DEPARTMENT OF TRANSPORTATION
ES-OE MS #43
1727 30TH Street, 2ND Floor
Sacramento, CA 95816

August 9, 2001

04-CC,Sol-680-40.1/41.4, L0.0/L1.0
04-006034
ACIM-680-1(054)56N

Addendum No. 6

Dear Contractor:

This addendum is being issued to the contract for construction on State highway in SOLANO AND CONTRA COSTA COUNTIES IN BENICIA AND MARTINEZ FROM 1.0 km NORTH OF SOLANO AND CONTRA COSTA COUNTY LINE TO 1.1 km NORTH OF MOCOCO OVERHEAD.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

Bids for this work will be opened on September 18, 2001, instead of August 21, 2001.

This addendum is being issued to set a new bid opening date as shown herein, and to revise the Project Plans, the Notice to Contractors and Special Provisions, and the Proposal and Contract.

Project Plan Sheets 5, 6, 8, 9, 10, 11, 12, 13, 18, 20, 37, 39, 65, 106, 107, 122, 124, 125, 126, 155, 159, 160, 176, 176A, 176B, 179, 181, 183, 289, 290, 322, 334, 340, 341, 367, 372, 374, 383, 384, 387, 388, 391, 407, 408, 410, 416, 417, 423, 426 and 488 are revised. Half-sized copies of the revised sheets are attached for substitution for the like-numbered sheets.

Project Plan Sheets 17A, 35A, 35B, 66A, 557B, 557C, 557D and 557E are added. Half-sized copies of the added sheets are attached for addition to the project plans.

In the Special Provisions, SECTION 2-1.04, "ESCROW OF BID DOCUMENTATION," the second paragraph is revised as follows:

"The escrow bid documentation will be the only documentation accepted from the Contractor regarding preparation of the bid."

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In the Special Provisions, SECTION 2-1.04, "ESCROW OF BID DOCUMENTATION," the seventeenth paragraph is revised as follows:

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

In the Special Provisions, SECTION 4, "BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES," the fourth paragraph is revised as follows:

"The work consisting of constructing the new at-grade railroad crossing at Mococo Road/Marina Vista Road shall be completed before the expiration of 130 working days beginning at 12:01 a.m. on the day after the day of the contract award. The Contractor shall pay to the State of California the sum of $3,000 per day, for each and every calendar day's delay in completing the work consisting of constructing the new at-grade railroad crossing in excess of the number of working days prescribed above."

In the Special Provisions, SECTION 4, "BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES," the fifth paragraph is revised as follows:

"The work consisting of constructing Frame 1, to a point where the hinge tiedown force may be applied (or the long-span hinge load added), shall be diligently prosecuted to completion before the expiration of 1060 working days beginning at 12:01 a.m. on the day after the day of contract award. Attention is directed to, "Order of Work," in these special provisions with regard to Construction of Frame 1."

In the Special Provisions, SECTION 5-1.121, "ELECTRONIC EXTRA WORK REPORT," is added as attached.

In the Special Provisions, SECTION 8-3.02, "WELDING QUALITY CONTROL," in the fourth paragraph, in the table the date of AWSD1.6 is revised from 1998 to 1999.

In the Special Provisions, SECTION 10, "CONSTRUCTION DETAILS," through SECTION 10-1.41, "PILING," inclusive, are replaced as attached.

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In the Special Provisions, "SECTION 10-1.45 "CONCRETE STRUCTURES," is revised as attached.

In the Special Provisions, SECTION 10-1.51, "JOINT SEAL ASSEMBLIES (MOVEMENT RATING EXCEEDING 100mm)," in the twenty-first paragraph, the second sentence is revised as follows:

"The number glands in the joint seal assembly shall be determined by dividing the MR shown on the plans by 130mm."

In the Special Provisions, SECTION 10-1.51, "JOINT SEAL ASSEMBLIES (MOVEMENT RATING EXCEEDING 100mm)," in the twenty-second paragraph, the following sentences are added:

"The Contractor may modify the blockout dimensions shown on the plans as necessary to accommodate the Contractor's joint seal assembly meeting these specifications. All modifications to the blockout dimensions and the resulting changes in the reinforcing shall be submitted to the Engineer for review and approval."

In the Special Provisions, SECTION 10-1.53, "HINGE C AND D BEARINGS," in the fortieth paragraph, the following sentences are added after the third sentence:

"Proof tests may be performed on two bearings simultaneously using an actuator to move a common element located between the two bearings. If the Contractor elects to proof test two bearings simultaneously, the friction force for an individual bearing may be assumed to be the average of the total friction determined during the test."

In the Special Provisions, SECTION 10-1.53, "HINGE C AND D BEARINGS," in the fortieth paragraph, subheading B, Items 1 and 2 are revised as follows:

"1. The Type I bearings shall be proof tested for maximum and minimum compression, range of motion, coefficient of friction and wear of PTFE with the sliding surface in a horizontal position.
2. The Type II bearings shall be proof tested for maximum and minimum compression, range of motion, coefficient of friction and wear of PTFE with the sliding surface in the vertical plane."

In the Special Provisions, SECTION 10-1.55, "ELASTOMERIC BUMPERS," the information under Item A is revised as follows:

"At Hinges C and D:
Minimum energy absorbed(per web) 200 kNm
Maximum compressive stress on mounting area @ above energy 45 MPa
Maximum compressive strain @ above energy 50%

At Hinge E:
Minimum energy absorbed(per web) 192 kNm
Maximum compressive stress on mounting area @ above energy 45 MPa
Maximum compressive strain @ above energy 50%"

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In the Special Provisions, SECTION 10-1.57, "WELDED HEADED BAR REINFORCEMENT," subsection "MATERIALS AND MANUFACTURE," the last paragraph is revised as follows:

"Where welded headed bar reinforcement is shown on the plans to be epoxy coated, epoxy coating shall conform to the requirements of "Epoxy Coated Reinforcement" of these special provisions. Only round or elliptical heads with 3mm minimum radiused edges shall be used for epoxy coated welded head bar reinforcement."

In the Special Provisions, SECTION 10-1.57, "WELDED HEADED BAR REINFORCEMENT," subsection "MEASUREMENT AND PAYMENT," the first paragraph is revised as follows:

"Quantities of welded headed bar reinforcement will be measured as units determined from the number of welded heads shown on the plans, as specified in these special provisions or as directed by the Engineer."

In the Special Provisions, SECTION 10-1.71 "SLOPE PAVING," is deleted.

In the Special Provisions, SECTION 10-1.75, "MISCELLANEOUS METAL (MAINTENANCE ACCESS)," in the third paragraph, Item 9 is revised as follows:

"9.) A railing system shall be provided on each side of the stairs and around all platforms on all sides of the platform. The railing shall consist of an upper bar or handrailing and an intermediate bar mounted at mid-height of the rail. The railings shall be supported by posting from the stairs and the platforms. The upper rail of the railing (the handrailing) shall be made continuous between the stairs and the platforms so that there is a continuous run of handrail from the bottom of the piers to the top of the piers, whether going up the stairs or down the stairs. The railing height shall be 1000mm on the stairs and on the landings."

In the Special Provisions, SECTION 10-1.76, "MISCELLANEOUS METAL (MOVABLE INSPECTION PLATFORMS)," the following sentence is added after the first paragraph:

"Maintenance travelers shall be provided within the structure anywhere where the structure consists of a single cell box. For spans with hinges in them a maintenance traveler shall be provided on each side of the hinge. There are a total of 18 maintenance travelers required."

In the Special Provisions, SECTION 10-1.87, "CONCRETE BARRIER (TYPE 60)," is deleted.

In the Special Provisions, SECTION 10-1.96, "TEMPORARY RETAINING WALL," is revised as attached.

In the Proposal and Contract, the Engineer’s Estimate Items 11, 17, 21, 25, 43, 74, 77, 99, 100, 137, 140, 176 are revised, Items 178, 179, 180, 181 are added and Items 36, and 177, are deleted as attached.

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To Proposal and Contract book holders:

Replace the entire Engineer's Estimate in the Proposal with the attached revised Engineer's Estimate. The revised Engineer's Estimate is to be used in the bid.

Attached is a copy of the Material Information Handout.

Indicate receipt of this addendum by filling in the number of this addendum in the space provided on the signature page of the proposal.

Submit bids in the Proposal and Contract book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.

Inform subcontractors and suppliers as necessary.

This office is sending this addendum by UPS overnight mail to Proposal and Contract book holders to ensure that each receives it.

If you are not a Proposal and Contract book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,

ORIGINAL SIGNED BY

REBECCA D. HARNAGEL, Chief
Plans, Specifications & Estimates Branch
Office of Office Engineer

Attachments

5-1.121 ELECTRONIC EXTRA WORK REPORT.-- Attention is directed to Sections 5-1.10, "Equipment and Plants," 7-1.01A(3), "Payroll Records," 9-1.03C, "Records," and 9-1.06, "Partial Payments," of the Standard Specifications.

All extra work reports shall be furnished to the Engineer using the department's electronic Extra Work Billing System. The Contractor shall conform to all the requirements set forth in the "Extra Work Billing System User's Guide." The Guide is available from the Department, and is also found on the Internet at: http://www.dot.ca.gov/hq/esc/oe/project_ads_addenda/04/04-006034/. Materials Handouts. The Department will provide electronic Extra Work Billing System accounts to a Contractor's representatives only after they have received training. The Department will provide system training to the Contractor's authorized representatives within 30 days of the Contractor's request for training.

An account, user identification assigned by the Department and password, used by the Contractor's representative is deemed to meet the following signature requirement in Section 9-1.03C of the Standard Specifications: "Daily extra work reports shall be signed by the Contractor or the Contractor's authorized representative."

Extra work reports that include materials shall be substantiated by a valid copy of a vendor's invoice as required in Section 9-1.03C, "Records," of the Standard Specifications. Each invoice shall clearly identify the relative electronic extra work report and associated amount. In addition to postal service and parcel service, invoices may be sent via FAX or as an e-mail attachment if approved by the Engineer.

The Engineer will compare the Engineer's records with the completed electronic daily extra work report, will reject a report that has an error that affects payment, and will indicate the necessary adjustments the Contractor must make prior to re-sending a corrected electronic extra work report. A daily extra work report that the Contractor's representative sends to the Department using the electronic Extra Work Billing System is deemed signed by the Contractor. A daily extra work report that the Engineer approves using the electronic Extra Work Billing System is deemed signed by the Engineer.

Electronic submittals via the file transfer process shall conform to the Department's specified format. The Contractor is responsible for maintaining the required data file format and satisfying criteria in the file transfer process. The Contractor is responsible for maintaining and operating the Contractor's interface with the Department's Extra Work Billing System.

There will be no additional compensation to the Contractor for furnishing daily extra work reports using the Department's electronic Extra Work Billing System.

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.01 ORDER OF WORK

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

Attention is directed to Section 5-1.34, "Environmental Work Restrictions," of these special provisions.

The first order of work shall be to place the order for the traffic signal equipment, electrical facilities, conduit layout, grounding layout and marine navigational aids systems. The Engineer shall be furnished a statement from the vendor that the order for the said systems has been received and accepted by the vendor.

Attention is directed to Section 10-4.01, "General," of these special provisions regarding the order of work concerning electrical work for the seismic monitoring system and the health monitoring system.

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 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.

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

Attention is directed to "Segmentally Erected Superstructure" 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, unless approved by the engineer. Nonconflicting work in subsequent stages may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

A first order of work shall be ordering the pipe for the 2.5 m Permanent Steel Casing.

Prior to constructing any production piles on this project the Contractor shall successfully complete the pile load tests as detailed on the plans and as specified in these special provisions. After a successful pile load tests, a first order of work shall be the construction of the middle pile of the southern side of the Pier 9 pile group. This pile shall successfully pass all acceptance tests, with concrete placed to the bottom of footing elevation, prior to proceeding with any other 2.5 m or 2.6 m cast-in-drilled-hole concrete piling on the project, excluding permanent steel casing installation.

If the Contractor elects to change the construction sequence from that shown on the plans, the Contractor shall complete work on Frame 1 on the same sequence as shown on the plans.

The submittal of the lightweight concrete quality control plan, mix design and lightweight concrete aggregate shall be a first order of work.

A first order of work shall be the submittal of sample 75 mm high strength prestressing rods for testing and certification.

A first order of work shall be the qualification of the Contractor's prestressing system in lightweight concrete in accordance with Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

The Contractor's attention is directed to the restrictions concerning construction of adjacent cast-in-drilled-hole concrete piling and installation of permanent or temporary casing elsewhere in these special provisions.

The steel plate girders at hinge C and D shall be installed after the steel box girders have been installed and the bearings locked into place.

The work defined in Section "Seismic Monitoring Electrical System," elsewhere in these special provisions shall not begin until the completion of all conflicting work in this contract and as determined by the Engineer.

The Contractor's attention is also directed to "Seismic Monitoring Electrical System" for installation of instruments within certain cast-in-drilled-hole concrete piles during construction of the piles.

Slurry cement-bentonite backfill at Pier 5 shall be placed in lifts and allowed to cure in accordance with these special provisions and such that the maximum wall pressure shown on the plans is not exceeded.

A first order of work shall be the ordering and fabrication of all materials required for the test piles. All work on the test piles shall be completed within 4 months of the award of this contract.

The Contractor's Preliminary Segmental Construction Sequence Drawings shall be submitted within 60 working days of approval of the Contract.

At Piers 5, 6, 16 and 17, no work shall be started on the cast-in-drilled-hole piling until the Engineer has performed additional geotechnical test borings. The Contractor shall provide access for the Engineer's 3-axle truck mounted drilling rig to do additional borings at Piers 6, 16 and 17. Access shall be such that the drill rig can drill a bore hole at the edge of but within the footprint of the pier pilecap. A 6 meter wide work platform of at least 6m in length shall be provided behind the drill rig for additional equipment used by the drillers. The work platform shall be designed for a 4.79kPa loading over the entire surface. Additional borings shall also be performed by the Engineer at Pier 5. The Engineer will require 4 days at each additional boring location to perform the drilling and logging of the additional holes. The information gathered by the Engineer at additional boring locations will be made available to the Contractor in the form of a Log of Test Boring sheet within 2 weeks of completion of each hole. For the land based drilling at Pier 5, the Engineer will drill within 2 weeks of the Contractor's having provided an access road for the Engineer's drilling rig to reach the footing location. For water based drilling, the Engineer will drill within 2 weeks of the Contractor having provided safe access for the Engineer's drill rig to reach the pier locations as noted above. The Contractor shall notify the Engineer in writing when access to each location is ready. Should the Engineer fail to complete the borings within the noted time allowances and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in doing the drilling, 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

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 these special provisions.

Within the boundaries of an ESA, no project related activities shall take place except on the allowable area where permits were obtained. 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 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 date to complete all contract work 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 that the number of calendar days bid to complete the contract 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 work 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 work 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 and 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.

10-1.04 MODIFY MONITORING WELLS

Modify monitoring wells shall consist of extending existing monitoring well 31 to an elevation at or above finished grade, as shown on the plans. The work shall include, but is not limited to, extension of existing steel pipe casing and PVC piping, backfilling the space between steel casing and PVC piping, construction of concrete pads at finished grade, and installation of metal frames and locking covers as shown on the plans. The Contractor shall perform all work in conformance with Contra Costa County regulations.

The contract unit price paid for modify monitoring wells shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in extending the existing monitoring wells, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

ABANDON MONITORING WELLS

Abandoning monitoring wells shall consist of removing obstructions from the well, removing or perforating the casing, and placing approved sealing material in monitoring wells NA and 42, as shown on the plans. The Contractor shall submit a well destruction permit application, plot plan, and permit fee to the Contra Costa County Environmental Health Division and perform all work in conformance with Contra Costa County Well Destruction Guidelines. Descriptions of the wells are included in the information provided to the bidders. The Contractor shall prepare and submit the required Well Completion Report (Department of Water Resources form DWR 188) to the County after placement of sealing material for final destruction approval.

The contract unit price paid for abandon monitoring wells shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in abandoning the existing monitoring wells, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.05 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.

Special attention shall be given to existing and new drainage inlets adjacent to traffic. The Engineer shall review the need for drainage inlet protection commensurate to each location. Any proposed drainage inlet protection in such cases shall be approved by the Engineer for safety related concerns.

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 submit temporary drainage inlet protection drawings for such cases to the Engineer for approval prior to installation.

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 non-woven polypropylene, with a minimum unit weight of 250g/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 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. **TEMPORARY FLEXIBLE DIKE.—**Temporary flexible dike fabric cover and skirt shall be a woven polypropylene fabric with a minimum tensile strength of 0.44-kN, conforming to ASTM Designation: D 4632. The prefabricated fabric shall be high visibility orange in color that is integral to the fabric; painting shall not be allowed. The fabric shall have an ultraviolet (UV) stability exceeding 70 percent.

Temporary flexible dike inner material shall be urethane foam and shall be shaped and dimensioned as shown on the plans.

Adhesive for temporary flexible dike shall be a solvent free rubber modified asphalt emulsion. The color of the emulsion shall be brown when wet and shall have a drying period of not more than 3 hours.

Anchoring nails or spikes for temporary flexible dike shall be a minimum of 25 mm in length and capable of penetrating concrete and asphalt surfaces.

D. **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:

E . **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.

F . **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 weight of 0.27-kg/m^2.

G . **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 flexible dike consists of individual sections of dike installed in conjunction with one another adjacent to existing drainage inlets as shown on the plans. The spacing and angle of placement shall be in accordance with the table shown on the plans. Temporary flexible dike shall be installed flush against the sides of concrete or asphalt curbs, dikes and pavement with the inner material and fabric cover cut smoothly and evenly to provide a tight flush joint.

Temporary flexible dike and rock bag dike installed as part of temporary drainage inlet protection shall be maintained to provide for adequate sediment holding capacity. Sediment deposits shall be removed when the deposit reaches one-half of the temporary flexible dike height. Removed sediment shall be deposited within the project in such a way that it is not subject to erosion by wind or water, or as directed by the Engineer.

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 by the Contractor at his 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 per 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.

10-1.06 WATER POLLUTION CONTROL (STORM WATER POLLUTION PREVENTION PLAN)

Water pollution control work shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications and these special provisions.

This project lies within the boundaries of the San Francisco Bay Regional Water Quality Control Board and shall conform to the requirements of the National Pollutant Discharge Elimination System (NPDES) Permit for General Construction Activities No. CAS000002, Order No, 99-08-DWQ, and the NPDES Permit for the State of California Department of Transportation Properties, Facilities, and Activities, No. CAS000003, Order No, 99-06-DWQ issued by the State Water Resources Control Board. These permits, hereafter referred to as the "Permits," regulate storm water discharges associated with construction activities. These NPDES Permits CAS000002 and CAS000003 will be available to the Contractor on the Caltrans Website : http://www.ca.gov/hq/esc/tollbridge/index.html.

Water pollution control work shall conform to the requirements in the "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual" and the "Construction Site Best Management Practices (BMPs) Manual," and addenda thereto issued up to, and including, the date of advertisement of the project, hereafter referred to respectively as the "Preparation Manual" and the "Construction Site BMP Manual" and collectively as the "Manuals." Copies of the Manuals and the Permits 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. Copies of the Manuals may also be obtained from the Department's Internet Web Site at: http://www.dot.ca.gov/hq/construc/stormwater.html.

In addition, a Conceptual Storm Water Pollution Prevention Plan (CSWPPP) has been prepared for this project by the Department and is available for review at the office of the Toll Bridge Duty Senior at the District 4 Office, 111 Grand Avenue, Oakland, CA 94612, email; duty_senior_tollbridge_district04@dot.ca.gov, telephone number; (510) 286-5549, fax number; (510) 286-4563. This document may be used by the Contractor for developing the actual contract Storm Water Pollution Prevention Plan (SWPPP).

The Contractor shall know and fully comply with the applicable provisions of the Manuals, Permits, 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 copies of the Permits at the project site and shall make the Permits available during construction.

Unless arrangements for disturbance or use 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 for the Contractor or property owner with respect to any arrangements made between the Contractor and property owner. The Contractor shall implement, inspect and maintain all necessary water pollution control practices to satisfy all applicable Federal, State, and Local laws and regulations that govern water quality for areas used outside of the highway right-of-way or areas arranged for the specific use of the Contractor for this project. Installing, inspecting, and maintaining water pollution control practices on areas outside the highway right-of-way not specifically arranged for and provided for by the Department for the execution of this contract will not be paid for.

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 Manuals, Permits and Federal, State and local regulations. 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, money due the Contractor under the contract, in an amount determined by the Department, may be retained by the State of California until disposition has been made of the costs and liabilities.

When a regulatory agency or other third party identifies a failure to comply with the permit or any other local, State, or federal requirement, the Engineer may retain money due the Contractor, subject to the following:

A. The Department will give the Contractor 30 days notice of the Department's intention to retain funds from partial payments which may become due to the Contractor prior to acceptance of the contract. Retention of funds from payments made after acceptance of the contract may be made without prior notice to the Contractor.
B. No retention of additional amounts out of partial payments will be made if the amount to be retained does not exceed the amount being withheld from partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications.
C. If the Department has retained funds and it is subsequently determined that the State is not subject to the 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 for the period of the retention, and the rate of interest payable shall be 6 percent per annum.

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.

The Contractor shall notify the Engineer immediately upon request from the regulatory agencies to enter, inspect, sample, monitor or otherwise access the project site or the Contractor's records pertaining to water pollution control work.

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 Manuals, the requirements of the Permits, and these special provisions. Upon the Engineer's approval of the SWPPP, the SWPPP shall be considered to fulfill the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications for development and submittal of a Water Pollution Control Program.

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

The Contractor shall designate a Water Pollution Control Manager. The Water Pollution Control Manager shall be responsible for the preparation of the SWPPP and any required modifications or amendments and shall be responsible for the implementation and adequate functioning of the various water pollution control practices employed. The Water Pollution Control Manager shall serve as the primary contact for all issues related to the SWPPP or its implementation. The Contractor shall submit to the Engineer a statement of qualifications, describing the training, previous work history and expertise of the individual selected by the Contractor to serve as Water Pollution Control Manager. The Engineer will reject the Contractor's submission of a Water Pollution Control Manager if the submitted qualifications are deemed to be inadequate.

Within 30 days after the approval of the contract, the Contractor shall submit 4 copies of the draft 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 10 days of receipt of the Engineer's comments. The Engineer will have 10 days to review the revisions. Upon the Engineer's approval of the SWPPP, 4 approved copies of the SWPPP, incorporating the required changes, shall be submitted to the Engineer. In order to allow construction activities to proceed, the Engineer may conditionally approve the SWPPP while minor revisions are being completed. If the Engineer does not review or approve the SWPPP within the time specified, compensation will be made in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The SWPPP shall apply to all areas that are directly related to construction including, but not limited to, staging areas, storage yards, material borrow areas, and access roads within or outside of the highway right-of-way.

The SWPPP shall incorporate water pollution control practices in the following six categories:

A. Soil stabilization;
B. Sediment control;
C. Wind erosion control;
D. Tracking control;
E. Non-storm water control; and
F. Waste management and material pollution control.

The Contractor shall develop a Water Pollution Control Schedule that shall describe the timing of grading or other work activities that could affect water pollution. The Water Pollution Control Schedule shall be updated by the Contractor to reflect any changes in the Contractor's operations that would affect the necessary implementation of water pollution control practices.

The Contractor shall incorporate the "Minimum Requirements" presented in the Preparation Manual into the SWPPP. In addition to the "Minimum Requirements" presented in the Preparation Manual, the Contractor shall complete the BMP Consideration Checklist presented in the Preparation Manual. The Contractor shall identify and incorporate into the SWPPP the water pollution control practices selected by the Contractor or as directed by the Engineer.

In addition to the Minimum Requirements presented in the Preparation Manual, special requirements shall be incorporated into the SWPPP and the Water Pollution Control Cost Break-Down as follows:

Special Requirement(s)

Category	BMP, location and quantity
Non Storm Water Control	NS-3 Paving and Grading Operations, Various, Lump Sum
Waste Management & Materials Pollution Control	WM-6 Hazardous Waste Management, Various, Lump Sum
Tracking Control	TC-2 Stabilized Construction Roadway, Unpaved Access Roadway, 600 M2

The following contract items of work, shall be incorporated into the SWPPP as "Temporary Water Pollution Control Practices": Temporary Cover, Temporary Concrete Washout Facility, Temporary Entrance/Exit, Temporary Drainage Inlet Protection, and Temporary Silt Fence. The Contractor's attention is directed to these special provisions provided for each temporary water pollution control practice.

The following contract items of work, as shown on the project plans or as specified elsewhere in these special provisions, shall be identified in the SWPPP as permanent water pollution control practices: Fiber Roll, Fiber Roll Check Dam, Erosion Control Blanket, and Erosion Control (Type D). These permanent water pollution control practices shall be constructed and utilized during the construction period. The Contractor shall maintain and protect the permanent water pollution control practices throughout the duration of the project and shall restore these controls to the lines, grades and condition shown on the plans prior to acceptance of the contract.

The SWPPP shall include, but not be limited to, the items described in the Manuals, Permits and related information contained in the contract documents.

The Contractor shall prepare an amendment to the SWPPP when there is a change in construction activities or operations which may affect the discharge of pollutants to surface waters, ground waters, municipal storm drain systems, or when the Contractor's activities or operations violate any condition of the Permits, or when directed by the Engineer. Amendments shall show additional water pollution control practices or revised operations, including those areas or operations not shown in the initially approved SWPPP. Amendments to the SWPPP shall be prepared, and submitted for review and approval in the same manner as specified for the SWPPP approval. Subsequent amendments shall be submitted within a time approved by the Engineer, but in no case longer than the time specified for the initial submittal and review of the SWPPP.

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

COST BREAK-DOWN

The Contractor shall submit to the Engineer a cost break-down for the contract lump sum item of water pollution control, together with the SWPPP.

The cost break-down shall be completed and furnished in the format shown in the example of the cost break-down included in this section. Unit descriptions and quantities shall be designated by the Contractor, except for the specified special requirements shown in the example. The units and quantities given in the example, if provided, are special requirements specified for the SWPPP, and shall be included in the cost break-down furnished to the Engineer. The Contractor shall verify the estimated quantities of the special requirements and submit revised quantities in the cost break-down.

The Contractor shall determine the quantities required to complete the work of water pollution control. The quantities and their values shall be included in the cost break-down submitted to the Engineer for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted for approval. The cost break-down shall not include water pollution control practices which are shown on the plans and for which there is a separate contract item.

The sum of the amounts for the units of work listed in the cost break-down shall be equal to the contract lump sum price bid for water pollution control. Profit shall be included in each individual unit listed in the cost break-down. The cost break-down shall be submitted and approved within the same times specified for the SWPPP. Partial payment for the item of water pollution control will not be made until the cost break-down is approved, in writing, by the Engineer. Attention is directed to "Time Related Overhead" of these special provisions.

Adjustments in the items of work and quantities listed in the approved cost break-down shall be made when required to address amendments to the SWPPP, except when the adjusted items are paid for as extra work.

No adjustment in compensation will be made in the contract lump sum price paid for water pollution control due to differences between the quantities shown in the approved cost break-down and the quantities required to complete the work as shown on the approved SWPPP. No adjustment in compensation will be made for ordered changes to correct SWPPP work resulting from the Contractor's own operations or from the Contractor's negligence.

The approved cost break-down will be used to determine partial payments during the progress of the work and as the basis for calculating the adjustment in compensation for the item of water pollution control due to increases or decreases of quantities ordered by the Engineer. When an ordered change increases or decreases the quantities of an approved cost break-down item, the adjustment in compensation will be determined in the same manner specified for increases and decreases in the quantity of a contract item of work in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications. If an ordered change requires a new item not on the approved cost break-down, the adjustment in compensation will be determined in the same manner specified for extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

If requested by the Contractor and approved by the Engineer, changes to the water pollution control practices listed in the approved cost break-down, including the addition of new water pollution control practices, will be allowed. The changes shall be included in an approved amendment to the SWPPP. If the changes to the water pollution control practices requested by the Contractor would result in a net cost increase to the lump sum price for water pollution control, an adjustment in compensation will be made without change to the item of water pollution control. The net cost increase to the item of water pollution control resulting from changes requested by the Contractor will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

WATER POLLUTION CONTROL COST BREAK-DOWN

Contract No. 04-006034

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
MINIMUM REQUIREMENTS				
SS-1 Scheduling	LS			
SS-2 Preservation of Existing Vegetation	LS			
SS-3 Hydraulic Mulch (Bonded Fiber Matrix)	M2			
SC-7 Street Sweeping and Vacuuming	LS			
WE-1 Wind Erosion Control	LS			
NS-6 Illicit Connection/Illegal Discharge Detection And Reporting	LS			
NS-8 Vehicle and Equipment Cleaning	LS			
NS-9 Vehicle and Equipment Fueling	LS			
NS-10 Vehicle and Equipment Maintenance	LS			
WM-1 Material Delivery and Storage	LS			
WM-2 Material Use	LS			
WM-4 Spill Prevention and Control	LS			
WM-5 Solid Waste Management	LS			
WM-9 Sanitary/Septic Waste Management	LS			
SPECIAL REQUIREMENTS				
NS-3 Paving and Grading Operations	LS	LUMP SUM		
WM-6 Hazardous Waste Management	LS	LUMP SUM		
TC-2 Stabilized Construction Roadway	M2	600		

TOTAL _____

SWPPP IMPLEMENTATION

Upon approval of the SWPPP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, maintaining, removing and disposing of the water pollution control practices included in the SWPPP and any amendments. Unless otherwise directed by the Engineer, 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 water pollution control practices are specified in the Manuals and these special provisions.

If the Contractor or the Engineer identifies a deficiency in any aspect of the implementation of the approved SWPPP or amendments, 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 precipitation. If the Contractor fails to correct the identified deficiency by the date agreed or prior to the onset of precipitation the project shall be in noncompliance. Attention is directed to Section 5-1.01, "Authority of the Engineer," of the Standard Specifications and the payment sections of these special provisions for possible noncompliance penalties.

If the Contractor fails to conform to the provisions of "Water Pollution Control," the Engineer may order the suspension of construction operations which create water pollution.

Implementation of water pollution control practices may vary by season. The Construction Site BMP Manual and these special provisions shall be followed for control practice selection of year round, rainy season and non-rainy season water pollution control practices.

Year-Round Implementation Requirements

The Contractor shall have a year-round program for implementing, inspecting and maintaining water pollution control practices for wind erosion control, tracking control, non-storm water control, and waste management and materials pollution control.

The National Weather Service weather forecast shall be monitored and used by the Contractor on a daily basis. An alternative weather forecast proposed by the Contractor may be used if approved by the Engineer. If precipitation is predicted, the necessary water pollution control practices shall be deployed prior to the onset of the precipitation.

Disturbed soil areas shall be considered active whenever the soil disturbing activities have occurred, continue to occur or will occur during the ensuing 21 days. Non-active areas shall be protected as prescribed in the Construction Site BMP Manual within 14 days of cessation of soil disturbing activities or prior to the onset of precipitation, whichever occurs first.

In order to provide effective erosion control the Contractor may be directed to apply permanent erosion control in small or multiple units as disturbed soil areas are deemed substantially complete by the Engineer. The Contractor's attention is directed to "Erosion Control" and "Move-In Move-Out (Erosion Control)" of these special provisions.

The Contractor shall implement, maintain, and inspect the following temporary sediment control practices on a year-round basis. The listed practices shall remain in place until their use is no longer needed, as determined by the Engineer.

Year-Round Sediment Control Practices	Location used
Temporary Entrance/Exit	At the interface between construction work areas and public roads
Stabilized Construction Roadway	On all temporary access roads

Rainy Season Requirements

Soil stabilization and sediment control practices conforming to the requirements in the Special Requirements and applicable Preparation Manual Minimum Requirements, shall be provided throughout the rainy season, defined as between October 1 and May 1.

An implementation schedule of required soil stabilization and sediment control practices for disturbed soil areas shall be completed not later than 20 days prior to the beginning of each rainy season. The implementation schedule shall identify the soil stabilization and sediment control practices to be implemented and the dates on which the implementation will be 25 percent, 50 percent and 100 percent complete, respectively. Construction activities beginning during the rainy season shall implement applicable soil stabilization and sediment control practices. The Contractor shall implement soil stabilization and sediment control practices a minimum of 10 days prior to the start of the rainy season.

Throughout the defined rainy season, the active disturbed soil area of the project site shall be not more than 2 hectares. The Engineer may approve, on a case-by-case basis, expansions of the active disturbed soil area limit. Soil stabilization and sediment control materials shall be maintained on site sufficient to protect the unprotected disturbed soil area. A detailed plan for the mobilization of sufficient labor and equipment shall be maintained to deploy the water pollution control practices required to protect the project site prior to the onset of precipitation events.

Non-Rainy Season Requirements

The non-rainy season shall be defined as all days outside the defined rainy season. The Contractor's attention is directed to the Construction Site BMP Manual for soil stabilization and sediment control implementation requirements on disturbed soil areas during the non-rainy season. Disturbed soil areas within the project shall be protected in conformance with the requirements in the Construction Site BMP Manual with an effective combination of soil stabilization and sediment control.

MAINTENANCE

To ensure the proper implementation and functioning of water pollution control practices, the Contractor shall regularly inspect and maintain the construction site for the water pollution control practices identified in the SWPPP. The construction site shall be inspected by the Contractor as follows:

A. Prior to a forecast storm;
B. After a precipitation event which causes site runoff;
C. At 24 hour intervals during extended precipitation events;
D. Routinely, a minimum of once every two weeks outside of the defined rainy season;
E. Routinely, a minimum of once every week during the defined rainy season.

