seismic monitoring casing shall consist of drilling into soil and rock, sampling soil and rock, providing a log of test borings and a boring report, and furnishing and installing casing for seismic monitoring equipment at the downhole locations shown on the plans in the vicinity of South Anchorage Building. Seismic monitoring casing shall be in accordance with the details shown on the plans and these special provisions.

Installation of seismic monitoring casing includes the following operations in the following order:

1. Drill 115 mm diameter hole, perform Standard Penetration Tests (SPT) and collect rock cores, and prepare a log of test borings and boring report.
2. Allow State forces to perform P-S suspension logging.
3. Drill 205 mm diameter hole for installation of casing.
4. Furnish and install 103 mm diameter polyvinyl chloride (PVC) pipe casing, including equipment furnished and attached to the bottom of the casing by the State.
5. Grout the annulus between the 205 mm diameter hole and the 103 mm diameter casing, and install pipe cap and enclosure.

**MATERIALS**.--The seismic monitoring casing shall consist of 103 mm diameter Schedule 80 screw joint (flush) polyvinyl chloride PVC pipe. Each screw joint shall include an O-ring and shall be sealed with an O-ring lubricant.

The casing will have a specially formed sealed cap (Bishops Hat) at the bottom with instrumentation cables extending up through the casing. The Bishops Hat and instrumentation cables will be furnished and installed by State forces. The casing shall be filled with clean water.

Grout for placement in the annular space between the casing and the hole shall be proportioned as follows:

| Grout Type | Downhole | Grout Proportion |
|---|---|---|
| A | The shallow hole (62 meters). | 6 sacks of cement, and 0.25 sack of bentonite per 380 liters of water. |
| B | The deep hole (122 meters) | 6 sacks of cement, and 0.25 sack of bentonite per 380 liters of water. |

The Contractor shall furnish sufficient quantities of grout for filling the annular space between the casing and the hole.

**BORINGS**.--Borings shall consist of drilling holes, taking samples, logging borings and furnishing test boring submittals to the Engineer.

The “Soil and Rock Logging Classification Manual” is included in the "Materials Information" 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.

The Contractor shall drill borings at the center of each downhole location as shown on the plans and as directed by the Engineer.

The Contractor shall notify the Engineer in writing not less than 10 working days in advance of drilling borings.

All borings shall be made under site supervision of a Geologist. The log of test borings shall be stamped by, and the test boring submittal shall be signed by a geologist who is registered in the State of California and has at least five years of geotechnical engineering experience of deep foundations in both soil and rock.

Borings shall be made by rotary drill methods and shall be at least 76 mm in diameter.

One boring shall be drilled and logged to a depth equal to that of the deepest hole at the downhole location.

Standard Penetration Tests (SPT) shall be made in all soil types and performed in accordance with ASTM D1586 in each test boring at 765 mm maximum intervals and terminate when bedrock is encountered. Soil classification and descriptions shall conform to the requirements for visual-manual procedures in ASTM D 2488.

Bedrock shall be continuously cored with at least 90% core recovery. Rock shall not be logged from drill cuttings. Rock quality designation (RQD) shall be made taken at 1.5 meter maximum intervals. Rock shall be cored using an outer and inner core barrel drilling system. The outer core barrel shall be fitted with either a diamond impregnated or polycrystalline drill bit and have an outside diameter of at least 115 mm. The split inner tube core barrel shall have an inside diameter of at least 50 mm.

Prior to removal from the split inner tube barrels and placement into core boxes, rock cores shall be photographed. After core boxes are filled, and prior to removal from the drilling platform, rock cores shall be photographed. All rock core photographs shall be color, 127 mm x 177 mm, and labeled with the bore hole number, sample elevation, scale, and date and time photographed.

The rock cores shall be retained in rock core boxes that are labeled with the job contract number, the pile location, and the sample elevation. Rock core boxes shall become the property of the State and will be removed from the job site by the State. Prior to their removal from the job site, the Contractor shall preserve and secure the rock core samples in a weather protected facility until notified by the Engineer.

The log of test borings including the soil and rock classification shall conform to the document “Soil and Rock Logging Classification Manual: Field Manual,” published by the Engineering Service Center, Caltrans, dated August 1995.

After completion of all borings, the Contractor shall furnish to the Engineer a test boring submittal that includes photographs of rock cores, a boring report and the log of test borings.

The log of test borings shall conform with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. All log of test borings shall be 560 mm x 864 mm in size. For initial review, 4 sets of drawings shall be submitted to the Engineer. Within 3 weeks after final approval of the test boring submittal, one set of the corrected prints on 27 kg (minimum) good quality bond paper, 560 mm x 864 mm in size, prepared by the Contractor shall be furnished to the Office of Structure Design, Documents P.O. Box 942874, MS#9, Sacramento, CA 94274-0001 (1801 30th Street, Sacramento, CA 95816) and 7 sets furnished to the Engineer.

Log of test borings shall show 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-Post mile on each sheet. The test boring/geotechnical subcontractor 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 following shall be shown on the log of test borings:

1. Stationing and offset of boring.
2. Northing and easting coordinates.
3. Reference elevation and datum.
4. Boring start and completion date.
5. Geotechnical notes and miscellaneous explanations.
6. Drill bit and sampler types and diameters.
7. Percent of core recovery and RQD.
8. Sample numbers.
9. SPT data.
10. Depth increments of borings.
11. Graphic log.
12. Soil classifications and descriptions.
13. Rock classifications and descriptions.
14. Log symbol legend.
15. Signature and seal of the Geologist or Civil Engineer.

The boring report shall include the following:

1. Summary of drilling methods, drilling equipment, drill platforms, and any drilling difficulties encountered.
2. Location map of the surveyed position of the borings relative to the existing pier (in California Coordinate System and bridge stationing).
3. Bore hole surveying notes.
4. Photographs of rock cores.
5. Copies of original daily drilling notes.

The Engineer will notify the Contractor in writing when a boring submittal is complete and approved.

All materials utilized in making boring shall be disposed of in accordance with the provisions in Section 7-1.13, “Disposal of Material Outside the Highway Right of Way,” of the Standard Specifications, and to the requirements of the non-storm water discharges in the "Caltrans Storm Water Quality Handbook, Construction Contractor's Guide and Specifications" as specified in the Section entitled "Water Pollution Control" elsewhere in these special provisions.

**P-S SUSPENSION LOGGING.**--P-S suspension logging, consisting of P-wave and S-wave (dilatational wave and shear wave) velocity measurements, will be made by State forces. P-S suspension logging will be made after completion of the Contractor’s boring, sampling, and logging operations. The Contractor shall notify the Engineer in writing not less than 10 working days prior to completing boring, sampling, and logging operations in order for the State forces to be on site to perform P-S suspension logging. The Contractor shall allow 3 working days for the State forces to complete P-S suspension logging.

**INSTALL CASING.**--The seismic monitoring casing shall be installed into a 205 mm diameter hole. The hole shall be drilled by mud rotary methods and shall be centered over the 115 mm diameter hole described in the section “Borings” in these special provisions.

The 105 mm diameter pipe casing shall be installed from 200 mm above the ground surface to the depth as shown on the plans unless directed by the Engineer (using the P-S suspension logs). The Contractor shall notify the Engineer in writing not

less than 15 working days prior to installing the casings in order for personnel from CDMG to attach the Bishops Hat to the casing. CDMG personnel shall be on site for the installation and grouting of the casings.

Grout shall be delivered at the low end of the void being filled by methods that prevent the mixing of grout with water during charging of the grout delivery tubes and placement of the grout. Until at least 3 meters of grout has been placed, the tips of grout delivery tubes shall be within 155 mm of the bottom of the void being filled. The grout delivery tubes may be raised during grouting, providing that the embedment of the tips are maintained at least 1.8 meter below the top surface of the grout.

Sufficient grout shall be injected to fill the annular space between the casing and the hole and be expelled at the top of the hole until there is no evidence of entrapped air or water. A minimum grout head of 610 mm shall be maintained above the top of the hole until the grout has set.

All residue from the grouting operation shall be removed after completing the grouting operations and shall be disposed of in accordance with Section 7-1.13, “Disposal of Material Outside the Highway Right of Way,” of the Standard Specifications, and to the requirements of the non-storm water discharges in the "Caltrans Storm Water Quality Handbook, Construction Contractor's Guide and Specifications" as specified in the Section entitled "Water Pollution Control" elsewhere in these special provisions.

**MEASUREMENT AND PAYMENT.--**Seismic monitoring casing shall be measured and paid for as install seismic monitoring casing. The length of seismic monitoring casing to be paid for shall be the total length in place in the completed work, measured from the bottom tip of the casing to the ground surface.

The contract price paid per linear meter for install seismic monitoring 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 the casings, complete in place, including drilling into soil and rock, SPT sampling, collecting soil and rock cores, preparing a log of test borings and boring report, furnishing and installing casing, grouting, and disposing of material resulting from drilling holes and grouting, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## SECTION 10-4. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

### 10-4.01 DESCRIPTION

Traffic signals, flashing beacons, lighting, sign illumination, traffic operation system and call box system shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Call box system shall consist of installing foundations, conduits, conductors and cables. Callbox housings and mounting bases shall be installed by others.

Traffic operations system shall consist of the following:

1. CCTV camera station.
2. Ramp metering system
3. Traffic monitoring station
4. Changeable message sign system
5. Microwave vehicle detection sensor system
6. Highway advisory radio system

Lighting equipment and call box conduits are included in the following structures:

A. Crockett viaduct (Bridge No. 28-0367L)
B. Crockett off-ramp westbound (Bridge No. 28-0370K)
C. Crockett off-ramp eastbound (Bridge No. 28-03695)
D. Crockett on-ramp westbound (Bridge No. 28-0368K)
E. Existing eastbound approach (Bridge No. 23-15R)

### 10-4.02 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 20 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.

**10-4.03 ABBREVIATIONS**

The following abbreviations are added to those listed in Section 1-1.02, "Abbreviations," of the Standard Specifications:

| | |
|---|---|
| BNC | Bayonet Nut Connector |
| CCD | Charge Coupled Device |
| CCITT | International Telegraph and Telephone Consultative Committee |
| DLCI | Data Link Control Identifier |
| FCC | Federal Communications Commission |
| GFCI | Ground Fault Current Interrupter |
| IDC | Insulation Displacement Connector |
| IPCEA | Insulated Power Cable Engineering Association |
| ISDN | Integrated Services Digital Network |
| NEC | National Electric Code |
| NTSC | National Television Systems Committee |
| OSHA | Occupational Safety and Health Administration |
| OSI | Open Systems Interconnect |
| PVC | Polyvinyl Chloride |
| REA | Rural Electrification Administration |
| SDLC | Serial Data Link Control |
| TIA | Telecommunications Industry Association |

**10-4.04 CODES**

All work performed and material installed on the contract shall conform to Section 86-1.02 "Regulations and Code" and the following codes:

1. California Administrative Code, Title 24, Part 3 Basic Electrical Regulations
2. National Fire Protection Association Standards.
3. All local ordinances.

**10-4.05 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS**

Traffic signal system shutdowns shall be limited to periods between the hours of 9:00 a.m. and 3:00 p.m.

**10-4.06 STANDARDS**

The materials to be furnished and work to be performed shall conform to Section 86-1.02 "Regulations and Code" and the following standards subject to the modifications and additional requirements in these special provisions:

1. REA Standard, "Fully Color-Coded, Polyethylene-Insulated, Polyethylene-Jacketed Telephone Cable," shall apply to telephone communication conductors and cables.
2. IPCEA No. A-61-402, NEMA WC-5, "Thermoplastic-Insulated Wire and cable for the Transmission and Distribution of Electrical Energy," shall apply to high voltage cable and 600-V class conductors.

**10-4.07 FOUNDATIONS**

Sleeve nuts shall be used on Type 1-B standard. Foundations for Type 1-B standards shall conform to the details on Standard Plan ES-7B, "Anchor Bolts With Sleeve Nuts", except that the bottom of the base plate shall be flush with the finished grade.

## 10-4.08 STANDARDS, STEEL PEDESTALS AND POSTS

Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted.

The sign mounting hardware shall be installed at the locations shown on the plans.

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.

The sheet titles for Standard Plans ES-7C, ES-7D and ES-7E are amended to read, as follows:

| Standard Plan | Title |
|---|---|
| ES-7C | Signal and Lighting Standards Case 1 Arm Loading<br>Wind Velocity=129 km/h<br>Arm Lengths 4.6 m to 9.1 m |
| ES-7D | Signal and Lighting Standards Case 2 Arm Loading<br>Wind Velocity=129 km/h<br>Arm Lengths 4.6 m to 9.1 m |
| ES-7E | Signal and Lighting Standards Case 3 Arm Loading<br>Wind Velocity=129 km/h<br>Arm Lengths 4.6 m to 13.7 m |

## 10-4.09 CONDUIT

Conduit to be installed underground shall be Type 1 or Type 3 unless otherwise specified. Detector termination conduits shall be Type 3 or Type 4.

The conduit in a foundation and between a foundation and the nearest pull box 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 |

When a standard coupling cannot be used for joining Type 1 conduit, a UL listed threaded union coupling conforming to the provisions in Section 86-2.05C, "Installation," of the Standard Specifications, or a concrete-tight split coupling, or concrete-tight set screw coupling shall be used.

When Type 3 conduit is placed in a trench (not in pavement or under portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled with commercial quality concrete, containing not less than 250 kg of portland cement per cubic meter, to not less than 100 mm above the conduit before additional backfill material is placed.

Conduit runs shown on the plans to be located behind curbs may be installed in the street, within 0.9-m of, and parallel with the face of the curb, by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications. Pull boxes shall be located behind the curb or at the locations shown on the plans.

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 locations where conduit is required to be installed under pavement and if a delay to vehicles will not exceed 5 minutes, conduit may be installed by the "Trenching in Pavement Method."

At the option of the Contractor, the final 0.6-m of conduit entering a pull box in a reinforced concrete structure may be Type 4.

## 10-4.10 PULL BOXES

Grout shall not be placed in the bottom of new or existing pull boxes.

### 10-4.11 CONDUCTORS AND WIRING

Splices shall be insulated by "Method B".

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.

Signal cable shall not be used.

Type TW insulation shall not be used for the CMS service feeder, nor for the CMS branch circuit conductors between the service pedestal and the CMS.

### 10-4.12 CLOSED CIRCUIT TELEVISION CABLES

Television control (TVC) cable shall consist of 15 No. 18 conductors, unshielded and with an outer jacket. Each conductor shall have a minimum of 16 tinned copper stands with a minimum of 400 µm insulation. Individual conductor insulation shall be chrome PVC with a nominal thickness of 1 mm. The outside diameter of the jacket shall not exceed 14 mm.

Color code for TVC cable shall be:

1. Black
2. White
3. Red
4. Green
5. Orange
6. Blue
7. White/ Black
8. Red/ Black
9. Green/ Black
10. Orange/ Black
11. Blue/ Black
12. Black/ White
13. Red/ White
14. Green/ White
15. Blue/ White

Television power (TVP) conductors shall be 3 No. 14 (120 VAC, AC-, equipment ground) individually insulated, stranded copper conductors in conformance with Section 86-2.08, "Conductors" of the Standard Specifications. The conductors shall be color coded black, white, and green respectively.

Television control power (TVCP) cable shall consist of 12 No. 18 conductors, unshielded and with an outer jacket. Each conductor shall have a minimum of 16 tinned copper strands with a minimum of 400 µm insulation. Individual conductor insulation shall be polyvinyl chloride (PVC), rated for 300 V (see color code below). The jacket shall be chrome PVC with a nominal thickness of 1 mm. The outside diameter of the jacket shall not exceed 12 mm.

Color code for TVCP cable shall be:

1. Black
2. White
3. Red
4. Green
5. Orange
6. Blue
7. White/ Black
8. Red/ Black
9. Green/ Black
10. Orange/ Black
11. Blue/ Black
12. Black/ White

Television video (TVL) cable shall consist of an RG-6/U coaxial cable. Each cable shall be provided with a solid No. 18 copper clad steel center conductor and shall conform to the following requirements:

| Electrical | TVL |
|---|---|
| Capacitance (picofarads/m nominal) | 54.1 |
| Impedance (ohms-nominal) | 75 |
| Velocity of propagation (nominal) | 84% |
| D.C. loop resistance (ohms/100 m) | 11.7 |

Attenuation at 20˚C:

| Frequency (MHz) | TVL (Nominal dB/ 100 m) |
|---|---|
| 5.0 | 1.90 |
| 30 | 3.64 |
| 108 | 6.40 |

| Physical Specifications | TVL Nominal O.D. (mm) |
|---|---|
| Copper-clad steel center conductor | 1.00 |
| Foam polyethylene dielectric | 4.57 |
| Sealed APA tape with 1.6 mm overlap | 4.75 |
| Woven aluminum braid | 5.39 |
| Sealed APA tape with 1.6 mm overlap | 5.49 |
| Woven aluminum braid | 6.12 |
| Flooding compound | |
| PVC outer jacket | 7.55 |

(APA = Aluminum polyolefin and aluminum with adhesive)

TVL cable shall be terminated with BNC plug connector at both ends.

**COAXIAL CABLE CONNECTORS (TVL COAXIAL CABLES)**
Coaxial cable connectors for attaching Type TVL coaxial cable shall meet the following requirements:

1. **Electrical:**

| | |
|---|---|
| Impedance | 75 Ω nominal |
| Return loss | 30 dB minimum<br>(5 MHz to 300 MHz) |
| Rated working voltage | 500 V rms |

2. **Mechanical:**

| | |
|---|---|
| Type of construction | Integral sleeve BNC |
| Method of attachment | Crimp-crimp |
| Composition | Bodies - alloy<br>Finish - chromate conversion, silver plating, or other corrosion resistant metal |

3. **Environmental:**

| | |
|---|---|
| Temperature | -10˚C to +50˚C |
| Moisture | Weather resistance design |

The mating connector for TVL cable in junction box shall be provided. The center contact of this jack shall be beryllium copper.

**TESTING**

Testing of TVL cables and connectors shall be performed in accordance with provisions in Section 86-2.14B, "Field Testing" of the Standard Specifications and these special provisions.

Cable lengths found to have faults shall be replaced and retested. The removed faulty cable shall be disposed of by the Contractor.

Prior to the beginning of work, each length of coaxial cable shall be tested for attenuation and faults to ensure compliance with specifications contained herein using a time domain reflectometer (TDR). For the purpose of these special provisions, a fault in a long length of cable is defined by one or more of the following:

a. Return loss measurements indicating that attenuation exceeds 3 dB at 5 MHz to 30 MHz in a portion of cable less than 3 m long.
b. A return loss measurement indicating that there is a short in the cable.
c. A return loss measurement indicating a cut or open circuit in the cable.
d. A visual inspection which reveals exposure of or damage to the cable shielding.