The Contractor shall use the Storm Water Quality Construction Site Inspection Checklist provided in the CSWPPP or an alternative inspection checklist provided by the Engineer. One copy of each site inspection record shall be submitted to the Engineer within 24 hours of completing the inspection.

REPORTING REQUIREMENTS

Report of Discharges, Notices or Orders

If the Contractor identifies any discharge into receiving waters in a manner causing, or potentially causing, a condition of pollution, or if the project receives a written notice or order from any regulatory agency, the Contractor shall immediately inform the Engineer. The Contractor shall submit a written report to the Engineer within 7 days of the discharge event, notice, or order. The report shall include the following information:

A. The date, time, location, nature of the operation, and type of discharge, including the cause or nature of the notice or order.
B. The water pollution control practices deployed before the discharge event, or prior to receiving the notice or order.
C. The date of deployment and type of water pollution control practices deployed after the discharge event, or after receiving the notice, or order, including additional measures installed or planned to reduce or prevent reoccurrence.
D. An implementation and maintenance schedule for any affected water pollution control practices.

Report of First-Time Non-Storm Water Discharge

The Contractor shall notify the Engineer at least 3 days in advance of each first-time non-storm water discharge event, excluding exempted discharges. The Contractor shall notify the Engineer of each different operation causing a non-storm water discharge and shall obtain field approval for each first-time non-storm water discharge. Non-storm water discharges shall be monitored at each first-time occurrence and routinely thereafter.

Annual Certifications

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

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 in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, payment for the remaining 25 percent of the contract item price for prepare storm water pollution prevention plan will be made in conformance with the provisions in Section 9-1.07.

The contract lump sum price paid for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing, constructing, removing, and disposing of water pollution control practices, including non-storm water and waste management and materials pollution water pollution control practices 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.

The cost of maintaining the temporary water pollution control practices shall be divided equally by the State and the Contractor as follows:

Soil Stabilization

All temporary water pollution control practices except:
SS-1 Scheduling, SS-2 Preservation of Existing Vegetation, Temporary Cover

Sediment Control

All temporary water pollution control practices except:
Temporary Drainage Inlet Protection, Temporary Silt Fence.

Tracking Control

All temporary water pollution control practices except:
SC-7 Street Sweeping and Vacuuming, Temporary Entrance/Exit

Wind Erosion Control

All temporary water pollution control practices.

Non-Storm Water Control

No sharing of maintenance costs will be allowed.

Waste Management & Material Control

No sharing of maintenance costs will be allowed.

The division of cost will be made by determining the cost of maintaining temporary water pollution control practices in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost. Clean-up, repair, removal, disposal, improper installation, and replacement of temporary water pollution control practices damaged by the Contractor's negligence shall not be considered as included in the cost for performing maintenance and no additional compensation will be allowed therefor.

The provisions for sharing maintenance costs shall not relieve the Contractor from the responsibility for providing appropriate maintenance on those items where maintenance costs are not shared.

Full compensation for maintenance costs of water pollution control practices not shared, as specified in these special provisions, shall be considered as included in the contract lump sum price paid for water pollution control and no additional compensation will be allowed therefor.

Those water pollution control practices 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," as determined by the Engineer.

Retention for failure to conform to the provisions in this section "Water Pollution Control" shall be in addition to the other retention 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.

10-1.07 TEMPORARY SILT FENCE

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

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 and one of the following:

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.

INSTALLATION

Temporary silt fence shall be installed as shown on the plans.

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 (SWPPP), 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.

10-1.08 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.

MEASUREMENT AND PAYMENT

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

The contract price paid per meter for temporary fence (Type ESA) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing temporary fence (Type ESA) complete in place, including installation, maintenance, removal and disposal of materials as specified in these special provisions and as directed by the Engineer.

10-1.09 TEMPORARY ENTRANCE/EXITS

This work shall consist of constructing and maintaining the temporary entrance/exits as shown on the plans, as directed by the Engineer, and as specified in these special provisions. When no longer required for the work, temporary entrance/exits shall be removed as specified in these special provisions.

Each temporary entrance/exits shall include a clean out sump.

The type of temporary entrance/exits shall be either Type 1 or Type 2 at the option of the Contractor.

The Contractor shall provide as many temporary entrance/exits, as shall be required for the duration of the contract. Attention is directed to "Water Pollution Control" of these special provisions.

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

MATERIALS

Materials shall conform the following:

Temporary Entry/Exits Fabric.

Temporary entrance/exits fabric shall be manufactured from one or more of the following materials: polyester, nylon or polypropylene. Temporary entrance/exits fabric shall be nonwoven type fabric conforming to the following:

	Non-Woven Needle Punched
Mass per unit area, grams per Square Meter, Min. ASTM Designation: D 5261	235
Grab Tensile Strength, 25 mm grip, kiloNewtons (kN), Min. ASTM Designation: D4632*	0.89
Elongation at Break, Percent, Min., ASTM Designation: D4632*	50
Toughness, grab tensile strength times percent elongation (kN x %)	53

* or appropriate test for method for specific polymer

Temporary entrance/exits fabric shall be a non-woven, needle-punched fabric, free of any needles which may have broken off during manufacturing. It may be manufactured from either virgin polymer materials, recycled materials, or a combination of recycled and virgin polymer materials such as polyester polyethylene terephthalate 'PETE'. None of the materials, whether virgin or recycled, shall contain biodegradable filler materials that degrade the physical or chemical characteristics of the finished roll products. To confirm the absence of biodegradable filler materials the Engineer may order tests such as ASTM E 204 (Fourier Transformed Infrared Spectroscopy-FTIR) or other appropriate tests.

Temporary entrance/exits fabric shall be accompanied by a Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificate of Compliance" of the Standard Specifications.

Aggregate

Aggregate shall range in size from 100 mm to 180 mm, shall be angular to subangular in shape, and shall conform to the provisions in Section 26, "Aggregate Base," of the Standard Specifications and these special provisions.

Corrugated Steel Panels

Manufactured corrugated steel panels with raised bars shall be provided in individual sections. Steel plate and raised bars shall be a minimum 12.7 mm thick. Bars shall be a minimum of 38.1 mm in height and shall be uniformly distributed 190.5 mm apart longitudinally throughout the full section of each panel. Raised bars shall be welded to the bottom plate and approximately 12.7 mm thick at the base and tapering to 6.35 mm thick at the top of the bar. Each panel shall have a nominal dimension of 3 m x 2.43 m 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.

CONSTRUCTION

Temporary entrance/exits shall be installed as shown on the plans and as follows:

A. Prior to placing the temporary entrance/exits fabric, the areas shall be cleared of all trash and debris. Vegetation shall be removed to the ground level. Cleared trash, debris, and removed vegetation shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13, Disposal of Material Outside the Highway Right of Way, of the Standard Specifications.
B. The ground to receive temporary entrance/exits fabric shall be graded to a uniform plane, watered and compacted, and shall be free of sharp objects that may damage the temporary entrance/exits fabric, and shall be graded to drain to the sump as shown on the plans.
C. Temporary entrance/exits fabric shall be positioned longitudinally along the alignment of the temporary entrance/exits.
D. Where needed, adjacent borders of the fabric shall be overlapped a minimum of 300 mm.
E. Aggregate to be placed directly over the fabric shall be spread in the direction of traffic, longitudinally along the alignment of the temporary entrance/exits. All remaining materials shall be uniformly placed and spread with 1:4 (V:H) tapers at the perimeter edges of the temporary entrance/exits where it conforms to existing roadway
F. During spreading of the aggregate, vehicles or equipment shall not be driven directly on the fabric. A minimum thickness of 150 mm of aggregate 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.
G. Should the fabric be damaged during placing, the damaged section shall be repaired by placing a new piece of fabric over the damaged area. The piece of fabric shall be large enough to cover the damaged area and provide a minimum 450 mm overlap on all edges.

For Type 2 temporary entrance/exits, a minimum of 3 panel sections coupled to one another is required at each temporary entrance/exits. Prior to installing panels, the ground surface shall be cleared of all debris which may prevent uniform contact with the ground surface.

A sump shall be constructed within 6 m of each temporary entrance/exits. The sump shall be sized sufficiently to hold soil removed from the temporary entrance/exits in order to maintain efficiency.

MAINTENANCE

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

Temporary entrance/exits, shall be maintained to minimize tracking of soil and sediment onto paved roads. If the efficiency of a temporary entrance/exits to minimize tracking of soil and sediment is compromised by the buildup of soil and sediment, or by other means, as determined by the Engineer, the Contractor shall remove and dispose of the soil and sediment, install additional corrugated steel panels, or spread additional aggregate.

Pavement cleaning shall be required at all locations where construction equipment is visibly tracking sediments onto the roadway.

Pavement cleaning shall be required each and every day when temporary entrance/exits are in use. Soil and sediment or other extraneous material tracked onto pavement shall not be allowed to enter drainage facilities and shall be removed at least once each day.

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

PAYMENT

The contract unit price paid for Temporary Entrance/Exits shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in Temporary Entrance/Exits, complete in place, including maintenance, removal and disposal of materials 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 COVER

Temporary cover shall conform to the details shown on the plans

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.

Rock bag fabric shall be non-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, conforming to the requirements in ASTM Designation: D 3786 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, be capable of containing a weighted mass of 13 kg to 22 kg. After filling, the opening shall be secured such that rock shall not escape from the bag.

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. Rock bags shall be placed on the overlap area and along the toe at a maximum spacing of 2.4m. Anchoring temporary cover by using staples or wooden lath and anchors may be allowed instead 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.

MAINTENANCE

Clean–up, repair, removal, disposal, improper installation and replacement of temporary cover damaged through the Contractor's negligence shall be considered as included in the cost for performing maintenance and no additional compensation will be allowed therefor.

MEASUREMENT AND PAYMENT

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

10-1.11 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 6.

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 seams or overlapping joints.

B **ROCK BAG.—**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, 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 100 mm for above grade facilities and 300 mm 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 facility 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.

10-1.12 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.

MARINE EXCAVATION DEWATERING

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 or aquatic vegetation 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 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 receiving water turbidity will be measured at a location that is unaffected by the 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 resumption of discharge activities shall be allowed upon approval of the corrective measures by the Engineer.

STOCKPILE DEWATERING

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

The Contractor shall depict and describe within 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 when free liquids are present, to seal the sides and bottom of the temporary stockpiles, and to prevent the flow of water into the stockpiles. Operations producing water will not be permitted until the Engineer has approved the plan.

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 the water to meet the permit requirements for discharge or hauling the 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.

LAND-BASED EXCAVATION DEWATERING

This work shall consist of dewatering and discharging water from land-based excavations including, but not limited to, footing excavations, and excavations for retaining walls, storm drainage systems, sanitary sewer systems and their appurtenances, except as specified in "Pier 5 Excavation Dewatering" of this special provision. The Contractor shall test groundwater prior to discharge for conformance with NPDES permits CAS000002 and CAS000003, and these special provisions. At the Contractor's option, test samples to confirm contaminant concentrations may be collected from the groundwater in the excavation or from closed-top watertight, transportable holding tanks furnished by the Contractor. The holding tanks shall have sufficient capacity to prevent delay of other work. Groundwater that has contaminant concentrations above the allowable concentrations specified in these special provisions shall be treated prior to discharge. Surface runoff shall not be permitted to enter the excavation. Groundwater contaminated by the Contractor's operations, such as use of slurry cement backfill to construct cast-in-drilled-hole piles, shall be treated to meet the permit requirements for discharge or hauled off site to an appropriately licensed liquid disposal facility. 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, and remove known or introduced groundwater 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 or introduced groundwater 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.

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 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 µg/L. Samples obtained from the discharge shall be analyzed in accordance with EPA methods 8015M. 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 and petroleum hydrocarbons. 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 in conformance with this section shall be handled as provided in ‘Effluent Treatment Systems' 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.

PIER 5 EXCAVATION DEWATERING

This work shall consist of removing and discharging water from the excavation for Pier 5. Groundwater within and adjacent to the excavation limits for Pier 5 contains heavy metals at concentrations greater than allowable for discharge under NPDES permits CAS000002 and CAS000003. Contaminant concentrations are summarized in the following table:

Contaminant	Concentration (mg/L)
Aluminum	18
Antimony	<0.005
Arsenic	0.040
Barium	0.070
Beryllium	<0.003
Boron	0.30
Cadmium	<0.003
Calcium	410
Chromium	0.020
Cobalt	0.060
Copper	1.2
Iron	73
Lead	<0.005
Magnesium	220
Manganese	2.2
Molybdenum	<0.005
Nickel	0.05
Selenium	<0.005
Silicon	44
Silver	<0.003
Thallium	<0.005
Vanadium	0.040
Zinc	19
Sulfate	2100
Hardness as Calcium Carbonate	2000
pH	6.19

Arrangements have been made for the Contractor to deliver groundwater removed from the Pier 5 excavation to Rhodia, Inc. for treatment in its Plant Effluent Purification (PEP) facility at a price of $2.65 per 1000 liters and an additional cost of $1410.00 per 12 hour shift. If this arrangement is used, deductions will be made from progress pay estimates due the Contractor, sufficient to cover the cost of groundwater treatment.

The PEP facility is located approximately 300 meters from Pier 5. The process flow rate of the PEP facility available to the Contractor is limited to 150 liters per minute from May 1 to October 31 and 19 liters per minute from November 1 to April 30. As a part of the work in delivering groundwater to the PEP facility the Contractor shall perform the following work:

A. Notify the Engineer 14 days prior to beginning delivery of water to the PEP facility.
B. Provide closed-top, watertight transportable, holding tanks (Baker tanks) sufficient for 2 days storage of pumped groundwater. The tanks shall be interconnected and installed in an area adjacent to the PEP facility as directed by the Engineer.
C. Install necessary piping and appurtenances to convey the pumped groundwater an estimated 300 meters from Pier 5 to the holding tanks.
D. Conduct a daily inspection of the dewatering equipment, when in use, to ensure that all components are functional and routinely maintained to prevent leakage. 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.
E. Remove, characterize, and dispose of sediments that accumulate in the holding tanks when dewatering is no longer required at Pier 5 or as needed to ensure that the treatment process remains functional.

In the event that the Contractor elects to deliver groundwater to the PEP facility for treatment, no groundwater may be delivered unless the Contractor has first executed a document that will guarantee to hold the owner harmless from all claims for injury to persons or damage to property resulting from the Contractor's operations on the property owner's premises and also agree to conform to all other provisions set forth in the arrangement made between the Department and the property owner. The document will be prepared by the Engineer for execution by the Contractor.

In the event that the Contractor elects to make other arrangements for treatment and disposal of groundwater from Pier 5 or perform the work at Pier 5 in a manner that results in a volume of groundwater that exceeds the available treatment flow rate at the PEP facility, the Contractor shall be responsible for making all arrangements for treatment and disposal, including but not limited to, entering into agreements with treatment facility owners and obtaining necessary permits, licenses and environmental clearances. Before dewatering may begin at Pier 5, the Contractor shall furnish to the Engineer satisfactory evidence that the Contractor has entered into agreements with the facilities involved and has obtained the permits, licenses, and clearances.

Groundwater samples will be made available to the bidders for conducting bench-scale assessments of treatment systems upon request to the Toll Bridge Duty Senior at the District 4 Office, 111 Grand Avenue, Oakland, California, 94612, email: duty_senior_tollbridge_district04@dot.ca.gov, telephone number; (510) 286-5549, fax number; (510) 286-4563. The request shall include a contact person, contact phone number, and the volume of groundwater required for the assessment. Bidders will be contacted with the date and location where samples may be picked up. The bidder shall arrange for shipment of the sample to the person making the assessment.

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 treat and discharge the groundwater. 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 or introduced groundwater 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.

EFFLUENT TREATMENT SYSTEMS

Effluent treatment systems shall be provided to treat 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 systems to treat 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 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 sufficient 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 1 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 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. Two 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. 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 equal to or less than the allowable discharge concentration for each contaminant. Industry accepted standard operating procedures shall be used to ensure quality assurance and quality control of sampling and analysis procedures. 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

The Contractor shall prevent the discharge of slurries, liquids, residues, or debris produced during the work to storm water facilities or surface waters of the State. 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 slurries, liquids, residues, and debris are not conveyed into or become present in drainage systems, San Francisco Bay, or other water bodies.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for non-storm water discharges shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in non-storm water discharges, complete in place, as shown on the plans, as specified in the Standard Specifications, and these special provisions, and as directed by the Engineer.

10-1.13 ELECTRONIC MOBILE DAILY DIARY COMPUTER 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 First Nname.	Alphanumeric; up to 15 characters
Contact Last Name	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 25 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 25 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.

10-1.14 COOPERATION

Attention is directed to Sections 7-1.14, "Cooperation," and 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 any moneys due or that may become due the contractor causing the loss or delay.

It is anticipated that work will be in progress by State forces and other contractors within or adjacent to the project limits of this contract.

Contracts which may be in progress during the working period of this contract include but are not necessarily limited to the following:

Contract No. 04-006064
Contract No. 04-006054

Progress schedules for other work in progress, if available, may be inspected by the Contractor upon approval by the Engineer. Such progress schedules are tentative and cannot be guaranteed accurate.

The Contractor shall attend joint weekly meetings, to be organized by the Engineer with other contractors on adjacent projects, in order to minimize potential conflicts. The Contractor shall coordinate with and accommodate other bridge contractors when preparing operations and work schedules.

10-1.15 SPAN 17 COOPERATION

Cooperation with the contractor constructing Contract, 04- 006064, Bridge Nos. 23-0212G and 23-0215R, will be required in Span 17.

The Contractor shall be responsible for coordinating his construction schedule for the construction of the Span 17 hinge with the contractor constructing Contract 04-006064.

The prestressing materials on the upper hinge anchored to the long span side of the hinge in Span 17 (Contract 04-006064, Bridge No's 23-0212G and 23-0215R) will be furnished as a part of Contract 04-006064. All prestressing systems which physically pass out of the concrete diaphragm on the long span side of the hinge at the contract limits and into this contract will be furnished as a part of Contract 04-006064. The work of stressing bars that secure the upper seat at the diaphragm and the shear key will be performed as a part of this contract and shall be coordinated with Contract 04-006064 Contractor's prestressing subcontractor. All bar reinforcing within the hinge will be furnished and installed in this contract, except as noted otherwise in these special provisions or on the drawings. All bar reinforcing which physically passes out of the concrete diaphragm on the long span side of the hinge at the contract limits and which enters this contract will be installed as a part of Contract 04-006064 by that Contractor. Removal of the forms and cleaning of the face of the diaphragm on the long span side of the hinge shall be performed as a part of this contract.

Deck grinding in Span 17 across the hinge and 15 meters into Contract 04-006064 as necessary to install the joint seal assembly shall be considered a part of this contract. The Contractor shall coordinate and furnish all necessary materials and install any temporary bridging required to allow grinding across the joint blockout prior to the installation of the joint.

PAYMENT

Full compensation for cooperating with the contractor constructing Contract 04-006064, for, prestressing the upper seat of the hinge (with materials supplied by the Contract 04-006064) in Span 17, for grinding 15m into Contract 04-006064, and for any temporary bridging required to grind across the joint shall be considered as included in the various items of work involved and no additional compensation will be allowed therefor.

10-1.16 CONSTRUCTION SURVEYING (NEW BRIDGE ONLY)

This work shall consist of construction surveying by the Contractor using Global Positioning Systems (GPS) surveying methods, including, Real-time kinematic (RTK) GPS as well as conventional surveying means to establish the lines and grades required for completion of the bridge work as shown on the plans and as specified in the Standard Specifications.

Except as otherwise provided herein for establishment of Project horizontal and vertical control and right-of-way staking (on land only) by the Engineer, all other specifications, including the first two paragraphs of Section 5-1.07, "Lines and Grade," of the Standard Specifications, which require the establishment of lines and grades by the Engineer, shall not apply to this contract.

The Engineer will provide survey control, both vertical and horizontal, including B-order monumentation (using California Coordinate System 1927, Zone 2 coordinates) at both the North and South ends of the bridge. The Engineer will also provide a control diagram for the monumentation (a Record of Survey depicting the Project Control Survey). Vertical Datum or benchmarks will also be provided. The Contractor's attention is directed to the third paragraph of Section 5-1.07, "Lines and Grade," of the Standard Specifications with regard to preserving control monuments furnished by the State.

The Contractor shall use GPS combined with software specifically designed for precise positioning of large structures for positioning of the piling templates and for driving of the permanent steel casings for the water piers. The software shall provide a visual display on a computer screen that allows the viewer to see real-time three-dimensional coordinates, attitude and orientation information with regard to a predetermined target position. The Engineer shall be provided access to the location where the computer monitor is located whenever the system is being used to maneuver and set piling or templates into place. The software shall also have user-defined reporting functions for quality control and as-built reporting.

Before starting any construction survey work, the Contractor shall submit in writing for approval by the Engineer, the proposed procedures, methods, equipment, and typical stake markings to be used for all Contractor surveying on the project. All procedures, methods and typical state markings shall be in accordance with Chapter 12, "Construction Surveys", of the Department of Transportation publication titled "Survey Manual." The Contractor's attention is also directed to the requirements for the "Geometry Control Plan" and the "Geometry Control Manual" for the construction of the segmental superstructure, elsewhere in these special provisions, which also require survey methods and procedures to be submitted. The segmental superstructure surveying submittals need not be considered in the above submittal.

Construction surveying shall be performed as necessary to control the work and with accuracy to assure that the completed work conforms to the lines, grades and sections shown on the plans.

When the project needs the right-of-way marked for clearing and grubbing, the Engineer will set monuments to control the right-of-way lines (on land). The Contractor shall notify the Engineer of the need for right-of-way control monuments at least 5 working days in advance of starting operations that require right-of-way monumentation..

The Contractor shall make all computations necessary to establish the exact position of the work from the Project control points. All computations, survey notes, and other records necessary to accomplish the work shall be neat, legible, and accurate. Copies of such computations, notes, and other records shall be furnished to the Engineer prior to beginning work that requires their use. Upon completion of all construction surveying and prior to acceptance of the contract, all computations, survey notes, and other data used to accomplish the work shall be furnished to the Engineer and shall become the property of the State.

The sum of the amounts for the items and work listed in the schedule of values shall be equal to the contract lump sum price for construction surveying. Changes in the schedule of values, due to changes by the Contractor in the items and work listed, shall not result in a change in the contract lump sum price for construction surveying.

The schedule of values for construction surveying shall be submitted to the Engineer within the time required for submittal of the Interim Baseline Schedule, as specified in "Progress Schedule (Critical Path)" of these special provisions. The items and work listed in the schedule of values shall be designated in the resource loading required in the Baseline Schedule required in "Progress Schedule (Critical Path)" of these special provisions.

When approved in writing by the Engineer, the schedule of values will be used only to determine progress payments for construction surveying during the progress of the work. No partial payment for construction surveying will be made until the schedule of values is approved in writing by the Engineer.

PAYMENT

The contract lump sum price paid for construction surveying shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the required survey work involved in constructing the new bridge, including surveying for geometry control as specified in the these special provisions, and as directed by the Engineer.

10-1.17 PROGRESS SCHEDULE (CRITICAL PATH)

Progress schedules will be required for this contract. Progress schedules shall utilize the Critical Path Method (CPM). Attention is directed to "Cooperation," and "Obstructions" of these special provisions. Nothing in theses special provisions shall be construed as relieving the Contractor from the responsibilities specified in Section 7, "Legal Relations and Responsibility," of the Standard Specifications.

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). This is the longest path of activities having the least amount of float.
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, dates are shown across the top, and activity durations are shown as date-placed horizontal bars.

PRECONSTRUCTION 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 (SBS) Code. The SBS structure will be finalized after submittal of the accepted Baseline schedule. 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 and 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 has 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 work. The Interim Baseline Schedule submittal shall include a 3 1/2 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 acceptance 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 (except for Contract Milestone dates.) The Baseline 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. Activities for the preparation and the review of submittals plus fabrication are to be assigned to the same calendar.

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

The Contractor shall not assign negative lags to any activities.

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 define the critical path. Each 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 CPM Schedule submitted by the Contractor shall show the sequence in which individual spans or cantilevers are constructed and made continuous. In addition, the following specific activities related to segmental cast-in-place construction shall be included:

A. Required shop drawing reviews;
B. Form traveler fabrication;
C. Erection equipment fabrication;
D. Form traveler assembly;
E. Erection equipment assembly;
F. Pier Casting;
G. Form traveler erection and assembly on pier table;
H. Moving from travelers;
I. Disassembly and removal of form travelers.

The Contractor's attention is directed to the requirements for submitting cost reduction incentive proposals elsewhere in these Special Provisions.

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 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. On the P3 resource dictionary, each resource should have the normal and maximum limits for the specified period of time. Based on the resource limits, 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, including submittal of requests for audits of manufacturers and fabricators in conformance with "Manufacturing and Fabrication Qualification Audit for Materials" of these special provisions;
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;
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;
M. Separate resources graphs for the Contract's labor, equipment and critical path labor, with an accompanying analysis of each and explanation for any variances (i.e., example front-end resource loading of schedules); and
N. Equipment and labor shall be differentiated by a cost account code within the resource dictionary.

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, narratives providing additional schedule detail as requested by the Engineer 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-weeks schedule identifying the previous week worked and a 3-week look ahead. It shall provide sufficient detail to include the actual and planned activities of the Contractor and all the subcontractors for offsite and construction activities, addressing all activities to be performed and to identify issues requiring engineering action or input.

Each activity in the 4 week rolling schedule shall be identified by an associated CPM schedule activity ID numbering system. This schedule should not be hand written. To create the 4 weeks rolling schedules, the Contractor shall utilize Primavera Project Planner or other software, as approved by the Engineer. The Engineer will provide the format of the schedule. This schedule shall be electronically submitted to the Engineer one day prior to the scheduled meeting date.

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 current problem areas;
E. Current and anticipated delays;
    1. Cause of the delay;
    2. Corrective action and schedule adjustments to correct the delay; and
    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; and
    4. Non-Compliance Notices;
H. Contract completion date(s) status;
1. Ahead of schedule and number of days; and
    2. Behind schedule and number of days; and
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 acceptance process prior to the next update schedule data 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 includes 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. The Contractor should add resources for all new activities, also adjust resources for those activities that their remaining duration were changed;
D. A narrative explanation of the revisions and their impact to the schedule; and
E. 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 4 weeks 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 update and schedule revision, both with the same data dates, demonstrating how the Contractor proposes to incorporate the Change Order or delay into the current schedule. The schedule revision 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, 21 inch color SVGA monitor (1024x768 pixels), Intel Pentium III 850 MHz microprocessor chip, or equivalent;
B. Computer operating system software, compatible with the selected processing unit, for NT4.0 or later or equivalent;
C. Minimum one-twenty-eight (128) megabytes of random access memory (RAM);
D. A 6.4 gigabytes minimum hard disk drive, a 1.44 megabyte 3 1/2 inch floppy disk drive, 32x speed minimum CD-ROM drive, Ethernet card and 56k modem;
E. A color-ink-jet plotter with a minimum 36 megabyte RAM, capable of 600 dots per inch color, 1200 dots per inch monochrome, or equivalent, capable of printing fully legible, time scaled 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, an HP Design Jet 1055 CM or equivalent, plotter stand, roll paper assembly and automatic paper cutter, and provide 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) in 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 Primavera Project Planner 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.

10-1.18 WORKING DRAWING LIST, SCHEDULE AND SUBMITTAL

Using the progress schedule required by these special provisions, the Contractor shall create and submit for review a list of the anticipated working drawings required by these special provisions and the Standard Specifications. The list shall show the name of the working drawing, the anticipated date for submittal of the working drawing, the reference section of the special provisions or the standard specifications requiring the working drawing and the allowable time for review of the working drawings by the State, as required by these special provisions or the Standard Specifications.

The Contractor shall submit the working drawing list and schedule to the Engineer for review with the baseline progress schedule.

All working drawing submittals shall be submitted in accordance with the Contractor's approved working drawing schedule. When submittals or re-submittals are not received in accordance with the approved schedule, they shall be downgraded in review priority and reviews conducted according to the approved schedule. Modifications and/or revisions to the approved schedule(and the resulting re-prioritizing of submittals)shall be submitted for review in accordance with "Progress Schedule (Critical Path)" of these special provisions.

PAYMENT

Full compensation for preparing and submitting the working drawing list and schedule, including all necessary revisions, shall be considered as included in the contract lump sum price paid for Progress Schedule(Critical Path), and no additional compensation will be allowed therefor.

10-1.19 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 1-800-227-2600
Underground Service Alert-Southern California (USA)	1-800-422-4133 1-800-227-2600

The Contractor's attention is directed to the Rhodia sampling wells located in the vicinity of Span 5. These sampling wells shall be protected in-place.

The Contractor's attention is directed to the "Materials Handout" regarding the report of the remnants of existing timber wharves extending from the southern shore into the Carquinez Straight both east and west of the new alignment. The Materials Handout will be made available 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.

If these facilities are not located on the plans in both alignment and elevation, no work shall be performed in the vicinity of the facilities, except as provided herein for conduit to be placed under pavement, until the owner, or the owner's representative, has located the facility by potholing, probing or other means that will locate and identify the facility. Conduit to be installed under pavement in the vicinity of these facilities shall be placed by the trenching method in conformance with the provisions in "Conduit" of these special provisions. If, in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the utility facilities not being located by the owner or the owner's representative, 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.

The Contractor's attention is directed the 300 mm Rhodia outfall pipe and diffuser structure located in the vicinity of Piers 6 and 7. These facilities shall be protected in-place by the Contractor. The Contractor shall locate and mark with buoys the Rhodia outfall pipe and the diffusers before any work will be allowed in the area of the pipe. A protection plan shall be submitted to the Engineer for approval. The protection plan shall detail methods of
locating the pipe and diffusers, placement of buoys, and shall summarize the Contractor's plans to prevent construction equipment from damaging the pipe and diffusers. The Contractor shall coordinate the protection plan with Rhodia prior to submittal to the Engineer for review.

The Contractor shall submit to the Resident Engineer's Office at 4585 Pacheco Blvd., Suite 200, Martinez, California 94553 for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," working drawings of the protection plan. For initial review, 6 sets of such plans, shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the said Office for final approval and for use during construction. The review time to be provided for the Engineer's review of the Contractor's working drawings and calculations for the protection plan, shall be 3 weeks.

Full compensation for locating and marking the Rhodia outfall pipe and diffusers, including removal of markers or buoys at the completion of the bridge construction, shall be considered as included in the contract prices paid for the various items of work shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

10-1.20 MOBILIZATION

Mobilization shall conform to the provisions in Section 11, "Mobilization," of the Standard Specifications and these special provisions.

MARINE ACCESS

The Contractor's establishment of marine access shall conform to the requirements of Section 11, "Mobilization," of the Standard Specifications and these special provisions.

Marine access shall be defined as the mobilization work of furnishing, erecting and removing barges, trestles and other facilities to provide marine access to the job site.

The Contractor's marine access shall not disturb the existing slurry wall that parallels the southern shoreline below and adjacent to the bridge footprint. No excavation or pile driving will be approved in the area of the slurry wall. The Contractor shall take all necessary precautions to locate and protect the slurry wall and shall design his marine access accordingly.

When access trestles are no longer needed, any piles installed by the Contractor for the access trestles shall be extracted and shall become the property of the Contractor and shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13 of the Standard Specifications.

The Contractor may construct access trestles on the both ends of the bridge in accordance with the permits obtained by the State and these special provisions.

The Contractor shall submit to the Resident Engineer's Office at 4585 Pacheco Blvd., Suite 200, Martinez, California 94553 in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," calculations and working drawings of any access trestle(s) that are constructed. Six sets of such plans, manuals and drawings shall be submitted to the said Office for use during construction. The working drawings and calculations shall be signed by a civil engineer registered in the State of California. The access trestles shall also conform to the following requirements:

A. Piling shall not be creosoted.
B. The number of piling and the total cross sectional area of the piling shall not exceed the requirements listed in the permits the State has obtained for this project.
C. Piling used to construct the access trestles shall be completely removed after no longer needed for construction.
D. The shadow area of the trestles (plan view area) shall not exceed the limits listed in the permits the State has obtained for this project.
E. Pile driving for the access trestle construction in waters less than 3m deep below MLLW, shall only be allowed during the period of July 1 through October 31.
F. Superstructure construction of the access trestles shall be achieved by means that do not disturb the mudline except as allowed during the period of July 1 through October 31.
G.

Full compensation for establishing marine access to the job site, including constructing, maintaining and removing access trestles, removing access trestle piles, preparing and submitting calculations and working drawings shall be considered as including in the lump sum price paid for mobilization and no additional compensation will be allowed therefore.

10-1.21 TRANSPORTATION FOR THE ENGINEER

The Contractor shall provide transportation for the Engineer in accordance with Section 5-108, "Inspection," of the Standard Specifications and these special provisions.

The Contractor shall provide, operate, berth and maintain, through out the life of the contract, a commercial grade work boat for the sole use of the Engineer and the Engineer's staff in performance of their work. The boat shall be available for the Engineer's use no later than 120 days after the award of the contract. In addition, the Engineer and all authorized representatives of the State, acting within the scope of their duties in connection with the work under this contract, shall be permitted to ride as passengers, with out charge, on any boat operated by, or for the Contractor for the transportation of personnel, equipment or materials. It is agreed that such transportation will be only on the boats that are making trips in connection with the Contractor's operation.

The commercial grade work boat shall be at minimum, an 11 meter (36 foot) launch adequate for open water operations, such as the Dauntless Class 3612-V Crew Boat by Sea Arc or equal, meeting or exceeding the following minimum requirements:

A. Drive Power:
1. Twin Diesel engines, minimum of 600 HP, Stern Drive;
2. Fuel capacity shall be adequate for the size of the craft (minimum 1136 liters (300 gal));
3. Minimum cruising speed of 20 knots.