**10-4.13 TELEPHONE CABLE**

The telephone cable (TC) shall consist of 6 pairs of No. 19 solid copper conductors. Conductors shall be twisted in pairs. Each conductor shall be insulated with a high molecular weight, heat stabilized, color coded polyethylene material. The insulation shall be 440 µm nominal.

Color code for TC cable shall be as follows:

1. White/Blue
2. White/Orange
3. White/Green
4. White/Brown
5. White/Gray
6. Red/Blue

The core shall be protected by a non-hygroscopic polyester film with a single longitudinally applied 120 µm thick corrugated copper shield (or 190 µm thick plastic coated aluminum shield). A moisture barrier of petrolatum-polyethylene compound shall be applied over the core tape and over and under the cable shield to fill all cable interstices.

The cable shall be provided with an outer jacket of extruded, black, high molecular weight, heat stabilized polyethylene material. The outer jacket shall have a thickness of 1.5 mm nominal. The outer diameter of the cable shall be 15.25 mm maximum.

Splices will not be allowed, except where shown on the plans.

All conductors shall be terminated inside the telephone demarcation cabinet and the controller cabinet as shown on the plans. All connections from the TBO terminal block to the 8-position connecting block shall be via a cable consisting of 2 pairs of No. 22 solid conductors and shall meet the same specifications as the TC cable.

**10-4.14 MICROWAVE SYSTEM CABLES**

The MicroWAve Transmitter Receiver Assembly Power (UWATRAP) Cable shall consist of 4 No. 14 with an outer jacket. The UWATRAP cable shall be Type TC as identify in article 340 of the NEC, with an overall jacket made of PVC. Each conductor shall be made from stranded copper, and be individually insulated in conformance with Section 86-2.08 of the Standard Specifications. The conductors shall be color coded black, white, green and red.

MicroWAve Antenna Coaxial Cable (UWACC) shall consist of an RG-6/U coaxial cable. Each cable shall be provided with a solid No. 18 copper clad steel center conductor and shall conform to the following requirements:

| Electrical | UWACC |
|---|---|
| Capacitance (picofarads/300m nominal) | 16.5 |
| Impedance (Ω-nominal) | 75 |
| Velocity of propagation (nominal) | 84% |
| D.C. loop resistance (Ω/300m) | 35.7 |

Attenuation at 20˚ C.:

| Frequency (MHz) | UWACC (Nominal dB/30m) |
|---|---|
| 5.0 | 0.60 |
| 30 | 1.11 |
| 108 | 1.95 |

| Physical Specifications | UWACC Nominal O.D. (mm) |
|---|---|
| Copper-clad steel center conductor | .102 |
| Foam polyethylene dielectric | .458 |
| Sealed APA tape with 1.6 mm overlap | .475 |
| Woven aluminum braid | .538 |
| Sealed APA tape with 1.6 mm overlap | .548 |
| Woven aluminum braid | .612 |
| Flooding compound | |
| PVC outer jacket | .754 |

(APA = Aluminum polyolefin and aluminum with adhesive)

UWACC cable shall be terminated with BNC plug connector at both ends.

**UWACC CONNECTORS**.--UWACC connectors for attaching Type UWACC coaxial cable shall meet the following requirements:

1. **Electrical:**

| | |
|---|---|
| Impedance | 75 Ω nominal |
| Return loss | 30 dB minimum (5 MHz to 300 MHz) |
| Rated working voltage | 500V RMS |

2. **Mechanical:**

| | |
|---|---|
| Type of construction | Integral sleeve BNC |
| Method of attachment | Crimp-crimp |
| Composition | Bodies - alloy<br>Finish - chromate conversion, silver plating, or other corrosion resistant metal |

3. **Environmental:**

| | |
|---|---|
| Temperature | -10˚ C. to +50˚ C. |
| Moisture | Weather resistance design |

**UWACC TESTING.--**Each section of UWACC cable shall be tested for attenuation and faults after the connectors are installed.

The Contractor shall arrange to have a technician qualified to performed all tests specified in these special provisions, in the presence of the Engineer.

The UWACC cable shall be tested with an Time Domain Reflectometer. Only those sections of cable approved in writing by the Engineer shall be considered satisfactory. Sections of cable found to have faults shall be removed and disposed of. Existing sections of cable found to have faults shall be replaced with new cable.

The Contractor shall give the Engineer five working days notice prior to the date of the UWACC testing.

The Contractor shall provide all of the test equipment necessary to perform all tests specified on these special provisions and tests required by the Engineer to ensure compliance with these special provisions.

For the purpose of these special provisions, a fault in a section of cable is defined as either of the following:

1. An attenuation measurement, indicating that the cable meets the attenuation losses per 30m (dB/30 m) as specified elsewhere in these special provisions.
2. A return loss measurement indicating an open or short circuit in the cable.
3. A return loss measurement indicating a cut in the cable.
4. A visual inspection which reveals exposure or damage to the cable shielding.

A section of cable which has zero faults shall be considered satisfactory.

Full compensation for coaxial cable testing shall be considered as included in the contract price paid for the item requiring the cable and no additional compensation will be allowed therefor

### 10-4.15 COMMUNICATION CLASS CABLES

All twisted pair No. 19 conductor cables (6 pairs, 10 pairs, 25 pairs) shall be shielded and solid annealed copper. Insulation shall be polyolefin with standard telephone color coding. A non-hygrosopic wrap shall be applied over the cable core. A minimum thickness 0.045 mm copper synthetic polymer backed tape, overlapped to provide 100 percent coverage, and a No. 19 standard copper drain wire shall be provided. The outer jacket shall be black polyethylene. The cable shall be rated for 300 Volts, minimum, and shall be suitable for wet or dry locations and for installation in conduit.

### 10-4.16 COMMUNICATION CABLE SPLICES

Splices for No. 19 twisted pair, shielded cables shall be as recommended by the cable manufacturer and suitable for the environment that the splice is located. The Contractor shall submit the splicing method to the Engineer for approval.

### 10-4.17 SERVICE

Type III service equipment enclosures shall be the aluminum type.

Circuit breakers shall be the cable-in/cable-out type, mounted on non-energized clips. All circuit breakers shall be mounted vertically with the up position of the handle being the "ON" position.

Each service shall be provided with up to 2 main circuit breakers which shall disconnect ungrounded service entrance conductors. Where the "Main" circuit breaker consists of 2 circuit breakers as shown on the plans or required in the special provisions, each of the circuit breakers shall have a minimum interrupting capacity of 10 000 A, rms.

Type H service shall consist of a conduit and conductors with length and size as required by the serving utility company.

The neutral conductor shall run from the service equipment enclosure to the controller cabinet without splicing to any other neutral conductor.

The bottom of the lowest circuit breaker shall be 600 mm minimum above the bottom of the service equipment enclosure.

### 10-4.18 SIGN DISCONNECTS

Sign disconnects shall be fused switches.

### 10-4.19 EQUIPMENT GROUNDING

All noncurrent-carrying metal parts of fixed, portable, and mobile equipment and associated fences, housings, enclosures, and supporting structures shall be grounded. Grounding methods shall meet the requirements of NEC Article 250.

### 10-4.20 NUMBERING ELECTRICAL EQUIPMENT

The placement of numbers on electrical equipment will be done by others.

### 10-4.21 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.

### 10-4.22 TELEPHONE DEMARCATION CABINET

The Contractor shall furnish and install the analog data station termination (ADST) unit, specified elsewhere in these specifications, inside the telephone demarcation cabinet (TDC) as shown on the plans and as directed by the Engineer. Installation of the ADST shall be in accordance with the suggested manufacturer's installation procedure and as directed by the Engineer.

The Contractor shall furnish and install all cable assemblies, punch block, and connecting blocks inside the TDC, except those that are provided by the telephone company (TELCO), as shown on the plans and as directed by the Engineer.

Ground rod shall meet the requirements of NEC Article 250-84.

Padlockable drawer latch shall be padlock hasp.

Backboard C shall be secured by a retaining screw.

Duplex outlet and GFCI duplex outlet shall be separately connected to the main circuit breaker.

The bottom plate for TDC shall be 3.2 mm aluminum.

### 10-4.23 ANALOG DATA STATION TERMINATION UNIT

**GENERAL --**Each analog data station termination unit (ADST) shall provide data phone digital service (DDS) transmission reliability for modems operating on voice grade special access service. The ADST shall meet or exceed the following requirements and specifications.

**NETWORK INTERFACE --**A one meter cable assembly with one end terminated with spade lugs and the other end terminated with RJ48 modular plug shall be included with each ADST. Network signal connections to the ADST shall be made via a barrier strip with spade lug end of the cable assembly. The receive data pair from the network shall connect to the terminals labeled RT and RR, and the transmit data pair to the network shall connect to the terminals labeled TT and TR in accordance with the RJ48S interface code. The modular plug end of the cable assembly shall be connected via the RJ48 jack provided by the telephone company. The network interface shall conform to the following:

| | |
|---|---|
| Line | 4 wire (Tx pair & Rx pair) |
| Operating Mode | Baseband, full duplex |
| Data Rate | 72 kbps |
| Signal Format | Bipolar, return to zero, 50% duty cycle |
| Tx Source Impedance | 135 Ω ±20% |
| Rx Input impedance | 135 Ω ±20% |
| Rx Input impedance | 0 to 45 dB loop loss measured at 36 kHz |
| Maximum Distance | 5480 m, No. 26 wire at 21˚C |

**CUSTOMER INTERFACE --**The Contractor shall furnish and install the cable assembly from the customer interface jack of the ADST to the punch block as shown on the plans. The customer interface shall conform to the following:

| | |
|---|---|
| Line | 4-wire (Tx pair Rx pair) |
| Rx and Tx Impedance | 600 Ω ±20% |
| Tx Input | 0 dBm (from customer) |
| Rx Output | -16 dBm (to customer) |

**CONTROLS AND INDICATORS --**

| | |
|---|---|
| Indicators | Power LED<br>Loopback LED<br>Loss of sealing current LED |
| Controls | Multipoint junction unit (MJU) -MJU option enable/disable |

**VOICE FREQUENCY (VF) CHANNEL CHARACTERISTICS --**

| | |
|---|---|
| Loss of Deviation | ± 0.5 dB |
| 3 - Tone Slope<br>404 and 2804 Hz | <br>± 0.5 dB |
| Attenuation Distortion<br>504 to 2804 Hz<br>404 to 2804 Hz<br>304 to 3004 Hz | <br>- 0.5 to 0.0 dB<br>- 0.5 to 1.0 dB<br>- 0.5 to 1.5 dB |
| Envelope Delay Distortion<br>1004 to 2604 Hz<br>804 to 2804 Hz<br>604 to 2604 Hz<br>504 to 2804 Hz<br>504 to 3004 Hz | <br>≤ 75 µs<br>≤ 130 µs<br>≤ 250 µs<br>≤ 350 µs<br>≤ 450 µs |

**MECHANICAL --**

a. Each ADST installed at the telephone demarcation cabinet (TDC) shall be provided with stand-alone housing.
b. Each ADST shall have a nominal size of 142 mm (W) x 36 mm (H) x 152 mm (D) and shall not weigh more than 230 grams.
c. The ADST shall be installed in accordance with manufacturers suggested procedure.

**POWER --**

a. Power shall be provided to the ADST via AC three-prong power cord.
b. A green indicator shall be provided for power "on".
c. The unit shall be fused by a 0.1 A SLO BLO fuse.

**ENVIRONMENTAL --**

| | |
|---|---|
| Operating temperature | 0˚C to 50˚C |
| Storage temperature | -40˚C to 85˚C |
| Relative humidity | Up to 95% non-condensing |

### 10-4.24 VEHICLE SIGNAL FACES AND SIGNAL HEADS

Lamps for vehicular traffic signal units (except programmed visibility type) will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

### 10-4.25 PEDESTRIAN SIGNALS

Lamps for Type A pedestrian signals will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

### 10-4.26 FLASHING BEACONS

Incandescent lamps for flashing beacon units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

### 10-4.27 DETECTORS

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Where one detector consists of a sequence of 4 loops in a single lane, the front loop closest to the limit line or crosswalk shall be located 0.3 m from the line. All 4 loops in each lane shall be connected in series.

### 10-4.28 POWER SUPPLY FOR MICROWAVE VEHICLE DETECTION SENSOR SYSTEM

**Power Supply**.--The power supply shall have the following requirements:

| | |
|---|---|
| Input | 115 VAC |
| Output | +12 VDC at 3 amperes |
| Regulation | 2% line, 2% load with 50 mV peak-to-peak ripple maximum |

Input shall be fuse protected. Output shall be short circuit protected. A power "ON" LED shall be used to indicate that the power supply is on.

### 10-4.29 MICROWAVE VEHICLE DETECTION SENSOR (MVDS) SYSTEM

The microwave vehicle detection sensor (MVDS) system shall include all microwave detector units, enclosures, connectors, cables, junction box, mounting equipment, software, firmware, power supply units and all other support equipment.

**Functional Requirements.—**The MVDS signal shall emulate the response of an inductive loop detector. The MVDS units shall be tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. Each MVDS unit shall operate independently and not interfere with other MVDS units.

The microwave sensor unit shall operate in the frequency band of 10.525 GHz ± 25 MHz. The transmitter power shall be a maximum of 10 mW.

The MVDS field of view shall be covered by a maximum detection range defined as follows:

| | |
|---|---|
| Elevation beam-width | 45 degrees |
| Azimuth beam-width | 15 degrees |
| Range | 3 to 60 meters |

Each MVDS unit shall have the capability of providing a minimum of 8 detection zones within each beam footprint. The size of each zone shall be user definable with a maximum range resolution of 2 meters. The minimum footprint shall be greater than or equal to 1.8 meters.

The time of events shall be measured in a maximum of 10 millisecond resolution.

Measurement accuracy shall be better than 95% certainty for vehicle presence.

Each MVDS unit shall be supplied with a connectorized MVDS cable harness with appropriate cable length for each installation. The MVDS cable shall consist of 15 unshielded twisted pairs of No. 20 conductors with an overall shield. Each conductor shall have a minimum of 19 tinned copper strands with a minimum of 1.60 mm PVC insulation rated for 300 V at 105 ˚ C. The outer jacket shall be chrome PVC with minimum thickness of 1.60 mm. The outside diameter of the cable shall not exceed 19.2 mm. A minimum of 4 meter slack of MVDS cable is required in each controller cabinet.

The connector shall be MS3476W18-32S or equivalent. This connector shall include contacts for powering the sensor unit, RS-232 serial data communications and contact pairs for each detection zone. The connector pinout is as follows:

| No. | Pin No. | Designation | Signal | Remark |
|---|---|---|---|---|
| 1 | A | Contact Closure | Opto 1 | |
| 2 | B | Contact Closure | Opto 1 Return | |
| 3 | C | Contact Closure | Opto 2 | |
| 4 | D | Contact Closure | Opto 2 Return | |
| 5 | E | Contact Closure | Opto 3 | |
| 6 | F | Contact Closure | Opto 3 Return | |
| 7 | G | Contact Closure | Opto 4 | |
| 8 | H | Contact Closure | Opto 4 Return | |
| 9 | J | Contact Closure | Opto 5 | |
| 10 | K | Contact Closure | Opto 5 Return | |
| 11 | L | Contact Closure | Opto 6 | |
| 12 | M | Contact Closure | Opto 6 Return | |
| 13 | N | Contact Closure | Opto 7 | |
| 14 | P | Contact Closure | Opto 7 Return | |
| 15 | R | Contact Closure | Opto 8 | |
| 16 | S | Contact Closure | Opto 8 Return | |
| 17 | d | Contact Closure | Opto 9 | |
| 18 | e | Contact Closure | Opto 9 Return | |
| 19 | f | DC Power | 12-24 VDC + | |
| 20 | g | DC Power | 12-24 VDC - | |
| 21 | h | AC Power | 115 VAC + | Not Used |
| 22 | j | AC Power | 115 VAC - | Not Used |
| 23 | V | RS-232 p2 | Tx | |
| 24 | T | RS-232 p3 | Rx | |
| 25 | U, W | RS-232 p5 | Signal Ground | |
| 26 | b | Auxiliary | +5VDC Out | Not Used |
| 27 | c | Auxiliary | +5VDC Out Return | Not Used |
| 28-32 | | | | Spares |

The Contractor shall wire the MVDS cable harness and power conductors to the 10 position din rail mounted terminal blocks in the controller cabinet as directed by the Engineer. The RS-232 serial data communication output conductors shall be terminated at the service panel terminal block, TB-0. The contact pair output conductors shall be terminated at the input panel terminal block, TB-2. The ends of all unused and spare conductors shall be taped to prevent accidental contact to other circuits.

All software for testing and set-up procedures shall be supplied with the MVDS unit. The software shall test the MVDS unit performance and provide diagnostic information.

**Operational Requirements—**The Contractor shall provide a certification from the manufacturer that the MVDS unit will interface and operate with a Model 170 controller. In addition, the MVDS unit shall meet the following requirements:

a. Electrical.—The unit shall operate with 12-24 VDC at 0.5 A power source. The unit shall have a feature of automatic recovery after a power failure.
b. Physical.—The unit shall be encased in a weatherproof NEMA-3R enclosure. The unit shall not exceed 160 mm x 240 mm x 250 mm in size and shall not weigh more than 4.5 kg. The unit shall operate over a temperature range from -37˚ to +74˚ C, up to 95 percent relative humidity.
c. Installation and Testing.—Prior to installing any MVDS units, the Contractor shall perform functional tests to verify that all MVDS units comply with these specifications. The MVDS units shall be installed as shown on the plans and in accordance with the manufacturer's recommended installation procedures. The Contractor shall confirm equipment placement with the Engineer before installing any equipment. The Contractor shall test the MVDS units for the following functions:

1. Presence and passage at all ramp and connector metering locations.
2. Speed, volume and occupancy for all mainline monitoring locations.
3. Correct speed and count readings of mainline traffic with a portable detection equipment.

The Contractor shall make sure that the MVDS system will not cause harmful interference to radio communication. If the operation of the MVDS system in a residential area is to cause harmful interference, the Contractor will be required to correct the interference at the Contractor's expense.

**10-4.30 CAMERA UNIT**

Each camera unit shall consist of a camera, lens, environmental housing and camera unit cable assembly. The camera, lens and environmental housing, combined, shall not weigh more than 6.8 kg. Each camera unit shall be interchangeable with the existing camera units already installed on various traffic operations system (TOS) projects without changes or adjustments to either the system or the camera unit.

Each camera unit shall be assembled, inspected, and tested in accordance with these special provisions prior to delivery to the job site. Installation, operations and maintenance manuals shall also be submitted at the time of delivery.