B. Equipment:
1. All welded aluminum construction;
2. Fender system adequate for site conditions;
3. Mooring bits located forward and aft on boat;
4. Anchor with chain and line (adequate for specific site condition);
5. High patterned inboard side rails;
6. Deep Vee Hull, with variable deadrise;
7. Hull construction using longitudinal framing with heavy-duty transverse support and watertight bulkheads;
8. Heavy duty Bow-Eye reinforcement;
9. 10 to 12 passenger cabin with large windows;
10. Heavy duty lifting and towing eye;
11. External steering capabilities;
12. Heavy-duty rub rails;
13. Tempered safety glass in pilothouse and tinted safety glass in cabin;
14. Insulated pilothouse and cabin;
15. Minimum of 2 high output bilge pumps;
16. All weather non-skid deck surface.

C Electronics:
1. VHF/FMRadio System;
2. One (1) Com58 or better;
3. Radar system, Furuno 1731 or better;
4. Depth finder, Digital;
5. Compass, Richie navigator, or better, 2 each;
6. Cell/radio phone programmed to the State frequency.

D. Safety & Emergency Equipment (Each Boat):
1. United States Coast Guard required commercial grade safety and emergency equipment;
2. Navigation lights, commercial U.S. Coast Guard Approved;
3. San Francisco Bay Navigation Charts appropriate for the project requirements;
4. United States Coast Guard Approved life jackets for the Contractor's personnel.

The Contractor shall provide mounting facilities to accommodate the cellular phone.

United States Coast Guard-approved life jackets for the Contractor's personnel shall be provided and maintained on the boat at all times, as required by the United States Coast Guard. The Department, at no cost to the Contractor, will provide life jackets for the Department's visitors and representatives .

The Contractor shall provide for the Department's visitors and representatives, safe and protected permanent vertical access, as approved by the Engineer, to all marine construction equipment being utilized for construction of the project.

The Contractor shall provide safety training relative to marine transportation to the State's and the Contractor's personnel, prior to the commencement of work. Training shall include a review of the approved U.S. Coast Guard Safety Manual by all personnel prior to using the Contractor's provided marine transportation. The Contractor shall also conduct a quarterly Marine Safety Workshop for the Department's representatives.

The Contractor shall furnish a licensed boat operator and crew members, as required for the boat's operation and in accordance with all Maritime Agreements and Laws, including, but not limited to, the regulations contained in the Title 46 Code of Federal Regulation Section 16 and Sections 24 through 26. The boat must have a valid U.S. Coast Guard Certificate of Inspection (COI), and must be manned and operated in accordance with the COI. The boat, boat operator, and crew shall be furnished no later than 120 days after the award of the contract for the duration of the contract. The boat, boat operator, and crew shall be furnished for the complete duration of the work on the days when the Contractor's work is in progress and for 10 hours each day, excluding Sundays and legal holidays on the days when the Contractor's work is not in progress.

The Contractor shall provide insurance coverage under the Federal Longshoremen's and Harbor Workers Compensation Act, the Jones Act and the Marine Act, with respect to work performed from, or by use of, vehicles on any navigable water of the United States, including liability insurance for watercraft operations. At the option of the Contractor, liability insurance for watercraft operations may be covered under a separate Protection and Indemnity policy, provided the policy contains a combined single limit of at least $50,000,000 per occurrence and $50,000,000 aggregate.

The Contractor shall provide berthing facilities at the same location the contractor utilizes for the departure of its construction crew, or at an alternate location approved by the Engineer.

The Contractor shall maintain the boat provided to the Engineer, including daily fueling, routine maintenance, equipment compliance, systems operations and the immediate repair of damage to the boat or its elements. In situations where a boat may be out of service for maintenance in excess of two (2) working days, the contractor shall provide an alternate boat for the exclusive use of the Engineer and the Engineer's staff. In situations where the boat will be out of service for two days or less, transportation with the Contractor will be sufficient.

The boat shall remain the property of the Contractor. The boat shall not be removed from the site of the work until after acceptance of the contract.

During the first 120 days after award of the contract the contractor shall supply an engineer's boat similar to the above specification and as approved by the engineer. The boat, boat operator, and crew shall be furnished for the complete duration of the work on the days when the Contractor's work is in progress. If the engineer requires the boat when the contractor's work is not in progress during the first 120 days such time will be paid for as extra work provided in Section 4-1.03D of the Standard Specifications.

The contract lump sum price paid for transportation for the engineer shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in providing transportation for the Engineer as specified herein.

10-1.22 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 Two 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:

BAY AREA TOLL AUTHORITY REGIONAL MEASURE 1 TOLL FUNDS

The sign message to be used for type of work shall consist of the following:

NEW BENICIA-MARTINEZ BRIDGE

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.

10-1.23 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 1-800-227-2600
Underground Service Alert-Southern California (USA)	1-800-422-4133 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 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.

Temporary railing (Type K), conforming to the details shown on Standard Plan T3 may be used. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance and vertical holes are not drilled in the top of the temporary railing to secure temporary traffic screen to the temporary railing.

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

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.

10-1.25 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.

Plans of the existing Benicia Martinez Bridge and Overhead (Br. No. 28-153L) and the retrofit of the existing bridge may be requested by fax from the Office of Structure Maintenance and Investigations, 1801 30th Street, Sacramento, California, Fax (916) 227-8357.

Plans of the existing bridges available to the Contractor are reproductions of the original contract plans with significant changes noted and working drawings and do not necessarily show normal construction tolerances and variances. Attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. Work practices and worker health and safety shall conform to the California Division of Occupational Safety and Health Construction Safety Orders Title 8, of the California Code of Regulations including Section 5158, "Other Confined Space Operations."

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.

Full compensation for removing and disposing of pavement markers and underlying adhesive shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A) and no separate payment will be made therefor.

REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING

Traffic stripes and pavement markings 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 ROADSIDE SIGN (WOOD POST)

Existing roadside sign, at those location shown on the plan to be removed, shall be removed and disposed of.

Sign panel shown on the plan shall be salvaged.

Existing roadside sign shall not be removed until replacement sign has been installed or until the existing sign is 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.

REMOVE ROADSIDE SIGN (METAL POST)

Existing roadside sign, at this location shown on the plan to be removed, shall be removed and disposed of.

Sign panel shown on the plan shall be salvaged.

Existing roadside sign shall not be removed until replacement sign has been installed or until the existing sign is no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

Full compensation for salvaging sign panel shall be considered as included in the contract unit price paid for remove roadside sign and no separate payment will be made therefor.

REMOVE GATE

Existing gate, at the locations shown on the plans, shall be removed

Full compensation for removing and disposal of the gate shall be considered as included in the contract price paid per gate and no separate payment will be made therefor.

RELOCATE TRAILERS

Two of the existing trailers shall be relocated to the new location shown on the plan. An additional trailer will be relocated , as shown on the plan, to the Maintenance Yard at 100 Industrial Way in the City of Benicia.

Full compensation for relocation of the trailer shall be considered as included in the contract lump sum price paid. All the utility work associated with the relocation of the trailer will be paid for as an extra work as directed by Engineer.

RELOCATE EXISTING PARK FACILITIES

Existing Picnic Table, Park Trash Receptacle, Park Sign known as park facilities shall be removed and relocated to the new location as shown on the plans.

Each existing park facility shall be installed at the new location on the same day that they were removed from its original location.

Full compensation for relocation of the Park Facilities shall be considered as included in the contract lump sum price.

RELOCATE SIGN PANEL

Existing sign panel shall be removed and relocated to the new location shown on the plans.

Each Sign panel shall be installed at the new location on the same day that the sign is removed from its original location.

Full compensation for relocation of the Sign Panel shall be considered as included in the contract lump sum price.

MODIFY INLET

Existing pipe inlets and concrete drainage inlets shall be modified 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.

Modification of inlets shall be performed prior to paving and shall be limited to the area to be paved or surfaced during the working day in which the adjustment is performed. The top of the inlet grate or cover shall be protected from the asphalt concrete during paving operations by means of heavy plywood covers, steel plate covers or by other methods approved by the Engineer. Excess paving material shall be removed prior to rolling.

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.

Modify inlets will be measured by each one.

The contract price paid per inlet shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in modifying inlets, including removing portions of inlets, bar reinforcing steel, concrete and structure excavation and structure backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

REMOVE CHAIN LINK FENCE(TYPE CL-1.8) WITH EXTENSION ARM AND 3-BARBED WIRES

Existing chain link fence, where shown on the plans to be removed, shall be removed and disposed of.

Access control shall be maintained at all times. Before leaving any work area, all fencing necessary to ensure the integrity of the original fenced areas shall be provided such that there are no gaps left between the existing fence and the fence being installed. Whether permanent or temporary fencing is used,

Full compensation for providing access control shall be considered as included in the contract price paid per linear meter for remove chain link fence (Type CL-1.8) with extension arm and 3-barbed wires and no additional compensation will be allowed therefor.

10-1.26 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.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

At locations where there is no grading adjacent to a bridge or other structure, clearing and grubbing of vegetation shall be limited to 1.5 m outside the physical limits of the bridge or structure.

Existing vegetation outside the areas to be cleared and grubbed shall be protected from injury or damage resulting from the Contractor's operations.

Activities controlled by the Contractor, except cleanup or other required work, shall be confined within the graded areas of the roadway.

Nothing herein shall be construed as relieving the Contractor of the Contractor's responsibility for final cleanup of the highway as provided in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

10-1.27 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

The Contractor's attention is directed to the following reports which are available from the State:

"Sediment Sampling and Analysis Report, New Benicia-Martinez Bridge Project, Contra Costa and Solano Counties, California," dated June 1999 and prepared by Caltrans District 4 Environmental Engineering Branch and Geocon Environmental.

"Site Investigation Report, Benicia-Martinez Bridge Upland Areas, Martinez, California," dated June 1999 and prepared by Caltrans District 4 Environmental Engineering Branch and Geocon Environmental.

Contaminated groundwater may be encountered during excavation for Pier 5 and for excavation of the cast-in-drilled-hole piling at Piers 2 through 4.

The Contractor's attention is directed to the need to minimize the structural excavation at Pier 5 and to minimize the area that will be disturbed by the removal of excavated material. The Pier 5 excavation shall be shored to the bottom of the excavation to minimize the disturbed area and to limit the amount of contaminated material to be disposed of. Equipment access ramps into the Pier 5 footing excavation will not be allowed if excavation is required beyond the shored area. The Contractor's shoring system shall be designed to be watertight so that no more than 150 liters/minute of water enters the excavation. Surface water runoff shall be diverted away from the Pier 5 excavation and surface water shall not be allowed to enter the excavation. If timber is used for portions of the shoring system, it shall be completely removed within the horizontal projection of the footing and within the excavation as the backfill is brought up.

Before performing any pile installation or structure excavation for Pier 5, the Contractor shall submit to the Engineer, as provided in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, a complete Pier 5 Construction Plan. The plan shall detail the methods that will be employed to install the piling, excavate for the footing, place the seal course only if necessary and per plan sheet 126 of 557, control and dispose of contaminated material and water including the sequence of construction of all aspects of the footing. The Engineer shall have 14 calendar days to review the plan. 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 plan, 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.

Sand shown on the plans to be placed at the bottom of structure excavations shall conform to the requirements of Section 19-3.025B, "Sand Bedding" of the Standard Specifications.

10-1.28 MOVE-IN/MOVE-OUT (EROSION CONTROL)

Move-in/move-out (erosion control) shall include moving onto the project when an area is ready to receive erosion control as determined by the Engineer, setting up all required personnel and equipment for the application of erosion control materials and moving out all personnel and equipment when erosion control in that area is completed.

When areas are ready to receive applications of erosion control (Types D), as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of the Engineer’s notification to perform the erosion control work.

Attention is directed to the requirements of erosion control (Type or D) elsewhere in these special provisions.

Quantities of move-in/move-out (erosion control) will be determined as units from actual count as determined by the Engineer. For measurement purposes, a move-in followed by a move-out will be considered as one unit.

The contract unit price paid for move-in/move-out (erosion control) shall include full compensation for furnishing all labor, materials (excluding erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of erosion control (Type or D), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.29 EROSION CONTROL (BLANKET)

Erosion control (blanket) shall conform to the details shown on the plans, the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Erosion control (blanket) work shall consist of applying seed and commercial fertilizer and installing erosion control blanket to unlined ditches and swales 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)" of these special provisions.

Erosion Control Blanket

Erosion control blanket shall consist of straw or wood excelsior mats secured in place with wire staples and shall conform to the following:

A. Excelsior blanket material shall consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The erosion control blanket shall be of consistent thickness and the wood fiber shall be evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with a photo-degradable extruded plastic mesh. The blanket shall be smolder resistant without the use of chemical additives and shall be non-toxic and non-injurious to plant and animal life. Erosion control blanket shall be furnished in rolled strips, 1220 mm ± 25 mm in width, and shall have an average mass of 0.5-kg/m^2 ± 10 percent at the time of manufacture.

B. Straw blanket shall be machine produced mats of straw with a lightweight photo-degradable netting on top. The straw shall be adhered to the netting with biodegradable thread or glue strip. The straw erosion control blanket shall be of consistent thickness and the straw shall be evenly distributed over the entire area of the blanket. Straw erosion control blanket shall be furnished in rolled strips with a minimum width of 2 m, minimum length of 25 m ± one m and a minimum mass of 0.27-kg/m^2.

C. Staples for erosion control blankets shall be made of 11-gage minimum steel wire and shall be U-shaped with 200-mm legs and 50-mm crown.

APPLICATION

Erosion control (blanket) materials shall be placed in separate applications as follows:

A. The first application shall consist of applying seed and commercial fertilizer at the following rates and in the following sequence:

Seed and commercial fertilizer shall be applied at the rates indicated in the following table. If hydro-seeding equipment is used to apply seed, fiber, compost, and commercial fertilizer, the mixture shall be applied within 30 minutes after the seed has been added to the mixture.

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	310.0
Compost	940.0
Non-Legume Seed	72.0
Legume Seed	14.0

B. The second application shall consist of installing the erosion control blanket over the seed and commercial fertilizer application.

C. Erosion control blanket strips shall be placed loosely along the unlined ditch or swale with the longitudinal joints parallel to the centerline of the unlined ditch or swale. Longitudinal and transverse joints of blankets shall be overlapped according to the manufacturer's recommendations and stapled. Staples shall be driven perpendicular to the slopes, and shall be located and spaced in conformance with the manufacturer's instructions. Ends of the blankets shall be secured in place in conformance with the manufacturer's instructions.

MEASUREMENT AND PAYMENT

The quantity of erosion control (blanket) will be determined by the square meter from actual slope measurement of the area covered by the erosion control blanket.

The contract price paid per square meter for erosion control (blanket) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing erosion control blanket, complete in place, including furnishing and applying pure live seed, compost, fiber, and the materials for the erosion control blanket, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.30 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 December 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.

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)	50	4.0
Lotus purshianus (Purshings Lotus)	50	4.0
Trifolium incarnatum (Crimson Clover)	50	6.0

Non-Legume Seed

Non-legume seed shall consist of the following:

NON-LEGUME SEED

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms pure live seed per hectare (Slope measurement)
Eschscholzia californica (California Poppy)	60	1.0
Achillea millefolia (White Yarrow)	50	1.0
Clarkia amoena (Farewell to Spring)	50	1.0
Hordeum vulgare ‘UC 603' (Cereal Barley)	60	30.0
Festuca rubra ‘Molate' (Molate Red Fescue)	60	10.0
Nassella pulchra* (Purple Needle Grass)	60	6.0
Bromus carinatus* (California Brome)	60	8.0
Elymus glaucus ‘Berkeley'* (Blue Wildrye	60	10.0
Vulpia microstachys (Six Weeks Fescue)	60	5.0

*California native species

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 60minutes after the seed has been added to the mixture:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	300.0
Compost	1000.0
Non-Legume Seed	72.0
Legume Seed	14.0

B. Straw shall be applied at the rate of 4 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	300.0
Compost	1000.0
Stabilizing Emulsion (Solids)	140.0

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.

10-1.31 FIBER ROLLS

Fiber rolls shall conform to the details shown on the plans and these special provisions.

MATERIALS

Fiber rolls shall consist of one of the following:

A. Fiber rolls shall be constructed with manufactured blankets consisting of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. Blankets shall measure approximately 2.0 to 2.4 m wide by 20 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. Blankets shall have a photodegradable plastic netting or biodegradeable jute, sisal or coir fiber netting on at least one side. 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 finished roll diameter shall be a minimum of 200 mm and a maximum of 250 mm and shall weigh not less than 0.81 kg/m. Overlapping of more than one blanket may be required to achieve the finished roll diameter. When overlapping is required, blankets shall be longitudinally overlapped 150 mm along the length of the fabric.

B. Fiber rolls shall be pre-manufactured rice or wheat straw, wood excelsior or coconut fiber rolls encapsulated within a photodegradable plastic or biodegradeable jute, sisal or coir fiber netting. Each roll shall be a minimum of 200 mm and a maximum of 250 mm in diameter, 3 m to 6 m in length and shall weigh not less than 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the individual rolls.

C. Stakes shall be fir or pine and shall be a minimum of 19 mm x 38 mm x 450 mm in length. Metal stakes may be used as an alternative. The Contractor shall submit a sample of the metal stake to the Engineer prior to installation. The tops of the metal stakes shall be bent over at a 90-degree angle. No additional compensation will be allowed for the use of a metal stake.

INSTALLATION

Fiber rolls shall be installed approximately parallel to the slope contour. Fiber rolls shall be installed prior to the application of other erosion control materials.

Furrows shall be constructed to a depth of 50 mm to 100 mm, and at a sufficient width to hold the fiber rolls. The installed angle of the fiber roll to the slope contour shall create a 2 to 5 percent grade from the center to the edge of the slope. 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. Fiber rolls shall be installed, overlapped and secured as shown on the plans.

Stakes shall be installed 600 mm apart along the total length of the rolls and 300 mm from the end of each individual roll. Stakes shall be driven flush or a maximum of 50 mm above the roll.

If soil or slope conditions present difficulty in constructing furrows, the Contractor may install fiber rolls using rope and notched stakes to restrain the fiber roll against the slope face in conformance with these special provisions. The additional cost of installing fiber rolls using rope and notched stakes shall be at the Contractor's expense.

Rope shall be sisal or manila, biodegradable, with a diameter of no less than 6.35 mm. Stakes shall be fir or pine and shall be a minimum of 19 mm x 38 mm x 450 mm in length and shall have a 12 mm x 12 mm notch cut 100 mm from the top.

Stakes shall be placed on alternate sides of the fiber roll, spaced 600 mm apart 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. Furrows shall not be required. If metal stakes are used instead of wood stakes, the tops shall be bent over so that the rope can be laced and knotted as with the wood stakes.

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, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.32 FIBER ROLL CHECK DAM

Fiber roll check dam shall be installed and maintained as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

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 and these special provisions.

Fiber Rolls

A. Fiber rolls shall be constructed with manufactured blankets consisting of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. Blankets shall measure approximately 2.0 to 2.4m wide by 20 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. Blankets shall have a photodegradable plastic netting or biodegradeable jute, sisal or coir fiber netting on at least one side. 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 finished roll diameter shall be a minimum of 200 mm and a maximum of 250 mm and shall weigh not less than 0.81 kg/m. Overlapping of more than one blanket may be required to achieve the finished roll diameter. When overlapping is required, blankets shall be longitudinally overlapped al150 mm along the length of the fabric.

B. Fiber rolls shall be pre-manufactured rice or wheat straw, wood excelsior or coconut fiber rolls encapsulated within a photodegradable plastic or biodegradeable jute, sisal or coir fiber netting. Each roll shall be a minimum of 200 mm and a maximum of 250 mm in diameter, 3 m to 6 m in length and shall weigh not less than 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the individual rolls.

C. Stakes shall be fir or pine and shall be a minimum of 19 mm x 38 mm x 600 mm in length.

INSTALLATION

Fiber rolls shall be installed approximately parallel to the slope contour across the centerline of ditch or drainage line and secured as shown on the plans. Fiber rolls shall be installed prior to the application of other erosion control materials.

Furrows shall be constructed to a depth of 50 mm to 100 mm, and at a sufficient width to hold the fiber rolls. The furrow shall be cleared of obstructions including, but not limited to, rocks, clods, mulch and debris greater than 25 mm in diameter prior to installation. Fiber rolls shall be installed in the furrow, and secured as shown on plans. Excess soil from excavation of the furrow shall be disposed of uphill of the installed fiber rolls.

Stakes shall be installed 600 mm apart along the total length of the rolls and 300 mm from the end of each individual roll. Stakes shall be driven flush or a maximum of 50 mm above the roll.

At the option of the Contractor, fiber rolls may be installed using rope and notched stakes to restrain the fiber roll against the slope face in conformance with these special provisions. The furrow will not be required. The additional cost of installing fiber rolls using rope and notched stakes shall be at the Contractor's expense.

Rope shall be sisal or manila, biodegradable, with a diameter of no less than 6.35 mm. Stakes shall be fir or pine and shall be a minimum of 19 mm x 38 mm x 600 mm in length and shall have a 12 mm x 12 mm notch cut 100 mm from the top.

Stakes shall be placed on alternate sides of the fiber roll, spaced 600 mm apart 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.

Wood stakes shall be placed on either side of the fiber roll with the notch facing away from the roll, as shown on the plans.

MEASUREMENT AND PAYMENT

Fiber roll check dam will be measured by the unit with each unit consisting of 3 fiber rolls installed as shown on the plans.

The contract unit price paid for fiber roll check dam 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, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.33 IMPORTED BORROW (LIGHTWEIGHT AGGREGATE)

Imported borrow (lightweight aggregate) shall consist of furnishing, placing and compacting lightweight aggregate material at the locations and to the lines and grades designated on the plans or specified in the special provisions. Imported borrow (lightweight aggregate) shall conform to the requirements specified for embankment and structure backfill in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Lightweight aggregate material shall consist of a rotary kiln expanded shale aggregate of the extruded type or a processed, naturally-occurring volcanic aggregate.

Lightweight aggregate material shall be, at the option of the Contractor, either coarse-graded or fine-graded as specified in these special provisions.

Lightweight aggregate material shall be coarse-graded material as specified in these special provisions.

Lightweight aggregate material shall be, fine-graded material as specified in these special provisions, and placed at the designated locations as shown on the plans.

Coarse-graded lightweight aggregate material, when deposited in place, shall conform to the following:

Gradation Requirements

Sieve Size	Percent Passing
50-mm	100
37.5-mm	90 - 100
25.4-mm	50 - 100
19-mm	45 - 85
4.75-mm	25 - 50
600-µm	9 - 25
75-µm	0 - 15

Gradation will be determined in conformance with the requirements of California Test 202, except shaking in the sieves shall be limited to 5 minutes.

QUALITY REQUIREMENT

Resistance (R-Value)	50 minimum
Durability Index	35

Fine-graded lightweight aggregate material, when deposited in place, shall conform to the following:

GRADATION REQUIREMENT

Sieve Size	Percent Passing
25-mm	95 - 100
19-mm	90 - 100
9.5-mm	45 - 95
4.75-mm	25 - 60
600-µm	8 - 30
75-µm	0 - 15

Gradation will be determined in conformance with the requirements of California Test 202, except shaking in the sieves shall be limited to 5 minutes.

QUALITY REQUIREMENT

Resistance (R-Value)	50 minimum
Durability Index	35

When imported borrow (lightweight aggregate) is used as structure backfill for pipe culverts, the imported borrow (lightweight aggregate) shall have a minimum resistivity greater than or equal to 1500 ohm-cm and a pH greater than or equal to 5.5. The imported borrow (lightweight aggregate) shall have a chloride content less than or equal to 500 PPM and a sulfate content less than or equal to2000 (parts per million) PPM. Minimum resistivity and pH shall be determined in conformance with the requirements of California Test Method 643, chloride content shall be determined in conformance with the requirements of California Test Method 422, and sulfate content shall be determined in conformance with the requirements of California Test Method 417.

Imported borrow (lightweight aggregate) shall have a maximum calculated saturated surface dry unit weight of 960 kg/m^3. The saturated surface dry unit weight shall be calculated by adjusting the dry loose unit weight by the absorption of the coarse and fine fractions. The absorption shall be determined by California Test Methods 206 and 207, except that the samples shall be oven dry before soaking and shall be soaked for 24 hours plus or minus 30 minutes. To calculate the saturated surface dry unit weight: 1) multiply the percent coarse aggregate by the absorption of the coarse aggregate; 2) multiply the percent fines aggregate by the absorption of the fine aggregate; 3) add the two values from 1) and 2) and divide by 10000; 4) add one (1) to the result from 3) and multiply by the dry loose unit weight.

Imported borrow (lightweight aggregate) shall be placed and compacted to the designated dimensions as specified in Sections 19-1.03, "Grade Tolerance," and the requirements specified for embankment construction in Section 19-6, "Embankment Construction," of the Standard Specifications, except Section 19-5, "Compaction," of the Standard Specifications shall not apply.

Initial layers of imported borrow (lightweight aggregate) may be placed by end dumping from trucks, or by any other method approved by the Engineer.

Coarse-graded imported borrow (lightweight aggregate) shall be spread or placed in uniform layers of a maximum 0.3-m thickness before compaction. Compaction shall be obtained by a minimum of 3 complete coverage passes using smooth drum steel roller compaction equipment imposing contact pressure of 5,360 kg per-meter-width of the roller face, or by another method as approved by the Engineer. Sufficient moisture treatment shall be made to aid the compactive effort. Compaction using pneumatic-tired equipment or compaction within trenches or other limited access areas, or compaction in areas of low confining pressure shall be of a method approved by the Engineer.

Fine-graded imported borrow (lightweight aggregate) shall be spread or placed in such manner that will prevent bulking of the material and minimize particle breakdown. Fine-graded imported borrow (lightweight aggregate) shall be compacted in uniform layers of 0.2-m maximum thickness before compaction. Sufficient moisture treatment shall be made to aid the compactive effort. Compaction shall be obtained by a minimum of 3 complete coverage passes using smooth drum steel roller compaction equipment imposing contact pressure of 5,360 kg per-meter-width

A test site using proposed lightweight aggregate material, shall be constructed and compacted when alternative compaction equipment and methods of compaction (including use of pneumatic-tired equipment in trenches, in limited access areas, and areas of low confining pressure) are proposed by the Contractor. The alternative compaction equipment and methods of compaction shall not be used until the alternative methods and equipment meet project and site conditions, as determined by the Engineer.

Quantities of imported borrow (lightweight aggregate) shall be paid for by the cubic meter calculated on the basis of the mass, measured in placed in accordance with Section 9-1.01, "Measurement of Quantities," of the Standard Specifications divided by the 95 percent of the dry unit weight measured in accordance with California Test Method 212, using test procedure (b) Compaction Method.

The contract price paid per cubic meter for imported borrow (lightweight aggregate) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing imported borrow (lightweight aggregate), complete in place (including constructing and removing any test sites required), as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

CONTAMINATED AND HAZARDOUS MATERIAL EXCAVATION

Contaminated and hazardous material excavation shall consist of excavating material identified on the plans as contaminated material, hazardous material, slag, or cinder within excavation limits shown on the plans, specified in the Standard Specifications, or specified or directed by the Engineer and placing or disposing of the material as specified in this section.

Excavated contaminated material, hazardous material, slag, and cinder shall be managed as follows:

A. Contaminated material – Haul and place the material within the roadway prism from "L" 12+35 to "L" 14+20, dispose of the material at a site outside of the highway right of way where ambient environmental conditions will not cause contaminants to be released at concentrations that exceed applicable water quality objectives or could degrade waters of the State, or dispose of the material at a permitted waste management facility in conformance with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications and these special provisions.

B. Hazardous material – Haul and dispose of the material at a permitted hazardous waste management facility in conformance with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications and these special provisions.

C. Slag – Haul and dispose of the material at a permitted waste management facility in conformance with Section 7-1.13, "Disposal of Material outside the Highway Right of Way," of the Standard Specifications and these special provisions.

D. Cinder – Haul and dispose of the material at a permitted waste management facility in conformance with Section 7-1.13, "Disposal of Material outside the Highway Right of Way," of the Standard Specifications and these special provisions.

Except that when the material is excavated from trenches for irrigation or electrical systems the material shall be used to backfill the trench.

Attention is directed to "Contaminated and Hazardous Material, General" of these special provisions for handling, characterization, and stockpiling requirements.

Contaminated and hazardous material excavation will be measured and paid for by the cubic meter as structural excavation (bridge)(contaminated) and as structural excavation (bridge)(hazardous). The quantities for payment will be determined as specified for the type of excavation involved.

Full compensation for excavating, loading, hauling, and placing or disposing of contaminated material shall be considered as included in the contract price paid per cubic meter for structure excavation (bridge) (contaminated), structure excavation (Type D) (contaminated), and roadway excavation (contaminated) and no further compensation will be allowed therefor.

Full compensation for excavating, loading, hauling, and disposing of hazardous material shall be considered as included in the contract price paid per cubic meter for structure excavation (bridge) (hazardous) and roadway excavation (hazardous) and no further compensation will be allowed therefor.

Full compensation for excavating, loading, hauling, and disposing of slag and cinder shall be considered as included in the contract price paid per cubic meter for structure excavation (Type A) (slag and cinder) and no further compensation will be allowed therefor.

Pervious backfill material in connection with bridge work will be measured and paid for by the cubic meter as structure backfill (bridge).

Pervious backfill material within the limits of payment for retaining walls will be measured and paid for by cubic meter as structure backfill .

Sand below footings, as shown at Piers 6, 16 and 17, shall be measured and paid by the cubic meter as sand backfill.

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) or (Type A), and where ground or surface water is encountered, except locations where seal course concrete is shown or specified, will be measured and paid for by the cubic meter as structure excavation (bridge).

Full compensation for submitting the Pier 5 Construction Plan shall be considered as included in the contract prices paid per cubic meter for the various items of excavation and backfill shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for controlling groundwater at excavations and cast-in-drilled-hole piling at Abutment 1 and Piers 2 through 5 shall be considered as included in the contract prices paid per cubic meter for the various items of excavation and backfill shown in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for placing sand backfill under completed footings shall be considered as included in the contract price paid per cubic meter for sand backfill and no additional compensation will be allowed therefor.

10-1.34 DREDGING

All material, including bay sediment, sand, gravel, and rock material resulting from Cast In Drilled Hole (CIDH) pile, structure excavation type A, over-excavation, and dredging operations, located either (1) within the steel shells and rock sockets at CIDH piling, (2) structure excavation for steel casing and precast concrete pile cap construction, except Pier 17 and (3) access channel dredging shall be considered dredging in these special provisions and under the terms of the various permits obtained by the Department. Attention is directed to "Upland Disposal" and "In-Bay (Aquatic) Disposal" of this section for disposal requirements of dredged material. Attention is directed to Sections "Permits and Licenses" and "Environmental Work Restrictions" of these special provisions. Dredging for barge or equipment access will not be allowed at any locations. Unless otherwise authorized in writing , all dredging shall be performed in the presence of the Engineer. Sloping back of excavations beyond pay limits shown on the plans will be allowed. The maximum amount of dredged material described under items (1) and (2) allowed for in-Bay (aquatic) disposal, as described elsewhere in these special provisions, shall not exceed 12,230 cubic meters (16,000 cubic yards) for the entire project, and for dredging operations described under item (3) shall not exceed 38,230 cubic meters (50,000 cubic yards) for the entire project . All material from excavations specified in items (1) and (2) as approved for in-Bay (aquatic) disposal, but in excess of 12,230 cubic meters (16,000 cubic yards), and material from access channel dredging shall be disposed upland as specified in these special provisions.

Over-excavation beyond the pay limits shown on the plans may be allowed if deemed necessary to complete the work, however no additional compensation shall be allowed therefore and these additional quantities are included in the maximum amount of dredging allowed. Lateral displacement of bay sediment material shall not be allowed. Maintenance dredging and removal of material entering excavations from outside the limits of excavation dredged by the Contractor shall be removed and no additional compensation shall be allowed therefor and these additional quantities are included in the maximum amount of dredging allowed. Modifications to the existing permits proposing revisions to the maximum quantities of dredged material shall not be allowed. If during the progress of the work, it becomes apparent that the Contractor may exceed the maximum quantity of dredged material permitted for this project, the Contractor shall immediately stop all dredging activities and notify the Engineer in writing. The Contractor shall then reevaluate the construction methods used to perform the dredging work and shall submit a revised dredging operation plan, as outlined elsewhere in these special provisions, to the Engineer, outlining the
proposal to complete the work without exceeding the permitted quantity of dredged material. This revised dredging operation plan may require the use of alternate means and methods of construction, such as use of shoring, which may be required to complete the work. The Contractor shall not be allowed to resume any dredging activities, until the revised dredging operation plan has been approved in writing by the Engineer. There shall be no compensation or extension of contract time in accordance with Section 8-1.09, "Right of Way Delays," of the Standard Specifications, for any delays resulting from conforming to the requirements of this section of the special provisions.