Applicable Documents - The following documents of the U.S. Military Specification (MIL-SPEC), Underwriters' Laboratory, Inc. (UL), Electronics Industries Association (EIA) Standards, and other Standards form parts of the specification to the extent specified in these standards. In the event of a conflict between the content of this section and the content of the specification, the standards defined in this section shall supersede.

| Military Specification Documents | |
|---|---|
| MIL-I-45208A | Inspection System Requirements, Dec. 16, 1963 |
| MIL-C-45662 | Calibration System Requirements, June 10, 1980 |
| MIL-STD-416A | Electromagnetic Interface Characteristics Requirements for Equipment, Subsystems & Systems, Aug. 1, 1968 |
| MIL-E-5400T | Electronic Equipment, Airborne General Specification |
| MIL-STD-810 | Environmental Test Methods, 19 July 1983 |
| MIL-C-5541 | Chemical Conversion Coatings on Aluminum Alloys, June 3, 1970 |

| Underwriters' Laboratory, Inc. and other documents | |
|---|---|
| UL-796 | Printed Circuit Boards |
| EIA-170A | Electrical Performance Standards Color Television Studio Facilities |
| EIA RS-330 | Electrical Performance Standards for Closed Circuit Television (CCTV) Camera 525/60 Interlaced |

**CAMERA**

Approved Camera - The cameras listed below have been approved by the Engineer. Further information such as the source of the cameras can be provided upon demand. Any camera submitted by the Contractor that is not one of the approved cameras listed below shall be stringently compared to the specifications set forth in these special provisions before it is approved by the Engineer.

Approved Cameras:

Cohu 8240
Sony SSC-C374
Burle/Philips TC293C-Z0P2X596

1. General -

a. Each camera shall be self-contained and designed for continuous unattended 24-hour operation.
b. Camera performance shall meet or exceed EIA-170A standards.
c. Each camera shall have automatic sensitivity and black level control so that it operates without further adjustment when illumination ranges from the minimum specified herein to that of full daylight.
d. Each active electronic device within the camera shall be solid-state.
e. Each camera shall have a switch selectable electronic shutter. The shutter speed shall range from 1/60 of a second (off) to 1/10,000 of a second in 8 steps. The control of the electronic shutter rate shall be accessible through a side panel opening. Remote on/off control of the shutter shall be accomplished via an output connector on the rear of the environmental housing.

2. Light sensitivity - At a scene with 50 percent light reflectivity and with light level on the scene measured to be 10 lux and greater, each camera with its 10:1 zoom lens shall generate a picture on the monitor specified in these special provisions

which resolves all 10 shades of gray on the EIA Television Test Chart. Not every camera shall be required to resolve the same gray scale when the light level on the same scene is measured to be less than one lux.

3. Electrical Power - Each camera shall operate when the applied voltage is between 95 to 130 VAC, 60 Hz ±0.3 Hz, single phase. The power consumption of camera shall not exceed 10 W. All camera circuitry shall be powered by a regulated, over-voltage protected DC power supply contained in the camera.

4. Synchronization -

a. Each camera shall generate synchronization signals by means of a single integrated circuit.
b. Each camera shall operate with the internal EIA-170A crystal as the sync reference source with the field rate of 59.94 Hz.
c. Each camera shall have the capability of synchronizing to an external input source.
d. The synchronization signal at the video output shall conform to EIA-170A.

5. Scanning - Each camera's mode of scanning shall be two-to-one interlaced at 525 lines, 60 fields per second, as specified by EIA-170A.

6. Video Processing -

a. The video output level shall be maintained to within 3 dB for changes in scene brightness of 0.17 to 109 600 cd/m$^2$ using a motorized iris lens having a transmission range of F/1.2 to F/1200.
b. Each camera shall have a black-level control system.
c. Each camera shall have an automatic white (color) balance control to maintain proper color rendition by automatically referencing to white areas of the scene. Manual control of the white balance shall be accessible through side panel or remotely controlled via the rear connector on the environmental enclosure.
d. Automatic gain control (AGC). The switch selectable fixed gain response shall maintain the output video level to 90 percent video when the light level on the image sensor falls too low to maintain full video output. The video out will be maintained at 90 percent peak-average setting to optimize video output under varying lighting conditions. The controls for the on/off and peak average adjustments shall be accessible through the side panel of the camera.
e. One 75 Ω (±1 percent) source-terminated, single-ended video output jack shall be provided.
f. An adjustable white clipper shall be provided to limit highlight brightness.
g. The video output level shall be 1.0 V peak-to-peak composite (0.7 V video, 0.3 V sync) signal, polarity black negative, across a 75 Ω load impedance.
h. The minimum signal-to-noise ratio shall be 50 dB at 25°C.

7. Imager -

a. Each camera shall be designed to use a 12.7 or 16.9 mm format solid-state, color, interline transfer charged-coupled device (CCD) imager.
b. The imager shall have a minimum resolution of 768 horizontal by 493 vertical active picture elements.
c. When provided with 6.89 lux of highlight illumination on the environmental housing window, the camera shall provide the following resolution with AGC off:

   i. Horizontal center resolution shall be 460 TV lines minimum.
   ii. Vertical resolution shall be 350 TV lines minimum in the center and all corners simultaneously.

8. Mechanical -

a. All camera circuitry shall be on a printed circuit board which shall be removable and replaceable using no more than common hand tools.
b. Test points and adjustment identifications shall be etched or silk-screened on the boards.
c. Each camera shall be self-supporting and operable when removed from the environmental housing and shall have a lens adapter ring which accommodates a standard 16 mm C-mount. A back focal distance adjustment shall be provided.
d. Each camera shall utilize the rigidity of the environmental housing for strength against shock and vibration.

9. Environmental Operation -

a. Each camera within its environmental housing shall withstand the following requirements:

i. Operate over an ambient temperature range on -10°C to +50°C with the use of heaters.
ii. Peak random vibration of 5 g from 60 to 1000 Hz, with camera in operation.
iii. Shock up to 15 g in all axes under non-operating conditions.
iv. Exposure to sand, dust, fungus, and salt atmosphere as per MIL-E-5400T paragraphs 3.2.24.7, 3.2.24.8, 3.2.24.9, and 3.2.24.10.
v. Up to 100 percent relative humidity as per MIL-E-5400T, paragraph 3.2.24.2.

10. Picture Quality -

a. The quality of the picture shall be such that most objects in low light levels can be distinguished without excess interference from undesirable picture attributes.
b. Undesirable picture attributes include blooming, transfer smear, vertical register shifting.

**LENS**

1. General -

a. Each lens shall be fully compatible with the camera provided.
b. Each lens shall have a maximum aperture of no less than F/1.2, and a minimum range of F/1.2 to F/1200.
c. Each lens shall be a 16 mm C-mount.
d. Each lens shall have a minimum zoom range of 10 to 1. The lens focal length for a 16.9-mm CCD camera shall be shall be 10-100 mm, 10.5-105 mm or 11-110 mm. The lens focal length for a 12.7 mm CCD camera shall be shall be 8-80 mm. A 1.5-X extender shall be included with the lens.
e. Each lens shall be equipped with a motorized zoom and focus control.
f. Each lens shall have an automatic, motor-driven iris with manual override. The iris shall be controlled directly through the camera in automatic mode and from the camera control unit in the manual mode. The automatic iris shall provide continuous aperture adjustments of the lens as determined by the amount of light reaching the camera imager. The power supply and electronics for iris motor shall be contained within the environmental housing.
g. Each lens shall be fitted with an intra-spot neutral density filter.
h. Each lens must be able to respond to the following inputs from camera control unit (CCU) for lens control:

| | |
|---|---|
| Focus near | +9.0VDC @ 100 mA |
| Focus far | -9.0VDC @ 100 mA |
| Zoom in | +9.0VDC @ 100 mA |
| Zoom out | -9.0VDC @ 100 mA |
| Iris closed | +9.0VDC @ 100 mA |
| Iris open | -9.0VDC @ 100 mA |

i. The travel time for the upper limit stop to the lower limit stop for zoom and focus shall be from 5 seconds minimum to 10 seconds maximum.
j. Each lens shall have the capability of at least 10 pre-positioning positions.

2. Environmental Operation -

a. Each lens within its pressurized environmental enclosure shall withstand the following requirements:

i. Operate over an ambient temperature range on -10°C to +50°C with the use of heaters.
ii. Peak random vibration of 5 g from 60 to 1000 Hz, with lens in operation.
iii. Shock up to 15 g in all axes under non-operating conditions.
iv. Exposure to sand, dust, fungus, and salt atmosphere as per MIL-E-5400T paragraphs 3.2.24.7, 3.2.24.8, 3.2.24.9, and 3.2.24.10.
v. Up to 100 percent relative humidity as per MIL-E-5400T, paragraph 2.24.2.

**ENVIRONMENTAL HOUSING**

1. General -

a. Each camera and lens shall be mounted in a sealed, cylindrical, environmental housing which shall not exceed 165 mm in diameter and 560 mm in length.
b. The housing shall be fabricated of seamless aluminum tubing Type 6061-T6 and shall be finished with heat reflecting, weather resisting enamel. The rear plate shall be fabricated of Type 6061-T6 aluminum.
c. The front of the housing shall be closed with a clear optically flat glass or Lexan window.
d. The housing shall include a sun shroud which shall be strapped to the housing bindings in such a manner as to minimize heat conduction by maintaining air space between shroud and housing. The shroud shall shield the entire top portion of the housing from the sun, and shall extend a minimum of 76 mm in front of the housing's glass plate.
e. The housing shall not interfere with the widest viewing angle of the lens.
f. The housing shall include a thermostatically controlled heating pad rated at 115 VAC, 100 W maximum.
g. The backplate, which is an integral part of the housing, shall have a nameplate attached bearing the manufacturer's camera assembly model number and serial number.
h. Camera connector -

   i. The camera connector shall be designed to MIL-C-28462 Series 1 specifications with solder contacts. It shall be PT-07C-20-39 P, the male counterpart to PT-06A-20-39 S SR.
   ii. The connector shall be made of the same shell material and pin arrangement as the PT-06A-20-39 S SR connector on the end of the wiring harness.
   iii. The pinout of the connector shall be as shown on the plans.
   iv. Each camera connector shall be mounted on the rear plate with an airtight connection and a watertight seal for each conductor on its connecting cable.

i. Each camera shall be designed for operating with the housing purged of air and filled with dry nitrogen to 35 kPa.
j. Valves -

   i. The housing shall have two valves, both on the rear end plate of the housing.
   ii. One valve shall be a standard Schrader valve. It shall have a tube running from the valve to the front end of the housing.
   iii. The other valve shall be an air escape/pressure relief valve preset to 140 kPa.
   iv. The two valves shall be arranged such that filling with dry nitrogen from the Schrader valve will force gas to flow from front end of the housing to the rear end and vent through the air escape valve.
   v. The leakage rate with both valves closed and the housing pressurized to 70 kPa, shall leak less than 7 kPa per year, and less than 0.7 kPa per month.

k. The enclosure shall be factory pressurized to 35 kPa with dry nitrogen.
l. The notation "CAUTION PRESSURIZED" shall be printed on the rear plate of the enclosed.
m. A safety pressure release bolt shall be incorporated such that the enclosure may not be opened without first releasing the internal pressure.
n. A low-pressure (LP) sensor with related circuitry shall be provided to send an LP alarm (dry contact closure) via the camera connector. The LP sensor threshold shall be preset to activate the LP alarm at 14 kPa.
o. Two units of desiccant shall be placed inside the housing but will not obstruct the camera view or operation.
p. A humidity level indicator strip with discrete indications for 10, 20 and 30 percent humidity, shall be installed inside the housing in a position that allows inspection, while facing directly, through the window without obstructing the view of the camera at the widest viewing angle of the lens.

2. Mounting Base -

a. A mounting base shall surround the enclosure to provide a tamper-resistant attachment of the environmental housing to the pan/tilt unit and securely hold the housing in either an upright or inverted position. The combined height of camera housing and mounting base shall be less than 254 mm. The mounting base attachment shall be as shown on the plans.
b. All fasteners and nuts used in attaching the mounting base to the environmental housing shall be of grade 18-8 stainless steel.
c. Each camera unit shall be provided with three stainless steel hex head bolts to secure the camera unit to the pan/tilt unit.

**CAMERA UNIT CABLE ASSEMBLY**

1. General - Each camera unit cable assembly shall consist of box mounting socket connector and a wiring harness.

2. Box Mounting Socket Connector -

a. Each box mounting socket connector shall be MS-3102E-28-21S-F80.
b. One full set of crimp contacts shall be provided with each box mounting socket connector.
c. The pinout of the connector shall be as shown on the plans.

3. Wiring Harness -

a. The camera unit cable assembly wiring harness shall be 3 m long and shall be COHU AC27E or other cable approved by the Engineer. The coaxial cables' impedance shall be 75 Ω. One end of each wiring harness shall be type PT06A-20-39S (SR) and shall mate with the camera connector. It shall have a 90-degree end bell, Bendix 10-25997-203 or equal, for strain relief. The end bell shall be positioned such that the opening is 180 degrees from the main key on the connector. The other end of each wiring harness shall be type MS-3106E-28-21P and shall mate with the box mounting socket connector.
b. All connectors shall be potted with an appropriate potting compound for environmental sealing.
c. All connectors' pinout shall be as shown on the plans.

**10-4.31 PAN/TILT UNIT**

**GENERAL**

a. Each pan/tilt unit, with camera unit attached, shall pan 355 degrees minimum in either direction, and tilt 60 degrees minimum from horizontal position to either up or down positions.
b. Each pan/tilt unit shall be capable of minimum ten preset positions for each pan and tilt operation.

**ELECTRICAL**

a. Each pan/tilt unit shall operate with input voltage of 115 VAC, 60 Hz ±0.3 Hz.
b. Each pan/tilt unit shall not exceed 200 W power consumption.
c. The motors shall be impedance overload protected, two phase induction type, rated for continuous duty and shall be instantaneous reversing.
d. The limit switches shall be rated 5 A, 10 million cycles and with external adjustments.
e. Each pan/tilt unit shall be provided with box-mounting type connector.
f. One mating connector with full set of crimp contacts and strain relief shall be provided with the box-mounting connector.

**MECHANICAL**

a. The maximum load shall be 45 kg at 127 mm from tilt table to center of gravity in both upright and inverted position.
b. Each pan/tilt unit shall have maximum dimensions of 400 mm high, 355 mm wide and 230 mm deep.
c. Each pan/tilt unit shall not exceed the maximum weight of 27 kg.
d. Each pan/tilt unit shall be constructed in aluminum casting and plate. All internal parts shall be corrosion protected.
e. Each pan/tilt shall have textured semi-gloss beige enamel finish.
f. All bearings shall be heavy duty ball or roller bearing.
g. All gears shall be hardened steel.
h. All gasket seals shall be designed for all weather protection.
i. Each pan/tilt unit shall have a mounting hole pattern as shown on the plans.
j. Each pan/tilt unit shall have a minimum pan torque rating of 34 N·m and an instantaneous minimum tilt torque of 68 N·m.
k. The pan speed at no load shall be 6 to 8 degrees per second, nominal.
l. The tilt speed at no load shall be 3 to 4 degrees per second, nominal.

**ENVIRONMENTAL**

a. Ambient operating temperature shall be from -10°C to 50°C.
b. It shall be able to withstand vibration of 760 µm total excursion from 5 to 30 Hz and a peak random vibration of 5 g from 30 to 1000 Hz.
c. It shall be able to withstand shock up to 15 g in all axes under non-operating conditions, conforming to MIL-E-5400R, Para. 3.2.24.6.
d. It shall be able to operate in atmospheres up to 95 percent relative humidity, conforming to MIL-E-5400R, Para 3.2.24.4.
e. It shall be able to withstand exposure to sand, dust, fungus, and salt atmosphere, conforming to MIL-E-5400R, Para 3.2.24.7, 3.2.24.8 and 3.2.24.9.

**PAN AND TILT UNIT MOUNTING**

The nuts and bolts securing the pan and tilt unit to the camera platform shall be hex head and made of stainless steel. Before each bolt is fastened, a locking type coating shall be applied to the threads. The coating shall lock the bolts and nuts in place making it impossible to turn bolt or nut without tools. This coating shall last and be effective through at least 10 insertions and withdrawals of the bolt or nut.

## 10-4.32 CAMERA JUNCTION BOX

The camera junction box (JCB) shall be constructed as shown on the plans and described in these special provisions. All seams shall be continuously welded. All JCB mounting Hex head stainless steel nuts and bolts shall be 6 mm □-20 x 25 mm. Steel surfaces on which JCB is to be mounted shall be drilled and tapped 6 mm □-20 thread. Each JCB shall be fabricated from 14 gauge sheet steel. Two 8-32 threaded studs for terminal strip mounting shall be welded on the bottom of the box as shown on the plans. After fabrication the JCB shall be hot-dip galvanized.

A twenty position terminal block with No. 8 lugs and cover shall be mounted on the bottom of the box. Permanent terminal position markings shall be used. A laminated wiring schematic shall be permanently attached to the inside of box cover showing wiring from the camera unit box mounting connector to the terminal block.

## 10-4.33 INTEGRATED SERVICES DIGITAL NETWORK TERMINAL ADAPTER UNIT

**GENERAL**

a. Each integrated services digital network terminal adapter (ISDN TA) unit shall provide an interface between data terminal equipment (DTE) such as the video encoder unit (VEU) or video decoder unit (VDU) and ISDN.
b. Each ISDN TA unit shall include an internal network termination Type 1 device (NT1) interface and include Terminal Adapter functionality. No external NT1 shall be allowed.
c. A prototype unit is not acceptable.
d. Each ISDN TA unit shall be of the current standard production units.
e. Each ISDN TA unit shall be new and not previously used.
f. The Contractor shall provide a manual for each unit supplied.