DREDGING OPERATION PLAN

Prior to beginning any dredging work, the Contractor shall submit a Dredging Operation Plan for approval 10 calendar days prior to the proposed commencement of dredging. Dredging shall not commence until all comments have been answered and written approval has been granted by the Army Corps of Engineers. The plan shall include the following:

A. Name and telephone number of the dredging Contractor's representatives on site;
B. Army Corp of Engineers;
C. Dredging start and completion dates;
D. Schedule of dredging operations including sequence of work, anticipated quantities and production rates;
E. Names of vessels;
F. Dump scow numbers or identification;
G. Bin or barge capacities;
H. Discussion of proposed dredging procedures, including types of equipment to be used, method of slurry of the material with detailed drawings or specifications of the grid or centrifugal pump system;
I. Quality of material to be removed;
J. Overall location of the area authorized to be dredged;

K. A vicinity map showing the proposed In-Bay (Aquatic) and Upland disposal sites;
L. Proposed volume of material to be dredged and disposed;
M. Dredging design depth based on Mean Lower Low Water (MLLW) and typical cross section including overdepth; and
N. Date of last dredging operations and design depth.

The dredging operation plan shall also provide the following information:

A. The controls being established to ensure that dredging operations occur at the locations shown on the plans and as specified in these special provisions.
B. The controls being established to ensure that disposal of the dredged material at the disposal site is at the assigned location and depth and the horizontal and vertical positioning systems that will be utilized.
C. Method of determining horizontal and vertical electronic positioning of dredge or dump scow during entire dredging operation at dredge site, disposal site and en route to and from disposal site.
D. Contractor's Quality Control (CQC) procedures including:

    1. A description of the CQC organization including, a chart showing lines of authority; and acknowledgment that the Contractor quality control staff shall conduct the inspections for all aspects of the work specified and shall report to the Contractor's Project Manager, or someone of higher authority, in the Contractor's organization.
    2. The name, qualifications, duties, responsibilities and authorities of each person assigned a quality control function.
    3. A copy of the letter to the CQC manager; signed by an authorizing official of the firm, which describes the responsibilities and delegates the authorities of the CQC manager; shall be furnished to the CQC manager and shall be countersigned by the CQC manager acknowledging receipt.
    4. Reporting procedures and methods used to obtain information for quality control forms, including the submittal of displacement and capacity charts for all scows.

After acceptance of the Dredging Operation Plan, the Contractor shall notify the Engineer in writing of any proposed changes. Proposed changes are subject to acceptance by the Engineer.

SOLID DEBRIS MANAGEMENT PLAN

The Contractor shall submit a solid debris management plan 10 calendar days prior to commencement of work, a plan which describes measures to ensure that solid debris generated during any construction operation is retained and properly disposed of. At a minimum, the plan shall include the following:

A. Source and expected type of debris;
B. Debris retrieval method;
C. Disposal method and site;
D. Schedule of disposal operations; and
E. Debris containment method to be used, if floatable debris is involved.

All such debris shall become the property of the Contractor and shall be disposed of outside the State's right of way in accordance with Section 7-1.13 of the Standard Specifications. No such material shall be disposed of within Army Corps of Engineers and Bay Conservation and Development Commission jurisdictions. Material deemed to be of historical significance as determined by the Engineer shall become the property of the State and will be disposed of by the State.

OVERFLOW

No overflow of dredged material or water will be allowed from the receiving barges, bins or dump scows during the dredging operations except as follows. Overflow will only be allowed if the Contractor includes provisions and operations acceptable to the Regional Water Quality Control Board, is included in the approved Storm Water Pollution Prevention Plan, and the material is designated for disposal at the Carquinez Strait disposal site. Where overflow is allowed, overflow time shall be limited to 15 minutes per barge load per day and the discharge shall be below the water surface. In the event the Contractor chooses to fill a receiving barge, bin or dump scow, the receiving vessel shall be located in an approved anchor site.

OVERFLOW AND LEAKAGE MONITORING REQUIREMENTS

Barges or dump scows having more than 10% loss in draft while transporting material to the disposal site shall be recorded on the daily report and shall not be used until repaired.

The Contractor shall provide equipment that will furnish a continuous printed record of readings and measurements of bulk density and mass flow rate for each pump. These records shall be provided to the Engineer as approved in the Dredging Operation Plan. The Contractor shall provide a list of equipment that will provide the required records. In the event either velocity and/or displacement equipment breaks down during the dredging operation, the following actions shall be accomplished:

A. An alternative means of measurement shall be performed as approved.
B. Alternative measurements shall not exceed a duration of 72 hours after the equipment breakdown or as otherwise approved by the Engineer. Verification of repairs shall be provided to the Engineer in the form of receipts or other documentation acceptable to the Engineer.

For hydraulic dredges the Contractor shall provide equipment that will furnish a continuous printed record of readings for measurement of flow rate of the material within 20 feet of the dredge pump, and furnish a continuous printed record of readings for measurement of flow rate of the material within 20 feet of the discharge manifold. The Contractor shall also furnish continuous velocity records at booster pumps. Equipment shall be accessible from above water platforms. If the readings from the velocity flow equipment indicate leakage within the system, the Contractor shall immediately cease work and repair the leaks. In the event that the dredged material is pumped into a barge or scow, displacement shall be monitored as specified for clamshell dredges after dredging and before disposal at the disposal site. The Contractor shall furnish to the Engineer, displacement and capacity plans of all scows. For clamshell dredges, the Contractor shall monitor hull displacement of each scow loaded by the dredge.

Monitoring shall be continuous from initial loading through discharge at the disposal site. The Contractor may use the general configuration in these special provisions for developing his system of monitoring displacement or submit his own method for approval. The method shall provide average hull displacement of each scow as specified. The data recorders shall store two-minute averages of the one second input signals from the sensors. The Contractor shall provide and maintain throughout the duration of the contract, one data transfer unit with support software to the State within 30 Calendar days after award of the contract, which shall become State property upon completion of the contract. In the event the displacement monitoring equipment breaks down during the dredging operation for any of the scows, an alternative means of measurement shall be performed as approved by the Engineer and results reported using a form approved by the Engineer. Alternative measurements shall not exceed a duration of 72 hours after equipment breakdown. If repairs to the primary equipment is not accomplished within this period, the scow shall not be used until repaired. The Contractor shall submit the continuous recording records specified for hydraulic dredge records and clamshell dredge reports on computer diskettes. Data shall be submitted on 3-1/2" (1.44 MB) disks, operating under MS-DOS 3.1 or newer version. All data shall be recorded in ASCII text. Any alternatives submitted by the Contractor shall be subject to the approval of the Engineer.

CONTROL AND MONITORING SURVEYS

A short to medium range Electronic Positioning System (EPS) or Global Positioning System (GPS) shall be provided on all vessels involved in dredging operations. The EPS shall be established, operated and maintained by the Contractor during the period of the contract when dredging work is actively underway. The EPS using range-range methods shall display and record the vessel's location continuously during dredging and transport for disposal. A continuous graphic printout plotter and/or graphic monitor shall be provided on any dredge utilizing a range-range positioning system and a complete record copy of the position data (dredge track history) including date, time, coordinates and Root Mean Square (quality of position closure); and such record shall be submitted to the Engineer as part of the daily report. The Engineer shall have access to the monitoring equipment in order to observe its operation during the dredging work. The EPS system shall be similar or equal in design, performance, accuracy, operating characteristics, and frequency to those identified in the following technical reference; which is available for purchase at the listed source, or which may be reviewed at the Army Corps of Engineers Construction-Operations Division, San Francisco District Office, 333 Market Street, San Francisco, California:

"Hydrographic Surveying" Department of the Army Engineering Manual No. 1110-2-1003, 28 February 1991 (or latest version). Available at:

USACE Publications Depot
2803 52nd Avenue
Hyattsville, MD 20781-1102

The Contractor shall be responsible for establishing the horizontal control to locate active and/or passive shore-based EPS transmitter/receiver devices. All control shall meet Third Order, Class 1, accuracy standards as defined in the publication "Standards and Specifications for Geodetic Control Networks" published by the Federal Geodetic Control Committee (and referenced) under chapter 2 of the Army Corps of Engineers Manual "Hydrographic Surveying". The Contractor shall obtain all right-of-entry permits and/or leases as required to operate and maintain shore-based electronic equipment on public/private property. EPS calibration techniques shall conform to standard hydrographic surveying practice; consistent with minimization of systematic errors inherent to, and consistent with, the selected EPS system as specified under Chapter 6 of the Army Corps of Engineers manual "Hydrographic Surveying". The Contractor shall be responsible for accurate and reliable EPS calibration for the duration of this contract.

TRANSPORTING AND DISPOSAL

The Contractor shall transport and dispose of the dredged material in accordance with these special provisions and the conditions of the various permits the State has obtained for this contract. During transport to the disposal sites, no material shall be permitted to overflow, spill, or leak out of the barges, bins or dump scows. Tugboats are required to use an electronic positioning system (i.e., a miniranger system with at least two transponders or a Global Positioning System (GPS) with a minimum accuracy and precision of 25 feet for disposal operations. If the positioning system fails, all disposal operations shall cease until the navigational capabilities are restored. The Contractor shall maintain daily records of dredging operations, transportation schedules, barge load volumes disposed, and exact location and time of disposal. The tug captain shall maintain a copy of all weather reports and shall make wind and sea observations. The Contractor shall observe all dredging operations and submit reports containing; a description of operations for each barge load, a checklist, a transit route map, a printout of coordinates from each way point and release point, a record of radio transmission, and facsimile from the tug captain on a daily basis. The Contractor shall allow observers from the State and other appropriate independent observers as specified in permits and approved by the Engineer to be present on disposal vessels on trips to the Carquinez Strait disposal site. Development and implementation of a more sophisticated surveillance systems, which can be demonstrated to and approved by the Engineer to be effective and capable of being audited, may be substituted for one or more of the above provisions. The Electronic Positioning System (EPS) and methods used for the dredge, as specified herein shall also be used to display and record the disposal vessel's location at one minute time intervals. All of the above-mentioned documentation shall be submitted to the Engineer after each transportation and disposal events.

UPLAND DISPOSAL

Landfill disposal shall be provided by the Contractor for the following dredged material:

A. Structure excavation Type A including existing rock and gravel.
B. Material resulting from the CIDH rock socket operations.
C. Synthetic slurry used in the CIDH or pile operations.
D. Material in contact with synthetic slurry used in the CIDH or pile operations.
E. Waste concrete resulting from the CIDH and CISS pile operation.
F. Material that does not pass through a debris grid as further described in "In-Bay (Aquatic) Disposal" of this section.
G. Material resulting from removal of slope protection including but not limited to asphalt concrete, concrete, and other waste material at the locations shown on the plans.

IN-BAY (AQUATIC) DISPOSAL

Aquatic disposal has been approved for 12,230 cubic meters (16,000 cubic yard) of the bay sediment material not listed in "Upland Disposal" of this section consisting of clay, silt, or sand resulting from cleaning out of pilings and casings.

Aquatic disposal shall be at the Carquinez Strait Dredged Material Disposal Site (DMDS, SF-9).

The specific location within the disposal area will be determined by the Army Corps of Engineers at the time of review of the dredging operation plan.

All dredged material shall be slurried in one of the following manners:

A. Pumped with a centrifugal pump prior to leaving the dredge site for the disposal site: or
B. The material shall pass through a debris grid, with a maximum opening size of 12 inches by 12 inches, which will cover the entire loading area of the dump scow. All material that does not pass through the grid will be considered solid debris and shall be disposed of as specified in "Upland Disposal" of this Section. At a minimum all solid debris shall be removed from the grid and disposed of at the end of each 8-hour shift.

Each tug boat shall maintain a computer printout from GPS or other approved navigation system showing transit routes and disposal coordinates including the time and position of the disposal barge when the barge doors open and close. If performance of the Contractors work is delayed as a result of scheduling disposal of dredged material at the Carquinez Strait disposal site and if in the opinion of the Engineer this delay impacts the controlling operation, an extension of contract time determined pursuant to the provisions of Section 8-1.07, "Liquidated Damages," of the Standard Specifications will be granted. No additional compensation will be allowed therefor.

DISPOSAL SITE VERIFICATION LOG (DSVL)

The Contractor shall submit a weekly log by 10:00 a.m. each Monday to the Engineer. The DSVL sheets provided by the Army Corps of Engineers shall be used to enumerate the work accomplished during the preceding week for submission to the Army Corps of Engineers, Regulatory Branch. The Vessel Traffic Control System will issue a confirmation number, which shall be included in the weekly log. If the DSVL is not submitted on Monday by 10:00 a.m., no work shall begin on the dredging operations for that week.

HYDROGRAPHIC SURVEYS

The Contractor shall be responsible for providing an independent surveyor to perform the pre- and post-dredging and quality control surveys for performing the related computations and furnishing the required drawings. The independent surveyor's equipment and work force shall be independent from the Contractor's. The name of the surveyor and samples of previous hydrographic work shall be submitted to the Engineer for review and approval. The independent surveyor shall be required to document and certify in writing to the Engineer that he has at least three years of experience in hydrographic surveying of navigable channels and possess either a current land surveyor's or professional engineer's license valid in California and American Congress on Surveying and Mapping (ACSM) certification as an "Inshore Certified Hydrographic Surveyor." He shall provide documentation that modern electronic horizontal positioning and depth finding equipment are available for the surveys to be performed including DGPS (Differential Global Positioning System) capability and shall include as a minimum; the name, model, and year of manufacture of the electronic equipment; the electronic frequencies of the horizontal positioning equipment and the depth finding equipment; and the manufacturer's stated positioning accuracy and capability of the equipment proposed for usage. In addition, he shall document availability of a safe and suitable work boat for operation in the water where the surveys are to be performed, and that experienced staff are available for the operation of the work boat as well as the operation and calibration of the electronic positioning and depth finding equipment calibration. Survey procedures, data collection equipment, methods and densities, and equipment calibration for this work shall follow the criteria given in the hydrographic survey manual specified in Section "Dredging" for a Class I hydrographic survey. Survey line spacing shall not exceed the limits given in Table 3-1 of the hydrographic survey manual for a Class I hydrographic survey unless approved by the Engineer. Survey lines shall be referenced to the project horizontal and vertical datum. Cross sections shall be run at 10 meter center to center (c/c) and shall extend 10 meter past the slope-original ground intersect point. Contractor hydrographic survey procedures (positioning modes, EPS calibration, accuracy requirements, depth measurement/calibration, and data reduction, adjustment, processing, and plotting) shall conform to industry standards identified in the hydrographic survey manual specified elsewhere in these special provisions. Horizontal location observations shall compensate for errors, geodetic corrections, and atmospheric variations. Data recordation, annotation, and processing procedures shall be in accordance with the hydrographic survey manual specified elsewhere. Failure to perform and process such surveys in accordance with the manual and these specifications will result in rejection and nonpayment for work performed. All vertical control shall be of second order accuracy, including levels for the setting of tide gage to Mean Lower Low Water (MLLW) elevation. An automatic electronic tide recording system shall be required during all surveying and dredging operations. Survey data shall include tidal cycle(s) (whether ebb, flood or slack tide conditions) while performing surveys. The Contractor shall conduct surveys using electronic system positioning method in accordance with the Hydrographic Survey Manual. The Contractor shall use an echo sounder to obtain soundings. The analog recording of soundings shall indicate a calibration check (bar check) of the echo sounding at the beginning and end of each analog paper change and at such times as necessary to ensure sounding accuracy. Echo sounder shall have a frequency of 200 kHz, with 3.5 degrees cone measured at 6 dB point. The top of the return signal trace shall be the point of interpretation of sounding. The bar check shall be taken at identical locations. Soundings shall be on MLLW datum. The excavation centerlines and slope toes shall be field marked on the fathogram chart during the data acquisition. The contract station, time of survey, tide height and direction that line is surveyed shall also be marked on the fathograms. Annotated survey data shall include tidal cycle(s), i.e., slack or slack tide conditions are occurring while performing surveys. Field notes shall indicate the location of

each sounding line, the date and the time (hour and minutes) each sounding line was taken and explanation for any line terminated early. The tide shall be recorded for each line surveyed and noted on the sections during the survey. Notes shall include tidal data, i.e., height of tide (Mean Lower Low Water Datum), bar checks, time of the tide readings and date and location of the tide gage used for each survey. Bound field survey books shall be used to record all field data. Fully automated survey systems shall require a field log to supplement the data recorded on magnetic media. The cross sections of hydrographic sounding line survey results shall be plotted at the scales specified in Table 3-1 of the hydrographic survey manual or as approved by the Engineer. Soundings shall be plotted on transparent sheets and show pay quantity excavation templates shown on the plans with survey cross-section. The Contractor's firm name shall be printed on each sheet along with contract name, number and date of survey. Plot scales shall be as approved by the Engineer. The Contractor shall perform Pre-Dredging Surveys no earlier than 60 calendar days and no later than 30 calendar days before commencement of dredging. The Pre-Dredging Survey shall be completed with accuracy to one-tenth foot which delineates the following areas to be dredged, with overdepth allowances, existing depths, estimated quantities to be dredged for the project, and estimated quantities for overdepth. The Contractor shall perform hydrographic Quality Control Surveys thirty days after start of dredging and every thirty calendar days thereafter, and after any natural event that would create shoaling of previously dredged areas of the project (e.g., severe storms and earthquakes). These surveys shall verify that all foundation excavation dimensions are being obtained as specified. All surveys shall begin where dredging commenced and end as close as possible to last dredging position. The accuracy shall be consistent with the Pre-Dredging Survey above. From the Quality Control Surveys, the Contractor shall compute quantities by the average end area method to the nearest cubic yard based on the sounding lines surveyed and the dredging section indicated on the contract drawings. Tabular summaries shall be submitted to show standard depth, overdepth, and total dredging quantities both incrementally and cumulative per pier location. The Contractor shall perform a Post-Dredging Survey within 15 calendar days of the last disposal activity at each pier prior to placing backfill (last being defined as that activity after which no further activity occurs for 15 calendar days), a survey with accuracy to 30 millimeters which delineates the following: areas dredged: dredged depths, actual quantities dredged for the project, and actual quantities of overdepth. The Post-Dredging Survey shall contain the dates of commencement and completion. The Contractor shall substantiate the total quantity dredged by including calculations used to determine the volume difference (in cubic yards) between the Pre- and Post Dredging Surveys and explain any variation in quantities greater than 15% beyond estimated quantities. The quantities calculated from pre-dredging, quality control, and post-dredging surveys shall only be used for permit reporting purposes. Quantities from these surveys shall not be used for measurement of quantities for payment. The Contractor shall submit all drawings, field notes and quantity computations within five (5) calendar days after completion of any survey. The number of sets of drawings shall be as specified below. The Contractor shall mail or deliver drawings and computations to the Engineer for review and submission to the various agencies.

A. Three (3) sets of transparent drawings for each survey.
B. Three (3) sets of computer sheet printouts or calculation sheets for dredging quantities for each survey.
C. Three (3) sets of cross sections for each survey.

The Contractor shall submit for each survey, the ASCII file of raw and corrected survey data. Data shall be on 31/2" (1.44 MB) disks, operating under MS-DOS 3.1 or newer version. The files shall have hydrosurvey information, in both raw and adjusted format. The raw data shall be original data from the hydrosurvey computer. The adjusted data shall be corrected to National Ocean Survey MLLW datum. The record of raw data shall be comma delimited and consist of the following information: index, "x" coordinate; "y" coordinate; "z" elevation; and time. Each adjusted record shall consist of the following information: index; "x" coordinate; "y" coordinate; "z" elevation; time; and tide. The index shall be the first entry, representing the sequence that each point was taken. The index shall be numerical, beginning with the number "one" and continuing until a 24 hour work effort is completed. Each day shall be in one file (one or more disks). This convention is applicable for both raw and adjusted data. Time shall be reported in Julian day and military hours and seconds. (For example, "17 March 1990, 9:00 A.M. would be "170390, 090000"). The recording distance between the hydrosurvey points shall be 10 feet or less. All data recorded shall be in ASCII test. Other Data collection formats will be considered if presented by the Contractor. Revisions in collection format will not be considered after the project has begun. All alternatives shall be approved by the Engineer. The Contractor shall provide a complete listing of hydrographic equipment he will use on the project prior to the survey conference specified herein below. At least five (5) calendar days prior to performing any survey, the person responsible for that survey, the Contractor's chief surveyor and/or the independent surveyor, shall meet with the Engineer in a survey conference to outline the scope of survey and section interval. No survey work shall be performed until such conference has taken place. The Department will retain an amount equal to 5 percent of the estimated value of the associated item of work performed during each estimate period in which the Contractor fails to complete the hydrographic surveys.

MEASUREMENT AND PAYMENT

Measurement for payment of the total amount of material dredged will be made based on the cubic meters of material in place, by computing the volume between the bottom surface shown by soundings of the pre-dredge survey taken before dredging and the bottom surface shown by soundings of the post-dredge survey compare with the neat line template, using the average-end-area method. This quantity shall include excavation performed within the allowable limits.

The contract drawings represent conditions existing on the date of the survey shown on the drawings and are for information purposes only. A pre-dredge survey will be performed by the Contractor prior to issuance of notice to proceed and will be used in determining quantity of material for payment. Determination of quantities removed and the deductions made therefrom to determine quantities by in-place measurement to be paid in the area specified after having once been made will not be reopened, except on evidence of collusion, fraud or obvious error. No payments will be made until all computations, field notes and drawings are received for progress payment.

Full compensation for all dredging, Dredging Operation Plan preparation and updating; preparing and implementing Solid Debris Management Plan; overflow and leakage monitoring; performing control and monitoring surveys; transporting and disposal of all dredged material to upland and aquatic disposal sites, preparation of disposal site verification logs; and performing hydrographic surveys including data collection and preparation of drawings, cross-sections and calculations shall be considered as included in the contract prices paid per cubic meter for access channel dredging and no additional compensation will be allowed therefor, except where paid for under Special Provision 10-1.41 PILING.

10-1.35 CEMENT-BENTONITE BACKFILL FOR PIER 5

Cement-bentonite backfill and dry bentonite backfill for pier 5 shall be placed in accordance with the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

GENERAL

Prior to excavating any material for construction of Pier 5, the Contractor shall submit to the Engineer a complete Pier 5 Construction Plan as specified elsewhere in these special provisions.

Definitions.--The following definitions shall apply to the cement bentonite backfill at Pier 5:

1. Cement-Bentonite Backfill: A continuous low-strength, low-permeability water barrier formed by backfilling with the specified cement-bentonite mixture.
2. Groundwater Level: The piezometric level of the groundwater as determined from piezometers installed in the alluvium outside the excavation and shoring.
3. Well-Graded: Well-graded as used in this section defines a mixture of particle sizes that have no specific concentration or deficiency of one or more sizes. Well-graded is used to help define a material that, when placed in the excavation, produces a relatively impermeable material free from detrimental voids.
4. API: American Petroleum Institute.
5. API RP: API Recommended Practice.
6. Fines: Material passing the U.S. Standard No. 200 sieve, when tested in accordance with ASTM C117.

Submittals

The Contractor shall submit working drawings for the materials listed below to the Resident Engineer's Office at 4585 Pacheco Blvd., Suite 200 Martinez, California 94553, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings". For initial review, 10 sets shall be submitted. The mix design report shall prepared under the supervision of and sealed by a professional engineer licensed in the State of California, with at least 5 years of experience in slurry backfill design and construction.
After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the Office for final approval and for use during construction.

1. Certifications, test results, and samples for all imported material, including bentonite. Provide manufacturer's written certification that geosynthetic clay liner provided for this project meet specified requirements.
2. Catalog and manufacturer's data sheets for cement-bentonite mixing and placing equipment.
3. Mix design report, including plan and sequence for mixing and placing cement-bentonite backfill.
4. Test results for design mix of cement-bentonite backfill including strength, permeability, slump, moisture content and grain size distribution.

Alternative Proposals

The Contractor may submit alternate proposals, in accordance with all permits obtained by the State, for the non-pervious backfill work at Pier 5 in accordance with the provisions in Section 5-1.14, "Cost Reduction Incentive" of the Standard Specifications. The Engineer shall be the sole judge as to the acceptability of alternate proposals and the Engineer's decision shall be final.

MATERIALS.--

Backfill--The cement-bentonite backfill mix shall be designed by Contractor. The mixed backfill shall meet the following requirements:

1. Hydraulic conductivity of field samples shall not exceed $1.0x10^{-6}$ cm/sec when tested in accordance with ASTM D5084. Hydraulic conductivity of lab-prepared mix design samples shall not exceed $5.0x10^{-7}$ cm/sec. Minimum compressive strength of 6.9MPa for backfill against bedrock and pile cap, and at Contractor's option, a minimum of 0.7MPa for backfill above the bedrock. All strengths are 28 days after placement. Cured samples shall not contain cracks or exhibit sidewall shrinkage.
2. Backfill shall be a mix of the following materials, as specified in this section, in the proportions determined by Contractor's mix design:

a. Imported fine-grained soil.
b. Bentonite.
c. Cement.
d. Water

3. The mix design report shall show the results of various tests at varying proportions of the above materials, and varying bentonite contents, so as to identify an appropriate mix to achieve the hydraulic conductivity specified. Initial and intermediate hydraulic conductivity testing may be conducted in fixed-wall parameters. Final testing to verify the mix hydraulic conductivity for the proposed mix design shall be accomplished in strict accordance with ASTM D5084.
4. The Engineer may order an increase in the amount of bentonite and cement to be added to the mixed backfill, at no addition cost, up to 3 percent by weight over the amount recommended in the mix design report if lab test results, field conditions, mixing equipment, or performance in the field does not meet the requirements of these special provisions.

Bentonite.--Bentonite for the slurry backfill shall be pulverized or powdered premium grade natural sodium cation bentonite, conforming to the requirements of the standards of API Specification 13A, with a minimum yield of 90 barrels per ton when tested in accordance with API RP 13B. Dry bentonite for use in construction joints and against concrete and excavation walls shall be powdered as required above or granular with a maximum particle size of 1 cm. Protect bentonite from moisture and contamination in transit and in storage at the site.

GCL (Geosynthetic Clay Liner): The GCL shall be new, first quality products designed and manufactured specifically for landfill cap type applications and shall have satisfactorily demonstrated by prior use to be suitable and durable for such purposes. The GCL shall consist of natural sodium bentonite clay, without chemical resistant
enhancers or polymers, encapsulated between two geotextiles and meet all the criteria of this section. The geotextiles shall be manufactured to hold the bentonite clay in a stable, uniform thickness that does not shift or become dislodged during handling. The geotextiles may be woven or nonwoven provided that at least one side is needlepunched through the bentonite effectively attaching both geotextiles.

The GCL shall be Bentomat, as manufactured by Colloid Environmental Technologies Company (CETCO), Arlington Heights, Illinois (827-392-5800), Bentofix, as manufactured by Fluid Systems, Cincinnati, Ohio, (800-346-9107), or an approved equal.

The bentonite used in the GCL shall meet or exceed the manufacturer's most recent published specifications and the following requirements:

Property	Test Method	Value
Montmorillonite Content	X-Ray Diffraction	90%
Free Swell	USP-NF-XVII	24 cc minimum
Moisture Content	As specified by Manufacturer	As specified by Manufacturer
Water Absorption	ASTM E 946	800% minimum

The GCL shall meet or exceed the manufacturer's most recent published specifications and the following requirements:

Property	ASTM Method	Minimum Avg. Value Unless Stated Otherwise
Thickness, typical (mm)	D 1777	6.0 (dry)
Clay Mass/Area (gm/sq. meter)	D 3776 (mod.)	4.89 @ 12% moisture (or equivalent)
Grab Strength (Newtons)	D 4632	392
Wide Width Strength. (Newtons/mm)	D 4595	7.0
Puncture Resistance (Newtons)	D 4833	267
Permeability (cm/sec)	D 5084	1×10^{-9} cm/sec*
Angle of Friction (Degrees), Apparent Cohesion (kPa), MinARV Slip-Plane Interface Strength Within Hydrated Bentonite Layer	ASTM D3080, Modified **	12° 24 kPa
Finished GCL Roll Width (meters), MinARV	3.66	Linear Measurement

* At 206 kPa maximum effective confining stress.

** Test shall be run at 4.8, 23.8, and 47.6 kPa normal loads with samples submerged for 24 hours prior to testing. Shearing rate shall not exceed 1 mm per minute. Residual strengths shall be used to assess strength parameters. Provide stress-strain curves and plot of peak stress for each normal load.

Transport, unload, store, handle and deploy GCL in accordance with manufacturer requirements. Store rolls of GCL onsite in plastic-wrapped bundles to prevent moisture intrusion and hydration of bentonite. Remove any rolls or portions of rolls with visible moisture from the site. Maintain rolls in new condition until placed in the final cap location.

Cement.--Portland cement shall conform to the requirements of Section 90-2.01, "Portland Cement," of the Standard Specifications and these special provisions. Portland cement shall be Type II cement and shall meet the requirements of ASTM C150, including Table 1 and Table 2. The source of cement shall consistently supply material with similar chemical and physical properties. The source of cement shall not be changed from those submitted at the time of mix design without written approval by Engineer.

Admixtures.--The use of any admixture, or of any plugging or bridging agent, will not be permitted without prior written authorization from Engineer.

Select backfill.--This material is not available onsite and must be imported. Select backfill shall be free from roots, organic matter, trash, debris, rocks larger than 50 mm, and other deleterious materials. Select backfill shall conform to the following washed sieve gradation when tested in accordance with ASTM C117 and C136:

Sieve Size	Percent Passing by Weight
50-mm	100
25-mm	80 - 100
12.5-mm	65 - 98
4.75-mm	50 - 90
425-µm	15 - 50
75-µm	5 - 30

In lieu of the above gradation, a combination of coarse aggregate and fine aggregate conforming to Section 90-3, "Aggregate Gradings," of the Standard Specifications may be used provided the gradation parameters above can be achieved.

Imported fine-grained material.--When tested in accordance with ASTM D4318, the Atterberg Limits of imported soil material shall conform to the following:

Liquid Limit: 25 to 55.
Plasticity Index: 10 to 30.

To the extent possible, obtain the imported fine-grained material at a low moisture content so that it behaves as a dry material. Protect imported fine-grained material from moisture and contamination both in transit and in storage at the site.

Water.--Water shall conform to the to Section 90-2.03, "Water," of the Standard Specifications.

IMPORTED MATERIAL ACCEPTANCE

Other than bentonite, all imported materials specified in this section are subject to the following requirements:

All tests necessary for Contractor to locate an acceptable source of imported material shall be made by Contractor. Certification that the material conforms to the Specification requirements along with copies of the test results from a qualified commercial testing laboratory shall be submitted to Engineer for approval at least 10 days before the material is required for use. All samples shall be furnished by Contractor at Contractor's sole expense. Samples shall be representative and be clearly marked to show the source of the material and the intended use on the project. Sampling of the source shall be done by Contractor in accordance with ASTM D75. Notify Engineer at least 24 hours prior to sampling. Engineer may, at Engineer's option, observe the sampling procedures. Tentative acceptance of the source shall be based on an inspection of the source by Engineer and/or the certified test results submitted by Contractor to
Engineer, at Engineer's discretion. No imported materials shall be delivered to the site until the proposed source and materials tests have been tentatively accepted in writing by Engineer. Final acceptance will be based on tests made on samples of material taken from Contractor's on-site stockpile. All testing for final acceptance shall be performed by Engineer.

Tests by Contractor shall be made on samples taken at the place of production prior to shipment. Tests shall be as specified for the material in question. Samples of the finished product for testing shall be taken at least each 75 cubic meters of material or more often as determined by Engineer, if variation in gradation is occurring. Test results shall be presented in writing to Engineer within 48 hours after sampling.

If tests conducted by Contractor or Engineer indicate that the material does not meet Specification requirements, material placement shall terminate until corrective measures are taken. Material that does not conform to the Specification requirements and that has been placed in the Work shall be removed and replaced at Contractor's sole expense. Sampling and testing performed by Contractor shall be done at Contractor's sole expense.

BENTONITE ACCEPTANCE

Acceptance of bentonite by the Engineer is subject to the following requirements:

The Contractor shall submit to the Engineer certification from the manufacturer that the bentonite conforms with API Specification 13A and these special provisions prior to placing orders.

The Contractor shall submit samples of bentonite to the Engineer for tentative acceptance prior to placing orders. Samples shall be representative and clearly marked to show the source of the material and the intended use on the project. Final acceptance of bentonite shall be based on tests made on samples of bentonite taken from Contractor's bentonite storage facilities. All testing for final acceptance will be performed by Engineer.

EQUIPMENT

All equipment shall be maintained and operated in strict accordance with the manufacturer's instructions and recommendations. All equipment shall be free of fluid leaks which discharge substances onto the ground or into the excavation. Immediately repair or remove from the site all broken or leaky lines, hoses, valves, pistons, pipes, tanks, and other equipment components. Equipment shall be maintained in such condition that it will deliver the manufacturer's rated output. If inadequate quantity or quality of production is obtained, provide larger and/or different equipment.

Backfill Mixing and Placing Equipment: Equipment for mixing and placing backfill shall be a suitable type capable of producing a homogenous mixture of backfill materials meeting these special provisions. The Contractor may use a concrete batch plant, auger mixer, or ready-mix trucks to combine the ingredients. No mixing on the ground will be allowed. Contractor shall submit a mixing plan to Engineer describing equipment and methods for placing the backfill. The Contractor shall obtain the Engineer's approval prior to starting excavation at Pier 5.

Moisture Control Equipment: Equipment for applying water shall be of a type and quality adequate for the Work, shall not leak, and shall be equipped with a distributor bar or other approved device to assure uniform application. Equipment for mixing and drying out material shall consist of blades, discs, or other approved equipment.

Quality Control Equipment: Provide all equipment necessary for Contractor's quality control testing. Minimum quality control testing by Contractor is specified hereinafter. Provide any additional equipment necessary for any additional testing Contractor elects to do. All equipment shall be maintained in good working order, and shall meet the requirements of the applicable test standards cited herein.