**QUALIFYING SPECIFICATIONS**

a. Operation --

i. Each ISDN TA shall support ISDN basic rate interface (BRI) service and shall provide three digital channels capable of simultaneous data and voice transmission via a standard telephone line. The three channels shall include two Bearer (B) channels at 64 kbps and one Data (D) channel at 16 kbps (2B+D).
ii. Leased operation shall support 1B (64 kbps) or 2B (128 kbps) clear channel synchronous configurations.
iii. At data rates over 64 kbps, the BONDING delay equalization protocol shall synchronize data over the two B channels.

b. Data rates --

i. Synchronous: 2.4, 4.8, 9.6, 19.2, 38.4, 48, 56, 64, 112, 128 kbps; selectable.
ii. Asynchronous: 0.3, 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 115.2 kbps; selectable.

c. Interoperability -- The ISDN TA unit shall support communications with public switched 56 kbps services and switched 56 kbps channel service unit/data service unit (CSU/DSU) as well as other ISDN TA, ISDN terminal equipment, and BONDING compatible inverse multiplexers.
d. D-Channel switch compatibility -- AT&T 5ESS, NTI DMS-100, National ISDN-1.
e. Dialing --Dialing shall be supported in the following ways:

i. Manually from a front panel keypad.
ii. Automatically from up to ten stored numbers.
iii. Automatically through an RS-366 parallel dial port.
iv. Dialing over the DTE interface using the asynchronous AT command set.
v. V.25 bis in-band dialing over the DTE interface using V.25 bis commands.

f. DTE interface -- The ISDN TA shall provide both EIA-530A and V.35 interfaces. The interface to be used shall be selectable. A three meter male/female EIA-530 interface cable shall be provided with each ISDN TA.
g. Network interface -- Network termination shall be designed into the ISDN unit thereby eliminating the need for an external NT1. Connection to the network shall be made by a telephone company provided 2-wire and/or 4-wire 2B1Q U-interface which is connected directly to an eight-pin RJ45 modular jack on the rear panel of the ISDN TA unit. The ISDN TA unit shall provide two RJ45 modular jacks, where one jack shall be designated for dial-up ISDN and the other jack designated for leased ISDN. The dial-up ISDN and leased ISDN operational modes maybe integrated on a single RJ45 jack if the operational modes are user selectable.
h. Local control facilities --Local operator control of all essential features of the ISDN TA unit shall be accomplished by the use of necessary discrete front panel controls.
i. Remote control facilities -- Remote configuration and control of the ISDN TA unit shall be possible using the AT command set in-band over the DTE interface. Remote call setup and termination shall also be possible using V.25 bis in-band dialing.
j. Diagnostics requirements -- Each ISDN TA unit shall be able to perform a variety of tests that allow problems to be identified and isolated. Testing shall be supported manually from the front panel, or in-band from either the network provider or distant end unit. Internal error checking shall be available for both the local and a remote activated digital loopback.
k. Physical --

i. Each ISDN TA unit shall be secured and mounted on a shelf assembly.
ii. Each shelf assembly shall provide for a minimum of four mounting screws in order to mount the shelf assembly in 89 mm (2 rack units) of EIA-310 rack space.

l. Electrical --

i. Power input voltage shall be 115 VAC ±10 percent, 60 Hz.
ii. Power dissipation shall not be greater than 8 W.

m. Environmental --

i. Operating temperature: 0°C to 50°C, minimum.
ii. Storage temperature: -20°C to 70°C, minimum.
iii. Relative humidity: 0 to 95 percent, non-condensing.

## 10-4.34 CAMERA CONTROL UNIT

### GENERAL

Each part of each camera control unit (CCU) shall be electrically and physically interchangeable with the like part in any other CCU furnished under this contract.

### MECHANICAL

a. Each CCU shall mount in 133 mm of EIA-310 rack space with a maximum depth of 356 mm.
b. The front panel shall be white gloss color Number 17886 as per Federal Standard Color Chart 595a.
c. The front and rear panel lettering shall be black color Number 17986 as per Federal Standard Color Chart 595a.

d. A high-impedance panel jack BNC (Bayonet Nut connector) connector shall be installed on the front panel as shown on the plans. This connector shall provide video input to a test monitor without affecting the remainder of the CCTV system. This connector shall be directly connected to the video input on the rear panel.
e. A glass type, size 6.35 mm x 31.75 mm (AG) slow blow fuse shall be installed on the front panel. The fuse shall be replaceable from the outside of the front panel.
f. Switches shall protrude no more than 25 mm from the front panel and shall be mounted as shown on the plans.
g. The rear panel connectors shall be mounted as shown on the plans and shall meet the following requirements:

i. Connectors C1-C3 shall be of the following type or equivalent:

| | |
|---|---|
| C1 | AMP 206430-1 |
| C2 | AMP 206043-1 |
| C3 | AMP 206306-1 |

ii. The pin and socket contacts for connectors C1-C3 shall be constructed with brass contact body material and with stainless steel spring that are sub-plated with 1.27 µm nickel and plated with 0.762 µm gold. Pin diameter shall be 1.575 mm. Contact size shall be 16.
iii. Each C1, C2 and C3 connector shall use the AMP No. 601105-1 or No. 91002-1 contact insertion and the AMP No. 305183 contact extraction tool.
iv. One mating connector with a full set crimp contacts and strain relief shall be supplied with connectors C1, C2 and C3.
v. The connectors C4 and C5 shall be a DB-25 socket connector.

h. Serial cable assemblies (SCA1 and SCA2) with length of 3 m shall be provided to mate with C4 and C5, respectively.
i. Pin and socket contacts for DB-25 connectors shall be copper alloy body; finished with 0.762 µm gold over 1.27 µm nickel.
j. The rear and front panel BNC connectors shall be of copper material with bright nickel (tarnish resistant) finish for the body and silver finish for the contact.
k. Each printed circuit board shall be vertically installed.
l. Each LED shall be equal to Hewlett Packard High Intensity Red Untinted, Non-diffused LED (Part Number HLMP-D105). Each LED shall be mounted as shown on the plans.
m. A front panel on/off switch shall turn the CCU on/off and shall also control AC power to the rear panel power output connector (C1). The indicator used for AC power shall be green when energized.
n. One coaxial cable labeled "AVO" (Analog Video Output) terminated with BNC plug connectors on each end shall be provided. This cable shall be RG-59/U with overall length of one meter.

**ELECTRICAL**

a. Each CCU shall have auto-iris override.
b. Each CCU shall have circuitry to detect the absence and presence of video sync on its video input. Each CCU shall also have circuitry to monitor the low-pressure alarm contact closure from the camera unit. A local/remote control switch shall be provided to override the lens and pan/tilt controls through C4 when the switch is in local mode. When in local mode, the local control alarm shall be active. Alarm status shall be constantly monitored and updated. Upon receipt of a "status query" message, the CCU shall send alarm status message with data as follows:

| | |
|---|---|
| "0" | None of the alarms active. |
| "1" | Local Control (LC) alarm active. |
| "2" | Low Pressure (LP) alarm active. |
| "3" | LP/LC alarms active. |
| "4" | Video Sync Absence (VSA) alarm active. |
| "5" | VSA/LC alarms active. |
| "6" | VSA/LP alarms active. |
| "7" | VSA/LP/LC alarms active. |

The front panel alarm light shall be lit if any the alarms are active.
c. Each CCU shall have circuitry for a source character generator. The source character generator shall display 16 alphanumeric characters superimposed on the video image. Each character shall be 28 TV lines high and shall be

derived from a standard 5 x 7 dot matrix. The programmed characters shall be stored in a non-volatile memory. Upon receipt of "Set ID" message, the CCU shall position from the camera ID in the video image as follows:

| | |
|---|---|
| "1" | Upper 15% limit of the left viewing area |
| "2" | Upper 15% limit of the right viewing area |
| "3" | Lower 15% limit of the left side viewing area |
| "4" | Lower 15% limit of the right side viewing area |

The characters shall be superimposed on the video signal using non-additive mixing techniques.

d. Each CCU shall be designed to prevent simultaneous operation of pan right/left, tilt up/down, zoom in/out, focus near/far or iris open/close.

e. Each CCU shall have power supply(ies) for camera zoom, focus, motors, control and interface circuits. The voltage for zoom, focus and iris shall be selectable internally by one jumper for 12.0 VDC, 9.0 VDC or 5.0 VDC at 100 mA. The CCU shall be pre-configured with the voltage jumper select set to 9.0 VDC. The operation of zoom, focus and iris shall be as follows:

| | |
|---|---|
| Zoom in | +VDC |
| Zoom out | -VDC |
| Focus near | +VDC |
| Focus far | -VDC |
| Iris close | +VDC |
| Iris open | -VDC |

f. The maximum power consumption for the CCU shall not exceed 450 W. Power consumption of equipment attached to pin 1 of connector C1 shall not exceed 100 W. Power consumption of equipment attached to pin 12 of connector C2 shall not exceed 200 W.

g. Each CCU shall have eight independently operating 24 VDC relays (options 1 to 8). Each relay shall be single pole, double throw (SPDT), with contacts rated 1.25 A at 120 VAC.

h. Each CCU shall be capable of a minimum of ten presets and capable of controlling camera units and pan/tilt units equipped with pre-positioning feedback potentiometers. Each CCU shall have circuitry to filter out any electrical noise interference on each of the pre-positioning feedback voltage signal for the camera unit and pan/tilt unit.

i. A system reset switch shall be a momentary-pushbutton type and be mounted on the front panel to function as external reset input to the microprocessor. System reset shall not cause existing pan/tilt and lens positions to change. System reset shall be executed without requiring the operator to hold the momentary-pushbutton for more than one second.

j. The front panel of the camera control unit shall have LEDs and switches to provide the following control functions as shown on the plans.

| Function | Hardware | Indicator |
|---|---|---|
| Zoom (In/Off/Out) | (ON)-OFF-(ON) | 2 LED |
| Focus (Near/Off/Far) | (ON)-OFF-(ON) | 2 LED |
| Pan (Left/Off/Right) | (ON)-OFF-(ON) | 2 LED |
| Tilt (Up/Off/Down) | (ON)-OFF-(ON) | 2 LED |
| Iris (Open/Off/Close) | (ON)-OFF-(ON) | 2 LED |
| Iris override (Manual/Auto ) | ON-OFF | 1 LED |
| Option 1 (On/Off) | ON-OFF | 1 LED |
| Option 2 (On/Off) | ON-OFF | 1 LED |
| Option 3 (On/Off) | ON-OFF | 1 LED |
| Option 4 (On/Off) | ON-OFF | 1 LED |
| Option 5 (On/Off) | ON-OFF | 1 LED |
| Option 6 (On/Off) | ON-OFF | 1 LED |
| Option 7 (On/Off) | ON-OFF | 1 LED |
| Option 8 (On/Off ) | ON-OFF | 1 LED |
| Alarm (On/Off ) | ON-OFF | 1 LED |
| Control (Local/Remote) | ON-OFF | |
| Reset | (ON)-OFF (momentary pushbutton) | |

k.

| CCU connector assignments | |
|---|---|
| C1 | 4 contact connector |
| C2 | 14 contact connector |
| C3 | 37 contact connector |
| C4, C5 | DB-25 connectors |

| C1 -- AC Power | |
|---|---|
| Position | Function |
| 1 | AC + |
| 2 | AC - |
| 3 | Equipment Ground |
| 4 | NA |

| C2 -- Pan/Tilt | | | |
|---|---|---|---|
| Pos. | Function | Pos. | Function |
| 1 | Pan right | 8 | Pan feedback |
| 2 | Pan left | 9 | Tilt feedback |
| 3 | AC- | 10 | Preset -VDC |
| 4 | Tilt up | 11 | NA |
| 5 | Tilt down | 12 | AC+ |
| 6 | AC- | 13 | AC- |
| 7 | Preset +VDC | 14 | Ground |

| C3 -- Camera | | | |
|---|---|---|---|
| Pos. | Function | Pos. | Function |
| 1 | Zoom | 20 | Option 3 N.O. |
| 2 | Z/F/I Common | 21 | Option 3 Common |
| 3 | Focus | 22 | Option 3 N.C. |
| 4 | Iris | 23 | Option 4 N.O. |
| 5 | Iris Override Common | 24 | Option 4 Common |
| 6 | Iris Override | 25 | Option 4 N.C. |
| 7 | Preset +VDC | 26 | Option 5 N.O. |
| 8 | Zoom Preset feedback | 27 | Option 5 Common |
| 9 | Focus Preset feedback | 28 | Option 5 N.C. |
| 10 | Preset -VDC | 29 | Option 6 N.O. |
| 11 | LP alarm | 30 | Option 6 Common |
| 12 | LP alarm | 31 | Option 6 N.C. |
| 13 | NA | 32 | Option 7 N.O. |
| 14 | Option 1 N.O. | 33 | Option 7 Common |
| 15 | Option 1 Common | 34 | Option 7 N.C. |
| 16 | Option 1 N.C. | 35 | Option 8 N.O. |
| 17 | Option 2 N.O. | 36 | Option 8 Common |
| 18 | Option 2 Common | 37 | Option 8 N.C. |
| 19 | Option 2 N.C. | | |

Note:
N.O. = Normally open
N.C. = Normally closed
NA = Not Available

| C4, C5 -- Serial communication ports to and from external device. | | | |
|---|---|---|---|
| Pos. | Function | Pos. | Function |
| 1 | NA | 14 | NA |
| 2 | Transmit Data | 15 | NA |
| 3 | Receive Data | 16 | NA |
| 4 | NA | 17 | NA |
| 5 | NA | 18 | NA |
| 6 | NA | 19 | NA |
| 7 | Signal Ground | 20 | NA |
| 8 | NA | 21 | NA |
| 9 | NA | 22 | NA |
| 10 | NA | 23 | NA |
| 11 | NA | 24 | NA |
| 12 | NA | 25 | NA |
| 13 | NA | | |

| Serial cables | | | |
|---|---|---|---|
| SCA1 | | SCA2 | |
| DB-25 Pin | DB-25 Pin | DB-25 Pin | DB-25 Socket |
| 2 | 2 | 2 | 2 |
| 3 | 3 | 3 | 3 |
| 7 | 7 | 7 | 7 |

**ENVIRONMENTAL**

a. Each CCU shall operate in an ambient temperature environment of -10°C to 50°C.
b. Each CCU shall conform to MIL-STD-810D-516.1 and MIL-STD-810D-514.1 shock and vibration test.

**CCU MESSAGES**

a. Each CCU shall communicate through the C4 serial port with the following communication message codes:

| DIREC-TION | MESSAGE | CHARACTER | | DATA |
|---|---|---|---|---|
| | | 1ST CODE | 2ND CODE | |
| Transmit | Alarm status | A | space | "0"-"7" |
| Receive | Status query | Q | space | NONE |
| Receive | Pan stop | p | space | NONE |
| Receive | Tilt stop | t | space | NONE |
| Receive | Zoom stop | z | space | NONE |
| Receive | Focus stop | f | space | NONE |
| Receive | Iris stop | i | space | NONE |
| Receive | Pan left | L | space | NONE |
| Receive | Pan right | R | space | NONE |
| Receive | Tilt up | U | space | NONE |
| Receive | Tilt down | D | space | NONE |
| Receive | Zoom in | I | space | NONE |
| Receive | Zoom out | O | space | NONE |
| Receive | Focus near | N | space | NONE |
| Receive | Focus Far | F | space | NONE |
| Receive | Iris open | J | space | NONE |
| Receive | Iris close | K | space | NONE |
| Receive | Iris manual | M | space | NONE |
| Receive | Iris auto | m | space | NONE |
| Receive | Set ID word | C | "1"-"4" | 16-ASCII char. |
| Receive | Home position 0-9 | H | "0"-"9" | NONE |
| Receive | Home position program 0-9 | P | "0"-"9" | NONE |
| Receive | Option on 1-8 | S | "1"-"8" | NONE |
| Receive | Option off 1-8 | s | "1"-"8" | NONE |
| Receive | Enter Echo mode | E | space | NONE |
| Receive | Exit Echo mode | ^]C | This sequence is not in a communication packet | |

b. After receiving the "enter echo" command the CCU shall pass all characters from C5 to C4 and C4 to C5. The CCU shall disable all camera movement.
c. When the "exit echo" mode sequence is received on C4, the CCU shall return to normal operation.

**SERIAL COMMUNICATIONS PROTOCOL**

a. The communication protocol shall consist of 8 data bits, 1 stop bit and no parity.
b. Communication handshaking shall use XON/XOFF.
c. The communication packet shall contain the following items: ADDRESS, CODE, DATA, CHECKSUM, CR. The packet is sent as a string of ASCII printable characters. The ADDRESS, which has its $80 bit set in order to signal the start of the packet. The CHECKSUM is generated by Exclusive-ORing the ADDRESS, CODE, and DATA. The communication byte count shall be as follows:

ADDRESS1CODE2DATA≥0CHECKSUM2CR1

d. The receiver will compute the CHECKSUM. If the computed CHECKSUM is correct the receiver will send ACK, otherwise the receiver will send NAK.

## 10-4.35 VIDEO ENCODER UNIT

### GENERAL

a. A prototype of the video encoder unit (VEU) is not acceptable.
b. All equipment shall be off the shelf production units.
c. All equipment shall be new and not previously used.
d. The Contractor shall provide a manual per each unit ordered.

### ACCEPTABLE EQUIPMENT

The VEU shall be compatible and interoperable with the existing video decoder unit (VDU), Enerdyne Technologies Model DEC1000R5. No other VEU/VDU pairs shall be different or deviate from other pairs.