EXECUTION

Backfill Preparation.--Remove all concrete protrusions, disturbed material, formwork, trash, or other debris from excavation. Remove all loose or disturbed material from the sides and bottom of the excavation to the degree acceptable to the Engineer. Use water jet to clean all concrete surfaces prior to placing backfill. Maintain all surfaces in clean condition until backfill has been placed.

Groundwater Control.--Regardless of source of ground or surface water, provide for continuous removal of all ponded water in excavation. Attention is directed elsewhere in these special provisions for requirements for testing and disposing of contaminated groundwater from the excavation.

Backfilling.--Do not begin backfilling any portion of the excavation until such portion has been dewatered, cleaned, and accepted by Engineer. At the Contractors option, the working slab and pile cap may be placed neat against the walls of the excavation in lieu of using the bentonite slurry. All cleaning and placement methods required for the slurry shall be included for the concrete backfill. Any areas where a questionable seal may occur between the concrete and the walls of the excavation shall be smoothed and excavated back to undisturbed bedrock prior to placement of concrete. Obtain approval of Engineer prior to placement of concrete.

Mixing of Backfill.--

1. Mixing shall generally be accomplished in the following stages:

    a. Thoroughly mix dry bentonite and cement with imported fine-grained select material.
    b. Thoroughly mix the backfill using a pugmill, batch plant, or other approved method.

2. The method of proportioning backfill components and mixing the backfill shall be determined by Contractor. The method used must meet the following criteria:

    a. The quantities and percentages of all backfill components shall be easily and accurately measurable by both Contractor and Engineer.
    b. The imported fine-grained material shall be broken down such that it is thoroughly dispersed in the backfill.
    c. The moisture content of the backfill shall be increased only with the addition of bentonite slurry. The use of water is prohibited unless it can be demonstrated the mixed proportions are equally wetted and homogenous.
    d. All backfill components shall be thoroughly dispersed and the backfill shall be homogeneous and shall have the properties specified herein.

3. Submit to Engineer at least 4 weeks prior to mixing and placing backfill, the backfill mixing plan. The plan shall contain, as a minimum, the general sequence of placement of backfill components, procedures to be used to verify that the proper proportions of each component are included, and the methods and equipment to be used to mix and place the backfill. Engineer must approve the plan prior to beginning placement.
4. The methods of mixing the backfill shall be demonstrated to Engineer at least 1 week prior to mixing any backfill and after approval of the Contractor's backfill mixing plan. The demonstration shall use the same methods, equipment, and personnel proposed for the excavation. The demonstration shall mix a minimum of 3 cubic meters of backfill. Backfill mixed for the demonstration may not be reused and placed in the excavation.
5. Engineer will make the determination on the acceptability of the backfill mixing procedures. If Engineer determines that the methods proposed are not sufficient to ensure the proper proportions, hydration, and dispersion of backfill components, Contractor shall change methods and repeat the demonstration at Contractor's sole expense.
6. The proportions of materials for each step shall be based on Contractor's mix design adjusted for field conditions.
7. Mix backfill at a moisture content to produce a mix having the consistency and appearance of wet concrete. The slump of the mixture, when measured in accordance with ASTM C143, shall generally be from 75 to 200 mm. Mix backfill into a homogeneous mass, free from large lumps or pockets of fines, sand, or gravel, or stones larger than 50 mm in their largest dimension.

Placing.--Backfill shall be placed in accordance with the following:

1. Sprinkle dry bentonite (approximately 5 mm thick) in granular or powdered form at backfill construction joints and horizontal surfaces. If dry bentonite will not remain stable, place bentonite concurrently with slurry backfill.
2. All vertical surfaces within the excavation (excavation walls and vertical faces of the footing and walls) shall receive a single layer of GCL just prior to backfilling. The GCL should be placed against as smooth a surface as possible. Overlap seams of at least 150 mm. Remove wrinkles, folds or other irregularities that would disrupt flow of water over the surface of the completed GCL. Provide GCL coverage as directed by the Engineer. Contractor is responsible for implementing and monitoring measures to prevent water from contacting the GCL until the backfill is placed in the excavation. If GCL is wetted by rainfall or other means prior to placing the backfill, the GCL shall be removed and replaced with new, unhydrated GCL material. Any visible damage to the GCL shall be repaired by placing a new sheet of GCL over the damaged area and extending the patch at least 305-mm beyond the damaged area.
3. Prevent raveling of soil, debris, or rock from walls of excavation.
4. Do not drop backfill, or deposit it in any manner that may cause segregation.
5. Surface of backfill is to be crowned to promote runoff of surface water.

Construction Joints.--Backfill shall be placed with the minimum number of construction joints. Joints may be horizontal, vertical, or have a positive slope. No overhangs shall be created. Remove all loose material, soil, or debris prior to placing dry powdered or granular bentonite at horizontal surfaces to receive new slurry backfill material. Thoroughly vibrate backfill against that previously placed using electric vibrators moved in the slurry, against the concrete footing and walls and against and walls of the excavation. Repair any visible shrinkage cracks by filling with a water-bentonite slurry to satisfaction of Engineer.

Maintenance Of Backfill.--After backfill of any portion of the excavation is complete, maintain the backfill in an undamaged condition until covered with clean, uncontaminated select fill. Portions of the backfill intended to remain that dry, crack, desiccate, or are damaged in any other way shall be corrected by removing all desiccated or otherwise unacceptable backfill to a depth acceptable to Engineer and placing of new cement-bentonite backfill on the excavated surface to the final grade.

Cleanup.--After completion of backfilling operations, any remaining excavated material and backfill shall be removed from the ground surface in the construction area. The excess materials shall be disposed of at the location designated by Engineer. Engineer shall be the sole judge of satisfactory cleanup, and cleanup shall be performed until accepted by Engineer.

Quality Control Sampling And Testing.--The Contractor shall perform the sampling and control testing specified below, according to the methods specified below, and at the frequencies specified below. Samples shall be representative of the overall volume of material from which the sample is taken.

Material	**Sampling And Testing**	**Frequency**
Imported Fine-Grained Soil	Samples as delivered to site: 1. Percent passing the 75-µm sieve 2. Atterberg limits 3. Moisture content	Every 75 cu meters
Backfill – Immediately Prior to Placing in Excavation	Random sample: 1. Percent passing the 75-µm sieve 2. Grain size distribution 3. Moisture content 4. Slump 5. Unit weight 6. Permeability 7. Compressive strength	Every 75 cu meters

Tests shall conform to the following standards:

Test	Standard
Percent passing 75-µm sieve	ASTM D1140
Grain size distribution	ASTM C136
Moisture content	ASTM D2216
Atterberg limits	ASTM D4318
Slump	ASTM C143
Unit weight of backfill	ASTM C138
Permeability	ASTM D2434
Compressive strength	ASTM C39

The Contractor shall sufficiently sample and test, using an Independent Testing Laboratory and independently of the Engineer's testing, to maintain materials and workmanship in accordance with the Contract Documents. Tests shall be performed in a timely manner and the results immediately submitted in writing to Engineer within 12 hours of test completion. Test results shall become the property of OWNER. Contractor shall be responsible for representative, quality, and accurate sampling and testing. Mathematical calculations shall be checked by someone other than the person performing the original calculations.

Whenever tests conducted by Contractor or Engineer indicate material or workmanship not in accordance with the Contract Documents, work shall be halted and the cause of the discrepancy shall be identified. Work not in accordance with the Contract Documents shall be removed, replaced, repaired, or otherwise corrected so as to conform to these Contract Documents, as ordered by the Engineer.

Sampling and testing performed by Contractor, work necessary to identify the cause of any nonconformance, and remedial work necessary because of construction not in accordance with the Contract Documents shall be at Contractor's sole expense.

PAYMENT.--

Structure backfill (bridge) (low permeable) of the various strengths shown on the plans for use at Pier 5 will be measured and paid for by the cubic meter in the same manner as specified for structure backfill (bridge).

The contract unit price paid per cubic meter for structure backfill (bridge) (low permeable) of the various strengths 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 furnishing and placing the low permeable backfill, GCL and dry bentonite, including submittal of all required information, 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 additional cement or bentonite ordered by the Engineer in low permeable backfill for Pier 5 shall be considered as included in the contract price paid per cubic meter for structure backfill (bridge)(low permeable) of the various strengths shown on the plans and no additional compensation will be allowed therefor.

10-1.36 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
6.3 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.

10-1.37 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	_____Maximum	
	Operating Range	Contract Compliance
50-mm		
37.5-mm		
25-mm	100	100
19-mm	90-100	87-100
4.75-mm	35-55	5-35
600-µm	10-30	5-35
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	_	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.

10-1.38 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.

10-1.39 ASPHALT CONCRETE

Asphalt concrete shall be Type A and open graded asphalt concrete shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

Open graded asphalt concrete may be placed when the atmospheric temperature is below 20°C, but above 7°C, provided the following requirements are met:

A. The aggregate grading shall be 12.5-mm maximum.
B. Open graded asphalt concrete shall not be placed in a windrow or stockpile. Open graded asphalt concrete shall be transferred directly from the hauling vehicle to the asphalt paver hopper.
C. Open graded asphalt concrete shall be not less than 30 mm in compacted thickness.
D. Immediately prior to adding the asphalt binder to the open graded asphalt concrete mixture, the temperature of the aggregate shall be not more than 135°C. Open graded asphalt concrete shall be spread at a temperature of not less than 105°C measured in the hopper in the asphalt paver.
E. The compaction operation shall be such that the maximum distance between the asphalt paver and the initial breakdown rolling shall be no greater than 15 m.
F. During the placement of open graded asphalt concrete, the speed of the asphalt paver shall not exceed 10 m per minute.
G. The Contractor shall cover loads of open graded asphalt concrete with tarpaulins. The tarpaulins shall completely cover exposed open graded asphalt concrete in the hauling vehicle until the open graded asphalt concrete has been completely transferred into the asphalt paver hopper.

The grade of asphalt binder to be mixed with aggregate for Type OGAC asphalt concrete shall be PBA Grade 6a and shall conform to the provisions in "Asphalt" of these special provisions.

The amount of asphalt binder used in asphalt concrete placed in dikes, gutters, gutter flares, overside drains, miscellaneous area and aprons at the ends of drainage structures shall be increased one percent by mass of the aggregate over the amount of asphalt binder determined for use in asphalt concrete placed on the traveled way.

10-1.40 MINOR CONCRETE MINOR STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications.

10-1.41 PILING

GENERAL

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.

The Contractor's attention is directed to the State's Retrofit of the existing Benicia Martinez Bridge and OH. As built pile driving records and installation data for the retrofit of the existing bridge are available for viewing at Caltrans Transportation Lab, 5900 Folsom Boulevard, Sacramento, California, Telephone (916) 227-7000.

The Contractor's attention is directed to "Seismic Monitoring System And Health Monitoring System Work" elsewhere in these special provisions for installation of conduits and sensors in cast-in-drilled-hole concrete piling. At Pier 8, the orientation of the reinforcing cage shall be maintained, as directed by the Engineer, while it is being inserted into the drilled hole so that the seismic monitoring tube remains properly positioned.

Rock cores are available for viewing at the Transportation Laboratory. The Contractor is encouraged to view the core samples of the bedrock from the State's test program prior to bidding. The samples are available for viewing at the Caltrans Office of Materials and Foundations, 5900 Folsom Boulevard, Sacramento, CA 95819 Telephone (916) 227-7047.

Attention is directed to "Welding Quality Control" and "Order of Work" of these special provisions and to the provisions in the Coast Guard "Preconstruction Checklist." Attention is also directed to "Seismic Monitoring Electrical System" for additional material installation within piles during pile construction. Attention is also directed to the requirements regarding changes in pile installation methods in "Load Test Piles" herein.

Proposals made by the Contractor to modify the specified tip elevations for the permanent steel casings or for the CIDH concrete piling(rock socket) shown on the plans will not be considered.

The specified tip of the permanent steel casing shall be considered to be the bottom of the permanent steel casing (without the driving shoe), as shown on the plans. The specified tip of the permanent steel casings will not be modified due to the length of the Contractor's driving shoe.

Proposals made by the Contractor to modify the specified pile installation methods will not be considered unless noted otherwise in these special provisions.

At the option of the Contractor, vibratory hammers, casing rotators or casing oscillators may be used to install temporary casings, corrugated steel pipes (isolation casings) or permanent steel casings at the locations listed in the following table:

Bridge Name or Number	Abutment Number	Pier Numbers
28-0153R	Abutment 1	2-17

The Contractor's attention is directed to the requirements for vibration monitoring of the Rhodia facilities adjacent to Piers 2 and 3 should temporary casing be driven or vibrated into place.

Difficult permanent steel casing and drilled shaft installation is anticipated due to the presence of soft bay mud overlying dense soils, caving soils, hard bedrock, degradation of bedrock when exposed to water, soils that gain strength during delays in driving, marine traffic, hazardous and contaminated materials, tidal flow fluctuation, high ground water, cobbles and boulders, buried water saturated logs, subsurface concrete debris, underground utilities, vibrations from Rail Road traffic, the requirements of permanent steel casing embedment into rock, and vibration monitoring.

The Contractor may not substitute a larger or smaller diameter or a thinner or thicker walled permanent steel casing for that shown on the plans. The dimensions and plate thicknesses of the permanent steel casings shall be as shown on the plans and substitutions will not be allowed.

PERMANENT STEEL CASING

General

Permanent steel casing shall consist of steel casing for cast-in-drilled-hole concrete piling. Permanent steel casing shall conform to the provisions in Section 49-5, "Steel Piles," of the Standard Specifications and these special provisions.

Attention is directed to "Falsework," of these special provisions for requirements concerning using permanent steel casings to support falsework for pier footing construction.

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	1996
API 5L	1995

Permanent steel casing shall have driving shoes as indicated on the plans and as specified in these special provisions. The driving shoe thickness and length shall be designed by the Contractor based on the Contractor’s proposed installation method and driving equipment but the thickness shall not be less than the minimum thickness shown on the plans. In addition, the outer diameter of the driving shoe shall not be greater than that of the permanent steel casing.

The 2.5 m permanent steel casing shall be positioned for installation using a template. If the Contractor elects to use a portion of the pier footing as a template for installing the casings, sufficiently rigid shimming or bracing shall be used to ensure that no relative movement occurs between the piles and the form template during placement of grout around the piles and of concrete into the footing. Where these special provisions allow splicing of the permanent steel casings, the Contractor shall make provisions to prevent the casing from running under its own weight and the weight of the Contractor's installation equipment, including, at a minimum, provisions to prevent the casing from penetrating below the top of the template or below water level. Attention is directed to "Precast Pier Footing Forms" elsewhere in these special provisions.

Permanent steel casing handling shall conform to the requirements in API RP2A "Recommended Practice for Planning, Designing, and Constructing Fixed Offshore Platforms." Working drawings for permanent steel casing handling shall include the following:

A. Details and calculations demonstrating adequate support and stability for the casing with the full operating weight and dynamic loading of the proposed installation equipment.
B. Provisions to provide stability and maintain alignment during placement of the casings and in wind, wave and current conditions.
C. Provisions for providing adequate work space for casing welding, cutting and inspection.
D. Provisions for ensuring the specified casing straightness, alignment, and support to prevent relative movement during field welding (where allowed) and to ensure that welding tolerances are met.
E. Details and equipment used for handling of permanent steel casings including the use of temporary lifting or handling attachments and supporting brackets.
F. Calculation of permanent steel casing stresses and deflections resulting from handling operations.

Six sets of the Contractor's template plans, casing handling plans and calculations shall be submitted to the Resident Engineer's Office 4585 Pacheco Blvd., Suite 200 Martinez, California 94553, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Template plans shall include complete calculations and details of the footing templates including all methods of support of the template, anticipated loads and stresses from casing installation, erection and removal details, as well as details of shimming or bracing for holding the piles secure during grouting into the footings. Design stresses for steel templates shall conform to Section 51-1.06A(2), "Design Stresses, Loadings and Deflections," of the Standard Specifications. If the plan calls for use of a portion of the concrete footing as a template, calculations shall include an analysis of the forces and stresses imposed on the footing during the installation of the piles. Stresses in portions of the concrete footings used as templates shall not exceed the allowable stresses in Section 8.15, "Service Load Method", of the Caltrans Bridge Design Specifications. Calculations and details shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The Engineer shall have 14 working days to review the template and casing handling submittal after a complete set has been received. 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 plan, 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 requirements of the codes listed above shall apply unless specified otherwise in the Standard Specifications, on the plans or in these special provisions.

Handling devices may be attached to permanent steel casing. Welds attaching these devices shall be aligned parallel to the axis of the casing and shall conform to the requirements for field welding specified herein. All handling devices shall be removed from the permanent steel casing when no longer needed. All remaining welds shall be ground flush. Prior to making attachments, the Contractor shall submit a plan to the Engineer that includes the locations, handling and fitting device details, welding and removal procedures and connection details. Attachments shall not be made to the permanent steel casing until the plan is approved in writing by the Engineer. The Engineer shall have 7 working days to review the plan. Should the Engineer fail to complete the review within 7 working 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 permanent steel casing shall be marked in conformance with the requirements in ASTM Designation: A 252.

For permanent steel casing ., including bar reinforcement in the casing , the Engineer shall be allowed 5 working days 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 permanent steel casing shall be installed, and no reinforcement in the casing 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 permanent steel casing 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.

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.) Permanent steel casing shall be considered to be "Fabricated Steel Pipe."

Fabricated steel pipe used for permanent steel casing 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 AASHTO M270 Grade 345 (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.
C. Permanent steel casing shall be fabricated from AASHTO M270, Grade 345 (ASTM Designation: A 709, Grade 50) plate. Charpy V-Notch specimens for transverse orientations shall be removed and tested per ASTM A 673M, frequency H, and shall meet 27 joules average at +4C.
D. Circumferential splices will not be allowed between sections of pipe in the locations shown on the plans.
E. Gas Metal Arc Welding is prohibited.
F. The welding filler materials (wire/electrode and flux, if used) shall be an essential variable for welding procedure qualification; i.e., any change in the filler material brand name or type shall require re-qualification of the welding procedure.
G. Permanent steel casing shall conform to any additional requirements in the special provisions, including but not limited to, tolerances for diameter, edge alignment, roundness, and straightness, that are required in order to conform with steel pile splice welding and welding inspection provisions.
H. Permanent steel casings shall be spliced in accordance with the requirements for steel pipe piles in Section 49-5.02, "Splicing," of the Standard Specifications and these special provisions and any additional amendments to AWS D1.1 listed herein.
I. The preheat and interpass temperature shall be in accordance with AWS D1.1, Section 3.5 "Minimum Preheat and Interpass Requirements."
J. Shear rings, stiffeners and stud connectors to be welded to permanent steel casing, as shown on the plans, shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications, except that welding shall be in accordance with AWS D1.1 and these special provisions and studs longer than 200 mm need not be made up of 2 shorter studs. The shear rings and stiffeners shall be the same type and grade of steel as the permanent steel casings.
K. The sulfur content of permanent steel casing shall not exceed 0.05 percent, except where through-thickness is designated on the plans. Where through-thickness is designated on the plans, steel shall conform to the low sulfur and 20% reduction of area requirements in AWS D1.5, Section 12.4.4.1.
L. The acceptance criteria for visual inspection of permanent steel casing welds shall be AWS D1.1 criteria for statically loaded structures, except within the "No Splice Zone" designated on the plans, where the criteria for cyclically loaded structures subject to tensile stress shall apply.

Field Welding

Field welding of permanent steel casing is defined as welding performed after the certificate of compliance has been furnished by the manufacturer or fabricator. Except at Piers 6, 16 and 17, field welded splices will not be allowed for the permanent steel casing in this contract. If permanent steel casing is damaged during installation and repair by splicing in a new section of casing is required, or if the Contractor plans to field splice permanent steel casing at Piers 6, 16 and 17, field welding shall conform to the following:

A. Match marking of pipe ends at the manufacturing or fabrication facility is required 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. If field cutting of the permanent steel casing is required, the cutting shall be by automated guided cutting equipment. Manual flame cutting shall not be used.

B. Welds made in the flat position or vertical position (where the longitudinal pipe axis is horizontal) shall be single-vee or double-vee groove welds. Welds made in the horizontal position (where the longitudinal pipe axis is vertical or near vertical) shall be single-bevel or double-bevel groove welds. Joint fit-ups shall conform to the requirements in AWS D1.1 and these special provisions.

C. All full thickness welds shall be made from both sides.

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, Table 4.1 or 4.2, for the welding of AASHTO M270 Grade 345 (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. Low hydrogen electrodes, defined as those with H4, H8 and H16 designators assigned by the filler metal manufacturer, shall be used.

F. For field welding, including 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 interrupted, preheating to 66°C must occur before welding is resumed. For welds with required preheat temperatures greater than 66°C, preheat temperatures shall be achieved and maintained using electric resistance heating bands for the entire length of the weld. The heaters shall be controlled by attached thermocouples at spacings not exceeding 2 m. For these welds, the minimum preheat temperature shall be maintained continuously from beginning to completion of the entire weld, even if welding is interrupted.

G. Welds shall not be water quenched. Welds shall be allowed to cool unassisted.

H. The Contractor shall provide durable enclosures at field splice locations to allow welding during inclement weather conditions.

I. Prequalified welding procedures will not be permitted for permanent steel casing splices. All field welding procedures shall be qualified by testing in conformance with the requirements in AWS D1.5 and these special provisions. Using the qualified WPS, a minimum of two additional weld mock-ups shall be required to qualify field welding of permanent steel casings. All mock-up welding shall be performed outside in the enclosure that will be used during actual casing installation. Both welds shall be made in the horizontal position. Each weld need not exceed 1 m in length, and all passes shall be stopped and restarted at the same location in the middle of the weld. The first weld shall be prepared and welded using the proposed production weld joint detail and welding parameters. The second weld shall simulate the most onerous combination of weld root opening, root face gap anticipated for field fit-up, as agreed with the Engineer. The out-of-tolerance fit-up shall be repaired and accepted per these specifications before completing the weld. The completed welds shall be examined by the ultrasonic testing (UT) procedure proposed for production joints, and any significant indications shall be marked for sectioning to confirm the UT results prior to mechanical testing the weldment. Qualification tests shall include all tests required by AWS D1.5, macroetch sections of the center stop-start location and all areas marked during UT, and Charpy V-Notch tests at -18°C of the weld metal and heat affected zone. The tests shall meet 27 Joules minimum average and 20 Joules minimum individual.

J. Stray current corrosion of the structure shall be avoided during field welding.. Where it is not practical to place the welding machines on the structure being welded, the insulated welded power source output "ground" lead shall be connected directly to the work at a location close to the weld being made and shall not be permitted to touch the water. The minimum total cross sectional area of the return ground cable(s) shall be 645 circular mm per 1000 amperes per 30.5 m of cable. Grounding sufficiency shall be periodically monitored by simultaneously measuring the potential of the structure being welded and that holding the welding machines using a standard calomel electrode (SCE), Ag-AgCl or other reference electrode approved by the Engineer. Any change in potential reading of the structure being welded of more than 10% shall indicate insufficient grounding.

Cleaning

Permanent steel casing shall be cleaned of all foreign material, including residue from drilling operations, prior to placement of concrete. Cleaning shall be performed while the slurry head is maintained on the pile as specified in these special provisions. Cleaning shall be by brushing, pressure jetting or equivalent methods as approved by the Engineer. Equipment or methods used during casing cleanout shall not cause blow-ins, scouring, or caving around or below the tip of the steel casing. The Contractor shall notify the Engineer prior to beginning cleaning operations on each pile. At the completion of cleaning, the Contractor shall demonstrate to the Engineer that the walls of the casing have been thoroughly cleaned. No reinforcing shall be placed in the pile until the cleaning performed is approved by the Engineer.

NONDESTRUCTIVE TESTING FOR PERMANENT STEEL CASING

Permanent steel casing shall receive nondestructive testing (NDT) in conformance with these special provisions.

Nondestructive Testing of Welds Made at the Fabrication Facility

Twenty-five percent of each longitudinal weld made at a permanent fabrication facility shall receive NDT. One-hundred percent of all circumferential welds shall receive NDT. If repairs are required in a portion of the weld not required to be 100 percent examined, additional NDT shall be performed using the same method as used in the original testing. The acceptance and repair criteria shall conform to the requirements in AWS D1.1, Section 6, for statically loaded structures under tensile stress, except within the "No Splice Zone" designated on the plans, where the criteria for cyclically loaded nontubular connections subject to tensile stress shall apply. 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 by the same method as used in the original testing.

Circumferential 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."

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.

UT shall be performed in accordance with a written procedure that shall be reviewed by the Engineer before use. The UT procedure shall address the unambiguous interpretation of indications from the weld root and backing and shall describe the treatment of root fit-up repairs. The procedure shall define all measurements and/or marking that may be required prior to the start of welding. This procedure shall be demonstrated during weld procedure qualification to verify its effectiveness in differentiating root and repair conditions.

All field welds on permanent steel casing shall receive either 100% ultrasonic testing (UT) or 100% radiographic testing (RT) in accordance with AWS D1.1 requirements for welds in tension . This 100% 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. In addition, Magnetic Particle testing (MT) shall be used for 100% of the root pass of all field welds unless otherwise directed by the Engineer. The acceptance criteria shall conform to
the requirements in AWS D1.1, Section 6, for statically loaded nontubular connections subject to tensile stress. UT shall be performed in accordance with a written procedure that shall be reviewed by the Engineer before use. The UT procedure shall address the unambiguous interpretation of indications from the weld root and shall describe the treatment of root fit-up repairs. The procedure shall define all measurements and/or marking that may be required prior to the start of welding. This procedure shall be demonstrated during weld mock-up qualification to verify its effectiveness in differentiating root and repair conditions.

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 permanent steel casing.

Permanent steel casing may be driven, vibrated, rotated or oscilated into under sized drilled holes in conformance with the provisions in Section 49-1.06, "Predrilled Holes," of the Standard Specifications at the locations and in accordance with the requirements shown in the following table:

Bridge Name or Number	Undersize Hole Size	Pier Number	Elevation of Bottom of Hole
Benicia Martinez Bridge and OH	Inside diameter of permanent steel casing minus 300 mm	5 through 9, 11 through 17	No more than two times the casing diameter below the casing at any time, except not lower than the specified tip of the permanent steel casing, and no more than 500 mm below the casing without slurry being used
Benicia Martinez Bridge and OH	Inside diameter of permanent steel casing minus 300 mm	10	No more than one times the casing diameter below the casing at any time, except not lower than the specified tip of the permanent steel casing, and no more than 500 mm below the casing without slurry being used

PERMANENT STEEL CASING OSCILLATION, ROTATION AND VIBRATION

If the Contractor chooses to oscillate, rotate or vibrate the permanent steel casing into place, the driving shoe shown on the plans may be eliminated, at the option of the Contractor, and upon approval by the Engineer of the Contractor's proposed installation method by non-driving methods and upon satisfactorily completing the test pile using the same proposed method. If the Contractor's non-driving permanent steel casing installation method involves modifying the bottom of the permanent steel casing in any way, the details shall be submitted to the Engineer for approval. Teeth or other attachments at the pile tip may not extend further than 13 mm outside the outer diameter of the permanent steel casing.

Load Test Piles

The Contractor shall install load test piles and perform pile load tests in accordance with the details on the plans and these special provisions. All the requirements in these special provisions for the production piles shall also apply to the load test piles, unless otherwise approved by the Engineer in writing.

The Contractor shall notify the Engineer, in writing, not less than 10 days in advance of installing the permanent steel casing portion of the load test piles and 10 days in advance of performing each pile load test.

The methods of installation of the load test piles shall be the same as those to be used on the production piling and as specified herein. Load Test Pile A shall be constructed without the use of the over ream and fill method, while Load Test Pile B shall be constructed using the over ream and fill method as described in these special provisions. Should the Contractor use a significantly different installation method for the production piling than was used for either of the load test piles (as determined by the Engineer), an additional load test shall be repeated on a new pile, at a new non-production location, as directed by the Engineer, and at the Contractor's expense, using the new method. Additional grout repair tubes, as shown on the plans for the production piling, will not be required for the load test piles. Expansion couplings, with a capacity of 150 mm, shall be provided for all gamma test tubes and shall be located between the bearing plates of the load cells or as directed by the Engineer.

Section 49-1.04, "Load Test Piles," of the Standard Specifications shall not apply.

A qualified representative of the manufacturer of the load cells shall be present at the job site during the installation of load cells, during concrete placement and during testing of the load test piles.

Load testing shall consist of furnishing and installing load cells, performing load tests, providing load test reports, and obtaining the Engineer's approval of load test reports for the load test piles, as shown on the plans, as specified in these special provisions, and as directed by the Engineer. Load testing shall include furnishing all materials and labor necessary

for conducting bi-directional load tests at the load test piles, including instrumentation, and reporting the results. The bi-directional load tests shall be used to test the side shear resistance of the load test piles by separately measuring the upward and downward movements of the load test piles. Bi-directional load testing shall be conducted using hydraulically activated sacrificial load cells capable of the full separation of the upward and downward side shear. The load cells shall be embedded in the load test piles as shown on the plans. During loading, separate load-movement curves shall be obtained for both the upward and downward side shear components. For these tests, all reactions shall be provided by the in situ soil, rock or fill concrete placed as a part of the over ream and fill method.

The load tests shown on the plans are intended to be two-stage tests such that side friction information is obtained for both the upper and lower portions of the rock sockets and for the permanent steel casings. The two stages are described in more detail below:

1. In the first stage, friction values for the lower portion of the rock sockets are obtained by activating the load cells and then collapsing the compressible material below the specified tips of the piles. Whether or not the ultimate capacity of the lower portion of the rock sockets is achieved, the first stage tests shall be stopped before the lower portion of the shafts move more than 75 mm. If the ultimate capacity is reached before the lower portions have moved 75 mm, then the load application shall continue until the lower portions have a displacement of 75 mm. In the next step, the plastic gamma tubes shall be drilled out at the pile tips, the tips shall be washed out with pressurized Strait water from tube to tube. Finally, grout shall be pressure injected at the pile tips.
2. In the second stage, with the development of end bearing below the tips, friction values are determined in the upper portions of the rock sockets and for the permanent steel casings. Strain gages located near the interface between the rock sockets and the end of the casings allow differentiation between the friction achieved in the upper portion of the rock sockets from that of the permanent steel casings.

As a minimum, instrumentation shall include displacement transducers to measure the expansion of the load cells and telltales for measurement of the elastic compression of the portions of the load test piles above and below the load cells and the side shear movement of the load test piles above and below the load cells. All data acquisition, including expansion of load cells, displacement telltales, hydraulic transducers, and strain gages, shall be automated by connecting all data acquisition instruments through a multiplexer to a data logger, and connected to a computer, so that an ASCII format data file with all applicable test data including time stamp will be available at the completion of the load tests. A minimum of 4 strain gages shall be located at each cross section in the pile where load determination is required. A minimum of eight levels (cross sections) in each pile shall have strain gages to determine the load at that level.

Tip Washout and Grouting.—Tip washout and grouting shall occur after the completion of the first stage of the load tests. Pipe caps at the ends of the gamma tubes shall be drilled out sequentially around the circumference of the test piles. Washout shall be performed from adjacent hole to adjacent hole sequentially around the circumference of the piles. Water shall be pumped into one tube and out of no more than two adjacent tubes at a time. Washout shall continue in each hole until the water coming out of the return pipe(s) runs clear. Grouting shall occur within 1/2 hour of satisfactorily completing the washout procedure. Pneumatic pipe packers placed at the bottom of the pipe near the specified tip shall be used to seal the gamma tubes as washout and grouting proceeds from hole to hole. Water pumping equipment shall be capable of generating a water pressure of at least 2756 kPa (measured at the top of the pile on the input line) at a flow rate of 378 liters per minute. Grout for pressure grouting shall consist of mixture of microfine Type V Portland cement, additives and water. Additives shall include a set retarder to extend the setup time and a dispersant to prevent flocculation. Microfine cement shall have a cement fineness measured in accordance with the Blaine air permeability test (ASTM C-204) of at least 10,000 cm2/g (1000 m2/kg). The water to dry grout ratio shall be 0.8/1.0 by weight of dry grout mix. Grout shall be injected at a minimum pressure of 5515 kPa (measured at the top of the hole on the injection line), until refusal. Refusal shall be defined as no more than one-tenth of a cubic foot of grout per minute for 10 minutes. Grout shall be injected into at least three of the holes equally spaced around the circumference of the piles. The three inner gamma holes shall be used to vent the grouting operation. As necessary to maintain the required pressures during grouting, steel pipes with packers shall be inserted into the PVC pipes (since the PVC pipe is not rated for such high pressures). Pipes shall be equipped with valves to be able to shut off and hold the grout once refusal is met. If refusal is not met upon initial grouting, a secondary grouting shall be performed.

Working Drawings.--The Contractor shall submit working drawings for each load test pile construction to the Resident Engineers Office , in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. For initial review, 6 sets of such drawings shall be submitted for each pile. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted for each pile to the said Office for final approval and for use during construction. Working drawings shall contain details of the Contractor's proposed methods for construction of the load test piles as described in these special provisions, including methods for installation of the permanent steel casing, methods for drilling and cleanout of cast-in-drilled-hole portions of the load test pile; details of strain gage protection, instrumentation device locations, access opening locations, sizes and patterns, and a description of the method for placing concrete in the load test piles; and calculations showing load transfer at the top and bottom bearing plates or equivalent truss at the cell assembly. Said working drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

Construction of the load test piles shall not proceed until the working drawing submittals have been approved in writing by the Engineer.

The Contractor shall allow 14 working days after complete drawings and all support data are submitted to the Engineer for the review of any working drawings for load test pile construction.