### QUALIFYING SPECIFICATIONS

a. Video encoding --

i. The VEU shall replicate the adaptive digital video standard (ADVS) for digital compression and transmission of video images.
ii. The VEU shall implement frame sensitive algorithms, joint photograhic experts group (JPEG) to perform frame updating. Motion sensitive algorithms motion picture experts group (MPEG) shall not be allowed.
iii. The VEU shall be compatible with integrated services digital network (ISDN) basic rate interface at 128 kbps and shall comply with bandwidth on demand interoperability group (BONDING) protocol.
iv. The VEU shall be compatible with Switched-56 digital service at 56 kbps.
v. The VEU shall be compatible with advanced digital network (ADN) service at 56 kbps.
vi. The VEU shall be compatible with T1 service at 1.544 Mbps.

b. Physical -- The physical size of the VEU shall be as follows:

| | |
|---|---|
| Weight | 9 kg, maximum |
| Height | 135 mm, maximum |
| Width | 483 mm, maximum |
| Depth | 300 mm, maximum |

c. Mounting --

i. The VEU shall be mountable in a standard EIA-310 equipment rack.
ii. Each VEU shall be designed and mounted in such a way that it is easily accessible for maintenance.

d. Primary power input and output requirements --

i. All electrical power distribution, service and wiring components shall be UL listed or equivalent and meet the requirements of the national electric code as well as these special provisions.
ii. Power input shall be 100 to 130 VAC at 60 Hz ±3 Hz.
iii. Maximum power requirement shall be 25 W at 120 VAC.

e. Local control facilities --

i. Local operator control of all essential features of the VEU shall be accomplished by the use of necessary discrete front panel controls and/or switches. Each VEU shall have a front panel status display.
ii. The VEU shall store operator set default parameters in EEPROM to retain system configuration after loss of power. These parameters shall be loaded into volatile RAM during operation where they may be modified by operator set operational parameters.
iii. The VEU shall have a front panel status display.

f. Remote control facilities --

i. The control/status ports shall be EIA-232 with selectable data rates of 1200 to 9600 bps and the connector shall be a DB-25 type.
ii. The control/status ports shall provide telephone dialing, remote and local diagnostics testing, and system configuration.
iii. The control/status port shall provide selection of any of the video inputs.
iv. The control/status port shall provide in-band dialing for all interfaces using the AT and/or V.25 bis command set.
v. The control/status port of the VEU shall override in-band control of the VEU via the VDU.
vi. The control/status port shall provide selection of all network interface data rates and/or services.
vii. The control/status port shall provide user selectable video resolution. Minimum resolution settings shall be 560 (high), 280 (standard), and 140 (low) pixels per line.
viii. The control/status port shall provide user selection of 480 lines interlaced (frame mode) or 240 lines non-interlaced (field mode).
ix. The control/status port shall provide user selection of the compression algorithm quantization levels (Q-factor).
x. The control/status port shall provide cropping of the encoded video image at minimum of 104 percent (overscan), 100 percent, 85 percent, and 63 percent.
xi. The control/status port shall provide control over image attributes including, but not limited to, color hue, tint, and saturation. Section of monochrome or color of the VEU digitized video stream shall also be possible.

g. Video interface requirements --

i. The VEU shall be capable of both color and black/white video operation without modification to the hardware. Minimum motion video resolution shall be 560 pixels x 240 lines for the 525 lines, National Television Systems Committee (NTSC) standard, 60 Hz, composite input. Motion handling capability shall be up to 30 frames per second.
ii. The video interface formats shall be the following:

| | |
|---|---|
| Composite | 525 line NTSC 60 Hz |
| Component | Y/C: Luminance / Chrominance |

iii. The video input for the VEU shall be compatible with EIA-170 at 75 Ω impedance with Bayonet Nut Connector (BNC) type connectors and shall be provided as a minimum the following:

| |
|---|
| 3 video inputs composite |
| 3 video input Y/C |

iv. All video inputs shall be software selectable from the front panel on the VEU and from the control/status port.

h. Network interface requirements --

i. The VEU shall have hardware and software selectable network bit rates with the following as a minimum: 56 kbps, 64 kbps, 112 kbps, 128 kbps, 384 kbps, 768 kbps and 1.544 Mbps (T1).
ii. The VEU shall have three network interfaces: EIA-530A, DS-1 (T1 service), and V.35.
iii. The VEU shall transmit compressed and digitized video at a minimum of 95 percent of the available channel bandwidth, whenever bandwidth is not used by telephone, camera controls and or remote diagnostics.

i. Diagnostic and alarm requirements --

i. The VEU shall have self-diagnostic features display on the front panel.
ii. The VEU shall blank video on loss of video input.
iii. The VEU shall regain video lost due to excessive temperature when the temperature has reduced to 69°C.

j. Telephone interface --

i. The VEU shall provide an RJ11 telephone jack for voice communication.

ii. The VEU shall provide 16 kbps bandwidth for telephony within the bandwidth allocated for video only when bandwidth is needed for telephone.

k. Camera control interface --

i. The camera control interface shall provide a half-duplex clear channel for camera control and status user data with the following requirements:

| |
|---|
| The port shall communicate at a user selectable data rate from 1200 to 9600 bps, asynchronous. |
| The port shall be EIA-232, and the connector shall be a DB-25 type. |

ii. The VEU shall provide bandwidth for camera control within the bandwidth allocated for video only when bandwidth is needed for camera control/status data transmission.

l. Environmental --

i. Minimum operating temperature range shall be from -40°C to 70°C ambient, with guaranteed start up at -10°C. An environmental housing with air conditioning will not be allowed.
ii. Operating humidity shall be from 0 to 95 percent, non-condensing.

**ACCESSORY ITEMS**

The following VEU equipment accessory items shall be supplied by the Contractor as specified in these special provisions:

a. Service and Operations manual describing the video VEU as ordered and in accordance with these special provisions.
b. EIA-530A cable assembly shall be provided to connect the VEU to the integrated services digital network terminal adapter (ISDN TA) unit with basic rate interface that is specified elsewhere in these special provisions.

## 10-4.36 CAMERA STATION

**GENERAL**

The Contractor shall furnish and install the following closed circuit television (CCTV) equipment at each camera station as described in these special provisions and as shown on the plans:

1. One camera unit.
2. One pan/tilt unit.
3. One CCTV pole.
4. One camera junction box (JCB).
5. One camera control unit (CCU).
6. One video encoder unit (VEU).
7. One integrated services digital network terminal adapter (ISDN TA).
8. Connectors and fittings as required.
9. Cable and conductors as required.

**CABLES AND CONNECTORS**

The camera unit cable assembly box mounting connector shall be mounted on one side of the JCB and shall be prewired to the 20 position terminal block as shown on the plans. The video signal pins of the camera unit cable assembly box mounting connector shall be terminated to a Bayonet Nut Connector (BNC) jack connector via Type RG-59/U coaxial cable stub.

The television control cable (TVC) and television power conductors (TVP) shall be wired to the 20 position terminal block as shown on the plans. The television control power cable (TVCP) cable shall go through but does not terminate inside the JCB. A watertight strain-relief box connector shall installed at the JCB hole for the TVCP cable.

**INSTALLATION OF CAMERA STATION**

The work to be done at each camera station, as shown on the plans, as a minimum, shall consist of the following:

1. Attach pan/tilt unit to the mounting plate.
2. Attach camera unit to the pan/tilt unit.

3. Install JCB junction box.
4. Terminate TVC and TVP inside JCB junction box.
5. Terminate television video cable (TVL) inside JCB junction box with a BNC plug connector.
6. Install camera unit cable assembly wiring harness (Type JC).
7. Terminate TVCP with pan/tilt mating connector.
8. Connect TVCP to the pan/tilt unit.
9. Terminate TVL inside controller cabinet with BNC plug connector.
10. Terminate TVP, TVCP and TVC with CCU mating connectors C1, C2 and C3, respectively.
11. Adjust limit stops of the pan/tilt unit as directed by the Engineer.
12. Adjust camera unit to provide the optimum picture for the full range of daylight and night time conditions as directed by the Engineer.

**CAMERA UNIT MOUNTING**

The camera unit shall be secured to the pan/tilt unit using the stainless steel bolts provided with the camera unit. Before each bolt is fastened, a locking type coating shall be applied to the threads. The coating shall lock the bolt and nut in place, making it impossible to turn the bolt or nut without tools. This coating shall last through and be effective through at least ten insertions and withdrawals of the bolt or nut.

The work to be done between the camera mount and the controller cabinet, as shown on the plans, as a minimum, shall consist of the following:

1. Install conduits and pull boxes as required up to the controller cabinet.
2. Install and terminate TVL, TVC, TVCP, and TVP as shown on the plans.

The work to be done at each CCTV controller cabinet, as shown on the plans, as a minimum, shall consist of the following:

1. Install CCU.
2. Connect TVC, TVCP, TVP and TVL to CCU via their respective connectors.
3. Install VEU.
4. Install ISDN TA.
5. Connect CCU to VEU.
6. Connect ISDN TA to VEU.
7. Install 8-position connecting block.
8. Connect ISDN TA to the 8-position connecting block.

The Contractor shall furnish all materials necessary to provide a complete and functional camera station in accordance with these special provisions. Miscellaneous equipment, and materials not mentioned but necessary to provide a complete and fully operational camera station shall be furnished by the Contractor as incidental to the work for which no additional compensation will be allowed therefor.

All items furnished under this contract shall be new and shall be the latest version.

The Contractor shall be responsible for demonstrating proper operation of the camera station using test software and diagnostics which shall be provided to the Engineer as incidental items at no additional cost. Testing procedures are described elsewhere in these special provisions.

**CAMERA STATION TESTING**

Prior to removal or relocation of existing CCTV equipment including cables, pole, camera, pan and tilt unit, controller cabinet, etc., the camera station will be tested in the field by the Engineer in the presence of the Contractor. Existing equipment that fail during this test period will be replaced or repaired by the State or, if directed by the Engineer, by the Contractor, and such work will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. The Contractor shall notify the Engineer in writing fifteen days prior to the scheduled testing.

Upon completion of work, each camera station shall be subjected to post-installation tests as outlined herein. All testing shall be performed by the District Electrical Systems Branch personnel, arranged by the Engineer and in the presence of the Contractor. The Contractor shall notify the Engineer in writing fifteen days prior to the scheduled testing. Upon receipt of the notification, the Engineer shall contact the Electrical Systems Branch at (510) 286-6142. The Contractor shall provide all necessary equipment required to access the CCTV equipment for testing.

The testing shall consist of five consecutive days of continuous satisfactory operation of each camera station. If any material and equipment furnished and installed by the Contractor in this project is found defective or otherwise unsuitable, or the workmanship does not conform with the accepted standards, the Contractor shall replace such defective material and equipment at no cost to the State.

Rejected material or equipment may be offered again by the Contractor for consideration provided all non-compliance has been corrected and pretested by the Contractor. After all defects have been corrected, the camera station shall be re-tested until five consecutive days of continuous satisfactory operation is obtained.

The post-installation tests shall consist of, but not be limited to, inspection and functional testing in accordance with these special provisions.

Inspection shall consist of, but not be limited to, verification of correct wiring terminations, correct cable interconnections, good workmanship and compliance with these special provisions.

Functional testing shall include, but not be limited to, the following:

a. Verification of all local mode CCTV operations using the CCU front panel controls.
b. Verify video signal output from CCU with a National Television Systems Committee (NTSC) monitor.
c. Verify the correct operation of the auto/manual iris and power zoom.
d. Verify the correct operation of the pan/tilt unit. The pan/tilt unit shall be functionally tested over 355 degrees in the horizontal plane and ±60 degrees in the vertical plane. The pan/tilt unit limit stops shall then be adjusted to optimize the camera viewing coverage of the freeway as directed by the Engineer.
e. Verify the correct operation of the preset positions.

**10-4.37 CAMERA POLES**

Camera poles shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

**10-4.38 TRAFFIC OPERATIONS SYSTEM EQUIPMENT TESTING**

Prior to shipping to the project, the Contractor shall submit the following items to the State of California, Department of Transportation Laboratory, 5900 Folsom Blvd., Sacramento, CA 95819 for acceptance testing:

1. Camera unit
2. Pan/tilt unit
3. Camera control unit (CCU)
4. Video encoder unit (VEU)
5. Analog data station termination (ADST) unit
6. Integrated services digital network terminal adapter (ISDN TA)

Approximately 30 days will be required for the testing. The Contractor will be notified upon completion of the testing and shall arrange for delivery of the equipment to a storage location designated by the Contractor. The costs of such testing and the transportation to and from the Laboratory shall be borne by the Contractor.

**10-4.39 SERVICE MANUAL REQUIREMENTS**

The Contractor shall provide to the Engineer a minimum of two copies of service manuals for the camera unit, pan/tilt unit, camera control unit (CCU), video encoder unit (VEU) and integrated services digital network terminal adapter (ISDN TA) unit under this special provisions. Each manual shall contain the following sections and sub-sections.

**GENERAL INFORMATION SECTION**

a. A list of applicable subassemblies that comprise the specified equipment.
b. Overall description of the equipment design features (including all enhance features if applicable), performance, and applications.
c. Equipment specifications summary.
d. Equipment installation instructions.

**THEORY OF OPERATIONS SECTION**

a. Theory of operation of the standard equipment, with unique or unusual circuitry described in detail.
b. Theory of operation reflecting any modifications to the standard equipment.

**MAINTENANCE SECTION**

a. Recommended test equipment and fixtures, or minimum operational and performance requirements for appropriate test equipment.
b. Trouble shooting information and charts.
c. Removal and installation procedures for replacing assemblies and subassemblies, if not obvious or if improper sequencing of steps may result in component damage.

**REPLACEMENT PARTS SECTION**

a. Each manual shall contain an equipment replacement parts list including electrical parts, mechanical parts and assemblies.
b. All semiconductors shall be identified by the supplier's numbers and by JEDEC numbers if applicable.

**DIAGRAM SECTION**

a. Schematic diagrams(s) identifying all circuit components and showing normal test voltages and levels.
b. An overall functional block diagram.
c. Detailed interconnecting diagram(s) showing wiring between modules, circuit boards and major components.
d. Pictorial circuit board layout diagram(s) showing both component placement and printed wiring detail.
e. Diagram(s) showing location of circuit boards and other subassemblies.
f. Exploded view diagram(s) of complex mechanical assemblies.

**PHYSICAL REQUIREMENTS**

a. All pages, including latest revisions, shall be securely fastened together between protective covers (loose-leaf ring binding is acceptable).
b. No page shall be subject to fading from exposure to any normal source of ambient lighting (ozalid reproduced pages are not acceptable).

## 10-4.40 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

Salvaged electrical materials shall be hauled to Caltrans Electrical Maintenance Station, 30 Rickard Street, San Francisco, CA 94134, (415) 330-6509 and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum of 2 working days' notice shall be given prior to delivery.

## 10-4.41 PAYMENT

The contract lump sum price paid for signal and lighting shall include highway lighting at intersections in connection with signals only.

Other roadway lighting on the project shall be considered as included in the contract lump sum prices paid for various bid items as shown on plans.

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.

Lighting (Stage Construction) will be measured and paid for in the same manner specified for lighting in Section 86 of the Standard Specifications.

The contract lump sum price paid for traffic operations system shall include full compensation for furnishing all labor, materials (except items covered by other bid items), tools, equipment, and incidentals, and for doing all the work involved in installing traffic operations system, complete in place, including all the foundations (except for the changeable message sign), poles, manuals and testing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract unit price paid for each of the following items shall include full compensation for furnishing all materials, tools, equipment, and incidentals, as shown on the plans, as specified in these special provisions, and as directed by the Engineer:

1. Camera unit.
2. Pan/tilt unit.
3. Camera control unit (CCU).
4. Video encoder unit. (VEU)
5. Integrated services digital network terminal adapter (ISDN TA).
6. Cluster controller for microwave vehicle detection sensor system.
7. Analog data station termination (ADST).

The contract lump sum price paid for callbox system shall include full compensation for furnishing all labor, materials (except items covered by other bid items), tools, equipment, and incidentals and for doing all the work involved in installing CCTV station complete in place, including documentation, testing and training, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for microwave vehicle detection sensor system shall be considered as included in the contract lump sum prices paid for traffic operations system at said location as shown on plans and no additional compensation will be allowed therefor.

Full compensation for electric service (irrigation) shall be considered as included in the contract lump sum price paid for lighting and sign illumination - location 1 and no separate payment will be made therefor.

Full compensation for flashing beacons shown on lighting - location 2 shall be considered as included in the contract lump sum price paid for lighting - location 2 and no separate payment will be made therefor.

Full compensation for stage construction work shown on E-12 shall be considered as included in the contract lump sum price paid for traffic operations system location 2 and no additional compensation will be allowed therefor.

Full compensation for lighting and flashing beacons shown on traffic operations system location 3 shall be considered as included in the contract lump sum price paid for traffic operations system location 3 and no separate payment will be made therefor.

Full compensation for traffic operations system shown on callbox system shall be considered as included in the contract lump sum price paid for callbox system and no separate payment will be made therefor.

Full compensation for flashing beacons shown on stage construction plans shall be considered as included in the contract lump sum price paid for stage construction at said location and no separate payment will be made therefor.

Full compensation for existing electrical conduits to be maintained during stage 3, phase 2A detour shall be considered as included in the contract lump sum price paid for lighting and sign illumination and traffic operations system stage construction location 3 and no additional compensation will be allowed therefor.

## SECTION 10-5. ELECTRICAL MONITORING SYSTEMS

### 10-5.01 GENERAL

**SCOPE**

This work shall consist of installing the seismic monitoring system and electrical work in accordance with the details shown on the plans, the provisions in Section 86, “Signals, Lighting and Electrical Systems” of the Standard Specifications, the Standard Plans, and these special provisions.

Electrical work shall include furnishing all labor, materials, equipment and services required to construct and install the complete seismic monitoring electrical system and bridge lighting and power system as shown on the plans.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and shall be coordinated with the work of other trades. Equipment requiring maintenance and inspection shall be located where it is readily accessible for the performance of such maintenance and inspection.

**Related work.--**Earthwork, foundations, mechanical, seismic monitoring casing, and such other work incidental to and necessary for the proper installation and operation of the seismic monitoring system and bridge lighting and power system electrical work shall be done in accordance with the requirements specified for similar work elsewhere in these special provisions.

**Order of work.--**The time to start and perform seismic monitoring system and electrical work shall be coordinated with the schedule of bridge work at the "D3" Line and "J" Line structures and as directed by the Engineer.

**State-Furnished Materials.--**Attention is directed to Section 8-1.01, “State-Furnished Materials”, of these special provisions.

The following seismic monitoring system materials will be furnished by the State for installation by the Contractor (after Pre-job meeting with Caltrans Electrical Engineer, California Division of Mines and Geology (CDMG) personnel and Earthquake engineering personnel):

FBA pigtails

Seismic sensor mounting plates

“Bishops Hat” Downhole Specially formed sealed cap

The Contractor shall notify the Engineer in writing not less than 20 working days in advance when the Contractor wants CDMG personnel to deliver the State-Furnished material to the Contractor.

**State-furnished and installed material.--** The Contractor shall notify the Engineer in writing at least 30 working days in advance when the Contractor wants CDMG personnel to install and test the seismic equipment as specified elsewhere in these special provisions. The Contractor shall notify the Engineer in writing at least 30 working days in advance when the Contractor wants Caltrans personnel to install and test the seismic monitoring equipment as specified elsewhere in these special provisions.

The following seismic monitoring system materials will be furnished and installed by the State personnel:
Downhole seismic sensors and cable to surface
Seismic sensors
Seismic recorders

**Access and Contractor assistance (Seismic Monitoring System).--**After all Contractor and State supplied equipment, conduit and cable has been installed, the contractor shall provide CDMG and associated Caltrans personnel, (total of 4 personnel) the means and equipment to safely access and perform work at all the recorder, sensor, and antenna locations. This is to include the transportation of equipment to and from the job site, traffic control, movement of stored materials, and vehicle parking where necessary. Access is for the purpose of installation, operational testing and performing necessary system troubleshooting and repair. The estimates below are for actual work at the locations and exclude transit time to the work locations and the set-up times of any lifts, scaffolds, etc. Some of the work can be accomplished simultaneously and the CDMG personnel will meet with the Engineer and the Contractor at the job site to work out a detailed, mutually agreeable schedule, including equipment and workplace access requirement. Access and contractors assistance will be needed as follows:

1. At the Seismic recorders location:

   a) Approximately 3 days access prior to their installation for the purpose of measuring and preparing to mount the recorders.
   b) Approximately 3 days access "per recorder cabinet" to install and wire the recorders.
   c) Approximately 2 days access per each recorder cabinet during the installation and testing of the seismic sensors wired to that specific recorder location.
   d) Approximately 3 days access per recorder cabinet during the final system testing and any necessary troubleshooting and repair.