Should the Engineer fail to complete his 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 working drawing review, 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.

Construction. --In addition to the useful geotechnical data that will be obtained from the pile load tests, construction of the load test piles is intended for the Contractor to demonstrate to the Engineer that the installation methods and equipment proposed for use on the production piling are capable of successfully installing the piles in accordance with the details on the plans and the requirements of these special provisions. The load test piles shall be constructed in conformance with all the requirements in these special provisions for the production 2.5 m permanent steel casing, the 2.5 m cast-in-drilled-hole concrete piling, the 2.6 m cast-in-drilled-hole concrete piling, and the 2.2 m cast-in-drilled-hole concrete piling (rock socket) including, but not limited to, all concrete mix design requirements, testing requirements (including sonic logging of the holes) and driving system submittal requirements (if the production permanent steel casings are to be driven).

The Contractor shall provide a template of adequate strength and stiffness for the installation of the permanent steel casings, such that the required vertical alignment within the casings is maintained during installation.

Compressible end bearing devices shall be used at the bottom of the piles at the end of the reinforcing cages. The devices shall consist of two steel plates separated by 50-75 mm of compressible material supplied by the manufacturer of the load cells. The inspection tubes shall pass through holes in both plates of the compressible end bearing device to allow for later grouting at the pile tips. The bar reinforcing cages shall be held at the proper elevation during placement of the concrete into the piles to prevent crushing of the compressible end bearing devices.

The installation of the load cells and all related testing instruments and equipment shall be performed as recommended by the manufacturer of the load cells, and as approved by the Engineer.

The load cells and pile movement measuring instruments shall be capable of applying the loads required and making all measurements necessary for conducting a bi-directional load test of the load test pile, under the conditions shown on the plans, and in conformance with the requirements of these special provisions. Such equipment shall be of a configuration that will allow the satisfactory construction of the load test piles by the specified methods, with the load cells and instruments in place in the work.

The load cell assemblies to be provided shall have a capacity of at least 81 MN, in each direction, for a total test capacity of 162 MN per test pile. The load cells shall be equipped with all components needed to compute deflection and capacity, including hydraulic lines, fittings, pressure source, pressure gage, displacement telltales, hydraulic transducers, strain gages, and automated data gathering and reporting equipment.

LOADTEST, Inc., the manufacturer and supplier of Osterberg cells, is the only supplier of load cells and technical assistance for this testing procedure that is known to the State. Load cells shall consist of Osterberg cells, or equal. Such cells are available from:

LOADTEST, Inc.
2631-D NW 41st Street
Gainsville, FL 32606
(800) 368-1138

or

LOADTEST, Inc.
5420 S. Klee Mill Road, Suite 4
Sykesville, MD 21784
(800) 436-2355

LOADTEST, Inc. has agreed to furnish the loading devices and other equipment and services described in these special provisions at the guaranteed prices as follows:

Item	Price Per Pile Load Test
Furnish Load Test Cell Assembly and Perform Load Test	$182,700

The above prices include delivery of materials to the job site, and will be guaranteed to any bidder ordering such materials and services prior to December 31, 2001, provided delivery is accepted within 90 days after the order is placed. For orders after January 1, 2002 and before December 31, 2002 the above guaranteed price per test shall be increased by 5% for inflation.

Other equipment and services to be provided by LOADTEST, Inc., included in the above prices, are as follows:

1. Technical advice and direction during construction of the load test piles, including the installation of the load cells with all associated measuring instruments.
2. Services of a qualified Geologist or Civil Engineer who is registered in the State of California.
3. Operation of the hydraulic pressure pump during load testing and recording of load test data.
4. Furnishing, installing, and testing of all test instruments, including related conduits and wiring, which will be embedded in the load test piles (except telltale casing and vent pipe).
5. Submittal of all test data and a final report to the Engineer.
6. Compressible material for end bearing devices
7. Hydraulic pumps, fluids, and supply lines as needed to operate the load cells.
8. Instrumentation tubes and telltales.
9. Strain gages, LVDTs (Linear variable differential transformer) and LVWDTs (Linear vibrating wire displacement transducers).

The Contractor shall furnish all materials, equipment, and labor necessary to instrument and test the load test piles, in addition to that which is supplied by the manufacturer of the load cells. This includes the following:

1. Potable water from an approved source to mix with a water-soluble oil provided by manufacturer of the load cells.
2. A stable reference beam system for monitoring movements of the top of the load test piles during testing. A self-leveling, surveyors level and operator shall be provided to monitor the reference system.
3. A protected work area (including provisions such as a tent or shed for protection from inclement weather for the load test equipment and personnel) of size and type required by the Engineer and the manufacturer of the load cells.
4. Electric power, as required for lights, welding, instruments, etc.
5. Materials for carrier frame, steel angles, steel bearing plates or equivalent truss system, tell tale casing (250 meters of 13 mm black iron or galvanized pipe per test pile), vent pipe (120 meters of 19 mm PVC with bell ends per test pile) and/or other devices needed to adapt the load cells to the bar reinforcing steel cage of the load test piles.
6. Steel end plates for compressible end bearing devices and top and bottom bearing plates for the load cells (two 50 mm thick and two 15 mm thick per test pile, with diameters as shown on the plans). Steel end plates shall be high strength steel plates conforming to ASTM Designation: A 709, Grade 50, unless otherwise directed by the Engineer.
7. Welding equipment, materials, and certified welding personnel, as required, to assemble the test equipment under the supervision of the manufacturer of the load cells, attach hydraulic fittings and telltales to the load cells, and prepare the work area.
8. Equipment and labor to construct the bar reinforcing steel cages and/or placement frames including any steel plates or trusses required for the load test piles.
9. Equipment and operators for handling the load cells, instrumentation and placement frame, bar reinforcing steel cages during the installation of the load cells and during the testing, including a crane or other lifting device, labor, and hand tools as required by the manufacturer of the load cells and the Engineer.
10. Equipment and labor sufficient to erect the protected work area, and reference beam including equipment capable of holding the bar reinforcing cages off of the bottom of the holes during concrete placement.
11. Air compressor (minimum 150 cfm) for pump operation during load testing.
12. Equipment and labor to plug and drill out the end caps the gamma tubes, to washout/flush the areas at the tip to be pressure grouted, and to pressure grout using a ultrafine Portland cement grout mixture.

Load testing (Stage 1) of the load test piles shall not begin until the concrete has attained a compressive strength of 25 MPa as approved by the Engineer. Stage 2 load testing shall not begin until the injected grout at the pile tips has cured for a minimum of 5 days.

The load cells, hydraulic supply lines and other attachments will be assembled and made ready for installation under the direction of manufacturer, in a suitable area, adjacent to the load test piles, to be provided by the Contractor. The load cell assemblies shall be welded to the bottom of the upper cages and to the top of the lower cages in conjunction with the construction of the cages.

The Contractor shall use the utmost care in handling the placement of the test equipment assembly so as not to damage the instrumentation or the bar reinforcing steel during installation. The Contractor shall limit the deflection of the bar reinforcing steel cages between pick points while lifting the cages from the horizontal position to vertical. The Contractor shall provide support bracing and strong backs as necessary to minimize the deflections between pick points and to prevent damage to the instrumentation or the bar reinforcing steel.

After placement of the bar reinforcing steel, load cells, and all instrumentation for the load test piles, the load test piles shall be concreted. Strain gages shall be located as approved by the Engineer.

The load test piles shall be constructed with the use of synthetic slurry in accordance with these special provisions. Testing for defects in the CIDH's shall be completed and all anomalies mitigated, before beginning the pile load testing.

At least 12 concrete tests cylinders shall be made for each test pile from the concrete used in the load test pile. Testing of cylinders shall be by the Contractor's independent laboratory, results shall be reported to the Engineer within 24 hours of each test performed. At least two of these test cylinders shall be tested for compressive strength prior to the load test and at least 2 cylinders shall be tested on the day of the load test. In addition, the modulus of elasticity of the concrete shall be determined for each load test pile by testing two cylinders each at 3 and 7 days after placement and two on each of the two days of testing (stage one and stage two testing). Elastic modulus testing shall be in accordance with the requirements of ASTM C 469, and the cylinders shall be moist cured until testing.

Testing and Reporting.-The load testing shall be performed by a qualified Geologist or Civil Engineer who is registered in the State of California, as provided by the manufacturer of the load cells.

The load testing shall be performed in general compliance with the requirements of ASTM Designation: D 1143 (Quick Test Method). Initially the loads shall be applied in increments equaling 5 percent of the design load specified herein. The magnitude of the load increments may be increased or decreased depending on actual load test pile capacity, and as approved by the Engineer.

Direct movement indicator measurements shall be made of the following: cell expansion (4 LVWDTs per cell assembly), top of load test pile movement (3 LVDTs or digital dial gages), and continuous compression measurements of the load test pile in 3 zones (3 LVWDTs per zone.)

Loads shall be applied, as determined by the Engineer, until the ultimate capacity of the load test pile is reached in side shear, or until the maximum capacity or maximum stroke of the load cells is reached, unless otherwise directed by the Engineer.

The load test procedure shall be as follows:

1. Construct the load test piles as shown on the plans. Place 8 sets of 4 strain gages (32 total) along the reinforcing steel cage of the rock socket as recommended by the manufacturer and as approved by the Engineer.
2. Load the bottom of the load test piles by pressurizing the load cell assemblies to determine the ultimate side shear capacity of the bottom sections of the load test piles. Design load of the bottom sections of the load test piles is estimated to be 28093 kN, after taking into account the pile buoyant weight.
3. Flush and washout the tip of the pile using the gamma tubes and high pressure water. Pressure grout below the pile tip, allow grout to cure 5 days.
4. Load the top section of the load test piles by pressurizing load cell assemblies to test the ultimate side shear capacity of the upper sections of the load test piles. Design load of the upper sections of the load test piles is 39026 kN, after taking into account the pile weight.
5. Determine the capacity of the steel shells by checking the strains in the steel shells at appropriate points.

At each load increment movement, indicators shall be read at the 0.0, 1.0, 2.0 and 4.0 minute intervals while the load is held constant.

Dial gages, digital gages, or LVWDTs used to measure end and side shear movement shall have a minimum travel of 150 mm and be capable of being read to the nearest 0.0025-mm division. End movement may be alternately monitored using LVWDTs capable of measuring the expansion of the loading device (150 mm).

The reference beam selected shall have a minimum length of 15 m and shall be firmly supported on poured reinforced concrete foundations. The reference beam elevations shall be monitored and recorded at all times during testing through the use of electronic surveying instruments.

The Contractor shall supply 8 copies of a report of each load test, as prepared by the manufacturer of the load cells or by others approved by the Engineer.

A preliminary report containing the load-movement curves and test data shall be provided to the Engineer within 5 days after the completion of each load test, to allow evaluation of the test results.

After the receipt of the preliminary report, the Contractor shall allow 5 working days for the Engineer to review the preliminary report and provide comments.

A final report for each pile load test that contains all preliminary reports, the Engineer's comments and the Contractor's replies to the comments on the load testing shall be submitted to the Engineer within 2 weeks after completion of each pile load test.

Removal.. Prior to load testing, the portion of the pile and casing above ground level shall be removed and disposed of. After completion of testing, the portion of the pile above elevation +1.5, all test materials and equipment, including the reference beam and its concrete foundations shall be removed. Removal shall be in accordance with the provisions in Section 15-4.02, "Removal Methods," of the Standard Specifications. All removed materials shall become the property of the Contractor and shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13 of the Standard Specifications.

Dynamic Monitoring

Driven 2.5 m permanent steel casing at 2.5 m CIDH concrete piling will be monitored during the final 8 m of driving for dynamic response to the driving equipment as specified in these special provisions. Four (4) permanent steel casings shall be monitored for the purpose of verifying that the Contractor's driving hammer is not damaging the casings. The first permanent steel casing driven (includes the load test pile at Location A) shall be dynamically monitored, in addition, the first driven permanent steel casings at Piers 6 and 10 shall be dynamically monitored. The fourth location shall be randomly selected by the Engineer. If the Contractor elects not to drive the permanent steel casing at Piers 6 and 10, but elects to drive casing at other piers, then the first casings at the first two other piers constructed shall be monitored. Monitoring will be done by State forces using State-furnished dynamic pile analyzer monitoring instruments. All permanent steel casings to be monitored shall be provided with an extra 4.0 meters of casing length above the cut-off elevation of the casing. The extra length shall be cut off at the completion of monitoring. The cut off section of casing shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The Contractor shall provide electric power (120-volt, 60 cycles stable power) for the State's monitoring equipment, including access to the piles and working space and shelter for State monitoring personnel.

Permanent steel casing to be dynamically monitored shall be made available to State forces 2 working days prior to driving. The permanent steel casing shall be safely supported a minimum of 150 mm off the ground in a horizontal position on at least 2 support blocks. The permanent steel casing shall be positioned so that State forces have safe access to the entire permanent steel casing length and circumference for the installation of monitoring equipment anchorages and control marks for monitoring. Three 5.6-mm diameter holes shall be drilled and tapped at the upper end of the permanent steel casing at 4 equal spaces around the pile perimeter at the Engineer's direction. Where the Contractor elects to install permanent steel casing at Piers 6, 16 and 17 in sections, and one of these casing is selected for monitoring, each upper section, as directed by the Engineer, shall be drilled and tapped as specified herein. The Contractor shall rotate the permanent steel casing on the blocks as directed by the Engineer.

Permanent steel casing to be dynamically monitored shall be prepared and driven in the following sequence:

A. Prior to driving, the Contractor shall rotate and align the permanent steel casing in the driving leads as directed by the Engineer
B. The Contractor shall temporarily suspend driving operations for approximately 30 minutes when the permanent steel casing tip is 8 m above the elevation to which the tip is required to be finally driven, or when the permanent steel casing tip first reaches rock, as determined by the Engineer.
C. During the 30 minute suspension, the Contractor shall bolt the 0.5-kg instrument package securely to plugs or expansion anchors previously installed in the permanent steel casing 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.
E. The Contractor shall remove the cables and instrument package from the permanent steel casing 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.

Should the results of any dynamic monitoring test by the Engineer indicate stresses of more than 95 percent of the specified yield strength of the permanent steel casing, all pile driving at that pier footing shall immediately stop and the Contractor shall resubmit the driving system submittal for that footing with modifications of the driving method and explanations for the excessive stresses. In addition, if in the opinion of the Engineer, similar conditions may lead to excessive stresses at other locations in different footings, the Engineer may elect to monitor up to 4 additional permanent steel casings. In this situation, when the casings have already been fabricated, the additional stickup length shall be added by welding on a 4 meter length of casing above the top of the pile in accordance with "Field Welding " of these special provisions.

The time required for the Contractor to install and remove the cables and instrument package from the permanent steel casing and/or permanent steel casing sections shall not constitute a delay to the Contractor's operations.

Driving System Submittal

Prior to installing driven permanent steel casing , the Contractor shall provide a driving system submittal, including driveability analysis, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. A submittal shall be made for each control location shown below. All proposed driving systems (i.e., each hammer that may be brought onto the site) shall be included in the submittal.

Pier Number	Control Location
Pier 6	A
Pier 7	B
Pier 8	C
Pier 9	D
Pier 10	E
Pier 11	F
Pier 12	G
Pier 13	H
Pier 14	I
Pier 15	J
Pier 16	K
Pier 17	L
Load Test Pile	M

The driving system submittal shall contain an analysis showing that the proposed driving systems will install permanent steel casing through bedrock to the specified tip elevation . Driving systems shall generate sufficient energy to drive the piles with stresses not more than 95 percent of the specified yield strength of the permanent steel casing . Submittals shall include the following:

A. Complete description of soil parameters used, including soil quake and damping coefficients, skin friction distribution, , assumptions made regarding the formation of soil plugs, and assumptions made regarding drilling through the center of permanent steel casings.
B. List of all hammer operation parameters assumed in the analysis, including manufacturer's rated energy, fuel settings, stroke limitations, and hammer efficiency.
C. Driveability studies that are based on a wave equation analysis using a computer program that has been approved by the Engineer. Driveability studies shall model the Contractor's proposed driving systems, including the hammers, capblocks, and pile cushions, as well as determine driving resistance and pile stresses for assumed site conditions. Separate analyses shall be completed at elevations above the specified tip elevations where difficult driving is anticipated. Studies shall include plots for a range of permanent steel casing compression capacities and shall be done for both plugged and unplugged conditions . Plots shall include the following:

    1. Permanent steel casing compressive stress versus blows per 0.30-m.
    2. Permanent steel casing tensile stress versus blows per 0.30-m.

    When the driveability analysis hammers indicate that permanent steel casing penetration rates are less than 0.30-m per 200 blows and the driving stresses will exceed 80 percent of the specified yield strength of the permanent steel casing, the study shall include assumptions for drilling through the center of permanent steel casing if center relief drilling is utilized.
D. Copies of all test results from any previous pile load tests, dynamic monitoring, and all driving records used in the analyses.
E. Completed "Pile and Driving Data Form," which is shown in these special provisions.

The driving system submittal shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California. Prior to installing piling, the Contractor shall allow the Engineer 15 working days to review a driving system submittal after a complete set, as determined by the Engineer, has been received. Should the Engineer fail to complete his 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 the driving system submittal 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.

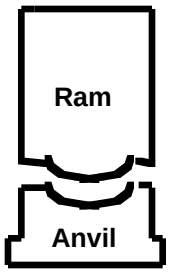
The Contractor shall use the driving system and installation methods described in the approved driving system submittal for a given control location. Any change in hammers from those submitted and approved by the Engineer shall also meet the requirements for driving system submittals. Revised and new driving system submittals shall be approved by the Engineer prior to using corresponding driving systems on production permanent steel casing . The Contractor shall allow the Engineer 15 working days to review each revised and each new driving system submittal after a complete set, as determined by the Engineer, has been received.

Approval of permanent steel casing driving equipment will not relieve the Contractor of his responsibility to drive permanent steel casing , free of damage, to the specified penetration.

CALIFORNIA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION LABORATORY

PILE AND DRIVING DATA FORM

Structure Name :_____ Contract No.:_____
_____ Project:_____
Structure No.:_____ Pile Driving Contractor or Subcontractor____
Dist./Co./Rte./kilo.post:_____ _____
(Pile Driven By)



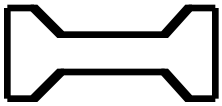
Hammer

Manufacturer:_____ Model:_____
Type:_____Serial No.:_____
Rated Energy:_____ at _____ Length of Stroke

Modifications: _____
_____
_____
_____
_____

Capblock (Hammer Cushion)

Material:_____
Thickness:_____mm Area:_____mm^2
Modulus of Elasticity - E:_____MPa
Coefficient of Restitution - e:



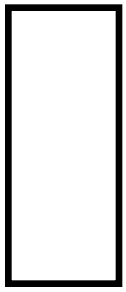
Pile Cap

Helmet
Bonnet
Anvil Block
Drivehead

Mass:_____kg

Pile

Material:_____
Thickness:_____mm Area: _____mm^2
Modulus of Elasticity - E:_____MPa
Coefficient of Restitution - e:_____



Pile

Pile Type:_____
Length (In Leads):_____m
kg/m.:_____Taper:_____
Wall Thickness:_____mm
Cross Sectional Area:_____ mm^2
Design Pile Capacity:_____kN
Description of Splice:_____
_____
Tip Treatment Description:_____

DISTRIBUTE one copy

- ☐ Translab, DSF Foundation Testing & Instrumentation
- ☐ Translab, DSF Structures Foundations
- ☐ Resident Engineer

Note: If mandrel is used to drive the pile, attach separate manufacturer's detail sheet(s) including mass (kg) and dimensions.

Submitted By:_____ Date:_____

Phone No.:_____

CONTRACT NO. 04-006034
REPLACED PER ADDENDUM NO. 6 DATED AUGUST 9, 2001

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.

Attention is directed to "Hazardous Material Excavation" elsewhere in these special provisions.

Cast-in-drilled-hole concrete piling (rock socket) shall consist of drilling or coring bedrock sockets to the depths or lengths specified and filling with reinforced concrete in conformance with the details shown on the plans and these special provisions. Cored holes shall conform to the provisions of Section 49-4.03, "Drilled Holes," of the Standard Specifications and these special provisions.

The Contractor's equipment used to excavate the entire length of 2.2 m Cast-in-Drilled-Hole Concrete Piling (Rock Socket) in this contract shall have the capability of excavating the holes to a larger constant diameter of at least 2.8 m, hereinafter referred to as over reaming. The Contractor's equipment used to excavate the entire length of 2.6 m Cast-in-Drilled-Hole Concrete Piling in this contract (except the 1 meter overlap within the isolation casing) shall have the capability of excavating the holes to a larger constant diameter of at least 3.2 m. The over reaming capacity of the equipment shall be capable of being activated from the top of the hole or casing without having to retract the equipment from the hole to add attachments. If the Contractor chooses to perform drilling operations on multiple piles simultaneously, the over reaming equipment shall be provided at each location where drilling is occurring. In addition, where over reaming is to be performed below permanent steel casing, the Contractor shall provide a means of securing the permanent steel casing from sinking into the over reamed hole.

Permanent steel casings are required at the locations shown on the plans. If directed by the Engineer the Contractor shall extend the cast-in-drilled-hole concrete piling, including bar reinforcing steel and permanent steel casing . If directed by the Engineer, the Contractor shall also extend the specified tip elevation of the cast-in-drilled-hole concrete piling (rock socket) and extend the inspection pipes to 100 mm clear of the bottom of the drilled or cored hole.

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

- Cast-in-place concrete piles shall consist of one of the following:

A. Steel shells driven permanently to the required bearing value and penetration and filled with concrete.
B. Steel casings installed permanently to the required penetration and filled with concrete.
C. Drilled holes filled with concrete.
D. Rock sockets filled with concrete.

- The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 25 MPa. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading. Concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," and Section 51, "Concrete Structures." Reinforcement shall conform to the provisions in Section 52, "Reinforcement."

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

- After placing reinforcement and prior to placing concrete in the drilled hole, if caving occurs or deteriorated foundation material accumulates on the bottom of the hole, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

The provisions of "Welding Quality Control" of these special provisions shall not apply to temporary steel casings.

Cast-in-drilled-hole(CIDH) concrete piles shall be excavated and constructed under slurry unless otherwise approved in writing by the Engineer. Additional methods, including but not limited to temporary casings and placement of slurry cement or concrete may be necessary to control caving at some locations. At 2.5 meter CIDH concrete piles, where a construction joint is used inside the permanent steel casings and the remainder of the pile can be dewatered, the portion of the pile above the construction joint may be placed without slurry.

Materials

Concrete deposited under slurry shall have a nominal penetration equal to or greater than 90 mm. Concrete shall be proportioned to prevent excessive bleed water and segregation.

Concrete deposited under slurry shall contain not less than 400 kg of 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

The Contractor shall 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:

	Percentage Passing Primary Aggregate Nominal Sizes			
	12.5 mm x 4.75 mm		9.5 mm x 2.36 mm	
Sieve Sizes	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		
	Percentage Passing	
Sieve Sizes	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

Seismic sensor steel pipes shall be furnished and installed in the cast-in-drilled-hole concrete piles as shown on the plans. The pipes shall be Schedule 40, 4-inch diameter galvanized steel pipe of commercial quality conforming to the requirements of Section 20-2.15A, "Steel Pipe," of the Standard Specifications. The Contractor shall notify the Engineer at least 2 weeks prior to installation of the seismic sensor steel pipes, within the piles and permanent steel casings. Specially formed sealed caps (Bishops Hats) will be installed at the bottom of the seismic sensor steel pipes, with instrumentation cables extending up through the casing. Bishops Hats and instrumentation cables will be furnished by the State and will be installed by personnel of the California Division of Mines and Geology (CDMG). The Contractor shall assist CDMG personnel with transferring Bishops Hat orientation marks to the tops of the seismic sensor steel pipes after said pipes are assembled and joints are secured. The seismic sensor steel pipes shall be installed in straight alignment and shall be plumb within ±1 degree. The seismic sensor steel pipes shall be securely fastened in place to prevent misalignment during installation of the reinforcement and placing concrete.

OVER REAM AND FILL

At the pier locations shown in the following table, where the Engineer has identified a significant probability of caving conditions, construction of each cast-in-drilled-hole piling below the permanent steel casings or isolation casings shall be preceded by over reaming of the hole, filling of the hole with fiber reinforced concrete and subsequently redrilling through fiber reinforced concrete in accordance with these special provisions.

Bridge Name or Number	Ream Hole Size	Pier Number	Elevation of Reaming
Benicia Martinez Bridge and OH	3.2m	Piers 4 and 5	Full length of 2.6m CIDH below isolation casing at Pier 4; from elevation –23m to the specified tip at Pier 5
Benicia Martinez Bridge and OH	2.8m	Piers 10, 13, 14 and Load Test Pile B	Full length of rock socket

The work involved in the over ream and fill shall be designated in the resource loading required in the Baseline Schedule required in "Progress Schedule (Critical Path)" of these special provisions. The assumed lift height between successive drillings and required cure time for the Contractor's selected fiber reinforced fill concrete shall be included in the scheduling assumptions.

At the locations specified in the table above and at other locations, as directed by the Engineer, the Contractor shall over ream the 2.2m rock socket length to a minimum diameter of 2.8m or the 2.6m CIDH to a minimum diameter of 3.2m. Immediately after a Contractor selected length of the hole has been over reamed, the excavation equipment shall be raised and fiber reinforced concrete shall be placed by tremmie into the hole to fill the entire length that was just over reamed. After allowing the concrete to reach a compressive strength of at least 14 Mpa, the hole for the 2.2 m CIDH (rock socket) or the 2.5m CIDH shall be drilled through the fiber reinforced concrete. This process shall be repeated until the specified tip elevation of the pile is reached. The length of over reaming to be used between concrete placements shall be determined by the Contractor to prevent caving but shall in no case be more than 10m in length without prior written approval of the Engineer.

A mix design for fiber reinforced concrete for filling of over reamed holes shall be submitted in accordance with Section 90, "Portland Cement Concrete" of the Standard Specifications. The concrete shall contain steel fiber reinforcement at a dosage of at least 59kg per cubic meter. Steel fiber reinforcement shall be a deformed wire at least 50mm in length with an aspect ratio of more than 50 conforming to ASTM A820. The type of steel fiber reinforcement shall be submitted to the engineer for approval with the mix design. There shall be no minimum cement content required; however, redrilling of filled holes shall not take place until the concrete has gained a compressive strength of at least 14 Mpa as determined by previous testing of the mix to develop a compressive strength versus time chart. The strength versus time chart shall be developed by breaking pairs of cylinders at 6 hour intervals for 7 days after casing of the cylinders. In addition, the 14, 21 and 28 day compressive strengths shall also be determined for the mix. The materials used for the fiber reinforced concrete mix shall conform to Section 90, Portland Cement Concrete," of the Standard Specifications. Fiber reinforced concrete shall be considered as containing steel reinforcement with regard to the use of calcium chloride.

All over reaming, placing fiber reinforced concrete and subsequent redrilling shall be performed under slurry as specified elsewhere in these special provisions. The Contractor shall pay special attention to maintaining the slurry properties when drilling through previously placed concrete due to the potential for slurry decomposition. Disposal of all over reaming drill cuttings shall be in accordance with these special provisions. At the locations where the over ream and fill method has been used, all the requirements for installation and testing of the cast-in-drilled-hole piles elsewhere in these special provisions shall still apply.

Where the Contractor is directed by the Engineer to use the over ream and fill method at locations not listed in the above table, the work will be paid for at the unit price bid for over ream and fill of the various sizes shown in the Engineer's estimate.

Alternatives to the over ream and fill method will be considered by the Engineer provided the Contractor demonstrates by testing that the shear friction capacity of the rock socket, when using the Contractor's proposed method, is equal to or greater than that assumed in the design. Acceptable proof that the Contractor's proposed method is equivalent shall be an Osterberg load test of a rock socket on a non-production pile constructed to the same elevations and under the same conditions as a production pile. The location of a Osterburg test pile shall be at the center of the Pier 10 pile cap or at another location as approved by the Engineer. Use of temporary casing, in accordance with 49-4.03, "Drilled Holes" of the Standard Specifications and these special provisions, within the rock sockets of pier locations designated herein to be drilled using the over ream and fill method, will be considered an alternative method. Alternative methods will be considered only when presented as part of a cost reduction incentive proposal as specified elsewhere in these special provisions.

SLURRY

Slurry shall be commercial quality synthetic drilling slurry and shall conform to the requirements of these special provisions.

Slurry shall be premixed prior to placement in the cast-in-drilled-hole concrete piling. In hole mixing or slurry within the casing prior to excavation of the rock socket will be permitted provided that excavation within the casing is not closer than 3 meters to the casing tip.

Water for slurry may be either fresh water (potable), natural ground water or saltwater. If freshwater is used, the Contractor shall determine the chlorine content prior to use. The 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 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. Suite 216 735 Broad Street Chattanooga, TN 37402 (800) 525-5237
Super Mud	PDS Company c/o Champion Equipment Company 8140 East Rosecrans Ave. Paramount, CA 90723 (562) 634-8180
Shore Pac GCV	CETCO Drilling Products Group 1350 West Shure Drive Arlington Heights, IL 60004 (847) 392-5800

Inclusion of a synthetic slurry on the above list may be obtained by meeting the Department's requirements for synthetic slurries. The requirements can be obtained from the Office of Structure Design, P.O. Box 942874, Sacramento, CA 94274-0001.

Synthetic slurries listed may not be appropriate for a given site.

Synthetic slurries shall not be used in holes drilled in primarily soft or very soft cohesive soils as determined by the Engineer.

A manufacturer's representative, as approved by the Engineer, shall provide technical assistance for the use of their product, shall be at the site prior to introduction of the synthetic slurry into a drilled hole, and shall remain at the site until released by the Engineer.

The Contractor shall develop a slurry plan and slurry test procedure specifically for this project with the aid of the slurry manufacturer's representative. The Contractor shall submit the slurry plan and test procedure for review to the Resident Engineer's Office, 4585 Pacheco Blvd, Suite 200 Martinez, California for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings." For initial review, 10 sets shall be submitted. The Contractor shall allow the Engineer 4 weeks to review the drawings and calculations after a complete set has been received. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to said Office for final approval and for use during construction. The Contractor's attention is directed to the supplemental boring program that will be conducted by the Engineer. Fresh core samples from the supplemental drilling program will be available to the Contractor for use in developing his slurry plan. The slurry plan and test procedure shall contain, as a minimum:

Directions for preparing and testing mix water, including methods of obtaining desired pH.
Methods of preparing and mixing the slurry, including amounts of products to be added and pH measurement.
Methods for cleaning the slurry of sediment, including viscosity and slurry maintenance procedures.
Methods for neutralizing and disposing of the slurry.

Synthetic slurries shall be sampled and tested at both mid-height and near the bottom of the rock socket. 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 KB Technologies Ltd.		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - during drilling - prior to final cleaning - just prior to placing concrete	 less than or equal to 1075* less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling -prior to final cleaning - just prior to placing concrete	 53 to 127 less than or equal to 74	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	6 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	 less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SUPER MUD PDS Company		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	34 to 64 less than or equal to 64	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 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 CETCO Drilling Products Group		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	35 to 78 less than or equal to 60	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8.0 to 11.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

The viscosity of slurry shall be maintained during drilling, and during final cleaning. Additional synthetic product and additives shall be added to the slurry in the cast-in-drilled-hole concrete pile, as necessary, to maintain minimum required viscosity. In addition, any fresh slurry to be added to the existing 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 to determine salt content. The accuracy of dissolved salt probes shall be tested by the Contractor to ensure that slurry mixed with drill cuttings will not give erroneous results. Testing shall be use a slurry temperature equal to the water temperature in the Carquinez Straits at the project site and shall include soils taken from the lower portions of the casing excavation. Testing shall be completed and approved by the Engineer prior to using any slurry in the piles.

Water

Water shall not be used as slurry .

Construction

The Contractor may not drill adjacent cast-in-drilled-hole concrete piling simultaneously and concrete shall have been placed to a level at least 1.0 meter into the permanent steel casing or to the cutoff elevation for piles without permanent steel casing and allowed to cure for a minimum of 2 days before beginning drilling or permanent or temporary casing installation on any piling immediately adjacent to another piling.

For all CIDH concrete piles constructed under slurry, once drilling or excavation of the CIDH has begun it shall continue 24 hours a day until the shaft is completed to the specified tip elevation and concrete has been placed at least up to the level of the optional construction joint near the bottom of the permanent steel casing. At locations where the over ream and fill method is utilized, the construction of the CIDH may be discontinuous only during the required cure time for the fiber reinforced fill concrete lifts. Where pile construction is interrupted for fiber reinforced concrete fill cure time, the circulation and testing of the slurry shall be maintained unless otherwise directed by the Engineer. Cleaning of the casing, sonic logging of the casing and shaft and placement of the reinforcing cage shall begin immediately after completion of the drilling to the specified tip elevation. Concrete placement shall begin immediately after the reinforcing cage is inserted into the hole and the bottom has been re-cleaned.

For all CIDH concrete piles constructed under slurry, spare grouting repair tubes(additional to gamma testing tubes) shall be provided as shown on the drawings, as specified in these special provisions and as directed by the Engineer.

The optional construction joint shown on the plans for the 2.5 m CIDH concrete pile, as well as the joint near the bottom of footing elevation (where the transition to footing concrete is made) shall be prepared in accordance with the requirements of Section 51-1.13, "Bonding" of the Standard Specifications and these special provisions.