2. At the seismic sensor enclosure locations:

   a) Approximately 30 minutes access time at each enclosure on a minimum of two occasions for installation and operational testing of each sensor.

3. At the Down hole and Free field locations:

   a) Approximately 1/2 day access time for each down hole and free field location plus two additional days for wiring and testing.

**TESTING--**After the complete installation of the seismic monitoring system by both the Contractor and CDMG personnel, the complete system will be tested by CDMG personnel in the presence of the Engineer to demonstrate that it is working properly. Any problems associated with the equipment installed by the Contractor (State or Contractor supplied) shall be, adjusted, replaced, and/or repaired as required at the contractors expense, and the complete system shall be retested. If problems occur with State installed equipment, it will be replaced, or repaired as required, and retested all at the States expense.

In the event, a 120 V (ac) single phase, 60 Hz power will not be available from existing Caltrans facilities during the testing, then the contractor shall provide 120 V (ac), single phase, 60 Hz power for each location for the duration of the testing.

**SUBMITTALS--**

**Product data--**

A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein.Manufacturer's descriptive data shall be submitted for the following:

Seismic Cable
Telephone (ISDN) cable
Interconnect Cable
Manhole (for Freefield)
Junction boxes

Seismic sensor enclosures (No 9A Pull box, cast metal enclosure and NEMA 4X SST)
Pull boxes
Downhole box
Receptacles
Panelboard S
Transformer T1
Lighting Fixtures

**10-5.02 CONDUIT AND FITTINGS**

**Conduit, general--**Conduit shall conform to section 86-2.05 “Conduit” in the Standard Specifications and as specified in these special provisions.

Rigid steel conduit shall be used unless otherwise shown on the plans or specified in these special provisions.

Rigid non-metallic conduit shall be used at the locations shown on the plans for direct underground burial outside the building foundation.

Unless otherwise specified or shown on the plans, liquid-tight flexible metal conduit shall be used on the bridge at the locations shown on the plans.

Conduit trade sizes are shown on the plans. No deviation from the conduit size shown on the plans will be permitted without written permission from the Engineer.

Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.

Rigid non-metallic conduit bends of 30 degrees or greater shall be factory-made long radius sweeps. Bends less than 30 degrees shall be made using an approved heat box.

A pull rope shall be installed in all empty conduits. At least one meter of pull rope shall be doubled back into the conduit at each termination.

Locations of conduit runs shall be planned in advance of the installation and coordinated with the electrical work shown on "Roadway Electrical Plans" in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.

Where practical, conduits shall be installed in groups in parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.

Exposed conduit shall be installed parallel and at right angles to the building lines or bridge line.

All raceway systems shall be secured to the structures using specified fasteners, clamps and hangers.

Single conduit runs shall be supported by using one hole pipe clamps. Where run horizontally on walls in damp or wet locations, conduit shall be installed with "clamp backs" to space conduit off the surface.

Multiple conduit runs shall be supported with construction channel secured to the building structure. Conduits shall be fastened to construction channel with channel compatible pipe clamps.

Raceways of different types shall be joined using approved couplings or transition fittings.

Expansion couplings shall be installed where conduit crosses a building separation or bridge expansion joint.

All conduit across regions of movement (hinges and abutments) shall be liquid-tight flexible metal conduit with slack to accommodate the movement expected.

Expansion deflection fittings shall conform to section 86-2-05D in the Standard Specifications and shall be used for expansion joint of 38 mm movement rating or less.

**Conduit terminations--**Rigid steel conduits shall be securely fastened to cabinets, boxes and gutters using 2 locknuts and specified insulating metallic bushing. Electrical metallic tubing shall be securely fastened to cabinets, boxes and gutters using specified connectors. Conduit terminations at exposed weatherproof enclosures and cast outlet boxes shall be made watertight using specified hubs.

Grounding bushings with bonding jumpers shall be installed on all type of conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

**10-5.03 CONDUCTORS AND CABLES**

**Seismic cable--**Seismic cable, SC, shall be eight (8) tinned copper conductors (4 twisted pairs with individual drain wires), AWG #22 (7 x 30 stranded), insulation 0.007 inch thick, individually shielded pairs with an aluminum-polyester shield and a AWG #22 stranded tinned copper drain wire, overall nominal outside diameter of 8mm or less and outer jacket 0.23 mm thick. Cable shall be instrument cable, NEC rated CLP2 plenum cable rated for 150°C. Cable shall be similar to Belden plenum cable, Catalog No. 87778 but with only four pairs and having a color code as specified below:

Color Code: 1st pair - red, black;
2nd pair - white, brown;
3rd pair - blue, violet;
4th pair - yellow, orange

Seismic cable shall be United Wire and Cable Co., Inc.; Consolidated Wire and Cable; or equal.

Cable spools shall be of sufficient length to allow cables to be installed without splices from the sensor enclosures to the recorder locations as shown on the plans. Only by permission from the Engineer will splices in these continuous runs be allowed.

**Seismic cable identification--**Each seismic cable shall be tagged with the channel number as shown on the plans at each termination. Additionally, at each junction box or pull box, recorder cabinet location, and pull box that contains more than one seismic cable, the cables shall be identified. Identification shall be made with one of the methods specified under "Conductor Identification".

Tags shall be located within 305 millimeters of the cables exiting the conduits.

**Telephone cable--**Telephone cable shall be Integrated Signal Digital Network (ISDN) rated cable with 2 twisted shielded conductor pairs, minimum AWG #20 tinned copper, polyethylene insulated, with a foil aluminum-polyester shield, drain wire and chrome PVC jacket rated for 300 V.

**Interconnect cable--**Interconnect cable shall be EIA RS-485 Applications cable, Plenum type, NEC rated CL2P for temperature of 150°C. Cable shall be similar to Belden cable #9844 but plenum rated. The cable shall have 8 tinned copper, insulated conductors (4 twisted pairs). Overall aluminum-polyester shield and 24 AWG stranded tinned copper drain wire. Overall tinned copper braid shield (90% coverage). Overall nominal O.D. of 9 mm or less, with outer jacket of 0.23 mm thick.

Color Code: 1st pair-White/Blue Stripe, Blue/White Stripe;
2nd pair-White/Orange Stripe, Orange/White Stripe;
3rd pair-White/Green Stripe, Green/White Stripe,
4th pair-White/Brown Stripe, Brown/White Stripe.

Interconnect cable shall be United Wire and Cable Co., Inc.; Consolidated Wire and Cable; or equal.

Cable spools shall be of sufficient length to allow cables to be installed without splices.

**Conductors--**Conductors shall conform to section 86-2.08 “Conductors” in the Standard Specifications.

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.

**Conductor and cable installation--**Conductors shall not be installed in conduit until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors and cables that insulation is not damaged. An approved non-petroleum base and insulating type pulling compound shall be used as needed.

Seismic and interconnect cables shall be installed continuous without any splices.

Splices and joints shall be insulated with insulation equivalent to that of the conductor.

Provide 155 mm of slack at each outlet and device connection. If the outlet or device is not at the end of a run of wire, connection shall be made with correctly colored pigtails tapped to the runs with splices as specified herein.

Branch circuit conductors in panelboards and load centers shall be neatly trained along a path from the breaker terminals to their exit point. The conductors shall have ample length to transverse the path without strain, but shall not be so long as to require coiling, doubling back, or cramming. The path shall transverse the panelboard gutter spaces without entering a gutter containing service conductors and, unless otherwise shown on the plans, without entering the gutter space of any panelboard feeder.

All pressure type connectors and lugs shall be retightened after the initial set.

Splices in underground pull boxes and similar locations shall be made watertight.

**Wire connections and devices--**Wire connections and devices shall be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

**Conductor identification--**The neutral and equipment grounding conductors shall be identified as follows:

Neutral conductor shall have a white or natural gray insulation except that conductors No. 4 and larger may be identified by distinctive white marker such as paint or white tape at each termination.

Equipment grounding conductor shall be bare or insulated. If insulated, equipment grounding conductors shall have green or green with one or more yellow stripes insulation over its entire length except that conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape over its entire exposed insulation.

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 |
|---|---|
| | |
| | |
| 120/208 V-Three phase | Black, red, blue |
| 277/480 V-Three phase | Brown, orange, yellow |

**Seismic cable identification--**Each seismic cable shall be tagged with the identification as shown on the plans at each termination. Additionally, at each junction box, recorder cabinet location, and pull box that contains more than one seismic cable, the cables shall be tagged. Tags shall be located within 305 millimeters of the cables exiting the conduits. Identification shall be made as follows:

a. At each termination: adhesive backed paper or cloth wrapped around markers with heat shrinkable tubing sealed over either type of markers.

b. At junction box or pull box: adhesive backed paper or cloth wrapped around markers.

**10-5.04 ELECTRICAL BOXES**

**Outlet, device and junction boxes--**Unless otherwise shown or specified, boxes shall be cast metal boxes and shall be the size and configuration best suited to the application indicated on the plans.

Cast metal boxes shall be cast iron boxes with threaded hubs and shall be of the size and configuration best suited to the application shown on the plans.

Cast metal boxes shall have cast metal covers with gaskets.

**Seismic cast metal junction boxes--**Seismic cast metal junction boxes shall be a cast ferrous metal, NEMA Type 6, gasketed screw cover box complete with external mounting lugs, weatherproof conduit hubs and size as shown on the plans.

**No. 9A pull boxes--**No. 9A pull box installed in the concrete railing containing seismic sensor cables shall have gasket and screw cover. The cover shall have the inscription "SEISMIC PULL BOX".

Pull box No. 9A installed flush to top of the concrete railing and used for seismic sensor enclosure shall have gasket and screw cover. The cover shall have the inscription "SEISMIC SENSOR ENCLOSURE #".

All pull boxes screws shall be stainless steel.

All bolts, nuts, washers, screws (size 8 or larger), hinges and hinge pins shall be stainless steel unless otherwise specified.

**Gutter--** Gutter for seismic sensor cables shall be NEMA 4X gutter with the size as shown on the plans and shall be 316 or 316L stainless steel with gasketed screw cover.

Gutter used as intermediate pull box for the conduits dedicated for future fiber optic cables shall be NEMA Type 1 for location inside the box girder, and NEMA Type 3R for location outside the box girder, without knockouts and with dimension as shown on the plans.

**Seismic Sensor Enclosures--**Seismic sensor enclosures mounted on the column shall be a 316 or 316L stainless steel NEMA Type 4X, hinged cover box, 152 mm deep, with other dimensions shown on the plans.

The enclosure shall be Hoffman, catalog No. A-1412CHNFSS6; Circle AW, Catalog No. 14126-4XSCHC (without upper and lower mounting flanges and with padlock hasp similar to catalog No. A-PLKJIC); or equal.

The seismic sensor enclosure mounted in concrete railing shall be No 9A pull box complete with gasket and cover and mounted as shown on the plans.

A nameplate with the inscription "SEISMIC ENCLOSURE #" shall be installed on the front cover (the # shall correspond to the # of the enclosure shown on the plans). The backside of the enclosure shall have a flush smooth surface.

**Seismic sensor enclosure Type 6--**Seismic sensor enclosure Type 6, shall be a cast ferrous metal NEMA Type 6, box with gasketed screw cover box, 6 inches deep and of dimensions shown on the plans. Seismic sensor enclosure cover shall have raised cast inscription "SEISMIC ENCLOSURE #" in 26 mm high letters (the # shall correspond to the # of the enclosure shown on the plans).

The box The box shall be able to withstand submersion in water up to six foot depth for extended periods. A minimum of two cast mounting lugs shall be attached on two opposing sides of the enclosure. The enclosure shall have a bossed, drilled and tapped (NPT) hole to accept a 27 mm conduit connector, centered between the mounting lugs on one side only. The enclosure shall also have a mounting button drilled and tapped for 6 mm x 20 located in the center (+/- 3 mm) of the inside bottom of the enclosure.

The enclosure shall be O-Z Gedney, catalog No. YF-121206-SUB, with raised cast lettering, “SEISMIC ENCLOSURE”, in the cover, mounting button P/N 1 MBT (installed in the center inside the bottom of the box), mounting lugs P/N 4ML1816 attached to each side, and one P/N BDT100 conduit connector hole centered between mounting lugs on one side; Crouse Hinds, Catalog No. WCB121208-1000G (except box shall be 150 mm deep), with mounting straps and raised cast lettering, “SEISMIC ENCLOSURE”, in the cover, mounting pad blind tapped for 6 mm x 20 installed in the center of the inside bottom of the enclosure, and one drilled and tapped (NPT) 27 mm conduit hole centered between the mounting straps on one side only; or equal.

**Manholes--**Manholes shall be 1220 mm x1220 mm (inside dimensions) x 610 mm deep with 155 mm thick walls, bottom and top. The manhole shall be precast or cast-in-place concrete designed for H-20-44 bridge loading. A 915 mm square hole shall be cut out or formed within the bottom of the manhole. The frame and cover shall be cast iron and cover shall have provisions for hold down bolts. Bolts shall be included. Conduits terminating inside the manhole shall end with bushings specified elsewhere in these special provisions. A cable pulling iron shall be installed in the wall opposite each conduit entrance. Manhole cover shall be engraved “SEISMIC” in 25 mm high letters.

The top of the manhole shall be installed 15 mm above the finished grade in unpaved areas and flush with grade in paved areas. Where conduits enter the manhole, the space around the conduits shall be grouted tightly or cast through the bottom.

**Downhole Box--**Downhole box shall be high density reinforced concrete box having an inside diameter of 356 mm minimum. The box shall be designed for installation in heavy truck traffic areas. Box cover shall be cast iron with provisions for hold down bolts. Bolts shall be included. Box cover shall be marked “SEISMIC”.

Downhole box installation shall be installed 15 mm above the finished grade in unpaved areas and flush with grad in paved areas. Where conduits enter the manhole, the space around the conduits shall be grouted tightly or cast through the bottom.

**Underground Pull Box--**Pull boxes shall be high density reinforced concrete box with ultraviolet inhibitor polyethylene etched face anchored in concrete and fiberglass cover with hold down bolts. The polyethylene and fiberglass material shall be fire resistant and show no appreciable change in physical properties with exposure to the weather.

Traffic rated pull boxes shall be high density reinforced concrete box with steel cover with hold down bolts and bonding strap. Pull box and cover shall be designed for H20 loading. No. 5 pull box shall have inside dimensions of 335 mm by 610 mm.

Electrical pull box covers or lids shall be marked "ELECTRICAL." Telephone service pull box covers or lids shall have plain, unmarked covers.

Seismic underground pull box covers or lids shall be marked "SEISMIC."

The bottom of pull boxes shall be bedded in 155 mm of clean, crushed rock or gravel and shall be grouted with 40 mm thick grout prior to installation of conductors. Grout shall be sloped to a 25 mm PVC pipe drain hole. Conduit shall be sealed in place with grout.

Top of pull boxes shall be flush with surrounding grade or top of curb. In unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box shall be set at plus 30 mm above surrounding grade. Pull boxes shown on the plans in the vicinity of curbs shall be placed adjacent to the back of curb. Pull boxes shown on the plans adjacent to lighting standards shall be placed on the side of foundation facing away from traffic.

## 10-5.05 RECEPTACLES AND SWITCHES

**Duplex receptacles--**Duplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

**Snap switches--**Snap switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

## 10-5.06 MISCELLANEOUS MATERIALS

**Warning Tape--**Warning tape shall be 100 mm wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 19 mm black letters at 760 mm intervals on bright orange or yellow background. The printed warning shall be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape shall have a tensile strength of not less than 70 kg per 100 mm wide strip and shall have a minimum elongation of 700 percent before breaking.

**Pull ropes--**Pull ropes shall be nylon or polypropylene with a minimum tensile strength of 225 kg.

**Watertight conduit plugs--**Watertight conduit plugs shall be a hollow or solid stem expansion plugs complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material shall be non-stick type rubber resistant to oils, salt, and alkaline substances normally available at the construction sites.

**Anchorage devices--**Anchorage devices shall be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, and expansion anchors and inserts.

**Electrical supporting devices--**Electrical supporting devices shall be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable cast iron.

Construction channel shall be, unless otherwise shown on the plans, 41 mm x 41 mm, 2.66 mm (12-gage) galvanized steel channel with 13 mm diameter bolt holes, 40 mm on center in the base of the channel.

**Equipment identification--**Equipment shall be identified with nameplates fastened with self-tapping, cadmium-plated stainless steel screws or nickel-plated bolts.

Nameplate inscriptions shall read as shown on the plans.

## 10-5.07 TELEPHONE SERVICE

**Utility connection--**The Contractor shall make all arrangements and obtain all permits and licenses required for the extension of and connection to an ISDN telephone service applicable to this project, shall furnish all labor and materials necessary for such extensions which are not performed or provided by the utility, and shall furnish and install any intermediate equipment required by the serving utilities.

Upon written request by the Contractor, the State will pay all utility permits, licenses, connection charges, and excess length charges directly to the utility. Such request shall be submitted not less than 15 days before service connections are required.

The costs incurred by the Contractor for the extension of utilities beyond the limits shown on the plans, and in furnishing and installing any intermediate equipment required by the serving utilities, will be paid for as an ordered change as provided for elsewhere in these special provisions.

Full compensation for any costs incurred by the Contractor to obtain the permits and licenses shall be considered as included in the contract lump sum price and no additional compensation will be allowed therefore.

**Installation details--**The Contractor shall submit complete service installation details to the serving utilities for approval. Prior to submitting installation details to the serving utility, the Contractor shall have said drawings reviewed and stamped "APPROVED" by the Engineer. Submittals shall be approved by the serving utility prior to commencing work.

Installation of service equipment shall be in accordance with the requirements of the serving utilities as shown on the approved installation details.

## 10.5.08 ELECTRICAL EQUIPMENT

**Panelboard S--**Panelboard S shall be indoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 208/120-volt, AC panelboard at least 500 mm wide with 70-ampere main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans. Panel shall be Square D Company, Westinghouse; General Electric; or equal.

**Panelboard installation--**Set cabinets plumb and symmetrical with structure lines. Train interior wiring as specified under "Conductor and Cable Installation" in "Basic Materials and Methods" of these special provisions. Touch-up paint any

marks, blemishes, or other finish damage suffered during installation. Replace cabinets, doors or trim exhibiting dents, bends, warps or poor fit which may impede ready access, security or integrity.

Mounting height shall be 1.4 meters to the highest circuit breaker handle, measured above the finished floor.

Where "Future" or "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 each cabinet door. Directory panel designation for each circuit breaker shall include complete information concerning equipment controlled, including room number or area designated on the plans.

**Transformer T1--**Transformer T1 shall be indoor, dry type, wall mounted, 3-phase, 480-volt primary, 208/120-volt secondary, 25-KVA transformer with NEMA enclosure. Transformer shall have two 2 1/2 percent full capacity taps above and four 2 1/2 percent full capacity taps below normal primary voltage.

**Transformer installation**--Connect primary to minimum value taps during construction period and prior to initial building start-up. Make voltage readings and adjust tap connections to nominal voltage during final construction review and prior to building occupancy. Install conduit connections which will prevent transmission of the transformer vibrations to the conduit system. Provide and install suitable brackets for installing the transformer inside the steel box girder. No welding or drilling to the structural steel shall be performed without a written permission from the Engineer for the purpose of installing support brackets.

**Equipment identification--**Equipment shall be identified with nameplates fastened with self-tapping, cadmium-plated stainless steel screws or nickel-plated bolts.

Nameplate inscriptions shall read as follows:

| Item | Letter height, mm | Inscription |
|---|---|---|
| Panel S | 6 | PANEL S<br>208/120V, 3-PHASE |

**10-5.09 LIGHTING**

**Lighting fixtures--**Lighting fixtures shall be as shown on the plans and as specified herein.

**F1--**Ceiling-mounted fluorescent fixture with one 26-watt lamp complete with vaporproof housing and guard, heat treated glass globe, integral high power ballast and an outlet box with threaded hubs. The fixture shall be Day Brite; NRL Lighting Products.

**Lighting fixtures installation--**Lighting fixtures shall be mounted securely in accordance with the manufacturer's recommendations. Mounting methods shall be suitable for the particular type of ceiling or support at each location.

The Contractor shall provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures.

Fixtures shall be set at the mounting heights shown on the plans, except heights shown shall be adjusted to meet conditions.

**10-5.10 MEASUREMENT AND PAYMENT**

Seismic monitoring electrical system shall be paid for on a lump sum price

The contract lump sum price paid for seismic monitoring system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals (except state furnished materials and labor), and for doing all the work involved in furnishing and installing the seismic monitoring system, complete in place, including transportation and storage of state furnished materials, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Metal components for supports and attachments shall conform to "Miscellaneous Metal (Bridge)" elsewhere in these special provisions.

Full compensation for furnishing and installing supports and attachments for the electrical monitoring systems shall be considered as included in the contract lump sum price paid for seismic monitoring system and no separate payment will be made therefor.

## SECTION 11. MODIFIED STANDARD SPECIFICATION SECTIONS

## 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 | 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 | | Desert (per Engineer) | |
| | | Type A | Type B | Type A | 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.

## 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 aggregateto 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.

### 39-3.03 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.<br>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, Appendix F, "Sieve Analysis of Aggregate from Bituminous Mixtures Processed in an Ignition Oven" as specified in "Asphalt Concrete" in Section 10-1, "General," of these special provisions. 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 α = 0.01) | degrees of freedom (nc+nv-2) | $t_{crit}$ (for α = 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 | ∞ | 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.

### 39-7.05 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.

Before placing the pavement reinforcing fabric, a binder of paving asphalt shall be applied to the surface to receive the pavement reinforcing fabric at an approximate rate of 1.15 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.

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 fabric shall be aligned and placed with no wrinkles that lap. The test for lapping shall be made by gathering together the 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. Pavement reinforcing fabric shall not be placed in areas of conform tapers where the thickness of the overlying asphalt concrete is 30 mm or less.

If manual laydown methods are used, the fabric shall be unrolled, aligned, and placed in increments of approximately 9 m.

Adjacent borders of the 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 fabric overlays, both the binder and the fabric shall overlap previously placed fabric by the same amount.

Seating of the 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 fabric immediately in advance of placing asphalt concrete surfacing in order to prevent fabric from being damaged by construction equipment.

Public traffic shall not be allowed on the bare reinforcing fabric, except that public 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;

$$\overline{X} = \frac{\sum x}{n}$$

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

| | Sample Size ( n ) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | 10 - 11 | 12 - 14 |
| $P_U$ and/or $P_L$ | 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 |
| 1 | 1.64 | 1.75 | 1.82 | 1.88 | 1.91 | 1.96 | 2.01 |
| 2 | 1.58 | 1.66 | 1.72 | 1.75 | 1.78 | 1.81 | 1.84 |
| 3 | 1.52 | 1.59 | 1.63 | 1.66 | 1.68 | 1.71 | 1.73 |
| 4 | 1.47 | 1.52 | 1.56 | 1.58 | 1.60 | 1.62 | 1.64 |
| 5 | 1.42 | 1.47 | 1.49 | 1.51 | 1.52 | 1.54 | 1.55 |
| 6 | 1.38 | 1.41 | 1.43 | 1.45 | 1.46 | 1.47 | 1.48 |
| 7 | 1.33 | 1.36 | 1.38 | 1.39 | 1.40 | 1.41 | 1.41 |
| 8 | 1.29 | 1.31 | 1.33 | 1.33 | 1.34 | 1.35 | 1.35 |
| 9 | 1.25 | 1.27 | 1.28 | 1.28 | 1.29 | 1.29 | 1.30 |
| 10 | 1.21 | 1.23 | 1.23 | 1.24 | 1.24 | 1.24 | 1.25 |
| 11 | 1.18 | 1.18 | 1.19 | 1.19 | 1.19 | 1.19 | 1.20 |
| 12 | 1.14 | 1.14 | 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 |
| 14 | 1.07 | 1.07 | 1.07 | 1.06 | 1.06 | 1.06 | 1.06 |
| 15 | 1.03 | 1.03 | 1.03 | 1.03 | 1.02 | 1.02 | 1.02 |
| 16 | 1.00 | 0.99 | 0.99 | 0.99 | 0.99 | 0.98 | 0.98 |
| 17 | 0.97 | 0.96 | 0.95 | 0.95 | 0.95 | 0.95 | 0.94 |
| 18 | 0.93 | 0.92 | 0.92 | 0.92 | 0.91 | 0.91 | 0.91 |
| 19 | 0.90 | 0.89 | 0.88 | 0.88 | 0.88 | 0.87 | 0.87 |
| 20 | 0.87 | 0.86 | 0.85 | 0.85 | 0.84 | 0.84 | 0.84 |
| 21 | 0.84 | 0.82 | 0.82 | 0.81 | 0.81 | 0.81 | 0.80 |
| 22 | 0.81 | 0.79 | 0.79 | 0.78 | 0.78 | 0.77 | 0.77 |
| 23 | 0.77 | 0.76 | 0.75 | 0.75 | 0.74 | 0.74 | 0.74 |
| 24 | 0.74 | 0.73 | 0.72 | 0.72 | 0.71 | 0.71 | 0.70 |
| 25 | 0.71 | 0.70 | 0.69 | 0.69 | 0.68 | 0.68 | 0.67 |
| 26 | 0.68 | 0.67 | 0.67 | 0.65 | 0.65 | 0.65 | 0.64 |
| 27 | 0.65 | 0.64 | 0.63 | 0.62 | 0.62 | 0.62 | 0.61 |
| 28 | 0.62 | 0.61 | 0.60 | 0.59 | 0.59 | 0.59 | 0.58 |
| 29 | 0.59 | 0.58 | 0.57 | 0.57 | 0.56 | 0.56 | 0.55 |
| 30 | 0.56 | 0.55 | 0.54 | 0.54 | 0.53 | 0.53 | 0.52 |
| 31 | 0.53 | 0.52 | 0.51 | 0.51 | 0.50 | 0.50 | 0.50 |
| 32 | 0.50 | 0.49 | 0.48 | 0.48 | 0.48 | 0.47 | 0.47 |
| 33 | 0.47 | 0.48 | 0.45 | 0.45 | 0.45 | 0.44 | 0.44 |
| 34 | 0.45 | 0.43 | 0.43 | 0.42 | 0.42 | 0.42 | 0.41 |
| 35 | 0.42 | 0.40 | 0.40 | 0.39 | 0.39 | 0.39 | 0.38 |
| 36 | 0.39 | 0.38 | 0.37 | 0.37 | 0.36 | 0.36 | 0.36 |
| 37 | 0.36 | 0.35 | 0.34 | 0.34 | 0.34 | 0.33 | 0.33 |
| 38 | 0.33 | 0.32 | 0.32 | 0.31 | 0.31 | 0.31 | 0.30 |
| 39 | 0.30 | 0.30 | 0.29 | 0.28 | 0.28 | 0.28 | 0.28 |
| 40 | 0.28 | 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 |
| 42 | 0.23 | 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 |
| 44 | 0.16 | 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 |
| 46 | 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 |
| 48 | 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 |
| 50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

(Table continued next page)

Table 39-7.—ESTIMATED PERCENT OF WORK OUTSIDE SPECIFICATION LIMITS

| $P_U$ and/or $P_L$ | Sample Size ( n ) | | | | | |
|---|---|---|---|---|---|---|
| | 15 to 17 | 18 - 22 | 23 - 29 | 30 - 42 | 43 - 66 | > 66 |
| | Upper Quality Index $Q_U$ or Lower Quality Index $Q_L$ | | | | | |
| 0 | 2.34 | 2.39 | 2.44 | 2.48 | 2.51 | 2.56 |
| 1 | 2.04 | 2.07 | 2.09 | 2.12 | 2.14 | 2.16 |
| 2 | 1.87 | 1.89 | 1.91 | 1.93 | 1.94 | 1.95 |
| 3 | 1.75 | 1.76 | 1.78 | 1.79 | 1.80 | 1.81 |
| 4 | 1.65 | 1.66 | 1.67 | 1.68 | 1.69 | 1.70 |
| 5 | 1.56 | 1.57 | 1.58 | 1.59 | 1.59 | 1.60 |
| 6 | 1.49 | 1.50 | 1.50 | 1.51 | 1.51 | 1.52 |
| 7 | 1.42 | 1.43 | 1.43 | 1.44 | 1.44 | 1.44 |
| 8 | 1.36 | 1.36 | 1.37 | 1.37 | 1.37 | 1.38 |
| 9 | 1.30 | 1.30 | 1.31 | 1.31 | 1.31 | 1.31 |
| 10 | 1.25 | 1.25 | 1.25 | 1.25 | 1.26 | 1.26 |
| 11 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 |
| 12 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 |
| 13 | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 |
| 14 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 |
| 15 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 |
| 16 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| 17 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| 18 | 0.91 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| 19 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| 20 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| 21 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.79 |
| 22 | 0.77 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 |
| 23 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 |
| 24 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| 25 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.66 |
| 26 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.63 |
| 27 | 0.61 | 0.61 | 0.61 | 0.61 | 0.61 | 0.60 |
| 28 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.57 |
| 29 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.54 |
| 30 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 |
| 31 | 0.49 | 0.49 | 0.49 | 0.49 | 0.49 | 0.49 |
| 32 | 0.47 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 |
| 33 | 0.44 | 0.44 | 0.43 | 0.43 | 0.43 | 0.43 |
| 34 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.40 |
| 35 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 |
| 36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 |
| 37 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.32 |
| 38 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 39 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 |
| 40 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| 41 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |
| 42 | 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 |
| 44 | 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 |
| 46 | 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 |
| 48 | 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 |
| 50 | 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

### SECTION 13-1. RELATIONS WITH RAILROAD COMPANY

**13-1.01 GENERAL.--** The term "Railroad" shall be understood to 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, the Contractor shall have no claim for damages, extension of time, or extra compensation in the event his work is held up by any of the work to be performed by the Railroad.

The Contractor must understand the Contractor's right to enter Railroads 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/or operations.

· **RAILROAD REQUIREMENTS.--** The contractor shall notify Mr. Jim Smith, Manager of Industry and Public Projects 10031 Foothills Blvd., Roseville, CA 95747, telephone (916) 789-6352 (FAX 916-789-6333) and the State’s Engineer, in writing, at least ten (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, in order to expedite the work and to 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 the proper manner of 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 Contractor shall perform his work in such manner and at such times as shall 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 necessary to keep railroad facilities, including track ballast, free of sand or debris resulting from his operations. Any 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 co-ordinate 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 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:

12'-0" horizontally from centerline of track
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 fifteen 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, the State 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 8'-6" horizontally from centerline of the nearest track, if tangent, or 9'-6" if curved.

Any infringement on the above temporary construction clearances due to the Contractor's operations shall be submitted to the Railroad by way of State's Engineer, and shall not be undertaken until approved by the Railroad, and until the State's 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 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, approved by the State's Engineer, showing details of construction affecting the Railroad's tracks and property not included in the contract plans, including but not limited to shoring and falsework, shall be submitted to the Railroad for approval. Shoring and falsework design shall be in accordance with Southern Pacific Lines (SPL) Guidelines for shoring and falsework, latest edition, issued by the Railroad's Office of Chief Engineer. Shoring and falsework plans and calculations shall be prepared and signed by a registered professional engineer. This work shall not be undertaken until such time as the Railroad has given such approval, review by Railroad may take up to six (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 will not be permitted to proceed with work across railroad tracks unless this requirement has been met. No extension of time or extra compensation will be allowed in the event the Contractor's work is delayed because of his failure to comply with the requirements in this paragraph.

The Contractor shall use the private crossing for the Nantucket Restaurant to move equipment or materials across Railroad's tracks.

No blasting will be permitted by Contractor unless approved by the Railroad.

The Contractor is required to place permanent Steel Deck Forms (See Section 10 – under Concrete Structure)

The Contractor shall, upon completion of the work covered by this contract to be performed by Contractor upon the premises or over or beneath the tracks of Railroad, promptly remove from the premises of Railroad all of Contractor's

tools, implements and other materials, whether brought upon said premises by said Contractor or any subcontractor, employee or agent of Contractor or of any subcontractor, and cause said premises to be left in a clean and presentable condition.

All under track pipeline installations shall be constructed in accordance with Railroad's current standards which may be obtained form Railroad. The general guidelines are as follows:
Edges of jacking or boring pit excavations shall be kept a minimum of 20 feet from the centerline of the nearest track. If the pipe to be installed under the track is four (4) inches in diameter or less, the top of the pipe shall be at least 42 inches below base of rail. If the pipe diameter is greater than four (4) inches in diameter, it must be encased and the top of the steel pipe casing shall be at least 66 inches below base of rail. Installation of any pipe or conduit under Railroad's tracks is to be done by dry bore and jack method. No hydraulic jacking or boring will be permitted. Care is to be exercised so as not to damage any underground facilities of Railroad.

The Railroad Line may only be closed between the hours of 11:00 p.m. and 6:00 am, a period of about 7 hours. The Contractor understands that the closure period may be reduced to late passenger trains and all work must be completed by 6:00 am. Contractor must give the Railroad at least ten (10) working days advance notice prior to requested closure.

## 13-1.03 PROTECTION OF RAILROAD FACILITIES

1. Upon advance notification of not less than 72 hours by Contractor, Railroad representatives, conductors, flagmen or watchmen will be provided by Railroad to protect its facilities, property and movements of its trains or engines. In general, 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.
(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.

(2) 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 State for a period of 120 working days beginning on the date work commences on or near property of Railroad. The Contractor shall pay to the State liquidated damages in the sum of $500 per day for each day in excess of the above 120 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.-** No work is expected to be done by the Railroad under this Contract other than flagging and inspection.

**13-1.05 DELAYS DUE TO WORK BY RAILROAD**. --No delays due to work by Railroad are anticipated.

**13-1.06 LEGAL RELATIONS.-** The provisions of this section, "Relations with Railroad Company" and the provisions of the following section, "Railroad Protective Insurance," of these special provisions shall inure directly to the benefit of Railroad

## SECTION 13-2. RAILROAD PROTECTIVE INSURANCE

The term "Railroad" shall be understood to mean the Union Pacific Railroad Company.

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.

The insurance herein required shall be obtained by the successful bidder and he shall furnish the Agreements Section, Division of Structures, Engineering Service Center, Department of Transportation, State of California, 1801 30th Street, Sacramento, California 95816, with two completed certificates, in the form attached hereto, signed by the insurance company or its authorized agent or representative, reflecting the existence of each of the policies required by 1 and 2 below including coverage for X, C and U and completed operations hazards, the original policy of insurance and one certified copy thereof required by 3 below. Engineer will convey one of the certificates of policy certifying 1 and 2 and the original policy of insurance required by 3 to Railroad upon receipt from successful bidder. Engineer will notify successful bidder whether Railroad approves the insurance policies.

Certificate of insurance shall guarantee that the policy under 1 and 2 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 the Engineer and to Railroad.

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 approximate ratio of the estimated cost of the work over or under or within 50 feet of Railroad's tracks to the total estimated cost is 0.028. Approximate daily train traffic is 24 passenger trains and 20 freight trains.

**1. Contractor's Public Liability and Property Damage Liability Insurance**

The Contractor shall, with respect to the operations he performs within or adjacent to Railroad's property, carry regular Contractor's Public Liability and Property Damage Liability Insurance providing for the same limits as specified for Railroad's Protective Public Liability and Property Damage Liability insurance to be furnished for and in behalf of Railroad as hereinafter provided.

If any part of the work within or adjacent to Railroad's property is subcontracted, the Contractor in addition to carrying the above insurance, shall provide the above insurance on behalf of the subcontractors to cover their operations.

**2. Contractor's Protective Public Liability and Property Damage Liability Insurance.**

The Contractor shall, with respect to the operations performed for him by subcontractors who do work within or adjacent to Railroad's property, carry in his own behalf regular Contractor's Protective Public Liability and Property Damage Liability Insurance providing for the same limits as specified for Railroad's Protective Public Liability and Property Damage Liability Insurance to be furnished for and on behalf of Railroad as hereinafter provided.

**3. Railroad's Protective Public Liability and Property Damage Liability Insurance**

The Contractor shall, with respect to the operations he performs within or adjacent to Railroad's property or that of any of his subcontractors who do work within or adjacent to Railroad's property perform, have issued and furnished in favor of Railroad, Policy or policies of insurance in the Railroad Protective Liability Form as hereinafter specified.

**Railroad Protective Liability Form**

_____
**(Name of Insurance Company)**

**DECLARATIONS**

Item 1. Named Insured:

Union Pacific Railroad Company
1416 Dodge Street - Mail Code 10049
Omaha, Nabraska 68179

Item 2. Policy Period: From _____to _____ 12:01 a.m., Standard Time, at the designated job site as stated herein.

Item 3. The insurance afforded is only with respect to such of the following coverages as are indicated in Item 6 by specific premium charge or charges. The limit of the company's liability against such coverage or coverages shall be as stated herein, subject to all the terms of this policy having reference thereto.

| Coverages | | Limits of Liability Each Occurrence | Limits of Liability Aggregate |
|---|---|---|---|
| A<br>B<br>&<br>C | Bodily Injury Liability<br>Property Damage Liability<br>and Physical Damage to<br>Property | $2,000,000<br>Combined<br>Single<br>Limit | $6,000,000 for<br>Coverages<br>A, B & C |

Item 4. Name and Address of Contractor:

Item 5. Name and Address of Governmental Authority for whom the work by the Contractor is being performed: State of California, acting by and through its Department of Transportation, P.O. Box 942874, Sacramento, California 94274-0001.