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 and/or coring methods and equipment.
3. Proposed method for casing installation, cleaning 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, seismic sensor steel pipes, gamma testing tubes, grout repair tubes, including spacing and layout of rollers and spacers.
6. Methods and equipment for accurately determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
7. Methods and equipment for verifying that the bottom of the drilled hole is clean prior to placing concrete.

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. 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.
7. Procedure for cleaning the construction joint, if used, at the base of the permanent steel casing, including a description of the methods and tools that will be used to access the whole area of the joint.
8. Procedure for cleaning the bottom of the hole after insertion of the reinforcing cage.

The Contractor shall continuously log information concerning drilling of all CIDH concrete piles in a "Drilling Log." The drilling log shall be available to the Engineer at any time during drilling and the completed log shall be submitted to the Engineer at the completion of drilling for each pile. The drilling log shall include penetration rate, cutting descriptions, estimated volumes of cuttings as compared to theoretical, and other information pertaining to the drilling process such as loss of circulation, zones of caving, down pressure methods and equipment used to prevent caving.

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 8 m of the pile. If the Contractor elects to use the optional construction joint and place the upper portions of the pile in the dry, the concrete shall also be vibrated in the upper 8m of the pile except that vibration may be done as the concrete is brought up within the casing.

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 the following:

A tremie tube or tubes, each of which are at least 250 mm in diameter, fed by one or more concrete pumps. The tremie tubes shall be gravity fed. If pumps are used to deliver the concrete, a hopper shall be used to feed the tremie tubes. Tremie tubes linked directly to the pump discharge tubes are not allowed.

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.

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.

The slurry level shall be maintained within 300 mm of the top of the permanent or temporary steel casing .

When concrete is delivered by pumping, a fully operational standby concrete pump available to be on site and in position, 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, the bottom of the drilled hole shall be cleaned by air lifting. The Contractor shall demonstrate to the Engineer that the bottom of the drilled hole is clean. Methods of demonstrating that the bottom of the hole is clean shall be subject to the approval of the Engineer. Satisfactory methods of demonstrating that the hole bottom is clean might include the use of a cleanup bucket and underwater television cameras. A second cleaning of the bottom of the hole shall be done by an air lift method after insertion of the reinforcing cage. The concrete tremie pipe may be used as the conductor for the air lift.

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, including all material excavated from piles when slurry is used, 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, in accordance with the permits obtained by the State, and in accordance with these special provisions.

Drill cuttings(sediments) from above the rockline and within the permanent steel casings, which are not contaminated with slurry, may be disposed of aquatically at the Carquinez Strait Dredge Material Disposal Site(SF-9) in San Pablo Bay, in accordance with the requirements of the Dredged Material Management Office and "Dredging" of these special provisions and as directed by the Engineer. If sediment excavated from piles is contaminated with slurry, aquatic disposal at the disposal site will be contingent on adequately separating the slurry from the sediment, chemically degrading the slurry and on obtaining the required disposal permits from the San Francisco Bay Area Water Quality Control Board and all other applicable permits. No delays will be allowed for the Contractor's failure to obtain the required permits for disposing of treated sediment. Drill cuttings excavated from below the rockline shall not be disposed of aquatically.

The Contractor's attention is directed to the existence of soils at Abutment 1, Piers 2, 3 and 5 and elsewhere that may require special treatment and handling, and to the requirements for disposal of this material included in these special provisions.

Permanent steel casings shall be furnished and placed tight in the hole where shown on the plans. The provisions of Section 49-1.08, "Bearing Value and Penetration," of the Standard Specifications shall not apply to permanent steel casing. Permanent casing shall be watertight and of sufficient strength to withstand the loads from installation, lateral concrete pressures, and earth pressures, and shall conform to the provisions of "Steel Pipe Piling" of these special provisions.

Sonic Logging

Just prior to inserting the reinforcing cage into the drilled hole where slurry is utilized, the Contractor shall log the hole diameter and plumbness for its full length (including the full length of the casing) using an ultrasonic logging instrument, such as a Koden Drilling Monitor Model DM 682-684, in accordance with the instrument manufacturer's recommendations and these special provisions.

The sonic logging instrument shall have the following standard features:

1. It shall be capable of determining the state of the drilled hole wall face, the hole diameter, and the deflection and inclination of the hole.
2. It shall provide hardcopy recordings of the measurements made with marks on the recordings to be able to conveniently read the results.
3. It shall be attached to a winch, cable and wire drum such that the cable is fed stabily and the sensor unit will not rotate in the hole.
4. The unit shall have signal processing circuits to distinguish wall face from floating objects.
5. It shall be equipped with a break, a high voltage protection circuit and an stylus auto stop recording function.
6. A digital depth indicator shall continuously show the depth of the submersible sensor unit.
7. It shall record the wall face in 4 directions simultaneously.

Sonic logging results shall be used to determine whether hole diameter and plumbness are in accordance with the requirements of these special provisions. Sonic logging of the CIDH hole shall be performed in the presence of the Engineer. Every 2.5 m, 2.2 m and 2.6 m CIDH concrete pile to be cast using slurry shall be sonically logged and hard copy printouts shall be provided to the Engineer for review. No reinforcing shall be placed into the hole or casing until the Engineer has approved the sonic log for that hole. Holes or portions of holes that deviate from plumb by more than 25 mm in 3 m of length shall be rejected and shall be backfilled with tremmie placed fiber reinforced concrete and redrilled in accordance with Section 49-4.03, "Drilled Holes," of the Standard Specifications. Plumbness within the casing shall be measured with respect to the vertical axis centered at the top of the casing. To account for possible irregularity within the rock socket, plumbness will be measured by fitting a theoretical cylinder the same diameter as that required for the rock socket, to the traces provided by the sonic logging, and comparing the longitudinal centerline axis of the cylinder to the vertical axis. Holes or portions of holes which indicate diameters greater than 1.5 times the pile diameter shall be rejected and shall be backfilled with tremmie placed, fiber reinforced concrete and redrilled in accordance with Section 49-4.03, "Drilled Holes," of the Standard Specifications. A mix design for fiber reinforced concrete for filling of rejected holes shall be submitted in accordance with Section 90, "Portland Cement Concrete" of the Standard Specifications. The concrete shall contain steel fiber reinforcement at a dosage of at least 59 kg per cubic meter. Steel fiber reinforcement shall be a deformed wire at least 50 mm in length with an aspect ratio of more than 50 conforming to ASTM A820. The type of steel fiber reinforcement shall be submitted to the engineer for approval with the mix design. There shall be no minimum cement content required; however, redrilling of filled holes shall not take place until the concrete has gained a compressive strength of at least 14 Mpa as determined by previous testing of the mix to develop a compressive strength versus time chart. The strength versus time chart shall be developed by breaking pairs of cylinders at 6 hour intervals for 7 days after casing of the cylinders. In addition, the 14, 21 and 28 day compressive strengths shall also be determined for the mix. The materials used for the fiber reinforced concrete mix shall conform to Section 90, "Portland Cement Concrete," of the Standard Specifications. Fiber reinforced concrete shall be considered as containing steel reinforcement with regard to the use of calcium chloride.

Acceptance Testing and Mitigation

Vertical inspection pipes shall be provided in all cast-in-drilled-hole concrete piles , except when the holes are dry or when the holes are dewatered without the use of temporary casing to control the groundwater. If the Contractor elects to use the optional construction joint in the 2.5 m CIDH concrete piling shown on the plans, and the permanent steel casing can be subsequently dewatered, then the acceptance testing using the gamma tubes will not be required within the cased zone of the pile above the construction joint.

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.

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 or as shown on the plans. 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. Additional hoops and cross ties shall be provided as necessary to secure the tubes where they are not tied directly to the bar reinforcing steel.

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 as approved by the Engineer, 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.

At all locations where inspection pipes are required, the Contractor shall construct working platforms at least 1.5 m above the high tide line and at least 1m wide on all sides of the pile. Integrity testing shall be performed from the platforms. The platforms shall be rigidly attached to the piles to prevent any movement. The platforms shall be designed for a minimum uniform load of 700 kPa. In addition, the Contractor shall provide transportation to and from all piers located within the Carquinez Straits for State personnel and all equipment required for pile integrity testing.

During acceptance testing of piling by State personnel, the Contractor shall not perform any work within 7 meters of the pile being tested.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging. Tests may also include crosshole sonic logging and other means of inspection selected by the Engineer. The Contractor shall not conduct operations within 8.0 m of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piling, the Contractor shall allow 15 working days for the Engineer to conduct these tests if the 48.3-mm diameter cylinder passed all inspection pipes, and 20 working days if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete these tests within the time allowance, and if in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All inspection pipes and cored holes in a pile shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Placement and removal of water in the inspection pipes shall be at the 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, the Contractor shall pay to the Department, $400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meters, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross-section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment for such piles be less than $400. The Department will deduct the amount from any moneys due, or that may become due the Contractor under the contract.

Pile mitigation plans shall include the following:

A. The designation and location of the pile addressed by the mitigation plan.
B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
C. A step by step description of the mitigation work to be performed, including drawings if necessary.
D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.
E. Methods for preservation or restoration of existing earthen materials.
F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post , and the Contractor's (and Subcontractor's if applicable) name on each sheet.
H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
I. The seal and signature of an engineer who is licensed as a Civil Engineer by the State of California.

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

A. An assessment of the nature and size of the anomalies in the rejected pile.
B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

A. The proposed location and size of additional piling.
B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piling. If, in the opinion of the Engineer, the structural response of the structure is altered by the Contractor's proposed modification, the Engineer will perform necessary calculations to verify the performance of the structure as intended and as originally designed, at the Contractor's expense. The State's cost of such calculations will be deducted from the monthly progress payment.

All provisions for cast-in-drilled-hole concrete piling shall apply to replacement piling.

The Contractor shall allow the Engineer 15 working days to review the mitigation plan after a complete submittal has been received. This time shall be increased to 30 working days if modifications to the footing are proposed.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor (and Subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

No extensions of time or compensation will be made for the submittal and review of a mitigation plan for rejected piling.

Grout Repair Pipes

Vertical grout repair pipes, as shown on the plans, shall be provided in all cast-in-drilled hole piles cast under slurry. Grout repair pipes will not be required when the holes are dry or when the holes are dewatered without the use of temporary casing.

Grout repair pipes shall be Schedule 40 polyvinyl chloride pipe with an inside diameter of 50.8 mm. Each repair pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50.8 mm diameter clear opening from the top of the pile down to the specified tip elevation. After approval of the pile by the Engineer, grout repair tubes shall be filled with grout following the same procedures as are used for filling of the inspection pipes above.

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

- The contract price paid per meter for cast-in-drilled-hole concrete piling shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in drilling holes, disposing of material resulting from drilling holes, temporarily casing holes and removing water when necessary, furnishing and placing concrete and reinforcement, and constructing reinforced concrete extensions, complete in place, to the required penetration, as shown on the plans, as specified in these specifications and in the special provisions, and as directed by the Engineer.

The sixth paragraph of Section 49-6.02 "Payment," of the Standard Specifications shall not apply.

If permanent steel casings are fabricated more than 480 airline kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for furnishing permanent steel casing will be reduced by $10,000 for each manufacture or fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles.

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).

The contract lump sum price paid for load test piles shall include full compensation for furnishing all labor, materials, equipment, and incidentals and for doing all the work involved in the two load test piles (except over reaming and filling at Load Test Pile B), including washout and grouting below the pile tip and additional load test piles should the Contractor propose a different installation methods for the production piling, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

Full compensation for cutting off test piles as specified, shall be considered as included in the contract lump sum price paid for the load test pile , and no additional compensation will be allowed.

No additional compensation or extension of time will be made for additional foundation investigation as required in "Install Seismic Monitoring Casing" of these special provisions, or for installation and testing of the load test pile(s), cutting off piling and restoring the foundation investigation and load testpile sites, and review of request by the Engineer.

Full compensation for slurry, storage of slurry, recycling of slurry, depositing concrete under slurry, test batches, inspection pipes, building test platforms above high tide, temporary and permanent steel casing, filling inspection holes and pipes with grout, filling cave-ins with fiber reinforced concrete where the diameter is shown to be greater than 1.5 times the intended diameter (not including filling of over reamed piles), storing, barging and disposing of sediment drill cuttings at the designated disposal site, storing, and disposal of bedrock drill cuttings and redrilling through concrete (except redrilling through concrete placed into over reamed piles) 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.

The contract price paid per meter for cast-in-drilled-hole concrete piling (rock socket) of the sizes 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 drilling or coring holes, disposing of the material resulting from drilling or coring holes, and furnishing and placing concrete and placing reinforcement, complete in place, to the required penetration, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per meter for permanent steel casing of the sizes listed in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing permanent steel casing, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Additional permanent steel casing, cast-in-drilled-hole concrete piling (rock socket) and cast-in-drilled-hole concrete piling, including inspection pipes, and bar reinforcing steel, required to extend the permanent steel casing to into bedrock and to maintain the length of cast-in-drilled-hole concrete piling (rock socket) into bedrock, as shown on the plans, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Full compensation for cleaning out the permanent steel casing prior to installing reinforcement and filling with concrete, for disposing of materials removed from the inside of the pile, as shown on the plans, and as specified in these special provisions, and as directed by the Engineer shall be considered as included in the contract unit price paid per meter for permanent steel casing and no additional compensation will be allowed therefor.

Full compensation for conforming to the provisions on welding and 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 , for providing access for the Engineer on monitored permanent steel casings, , for providing additional stickup length on casing to be monitored, for providing and welding additional stickup length on additional permanent steel casings required to be monitored as directed by the Engineer, and for installing and removing the instruments from the permanent steel casings shall be considered as included in the contract unit price paid per meter for permanent steel casings and no separate payment will be made therefor. The length of permanent steel casing to be paid for shall include the lengths that monitored piles are redriven.

Full compensation for providing special tips, or for subexcavating or employing other measures to prevent damage to the permanent steel casings shall be considered as included in the contract price paid per meter for 2.5 m permanent steel casing and no additional compensation will be allowed therefor.

Full compensation for center relief drilling to install 2.5 m permanent steel casing and for disposing of material resulting from , center relief drilling, shall be considered as included in the contract unit price paid per meter for 2.5 m permanent steel casing and no additional compensation will be allowed therefor.

Full compensation for driving system submittals shall be considered as included in the contract unit price paid per meter for 2.5 m permanent steel casing and no additional compensation will be allowed therefor.

Full compensation for constructing the CIDH concrete piles 24 hours a day shall be considered as included in the unit prices paid for the various types of CIDH concrete piling shown on the plans and no additional compensation will be allowed therefor.

Full compensation for furnishing and installing grout repair piping, as shown on the plans, shall be considered as included in the contract price paid for piles of the various classes and types shown on the plans and no additional compensation will be allowed therefor.

Full compensation for sonic testing and logging of CIDH's placed under slurry to verify hole diameter and plumbness, shall be considered as included in the contract price paid for piles of the various classes and types shown on the plans and no additional compensation will be allowed therefor.

Full compensation for added length of permanent steel casing in casings to be driven and dynamically monitored shall be included in the contract price paid for 2.5 m permanent steel casing and no additional compensation will be allowed therefor.

Over reaming cast-in-drilled-hole piling and filling of the over reamed hole with fiber reinforced concrete will be measured and paid for by the linear meter as over ream and fill of the various sizes shown in the Engineer’s Estimate.

Full compensation for providing over reaming equipment for constructing 2.2 m Cast-in-Drilled-Hole Concrete Piling (Rock Sockets) and for 2.6 m Cast-in-Drilled-Hole Concrete Piling, including maintaining such equipment on site for the duration of the pile excavations, shall be considered as included in the contract unit price paid for 2.2 m Cast-in-Drilled-Hole Concrete Piling (Rock Socket) or 2.6 m Cast-in-Drilled-Hole Concrete Piling, and no additional compensation will be allowed therefor.

Full compensation for drilling through fiber reinforced concrete placed as part of the over ream and fill method, including disposing of the drill cuttings from drilling through fiber reinforced concrete, shall be considered as included in the contract unit price paid for 2.2 m Cast-in-Drilled-Hole Concrete Piling (Rock Socket) or 2.6 m Cast-in-Drill Hole Concrete Piling, and no additional compensation will be allowed therefor.

The contract unit price paid per meter for over ream and fill of the various sizes 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 over reaming and for filling the over reamed length with fiber reinforced concrete, including disposal of all drill cuttings, maintaining of the slurry during the concrete cure period, and submittal and testing of fiber reinforced concrete mix designs, complete in place, as specified in these special provisions, and as directed by the Engineer."

Full compensation for testing, hauling and disposing of contaminated and hazardous drill cuttings from the excavation of the 750mm CIDH piling at Abutment 1, in accordance with the requirements specified elsewhere in these special provisions for hazardous and contaminated materials, shall be considered as included in the contract unit price paid per meter for 750mm CIDH piling and no separate payment will be made therefor.

10-1.45 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

GENERAL

Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

When a roughened concrete surface is shown on the plans or called for in these special provisions, the existing concrete surface shall be roughened to a minimum amplitude of 6 mm by abrasive blasting, water blasting or mechanical equipment. The interior and top sides of the concrete footing forms, if used by the Contractor, whether cast-in-place or precast, shall be roughened.

Where the Contractor elects to use construction joints to place mass concrete in lifts, the joints shall be prepared in accordance with 51-1.13, "Bonding," of the Standard Specifications except at locations were epoxy coated bar reinforcing is shown on the plans. At these locations, the surface of the concrete shall be cleaned using high pressure water blasting using potable water. Abrasive blast methods shall not be used on construction joints with epoxy coated bar reinforcing passes through the construction joint. Water blasting shall commence within 24 hours of having placed the concrete and as soon as the concrete can be cleaned without washing cement from the surface matrix.

Neoprene strip shall be furnished and installed in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

Furnishing and installing neoprene strip shall conform to the requirements for strip waterstops as provided in Section 51-1.145, "Strip Waterstops," of the Standard Specifications, except that the protective board will not be required.

Materials for access opening covers in soffits of new cast-in-place concrete box girder bridges shall conform to the provisions for materials in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Plastic pipe located at vertical drains used behind retaining walls and bridge abutments, including horizontal or sloping drains shall be polyvinyl chloride (PVC) plastic pipe, Schedule 80, conforming to the provisions for pipe for edge drains and edge drain outlets in Section 68-3.02, "Materials," of the Standard Specifications. The vertical drain pipe shall be rigidly supported in place during backfilling operations.

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.

Embedded sleeves to form holes through the deck for future connections of barrier and transit rails, as shown on the plans, shall be PVC pipe. Sleeves shall be capped flush with the top mat of bar reinforcing steel. A plug attached to the forms shall be used to secure the sleeve to the form. The sleeves shall be securely tied in place so that they will not be displaced during concrete placement. After removal of the forms, the Contractor shall remove all plugs from the sleeves and demonstrate that the sleeves are unobstructed by inserting bar into each hole. Obstructed or incorrectly positioned sleeves shall be replaced or repaired as approved by the Engineer.

Embedded sleeves to form holes through the deck for electrical conduits, as shown on the plans, shall be PVC pipe. Sleeves shall be securely tied in place so that they will not be displaced during concrete placement.

Where 150 mm pier cap diaphragm openings are shown on the plans, the openings shall be formed by embedding a length of 150 mm inside diameter rigid galvanized steel pipe electrical conduits conforming the requirements of Section 86-2.05A, "Material", of the Standard Specifications. The conduit shall be stubbed out from the diaphragm 150 mm on each side, or, alternately, shall be fitted with threaded couplings on either end which are flush with the face of the diaphragm. If the Contractor elects to use pipe with couplings, the threads of the couplings shall be protected from concrete. Rigid galvanized steel pipe shall be secured in place so that it is not displaced during concrete placement.

Ferrule loop type anchor inserts for future maintenance travelers shall conform to the details shown on the plans, and "Miscellaneous Metal" of these special provisions.

Concrete used to fill the annular space between the CIDH and the isolation casings shall be minor concrete conforming to the requirements of Section 90-10 "Minor Concrete," of the Standard Specifications.

Where called for on the plans and as directed by the Engineer, expanded polystyrene used to form gaps shall be removed from joint areas and around bearings. Removal shall be done in an approved manner without the use of solvents and such that the debris is contained and collected for disposal.

All forms inside the superstructure of both the segmentally constructed portions and the conventionally constructed portions of the bridge and inside all hollow piers shall be removed. The inside of the superstructure of both the segmentally constructed portions and the conventionally constructed portions of the bridge shall be swept clean to remove all debris after stripping of the forms and all surfaces shall receive an ordinary surface finish in accordance with the requirements of Section 51-1.18A, "Ordinary Surface Finish," of the Standard Specifications.

For tremmie concrete placed under water at seal courses, the tremmie tube shall be equipped with an inflatable bladder or other device which closes the end of the tube when it is necessary to lift or reposition it during the pour.

The Contractor's attention is directed to "Span 17 Cooperation" of these special provisions regarding grinding performed under this contract across hinges A and B into Contract EA 04-006061.

The waterstop shown on the plans at the footings shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions:

The waterstop shall be a 152.4 mm x 9.5 mm center-bulb type with parallel ribs or protrusions on each side of strip center. Corrugated or tapered type water stops are not acceptable. Minimum weight per meter of water stop shall be 2.42 kg.

The waterstop shall be polyvinyl chloride (PVC) formulated to perform in contact with salt water. The waterstop shall conform to the following requirements:

Property	Testing Method	Required Limits
Water Absorption	ASTM D 570	5% max.
Ultimate Elongation	ASTM D 628	360 %
Stiffness in Flexure	ASTM D 747	4.14 Mpa
Specific Gravity	ASTM D 792	1.4 max.
Volatile Loss	ASTM D 1203	0.50% max.
Hardness, Shore A/15	ASTM D 2240	65 to 80
Tensile Strength After Accelerated Extraction	CRD-C 572	11.03 Mpa
Elongation After Accelerated Extraction	CRD-C 572	300 % min.
Effect on Alkali after 7 Days	CRD-C 572 Weight Change Hardness Change	Passed +0.25% max. -0.0% max. ± 5 max.

Waterstop shall be provided with embedded wire or grommeted holes at the edges in order to secure the waterstop at the locations detailed on the plans. The waterstop bulb shall be centered in the gap during and at the end of construction. Holes made in waterstops without grommets shall not be allowed.

Waterstop splices shall be not be pulled or strained in any way for at least 10 minutes after they are welded.

Finished splices shall provide a cross-section that is dense and free of porosity with tensile strength of not less than 80 percent of the unspliced materials.

MASS CONCRETE

All concrete used in the new Benicia Martinez Bridge's 2.5 m or 2.6 m CIDH concrete pilings, the pier footings (including precast pier footing forms), the piers, the pier tables and the first four segments of each segmentally constructed pier, as well as any portions of the bridge where the concrete being placed has a minimum dimension that exceeds 2 m and, at the Contractor's option, other concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these requirements for mass concrete.

The Contractor shall be responsible for controlling the internal temperature of mass concrete during curing to control and limit thermal cracking due to heat generation and dissipation. Use of ice, liquid nitrogen, insulated curing blankets, insulated forms, cooling pipes and other measures may be necessary to satisfy the temperature requirements of this special provision. A post-cooling backup system is required to be designed and installed by the Contractor in accordance with these special provisions.

The Contractor's attention is directed to several reports prepared for this project regarding mass concrete which may be obtained from the State as a part of the "Materials Handout". The reports contain suggested guidelines and recommendations for controlling thermal cracking of mass concrete on this project. The Material Handout will be made available 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.

Materials–

A. The amount of free water used in mass concrete in footings and piers shall not exceed a water to cementicious materials ratio of 0.40.
B. Either Type A admixture or a Type D admixture conforming to the requirements of ASTM Designation: C 494 and Section 90-4, "Admixtures," of the Standard Specifications shall be used at such dosage that will produce a workable concrete suitable for its intended use. The admixture at such dosage shall not cause an increase in drying shrinkage of the mass concrete in excess of that permitted in ASTM Designation: C 494.
C. The temperature of the concrete at time of discharge from the mixer shall not exceed that determined by the Contractor's thermal control plan as required herein. The minimum temperature requirements of Section 90-6.02, "Machine Mixing," of the Standard Specifications will not apply. When ice is used, all the ice shall be melted before discharging the concrete from the mixer. The maximum internal temperature of the mass concrete once placed shall not exceed 65°C and the maximum temperature difference between any surface of the mass concrete and the hottest portion shall not exceed that determined by the Contractor's thermal control plan as required herein.

Thermal Control Plan

Temperature modeling and temperature monitoring shall be required for each typical placement of mass concrete. The Contractor's thermal control plans shall be designed to keep thermal cracking below the limits specified for the various elements specified herein. The Contractor shall submit to the Engineer a temperature control plan for each typical concrete placement, as described herein. The thermal control plan shall include working drawings, with design calculations, for the proposed pre-cooling of materials, concrete placement, post-cooling system (where required herein), and the temperature monitoring and recording system for each typical mass concrete placement. A typical placement shall be defined as a mass concrete pour of similar dimensions in a similar location within the structure.

A thermal control plan shall be completed and approved by the Engineer for each typical mass concrete location before any concrete represented by that plan is placed. Mix designs for mass concrete shall not be approved until the thermal control plan for placements utilizing that mix are submitted and approved. The proposed post-cooling system and the temperature monitoring and recording system shall be designed by a licensed engineer with experience in modeling heat build up and in designing cooling systems to control heat build up in mass concrete elements. The design calculations shall adequately demonstrate that the mass concrete acceptance criteria of these special provisions and any supplemental criteria proposed for use by the Contractor are both satisfied.

Temperature modeling for each typical placement shall be included with each thermal control plan submittal. As a minimum, the modeling for each typical placement shall consist of performing a two-dimensional finite-difference analysis (see ACI 207.1R-96). The analysis shall be based on the Contractor's actual mix designs. The coefficient of thermal expansion of the concrete used in the modeling shall be determined by testing of the proposed mixes in accordance with US Army Corps of Engineer's Method CRD-C39-81, "Test Method for Coefficient of Linear Thermal Expansion of Concrete." The heat of hydration used in the modeling for the cementicious blend used in the proposed mix designs shall be tested at 1, 3, 7 and 28 days in accordance with ASTM C186, "Heat of Hydration of Hydraulic Cement" or another approved method.

Thermal Control Plan requirements for each typical mass concrete placement:

1. Dimensions of each typical mass concrete placement, including all locations in the structure to be represented by that placement.
2. Types and dimensions of materials to be used for mass concrete forms and insulation, and time frames for when the concrete forms and insulation will be removed, including time periods for removal and reinstallation of insulation where required as a part of the thermal control plan.
3. Assumptions for average ambient air and average surface water temperature for time period of placement and curing of each typical mass concrete element.
4. Define time delay between placing seal course and pier footing concrete, where applicable.
5. For piers, if multiple lifts with time delay are proposed, provide lift height and define time delay between lifts.
6. Define the length of time or at what temperature in the concrete footing will ocean water be allowed back into the cofferdams around the new mass concrete footings, if cofferdams are used.
7. Include a placing diagram showing the typical mass concrete placement sequence and construction joint locations, if any.
8. Identify areas where steep cooling gradients may occur, which may result in cracking the mass concrete, and how they will be avoided or minimized.

9. Predict peak temperature, peak differential temperatures and at what approximate times they will occur.
10. Define allowable time periods for placing or removing insulation and or forms.
11. A summary of the modeling assumptions used in the analysis.
12. Identify contingency operations to be implemented to control the internal temperature of the concrete should the maximum allowable or the maximum allowable differential temperature be exceeded. For post cooling systems after the peak internal temperature is reached, include the maximum cooling rate at which cracking will not occur.

The working drawings and design calculations for each typical mass concrete placement shall conform to the requirements in Section 5-1.02, "Plans and Working Drawing," of the Standard Specifications. The number of sets of drawings and times for review for each typical mass concrete element shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications, except that two sets of calculations shall be submitted.

Approval by the Engineer of the Contractor's proposed pre-cooling materials, if used, concrete placement, post-cooling system and proposed temperature monitoring and recording system for each set of typical mass concrete placement's working drawings and design calculations or field inspection performed by the Engineer will in no way relieve the Contractor of full responsibility for placing, curing and repairing excessive cracking in each mass concrete element.

Any adjustments made to a previously approved mix design for mass concrete and/or a change to a thermal control plan for a typical placement, shall require resubmittal of that thermal control plan for approval. The review time for resubmitted thermal control plans shall be 3 weeks.

Should the Engineer fail to review the complete working drawing submittal within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the working drawing submittal, an extension of time commensurate with the delay in completion of the work thus caused will be granted in accordance with Section 8-1.09, "Right of Way Delays," of the Standard Specifications. No extensions of time will be given for resubmittal of any previously approved temperature control plans.

Temperature Monitoring and Recording—

The Contractor shall design and implement a temperature monitoring and recording system for each mass concrete placement. Temperature shall be monitored in all mass concrete placements in accordance with these special provisions and as directed by the Engineer.

Concrete temperatures shall be monitored using thermocouples at all mass concrete placements. Other types of temperature measuring devices may be considered provided they have a history of successful use in past concrete temperature monitoring programs, as determined by the Engineer. Thermocouples shall be located as recommended in the "Materials Handout" prepared for this project and as necessary to verify the Contractor's temperature modeling. The "Materials Handout" will be made available 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. Secondary thermocouple trees shall be used adjacent to the primary trees to account for possible defective or damaged units, though only one set need be monitored. The average ambient air temperature and the average water temperature (if the concrete is placed with a face of the form exposed to water) shall also be recorded. Temperature readings shall be automatically recorded on an hourly basis and average ambient air temperature shall be calculated by averaging hourly job-site temperatures over a period of several days before and after specific concrete placements..

Temperature monitoring may be discontinued when the interior concrete temperature at any location within the concrete element being monitored minus the coldest nighttime air temperature adjacent to the element for the three previous consecutive days is less than the maximum allowable temperature differential determined in the Contractor's thermal control plan. Upon evidence of consistent reliability of the primary thermocouple trees at the first 10 mass concrete placements, the requirement for redundant thermocouple trees may be reduced or eliminated at the discretion of the Engineer.

Wiring from thermocouples that must be cast into the concrete shall be protected in steel or plastic conduits that are securely tied to the bar reinforcing to prevent movement. Wire runs shall be as short as possible. The ends of the thermocouples shall not come into contact with either a support or concrete form, or bar reinforcing steel.

Temperature monitoring equipment shall be capable of printing and data storage and shall be able to download monitoring data to a computer. Recording instruments shall be stored in a heavy duty tamperproof box and readings shall be downloaded daily and reported to the Engineer. During monitoring, should the maximum allowable internal temperature of the mass concrete be exceeded or the maximum allowable temperature difference between any surface of the mass concrete and the hottest portion be exceeded, the Contractor shall implement the contingency measures in accordance with his approved thermal control plan.

Working drawings for the temperature monitoring and recording system for each mass concrete placement shall include:

1. Type and description of equipment to be used in the temperature monitoring and recording system.
2. Detailed layouts for all thermocouples in each mass concrete placement.
3. Details to support the thermocouples at fixed locations and precautions to be taken so that the support, reinforcement, or type of concrete forms do not influence results of the temperatures by acting as a heat sink.
4. Details of computer printout spreadsheet and graphs for temperatures at each thermocouple and temperature differentials between thermocouples for each typical mass concrete placement.

The records and graphs of the temperatures and temperature differentials for each mass concrete element placed shall be signed by the Contractor's engineer, and a copy of the record shall be delivered to the Engineer at the end of each day of the monitoring period starting on the day after the mass concrete placement has been completed. At the completion of monitoring, the actual readings for the mass concrete element shall be compared with those predicted by the modeling and a summary report prepared by the Contractor's Engineer. The report, signed by the Contractor's engineer, shall include all supplementary or contingency measures implemented and suggested corrections to any future modeling or monitoring to be performed. The summary report shall contain all the temperature data collected for each instrument, both in hardcopy and in a digital form on diskette. Digital data shall be in Microsoft Excel format or as otherwise approved by the Engineer. The summary report shall also have the data shown in a graphical format with all instruments for a given mass concrete element shown on the same page with time as the horizontal axis. The summary report shall be submitted within one week of completing the monitoring of the mass concrete element.

Post-Cooling System for Mass Concrete–

The Contractor shall design and install a post-cooling pipe system when either of the following conditions are met:

CONDITION A. At the first mass concrete placement for each typical placement.
CONDITION B. As determined by the Contractor's temperature control plan for each typical mass concrete placement.

For Condition A only, if the Contractor meets the acceptance criteria on the initial typical mass concrete placement without the use of coolant circulation, installation of a pipe cooling system will not be required for the remaining elements represented by that typical mass concrete placements provided the environmental conditions remain within the assumed values.

If the Contractor's design calculations for a typical placement determine that a cooling pipe system is not necessary to control internal concrete temperatures, then the Contractor shall design and install a cooling pipe system to provide minimal cooling capacity. Minimal is defined as cooling pipe system that will reduce temperature gradient by at least 5 degrees C.

If the post-cooling system is required by the Contractor’s design calculations for a typical placement, the Contractor shall design and install a post-cooling system. Where placing concrete in lifts is required by the Contractor’s thermal control plan, attention is directed to “Concrete Structures” of these special provisions for water blasting preparation of construction joints at locations where epoxy coated bar reinforcing is being used.

Additional requirements in the working drawing when a post-cooling system is required:

1. Detailed layout of proposed embedded cooling pipe system, including pipe spacing, coolant temperature and rate of flow, and approximate duration of cooling.
2. Item list of embedded cooling pipe system materials. Details to support the cooling pipes at fixed locations.

If the contractor uses an embedded cooling pipe system, the following elements are required:

1. Forms shall be designed so that shutdown of cooling or temperature recording activities is not necessary if forms are removed.
2. The Contractor shall provide thermometers to measure coolant temperatures at supply and return manifolds.