Item 6. Designation of the Job Site and Description of Work:

FOR CONSTRUCTION ON _____

_____

_____

_____

_____

| Premium Bases | Rates per $100 of Cost Coverage A | Coverages B & C | Advance Premiums Coverage A | Coverages B & C |
|---|---|---|---|---|
| Contract Cost | $ | $ | $ | $ |
| Rental Cost | $ | $ | $ | $ |

Countersigned _____ 19____ by _____

_____
Title

POLICY

_____
(Name of Insurance Company)

A _____ insurance company, herein called the company, agrees with the insured, named in the declarations made a part hereof, in consideration of the payment of the premium and in reliance upon the statements in the declaration made by the named insured and subject to all of the terms of this policy:

**INSURING AGREEMENTS**

**I. Coverage A--Bodily Injury Liability.**

To pay on behalf of the insured all sums which the insured shall become legally obligated to pay as damages because of bodily injury, sickness, or disease, including death at any time resulting therefrom, hereinafter called "bodily injury," either (1) sustained by any person arising out of acts or omissions at the designated job site which are related to or are in connection with the work described in Item 6 of the declarations, or (2) sustained at the designated job site by the Contractor or any employee of the Contractor, or by any employee of the Governmental Authority specified in Item 5 of the Declarations, or by any designated employee of the insured whether or not arising out of such acts or omissions.

**Coverage B--Property Damage Liability.**

To pay on behalf of the insured all sums which the insured shall become legally obligated to pay as damages because of physical injury to or destruction of property, including loss of use of any property due to such injury or destruction, hereinafter called "property damage," arising out of acts or omissions at the designated job site which are related to or are in connection with the work described in Item 6 of the declarations.

**Coverage C--Physical Damage to Property.**

To pay for direct and accidental loss of or damage to rolling stock and their contents, mechanical construction equipment, or motive power equipment, hereinafter called "loss," arising out of acts or omissions at the designated job site which are related to or are in connection with the work described in Item 6 of the declarations; provided such property is owned by the named insured or is leased or entrusted to the named insured under a lease or trust agreement.

## II. Definitions.

(a) **Insured**.--The unqualified word "insured" includes the named insured and also includes any executive officer, director or stockholder thereof while acting within the scope of his duties as such.

(b) **Contractor.--**The word "contractor" means the Contractor designated in Item 4 of the declarations and includes all subcontractors of said Contractor but shall not include the named insured.

(c) **Designated employee of the insured.--**The words "designated employee of the insured" mean:

(1) any supervisory employee of the insured at the job site,

(2) any employee of the insured while operating, attached to or engaged on work trains or other railroad equipment at the job site which are assigned exclusively to the Contractor, or

(3) any employee of the insured not within (1) or (2) who is specifically loaned or assigned to the work of the Contractor for prevention of accidents or protection of property, the cost of whose services is borne specifically by the Contractor or by governmental authority.

(d) **Contract.--**The word "contract" means any contract or agreement to carry a person or property for a consideration or any lease, trust or interchange contract or agreement respecting motive power, rolling stock or mechanical construction equipment.

## III. Defense, Settlement, Supplementary Payments.

With respect to such insurance as is afforded by this policy under Coverages A and B, the company shall:

(a) defend any suit against the insured alleging such bodily injury or property damage and seeking damages which are payable under the terms of this policy, even if any of the allegations of the suit are groundless, false or fraudulent; but the company may make such investigation and settlement of any claim or suit as it deems expedient;

(b) pay, in addition to the applicable limits of liability:

(1) all expenses incurred by the company, all costs taxed against the insured in any such suit and all interest on the entire amount of any judgment therein which accrues after entry of the judgment and before the company has paid or tendered or deposited in court that part of the judgment which does not exceed the limit of the company's liability thereon;

(2) premiums on appeal bonds required in any such suit, premiums on bonds to release attachments for an amount not in excess of the applicable limit of liability of this policy, but without obligation to apply for or furnish any such bonds;

(3) expenses incurred by the insured for such immediate medical and surgical relief to others as shall be imperative at the time of the occurrence;

(4) all reasonable expenses, other than loss of earnings, incurred by the insured at the company's request.

## IV. Policy Period, Territory.

This policy applies only to occurrences and losses during the policy period and within the United States of America, its territories or possessions, or Canada.

## EXCLUSIONS

This policy does not apply:

(a) to liability assumed by the insured under any contract or agreement except a contract as defined herein;

(b) to bodily injury or property damage caused intentionally by or at the direction of the insured;

(c) to bodily injury, property damage or loss which occurs after notification to the named insured of the acceptance of the work by the governmental authority, other than bodily injury, property damage or loss resulting from the existence or removal of tools, uninstalled equipment and abandoned or unused materials;

(d) under Coverages A(1), B and C, to bodily injury, property damage or loss, the sole proximate cause of which is an act or omission of any insured other than acts or omissions of any designated employee of any insured;

(e) under Coverage A, to any obligation for which the insured or any carrier as his insurer may be held liable under any workmen's compensation, unemployment compensation or disability benefits law, or under any similar law; provided that the Federal Employers' Liability Act, U.S. Code (1946), Title 45, Sections 51-60, as amended, shall for the purposes of this insurance be deemed not to be any similar law;

(f) under Coverage B, to injury to or destruction of property (1) owned by the named insured or (2) leased or entrusted to the named insured under a lease or trust agreement.

(g) 1. Under any liability coverage, to injury, sickness, disease, death or destruction

(a) with respect to which an insured under the policy is also an insured under a nuclear energy liability policy issued by Nuclear Energy Liability Insurance Association, Mutual Atomic Energy Liability Underwriters or Nuclear Insurance Association of Canada, or would be an insured under any such policy but for its termination upon exhaustion of its limit of liability; or

(b) resulting from the hazardous properties of nuclear material and with respect to which (1) any person or organization is required to maintain financial protection pursuant to the Atomic Energy Act of 1954, or any law amendatory thereof, or (2) the insured is, or had this policy not been issued would be, entitled to indemnity from the United States of America, or any agency thereof, under any agreement entered into by the United States of America, or any agency thereof, with any person or organization.

2. Under any medical payments coverage, or under any Supplementary Payments provision relating to immediate medical or surgical relief, to expenses incurred with respect to bodily injury, sickness, disease or death resulting from the hazardous properties of nuclear material and arising out of the operation of a nuclear facility by any person or organization.

3. Under any liability coverage, to injury, sickness, disease, death or destruction resulting from the hazardous properties of nuclear material, if

(a) the nuclear material (1) is at any nuclear facility owned by, or operated by or on behalf of, an insured or (2) has been discharged or dispersed therefrom;

(b) the nuclear material is contained in spent fuel or waste at any time possessed, handled, used, processed, stored, transported or disposed of by or on behalf of an insured; or

(c) the injury, sickness, disease, death or destruction arises out of the furnishing by an insured of services, materials, parts or equipment in connection with the planning, construction, maintenance, operation or use of any nuclear facility, but if such facility is located within the United States of America, its territories or possessions or Canada, this exclusion (c) applies only to injury to or destruction of property at such nuclear facility.

4. As used in this exclusion:

"hazardous properties" include radioactive, toxic or explosive properties;

"nuclear material" means source material, special nuclear material or byproduct material;

"source material", "special nuclear material", and "byproduct material" have the meanings given them in the Atomic Energy Act of 1954 or in any law amendatory thereof;

"spent fuel" means any fuel element or fuel component, solid or liquid, which has been used or exposed to radiation in a nuclear reactor;

"waste" means any waste material (1) containing byproduct material and (2) resulting from the operation by any person or organization of any nuclear facility included within the definition of nuclear facility under paragraph (a) or (b) thereof;

"nuclear facility" means

(a) any nuclear reactor,

(b) any equipment or device designed or used for (1) separating the isotopes of uranium or plutonium, (2) processing or utilizing spent fuel, or (3) handling, processing or packaging waste,

(c) any equipment or device used for the processing, fabricating or alloying of special nuclear material if at any time the total amount of such material in the custody of the insured at the premises where such equipment or device is located consists of or contains more than 25 grams of plutonium or uranium 233 or any combination thereof, or more than 250 grams of uranium 235,

(d) any structure, basin, excavation, premises or place prepared or used for the storage or disposal of waste, and includes the site on which any of the foregoing is located, all operations conducted on such site and all premises used for such operations;

"nuclear reactor" means any apparatus designed or used to sustain nuclear fission in a self-supporting chain reaction or to contain a critical mass of fissionable material;

with respect to injury to or destruction of property, the word "injury" or "destruction" includes all forms of radioactive contamination of property.

(h) under Coverage C, to loss due to nuclear reaction, nuclear radiation or radioactive contamination, or to any act or condition incident to any of the foregoing.

## CONDITIONS

(The conditions, except conditions 3, 4, 5, 7, 8, 9, 10, 11 and 12, apply to all coverages. Conditions 3, 4, 5, 7, 8, 9, 10, 11 and 12, apply only to the coverage noted thereunder.)

**1. Premium.--**The premium bases and rates for the hazards described in the declarations are stated therein. Premium bases and rates for hazards not so described are those applicable in accordance with the manuals in use by the company.

The term "contract cost" means the total cost of all work described in Item 6 of the declarations.

The term "rental cost" means the total cost to the Contractor for rental of work trains or other railroad equipment, including the remuneration of all employees of the insured while operating, attached to or engaged thereon.

The advance premium stated in the declarations is an estimated premium only. Upon termination of this policy the earned premium shall be computed in accordance with the company's rules, rates, rating plans, premiums and minimum premiums applicable to this insurance. If the earned premium thus computed exceeds the estimated advance premium paid, the company shall look to the Contractor specified in the declarations for any such excess; if less, the company shall return to the said Contractor the unearned portion paid.

In no event shall payment of premium be an obligation of the named insured.

**2. Inspection.--**The named insured shall make available to the company records of information relating to the subject matter of this insurance.

The company shall be permitted to inspect all operations in connection with the work described in Item 6 of the declarations.

**3. Limits of Liability, Coverage A.--**The limit of bodily injury liability stated in the declarations as applicable to "each person" is the limit of the company's liability for all damages, including damages for care and loss of services, arising out of bodily injury sustained by one person as the result of any one occurrence; the limit of such liability stated in the declarations as applicable to "each occurrence" is, subject to the above provision respecting each person, the total limit of the company's liability for all such damage arising out of bodily injury sustained by two or more persons as the result of any one occurrence.

**4. Limits of Liability, Coverages B and C.**--The limit of liability under Coverages B and C stated in the declarations as applicable to "each occurrence" is the total limit of the company's liability for all damages and all loss under Coverage B and C combined arising out of physical injury to, destruction or loss of all property of one or more persons or organizations, including the loss of use of any property due to such injury or destruction under Coverage B, as the result of any one occurrence.

Subject to the above provision respecting "each occurrence," the limit of liability under Coverages B and C stated in the declarations as "aggregate" is the total limit of the company's liability for all damages and all loss under Coverages B and C combined arising out of physical injury to, destruction or loss of property, including the loss of use of any property due to such injury or destruction under Coverage B.

Under Coverage C, the limit of the company's liability for loss shall not exceed the actual cash value of the property, or if the loss is of a part thereof the actual cash value of such part, at time of loss, nor what it would then cost to repair or replace the property or such part thereof with other of like kind and quality.

**5. Severalty of Interests, Coverages A and B.--** The term "the insured" is used severally and not collectively, but the inclusion herein of more than one insured shall not operate to increase the limits of the company's liability.

**6. Notice.--**In the event of an occurrence or loss, written notice containing particulars sufficient to identify the insured and also reasonably obtainable information with respect to the time, place and circumstances thereof, and the names and addresses of the injured and of available witnesses, shall be given by or for the insured to the company or any of its authorized agents as soon as practicable. If claim is made or suit is brought against the insured, he shall immediately forward to the company every demand, notice, summons or other process received by him or his representative.

**7. Assistance and Cooperation of the Insured, Coverages A and B.--**The insured shall cooperate with the company and, upon the company's request, attend hearings and trials and assist in making settlements, securing and giving evidence, obtaining the attendance of witnesses and in the conduct of suits. The insured shall not, except at his own cost, voluntarily make any payment, assume any obligation or incur any expense other than for such immediate medical and surgical relief to others as shall be imperative at the time of accident.

**8. Action Against Company, Coverages A and B.--**No action shall lie against the company unless, as a condition precedent thereto, the insured shall have fully complied with all the terms of this policy, nor until the amount of the insured's obligation to pay shall have been finally determined either by judgment against the insured after actual trial or by written agreement of the insured, the claimant and the company.

Any person or organization or the legal representative thereof who has secured such judgment or written agreement shall thereafter be entitled to recover under this policy to the extent of the insurance afforded by this policy. No person or organization shall have any right under this policy to join the company as a party to any action against the insured to determine the insured's liability. Bankruptcy or insolvency of the insured or of the insured's estate shall not relieve the company of any of its obligations hereunder.

**Coverage C.--**No action shall lie against the company unless, as a condition precedent thereto, there shall have been full compliance with all the terms of this policy nor until 30 days after proof of loss is filed and the amount of loss is determined as provided in this policy.

**9. Insured's Duties in Event of Loss, Coverage C.--**In the event of loss the insured shall:

(a) protect the property, whether or not the loss is covered by this policy, and any further loss due to the insured's failure to protect shall not be recoverable under this policy; reasonable expenses incurred in affording such protection shall be deemed incurred at the company's request;

(b) file with the company, as soon as practicable after loss, his sworn proof of loss in such form and including such information as the company may reasonably require and shall, upon the company's request, exhibit the damaged property.

**10. Appraisal, Coverage C.--**If the insured and the company fail to agree as to the amount of loss, either may, within 60 days after the proof of loss is filed, demand an appraisal of the loss. In such event the insured and the company shall each select a competent appraiser, and the appraisers shall select a competent and disinterested umpire. The appraisers shall state separately the actual cash value and the amount of loss and failing to agree shall submit their differences to the umpire. An award in writing of any two shall determine the amount of loss. The insured and the company shall each pay his chosen appraiser and shall bear equally the other expenses of the appraisal and umpire.

The company shall not be held to have waived any of its rights by any act relating to appraisal.

**11. Payment of Loss, Coverage C.--**The company may pay for the loss in money but there shall be no abandonment of the damaged property to the company.

**12. No Benefit to Bailee, Coverage C.--**The insurance afforded by this policy shall not inure directly or indirectly to the benefit of any carrier or bailee, other than the named insured, liable for loss to the property.

**13. Subrogation.--**In the event of any payment under this policy, the company shall be subrogated to all the insured's rights of recovery therefor against any person or organization and the insured shall execute and deliver instruments and papers and do whatever else is necessary to secure such rights. The insured shall do nothing after loss to prejudice such rights.

**14. Application of Insurance.**--The insurance afforded by this policy is primary insurance.

**15. Three Year Policy.**--A policy period of three years is comprised of three consecutive annual periods. Computation and adjustment of earned premium shall be made at the end of each annual period. Aggregate limits of liability as stated in this policy shall apply separately to each annual period.

**16. Changes.--**Notice to any agent or knowledge possessed by any agent or by any other person shall not effect a waiver or a change in any part of this policy or estop the company from asserting any right under the terms of this policy; nor shall the terms of this policy be waived or changed, except by endorsement issued to form a part of this policy.

**17. Assignment.--**Assignment of interest under this policy shall not bind the company until its consent is endorsed hereon.

**18. Cancellation.--**This policy may be canceled by the named insured by mailing to the company written notice stating when thereafter the cancellation shall be effective. This policy may be canceled by the company by mailing to the named insured, Contractor and governmental authority at the respective addresses shown in this policy written notice stating when not less than 30 days thereafter such cancellation shall be effective. The mailing of notice as aforesaid shall be sufficient proof of notice. The effective date and hour of cancellation stated in the notice shall become the end of the policy period. Delivery of such written notice either by the named insured or by the company shall be equivalent to mailing.

If the named insured cancels, earned premium shall be computed in accordance with the customary short rate table and procedure. If the company cancels, earned premium shall be computed pro rata. Premium adjustment may be made either at the time cancellation is effected or as soon as practicable after cancellation becomes effective, but payment or tender of unearned premium is not a condition of cancellation.

**19. Declaration.--**By acceptance of this policy the named insured agrees that such statements in the declarations as are made by him are his agreements and representations, that this policy is issued in reliance upon the truth of such representations and that this policy embodies all agreements existing between himself and the company or any of its agents relating to this insurance.

In witness whereof, the _____ Insurance Company has caused this policy to be signed by its president and a secretary at _____, and countersigned on the declarations page by a duly authorized agent of the company.

(Facsimile of Signature) (Facsimile of Signature)

_____ _____

Secretary President

CERTIFICATE OF INSURANCE

This is to certify to:

RAILROAD FILE NO.:
PUC # A-28.80-A

(1) Agreements Section
Division of Structures
Engineering Service Center
Division of Structures
California Department of Transportation
State of California
1801 30th Street, Sacramento, California 95816

(2) and to the following Railroad Company

that such insurance as is afforded by the policy or policies described below for bodily injury liability and property damage liability is in full force and effect as of the date of this certificate and covers the following contractor as a named insured with respect to liability for damages arising out of operations performed by or for the named insured in connection with the contract or work described below.

1. Named Insured and Address

This is to certify that policies of insurance listed below have been issued to the insured named above and are in force at this time. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions and conditions of such policies.

2. Description of Work

Contract No. _____

| 3. Coverages | Policy Expiration Date | Limits of Liability Each Occurrence | Aggregate |
|---|---|---|---|
| Contractor's Bodily Injury Liability and Property Damage Liability | | | |
| Umbrella or Excess Liability | | | |

All of the coverages include coverage for the completed operations hazard, and X, C and U exposures.

Name of Insurance Company by Coverage

| Coverages | Company | Policy Number |
|---|---|---|
| Bodily Injury Liability | | |
| Property Damage Liability | | |
| Umbrella or Excess Liability | | |

4. The policy or policies described above will not be amended, altered, modified or cancelled until thirty (30) days after written notice thereof has been given by registered mail to the (1) Agreements Section, Division of Structures, Engineering Service Center, Department of Transportation, and (2) the Railroad named as certificate holder in this certificate.

Certificate Date:

For _____
(Insurance Company)

By _____
(Authorized Agent or Representative) DH-0S-A104(9-15-98)

State of California
Department of Transportation