Cooling pipes may be polyvinyl chloride (PVC) or steel pipes or some other material, but shall not be aluminum, copper or any other dissimilar metal that can cause a corrosion cell with the steel reinforcing. Surface connections to the cooling pipes shall be removable to a depth of 100 mm after they are no longer needed. Cooling pipes shall be satisfactorily secured to bar reinforcing steel to prevent movement or damage during mass concrete placement.

Cooling water may be sea water. If sea water is used it shall be filtered to remove sediment which could clog the pipes or control valves. The Contractor shall conform with local, state, and national environmental codes for the discharge of cooling water into the Bay.

Prior to the placement of the mass concrete, the cooling pipe system shall be pressure tested by the Contractor in the presence of the Engineer for leaks at 120 percent of the maximum pressure it will receive during use. The test pressure shall be held for 15 minutes. All leaks shall be repaired and the cooling pipe system retested by the Contractor in the presence of the Engineer until satisfactory results are obtained.

Construction.—

The Contractor shall install the thermocouples, temperature monitoring and recording systems, thermocouple supports, and formwork in accordance to the approved working drawings and design calculations in the Thermal Control Plan and as required by these special provisions.

The post-cooling temperature monitoring and recording systems shall be inspected on a daily basis and a report shall be issued in writing on the status of each system. A copy of the daily reports shall be available at the site of the work at all times. Should an unplanned even occur, the Contractor shall take action immediately to correct or remedy the occurrence and report same, in writing, to the Engineer.

In addition, the following requirements shall apply to coolant circulation:

For CONDITION A, coolant circulation shall be activated as determined by the Contractor, unless otherwise directed by the Engineer.

For CONDITION B, coolant circulation shall either have the coolant circulation in progress or the cooling pipes shall be filled with coolant at the time concrete placement begins. The Contractor shall state in the working drawings at what time or what temperature the coolant shall be circulated.

After the mass concrete pour has been topped out and finished it shall be revibrated and refinished. Revibration shall extend below the top mat of reinforcement and shall be done as late as the concrete will again respond to vibration. For concrete pours without top reinforcement, revibration shall extend to a depth of 150 mm.

During the period of early heat generation and temperature rise, pipe cooling shall be carried out as vigorously as the system permits. In general, when the mass concrete has reached its peak temperature, cooling shall be continued at a rate such that internal cracking from excessive temperature differentials between the cooling pipe temperatures and the surrounding concrete is prevented. For cooling systems that rely on a non-uniform distribution of cooling pipes at the top, bottom or side of the mass concrete placement, the concrete temperature drop shall not exceed $0.6^{o}C$ per day. When this desired rate of temperature change is exceeded, post-cooling operations shall be stopped until the temperature rises again. Cooling shall resume when concrete temperature exceeds the initial peak temperature and is predicted to continue to increase to unacceptable levels. Where the Contractor's cooling pipes are evenly distributed (and spaced) within the mass concrete placement, the cooling can be performed at a faster rate than $0.6^{o}C$ per day, however, cooling shall still be performed in a manner that does not produce internal thermal cracking, in accordance with the Contractor's thermal control plan.

After cooling has been completed and the cooling pipes are no longer needed, they shall be thoroughly flushed with potable water and grouted full with the same grout and the same procedures as required for filling prestressing tendons in "Prestressing Concrete" of these special provisions.

After surface connections to the cooling pipe are removed, the holes shall be prepared and filled with nonshrink grout in the same fashion as the pocket recesses for the high strength rods in "Prestressing High Strength Rod" of these special provisions. Nonshrink grout for filling the recesses shall conform to "Nonshrink Grout" of these special provisions.

Acceptance Criteria for Mass Concrete—

Failure to meet the maximum temperature requirements herein for any placement of mass concrete will be cause for rejection of that mass concrete. In addition, cracking in mass concrete in excess of that specified herein, will be cause for the Engineer to suspend further work on members of similar size and configuration; and to require from the Contractor an explanation of the thermal cracking, and that additional steps be taken in the future to eliminate excessive cracking.

If the Contractor fails to meet any of the mass concrete acceptance criteria specified herein, as determined by the Engineer, the typical mass concrete element placement will be rejected on the basis that the internal temperature of the mass concrete and attendant volume change was not controlled adequately.

The Contractor shall remove all equipment and materials from the mass concrete element and clean the surfaces as necessary for the Engineer to measure the surface crack intensity. Surface crack intensity will be determined after monitoring shows the maximum internal temperature has dropped to within 5°C of the average outer concrete temperature. Cracking shall be considered excessive if a surface crack intensity on any face of a concrete surface, where cracks greater than 0.15 mm in width, measure more than 1.0 m in cumulative length within any 2m square area. If the Engineer suspends work due to excessive cracking, the Contractor shall submit proposed modifications in writing to the Engineer for review; concreteing may not resume without the approval of the Engineer of the proposed modifications.

In addition, thermal cracking (cracks greater than 0.15 mm in width) shall be repaired using pressure injected epoxy. Prior to epoxy injection, cracks shall be cleaned of all loose material. All portions of the cracks which are wider than 0.1mm shall be completely filled with epoxy.

Core drilling may be necessary, as determined by the Engineer and at the Contractor's expense, to sample and examine the extent of the cracking and or crack repairs. The minimum depth of core sampling for mass concrete will be 0.6 meters and the number of cores taken per mass concrete element shall be in accordance with ASTM Designation: C 823. Prior to coring, the Contractor shall identify the location of the main reinforcing steel. The holes shall be cored by methods that will not shatter or damage the concrete adjacent to the holes. Water for core drilling operations shall be potable water. Immediately after coring, the concrete cores shall be identified by the Contractor with a description of the core locations and submitted to the Engineer for inspection.

If any reinforcement is cut during coring, coring operations shall be terminated, and the Contractor shall submit to the Engineer for approval, the procedure proposed to repair the cut reinforcement and to prevent further cutting of reinforcement. All cored holes shall be filled with nonshrink grout conforming to "Nonshrink Grout," of the these special provisions. Cracks not showing full penetration with epoxy shall be reinjected

LIGHTWEIGHT CONCRETE

Lightweight concrete shall be composed of portland cement, lightweight coarse aggregates, normal weight fine aggregates, admixtures, and water, proportioned and mixed in accordance with the requirements of ACI 211.2, “Standard Practice for Selecting Proportions for Structural Lightweight Concrete,” as specified in these special provisions. Portland cement, water, and admixtures used in lightweight concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

For lightweight concrete only, the 2nd paragraph of Section 90-6.02, “Machine Mixing,” of the Standard Specifications is amended to read:

· The temperature of mixed lightweight concrete, immediately before placing, shall be not less than 10°C nor more than 25°C. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C. If ice is used to cool the concrete, discharge from the mixer will not be permitted until all ice is melted.

For lightweight concrete only, the first sentence of the 2nd paragraph of Section 90-9.01, "General," of the Standard Specifications is amended to read:

· The compressive strength of concrete will be determined from test cylinders which have been fabricated from concrete sampled in accordance with California Test 539, except that the cylinders shall be 102 x 203 mm. Compressive strength acceptance of lightweight concrete shall be based on 102 x 203 mm cylinders.

Concrete for the superstructure between the pier tables (except Frame 4 superstructure) and for the edge beam shall be lightweight concrete.

The fine aggregate portion of the lightweight concrete mix shall consist of normal weight natural sand conforming to the requirements of ASTM C 33 or normal weight manufactured sand fine aggregate, or a combination thereof, as required to comply with the equilibrium density requirements of these special provisions.

The Contractor may propose use of a chemical admixture to reduce shrinkage in lightweight concrete in accordance with Section 90-4, "Admixtures" of the Standard Specifications and these special provisions. The shrinkage reducing admixture shall be submitted for approval by the Engineer in accordance with Section 90-4.03, "Admixture Approval," of the Standard Specifications. Proportioning and dispensing of the shrinkage reducing admixture shall be in accordance with the manufacturer's written recommendations.

Attention is directed to "Segmentally Erected Superstructure" of these special provisions for pre-28-day compressive strength requirements for lightweight concrete used in the superstructure. Lightweight concrete shall have not less than the 28-day compressive strength shown on the plans. Lightweight portland cement concrete shall contain chemical and mineral admixtures in accordance with Section 90-4, "Admixtures," of the Standard Specifications. The water to cementicious material ratio shall not exceed 0.40. Lightweight concrete shall contain air entraining admixtures in accordance with Section 90-4.06, "Required Use of Air-entraining Admixtures," of the Standard Specifications. The air content of lightweight concrete shall not exceed 8.0 percent.

Prequalification by the submission of certified independent laboratory test data and 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. In addition to design for strength, the lightweight concrete mix for the segments and edgebeam shall be designed to achieve the following additional properties:

Modulus of Elasticity-The modulus of elasticity of lightweight portland cement concrete shall be at least 23,440 MPaat 28 days when tested in accordance with ASTM C 469. The samples shall be moist cured for seven days, followed by air drying at 23^{o}C and 50% relative humidity until test age. The modulus shall also be reported at 3, 7 and 90 days. Test results shall be based on the average of three test specimens at each age. All specimens in a given sample shall be taken from the same batch of concrete. Full size sample cylinders shall be used for all modulus of elasticity tests except that companion compressive strength shall be determined from 102 x 203 mm cylinders.

Creep-The specific creep coefficient, as determined in accordance with ASTM C 512, after 365 days of loading, shall not exceed 70 millionths/MPa. The test cylinders shall be loaded at 28 days to a stress of 20 to 40% of the 28-day design compressive strength shown on the plans. For submittal of prequalification data, coefficients after 28, 56 and 90 days of loading shall be submitted and used to predict the coefficient at 365 days based on the procedures of CEB-FIP Model Code for Concrete Structures, by the Comite Euro-International de Beton. Approval of the mix design shall be contingent upon the 365-day creep coefficient satisfying the stated requirement.

Shrinkage-The shrinkage strain of lightweight Portland cement concrete shall not exceed 0.05% after 180 days of drying in accordance with ASTM C 157. Sample size shall be 100x100x285 mm. The samples shall be moist cured for 7 days followed by air drying at 23^{o}C and 50% relative humidity.

Tensile Strength-The tensile strength of lightweight portland cement concrete shall be not less than 3.2 MPa at 14 days, 3.4 MPa at 28 days and 3.6 MPa at 90 days when tested in accordance with ASTM C 496. The samples shall be moist cured for 7 days followed by air drying at 23^{o}C and 50% relative humidity until test age.

The prequalification data or reports required herein and the proposed mix design, , shall be furnished to the Engineer, in writing, not less than 150 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. The equilibrium density of lightweight concrete furnished for each mix design used shall be a single density, selected by the Contractor, within the limits of 1922 kilograms plus 0 or minus 80 kilograms per cubic meter. The Contractor shall furnish certified copies of the manufacturer's test reports showing the fresh concrete density that is anticipated to result in the equilibrium density selected by the Contractor. The density of fresh concrete produced for use in the work shall not vary from the density shown in the test report by more than 65 kg per cubic meter nor shall it exceed 2002 kg per cubic meter. The density of fresh concrete shall be determined in conformance with the requirements in California Test 518. The equilibrium density shall be determined in conformance with the requirements in ASTM Designation: C 567, except that the drying time shall be 112 days.

Lightweight aggregate shall conform to the requirements in ASTM Designation: C 330, and the following requirements:

A. Lightweight aggregates shall be rotary kilnexpanded shale, clay or slate The 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. Lightweight aggregates shall have not more than 5 percent loss when tested for soundness in conformance with the requirements in California Test 214.
D. Natural sand and manufactured sand fine aggregates shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications.
E. The lightweight aggregate manufacturer shall have an established and documented quality control program. Documentation of the quality control program shall be submitted as a part of the Contractor's "Lightweight Concrete Quality Control Plan."

Proportioning of lightweight concrete shall conform to the provisions in Section 90-5, "Proportioning," of the Standard Specifications and to these special provisions.

All 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. For lightweight aggregate, the following minimum pre-wetting or presaturation procedures shall be followed:

The lightweight aggregate shall be uniformly sprinkled with water, either by continuous or intermittent methods for seven days in advance of concrete placement. Water sprinkling shall be discontinued for 12 hours preceding the incorporation of the lightweight aggregate into the respective mix. However, the stockpile shall be monitored, and when necessary top-dressed to maintain the surface zone moisture content consistent with the material beneath the surface zone. Lightweight aggregate shall be used in a uniform damp condition. Where practical, the entire inventory shall be stockpiled and conditioned before the initial placement to promote uniformity. If after 5 days of water conditioning, the Contractor can demonstrate to the Engineer, that the lightweight aggregate exhibits an internal moisture of at least 15 percent (or the maximum saturated surface dry absorption for the aggregate in accordance with ASTM Designation: C 127), the seven day conditioning period may be reduced accordingly.

Portland cement, aggregates, water, and admixtures shall be proportioned to produce lightweight concrete containing not less than 350 kg nor more than 600 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. The penetration requirements in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications shall not apply to lightweight portland cement concrete. Penetration shall in accordance with the Contractor's approved mix design. 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 8.0 percent. The proportions shall be such that the concrete will meet or exceed the strength shown on the plans or specified in these special provisions.

The air content of the freshly mixed lightweight concrete will be determined in conformance with the requirements in ASTM Designation: C173.

Fine aggregate 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.

"Mixing and transporting lightweight concrete shall conform to the provisions in Section 90-6, "Mixing and Transporting," of the Standard Specifications and the following:

1. When lightweight concrete is pumped, a steel pump line at least 125mm in diameter without reducers is recommended, but not required.
2. The Contractor shall pay special attention to proper vibration techniques to avoid segregation of the concrete. Larger diameter vibrators operating at lower vibration amplitudes may be required to achieve proper vibration of lightweight concrete. A training class and practice vibration session for the Contractor's workers and for the State's Inspectors shall be held prior to placement of the first production lightweight concrete. The training class shall include actual practice vibrating using the approved lightweight concrete mix and the type of vibrators proposed for use in production. Vibrating techniques shall be demonstrated on the test blocks and on the practice placement cubes."

The Contractor's attention is directed to the need to determine proper mixing techniques for lightweight concrete so that a uniform non-segregated mix can be obtained. The use of "slurry mixers" where the sand, water and cement are mixed first and then the coarse aggregate is added, is encouraged but not required.

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.

Testing Lightweight Concrete

Lightweight concrete testing shall be performed by the Contractor's independent test laboratory. All certified test results shall be furnished to the Engineer within one week from the time of the performance of each test. The laboratory shall be ACI certified and approved by the Engineer. In addition to the requirements of Section 90-9, "Compressive Strength," of the Standard Specifications, lightweight concrete for the superstructure shall have the following additional testing performed by the Contractor's independent testing laboratory:

For each set of lightweight concrete cylinders taken for strength testing, three additional companion cylinders shall be taken to determine the equilibrium density of the lightweight concrete. Testing of two of the cylinders for equilibrium density shall be in accordance with ASTM Designation: C 567, except that the equilibrium density shall be reported at 28, 56, 84 and 112 days for each cylinder. The third cylinder shall be utilized to calculate the approximate equilibrium density using the oven-dry density in accordance with Section 9.2, "Calculation of Approximate Equilibrium Density," of ASTM Designation: C 567.

For each set of lightweight concrete cylinders taken for strength testing, three additional companion cylinders shall be taken to determine the air-dry unit weight of the lightweight concrete. Testing of two of the cylinders shall be in accordance with ASTM C 567, except that the cylinders shall be dried for additional time and the dry unit weight reported at 28, 60 and 90 days for each cylinder. The third cylinder shall be tested in accordance with Section 9, "Calculations and Reporting for Rapid Information," of ASTM C 567.

Three samples taken from the first segment of each cantilever shall be tested for modulus of elasticity in accordance with ASTM C 469-94, "Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression." The results shall be reported as an average of the three samples. Samples shall be moist cured for 3 days and then tested to determine 3 day results.

Two samples taken from the first segment of each cantilever shall be tested for creep in accordance with ASTM C 512-87 (Reapproved 1997), "Standard Test Method for Creep of Concrete in Compression." Creep data shall be presented both as specific creep(creep strain/applied creep load) and creep coefficient(creep deformation as a ratio to initial elastic deformation). The test cylinders shall be loaded at 28 days to a stress of 20 to 40% of the 28-day design compressive strength shown on the plans. Coefficients after 28, 56 and 90 days of loading shall be submitted and used to predict the coefficient at 365 days based on the procedures of CEB-FIP Model Code for Concrete Structures, by the Comite Euro-International de Beton.

Samples taken from the first segment of each cantilever shall be tested for shrinkage in accordance with ASTM C 157. Sample size shall be 100x100x285 mm. The samples shall be moist cured for 7 days followed by air drying at 23^{o}C and 50% relative humidity.

Three full size 150 x 300 mm and three 102 x 203 mm reserve cylinders shall be taken for each segment placed. The cylinders shall be stored at the bridge site and shall be kept for the duration of the project. Cylinders shall be stripped from their molds when formwork at the corresponding segment is stripped. Thereafter specimens shall be stored on site protected from direct rain and sunlight. Each cylinder shall be clearly identified as to segment number and date cast using permanent markers and they shall be stored in such a way that specific cylinders are easily retrievable. At the completion of the project any cylinders not requested by the Engineer shall become the property of the Contractor and shall be removed and disposed of as provided in Section 7-1.13, "Disposal of Material Outside the Right of Way," of the Standard Specifications.

Should the results of any modulus, creep or shrinkage test not satisfy the specified mix design requirements for two consecutive tests, all work involving lightweight concrete shall cease until the problem is identified and resolved to the satisfaction of the Engineer. For concrete already in place with failed test results, the Contractor shall propose remedial measures or shall remove the concrete represented by the failed tests. All costs associated with corrections to the lightweight concrete mix design, and or any remedial measures or removal shall be borne by the Contractor.

Should the results of any single 112-day equilibrium density test (based on sample cylinders) not satisfy the specified mix design requirements but not be more than 30 kg per cubic meter above the design equilibrium density, the Contractor shall, at the Contractor's expense, make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures before placing additional concrete, and shall pay to the State $50.00 for each structurally adequate in-place cubic meter of concrete represented by the deficient test. If the result of any single 112-day equilibrium density test (based on sample cylinders) is more than 30 kilograms but less than 60 kilograms above the specified equilibrium density, the Contractor shall make the corrective changes specified above, and shall pay to the State $100.00 for each structurally adequate in-place cubic meter of concrete represented by the deficient test. All concrete represented by a single test (based on sample cylinders) which indicates an equilibrium density above 1982 kilograms per cubic meter will be rejected in accordance with the provisions in Section 6-1.04, "Defective Materials.

If the sample cylinder test results indicate an air-dry unit mass greater than 1922 kilograms per cubic meter, 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 air-dry unit mass of the concrete placed in the work is less than the maximum specified air-dry unit mass. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in accordance with the specifications of ASTM Designation: C 42.

Lightweight Concrete Quality Control Plan

Prior to placing any lightweight concrete on the project, the Contractor, in coordination with the lightweight concrete supplier (and his supplier of the lightweight aggregate), shall submit to the Engineer the manufacturer's lightweight concrete quality control plan for review and approval. The plans shall address all aspects of the lightweight concrete production from transportation of the aggregates to mixing and transportation of the lightweight concrete. The plan shall be developed to maintain consistent lightweight concrete properties and workability under various environmental conditions and shall include flowcharts showing the procedure for adjusting the mix design should properties not meet those required in these special provisions.

The manufacturer's Quality Control Manual (QCM) for the production of lightweight concrete shall include the following:

1) The pre-production procedures for the qualification of materials and equipment; including requirements for testing and reporting of lightweight aggregate gradation, dry unit weight and wet unit weight both before and after transporting from the manufacturing facility;
2) The methods and frequencies for performing all quality control procedures during production; including the daily sampling procedures for determining the wet unit weight of the lightweight aggregates in the lightweight aggregate stockpiles;
3) The calibration procedures and calibration frequency for all equipment;
4) A system for the identification and tracking of placements of lightweight concrete. The system shall have provisions for identifying the location of the concrete in the structure of represented by each set of samples taken.
5) An outline of the daily production log for the production of lightweight concrete shall be kept by the manufacturer for each day of production. The log shall clearly indicate the cement and additive lot numbers, the aggregate sources, the batch ticket numbers, the ticket numbers of the batches where samples were taken, including tracking of all tests and results of all tests performed.

The quality control plan shall be submitted to the Resident Engineer's Office, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. For initial review, 5 sets of drawings and calculations shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted for final approval and use during construction.

Lightweight Concrete Preplacement Conference

At least two weeks prior to the placement of the first lightweight concrete on the project, a mandatory preplacement conference shall be held with the Contractor, the lightweight concrete supplier, the Contractor's Independent Testing Laboratory, the Engineer, the State's inspectors and any other parties involved with the lightweight concrete for the project. The Contractor shall present his plans for furnishing, placing, sampling and testing of the lightweight concrete in accordance with the requirements of these special provisions. The preplacement conference shall be followed with a practice placement as outlined herein. At the conclusion of the practice placement, the group shall meet again and discuss the results of the practice placement. The Contractor shall make changes to his procedures (documented in writing) for any problems noted by the Engineer during the practice placement prior to placing any lightweight concrete in the superstructure.

Practice Placement

The Contractor shall demonstrate his capability to deliver and place lightweight concrete in accordance with these special provisions prior to placing any permanent lightweight concrete into the bridge superstructure. Practice placement of lightweight concrete shall utilize the same delivery and placing equipment as shall be used in the actual work and shall use the same mix as approved by the Engineer. As a minimum, two one cubic meter lightweight concrete cubes shall be cast. The cubes shall have bar reinforcing in them with a similar density to the most dense reinforcing in the lightweight concrete areas with covers matching those shown on the plans for the girder webs and soffit. The cubes shall be located at the top of the first pier table where the first segmental construction is to begin.

If lightweight concrete is to be pumped, the air content, penetration, and unit mass shall be measured before and after pumping of the practice lightweight concrete placement. Twelve sample cylinders shall be taken for each cube cast: six before pumping and six after pumping. The lightweight concrete penetration as sampled after pumping or transporting to the top of the pier shall conform to the Contractor's approved lightweight concrete mix design. The compressive strength at 3 and 7 days, based on an average of 3 breaks, shall be reported to the Engineer for approval. Pumping of lightweight concrete for the actual superstructure shall not be allowed until the Engineer approves the pumping procedure, equipment and compressive strength results of the practice placement.

The sample cubes shall be stripped and inspected for rock pockets and lightweight aggregate segregation. If the Engineers reject the practice cubes, placement procedures or strength results, the Contractor shall repeat the practice placement, at the Contractor's expense, until acceptable results are obtained. The sample cubes shall become the property of the Contractor and shall be removed and disposed of as provided in Section 7-1.13, "Disposal of Material Outside the Right of Way," of the Standard Specifications.

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.

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)	11×10^3 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	$110\ 300\text{-}2.62(L/r)^2$ 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	83 000	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
	Ld/bt	
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 20.7×10^4 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 x 10^3 mm^3, or sound timbers with a minimum section modulus about each axis of 4.1 x 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
Portion of Frame 1 to be cast on falsework(from contract beginning to middle of Span 15)	6
Frame 4	6

The Contractor's falsework may not be supported within the Rhodia Treatment Plant Property limits. However, stringers and cap beams may protrude into the air space above the property provided 1.0 meters of vertical clearance is obtained above these facilities. Falsework near this facility shall conform to the details shown on the plans.

The Contractor's attention is directed to the existing Rhodia water sampling wells in the vicinity of Pier 4. The Contractor's falsework supports shall not be placed within a 3 meter radius of any wells. In addition, access to these wells shall be provided at all times should sampling need to be performed.

Falsework for the pier footings may be supported from the top of the piles (2.5 m permanent steel casings). Falsework shall not be supported by welding or bolting connections to the permanent steel casings below the bottom of footing. Circular clamp-on collar supports which are not permanently attached to the permanent steel casings, may be used below the bottom of footing elevation to support falsework. Falsework and supports shall be sufficiently rigid to support the full weight of falsework, footing Stage 1 concrete, "starter" pier reinforcing steel cage, and construction live load acting on the footing. The falsework shall be such that there is no measurable vertical displacement between any piling and the footing since such displacement could damage the integrity of the grouted joint between the piles and steel ring sleeves.

The Contractor's attention is directed to the permits the State has obtained for construction this project. Falsework shall meet all the requirements of these permits.

SEGMENTALLY ERECTED SUPERSTRUCTURE

Portions of the bridge superstructure, as shown on the plans, shall be constructed using cast-in-place cantilevered segmental construction with form travelers. Cast-in-place segmental construction shall conform to the requirements in these special provisions.

Definitions.-- The following definitions shall apply to segmental bridge construction:

1. Segment: refers to a unit of the superstructure that is cast between two vertical construction joints. The cross section and length of the segments are detailed on the Plans.
2. Pier Table: refers to a segment located directly on top of the pier.
3. Balanced Cantilever Construction: is a method by which the segments are sequentially cast alternately on either side of a pier in cantilever to a point where a closure is cast-in-place or a hinge is constructed.
4. Form traveler: is a movable form truss used to support the formwork and cast the concrete of the segments.
5. Camber: is the vertical dimension added or subtracted to the geometric profile grade that shall be set at the time of casting a new segment, or to counter the deformations of the superstructure at different construction stages to control the construction geometry to achieve the theoretical profile after the final deformations have taken place, including residual camber. The determination of camber values and erection elevations are dependent upon the Contractor's erection sequence, schedule, construction loads, prestressing scheme and achieving the material properties as specified.

Contractor's Personnel.--

The Contractor shall provide the various professional engineering functions in order to effectively carry out the responsibilities assigned to him by requirements contained in these special provisions including providing technician level functions in conjunction with geometry control activities during casting of segments on the bridge. The Contractor's personnel shall conform to the following:

Contractor's Engineer- The Contractor's Engineer shall be a professional engineer registered in the State of California who has specific knowledge of and experience in the design and construction of concrete segmental bridges erected using balanced cantilever techniques. This may be a professional engineer who is an employee of the Contractor or a consulting engineering firm under contract to the Contractor. The Contractor may utilize more than one person or firm to provide these services.

The Contractor's Engineer shall be responsible for carrying out all engineering services required to construct the bridge in accordance with the plans and specifications. He shall also be responsible for the monitoring of any engineering services developed by him during construction of the bridge. The Contractor's engineer shall be intimately familiar with the Contractor's Form Traveler Operation Manual, Geometry Control Manual, and Camber Control Manual.

The Contractor's Engineer shall witness and supervise important milestones in the work. As a minimum, the Contractor's Engineer shall witness and be present for the following items of work:

a. During first time erection and first time moving of the form travelers.
b. During in-place friction testing of tendons.
c. During the construction of the first balanced cantilever until the travelers have been moved to another pier.
d. During the start up of any critical operation such as post-tensioning and grouting of tendons.

The Contractor's Engineer shall be available on a one hour notice to discuss occurrences by telephone on any day when the following activities are underway at the job site:

a. Casting of segments.
b. Post-tensioning of tendons.
c. Grouting of tendons.
d. Each time the form traveler is moved.

Within 10 days after award of contract, the Contractor shall submit in accordance with Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, evidence which establishes, to the satisfaction of the Engineer, that an employee or consulting engineering firm he proposes to designate as the Contractor's engineer has the qualifications set out herein. No work requiring involvement of the Contractor's engineer shall be started until the Engineer has reviewed this submittal, and responded with written acceptance of the proposed Contractor's engineer for this project. A written acceptance or denial of the proposed Contractor's engineer shall be provided by the State within 30 days of receiving the Contractor's submittal. Should the Contractor elect to utilize a different engineer or consulting engineering firm as the "Contractor's engineer" during the course of the work, the Contractor shall resubmit new qualifications for approval.

Geometry Control Technician(s).--The Contractor's personnel responsible for carrying out geometry control activities during casting superstructure segments shall possess the skills and prior experience in the specific type of work necessary to effectively control the final geometry of the bridge. The Contractor may utilize more than one person to provide these services.

The Contractor's geometry control technicians shall carry out all geometry control during casting of the segments. The Contractor's geometry control technicians shall be intimately familiar with the Contractor's Form Traveler Operation Manual, Geometry Control Manual, and Camber Control Manual.

Prior to beginning any work which requires superstructure geometry control measurements, the Contractor shall submit, in accordance with Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, complete information establishing the control activities and qualifications of his/her geometry control technician(s). The minimum qualifications for a geometry control technician shall be: hands-on experience controlling geometry on three long span (greater than 120m span) cast-in-place balanced cantilever segmentally erected bridges. Only technicians whose qualifications have been approved by the Engineer shall be assigned to carry out geometry control activities. A written acceptance or denial of the proposed geometry control technician(s) shall be provided by the State within 30 days of receiving the Contractor's submittal. Should the Contractor elect to utilize a different person(s) as the "geometry control technician(s)" during the course of the work, the Contractor shall resubmit new qualifications for approval.

General

The form travelers shall be supported by previously erected portions of the superstructure, as shown on the plans.

Alternatives other than cast-in-place cantilevered segmental construction, for portions of the bridge shown to be segmentally constructed, will not be considered. Segment construction equipment and methods proposed for use by the Contractor shall be consistent with the concepts and erection sequence shown on the plans in order to ensure compatibility with the overall design. Any deviation from the construction concepts presented on the plans will require reanalysis (and redesign) to insure the structural adequacy of the bridge for construction, service and ultimate loadings. The Contractor's attention is also directed to the requirements for submitting cost reduction incentive proposals elsewhere in these special provisions.

The Contractor's attention is directed to "Prestressing Concrete" and "Lightweight Concrete" of these special provisions and to Section 51-1.11, "Construction Methods," of the Standard Specifications for additional materials and installation requirements not included herein. The Contractor's attention is directed to "Progress Schedule (Critical Path)" for requirements on submitting the Contractor's proposed segmental construction sequence.

Contractor's Qualifications

Experience in constructing multi-span cast-in-place prestressed concrete segmental bridges with form travelers is highly desirable and will be an important factor in determining the Contractor's qualifications to perform the project. Responsible experience and qualifications of the Contractor's authorized representative, as designated in accordance with Section 5-1.06, "Superintendence," of the Standard Specifications, in the use of form travelers for cast-in-place construction work is also highly desirable and will be an important factor in determining the Contractor's qualifications to perform the project. The bidder's attention is directed to Section 2-1.03, "Pre-Award Qualification Questionnaire," Section 3-1.01A, "Pre-Award Meeting," and Section 3-1.01B, "Award and Execution of Contract," in these special provisions. The experience and qualifications of the Contractor's authorized representative, whether originally designated or as replaced by a subsequent designee during performance of the contract, will be subject to review by the Department in accordance with the considerations as specified in the "Pre-Award Qualification Questionnaire" of these special provisions and the "Pre-Award Qualification Questionnaire" in the Proposal and Contract book. Upon request by the Engineer, the Contractor shall provide the same information regarding any subsequent authorized representative as required to be provided for the original authorized representative as set forth in the "Pre-Award Qualification Questionnaire.

Reference Standards

The work shall be in accordance with the Standard Specifications, and with the applicable provisions of the 1989 AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges (hereinafter the "AASHTO Guide Specifications"), both as amended by these special provisions. These special provisions shall take precedence over the AASHTO Guide Specifications, when the provisions of these are clearly contradictory.

The following sections of Division II Construction Specifications of the 1989 AASHTO Guide Specifications shall be considered to be applicable: 2.7, 2.9, 4.3, 4.5.2, 4.5.3, 4.5.4, 5.0, 8.0, 9.0, 10.0, 11.0, 13.0, and 16.0. Other sections may be included by specific reference in other parts of these special provisions. Sections not included here or elsewhere may be considered to be not applicable; the subjects of these are treated in the Standard Specifications or elsewhere in these special provisions.

If the provisions of the various AASHTO Guide Specifications referenced above and herein are found to be conflicting with Caltrans Standard Specifications or these special provisions, the more stringent requirements will apply, as directed by the Engineer.

Construction Equipment

(A) Formwork. Forms shall conform to the requirements in Section 51-1.05, "Forms," of the Standard Specifications and the following special provisions:

Where sections of forms are to be joined, a maximum offset of 1.5 mm for flat surfaces and 4mm for corners and bends will be permitted.

Forms shall be checked and inspected by the Contractor prior to placing bar reinforcing into each segment to assure proper alignment and geometric accuracy is maintained. Forms which fail to meet the specified casting tolerances shall not be used until such corrections are made to produce segments within the specified tolerances.

(B) Form Travelers. Form travelers shall be designed, detailed, and fabricated in accordance with the applicable provisions of the AASHTO Standard Specifications for Highway Bridges and the AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges. Materials shall be in accordance with appropriate ASTM (or equivalent) specifications. Detailed design requirements are given in "Construction Requirements" of this section. The structural design of the Benicia Martinez Bridge and OH is based upon the construction equipment, equipment weight and construction loading shown on the plans. Redesign of the structure to accommodate construction equipment loadings other than those shown on the plans will be the responsibility of the Contractor; see "Cost Reduction Incentive Proposals For Cast-In-Place Segmentally Constructed Bridges" of these special provisions. Attention is also directed to the temporary vertical and horizontal clearance requirements for construction above the shipping channels of the Carquinez Straits.

(C) Tower Cranes. The Contractor's attention is directed to Section 51-1.11, "Construction Methods," of the Standard Specifications and these special provisions. If tower cranes are utilized on the piers to construct the cantilevers or other portions of the structure, redesign of the structure to accommodate construction equipment other than that shown on the plans will be the responsibility of the Contractor; also see "Cost Reduction Incentive Proposals For Cast-In-Place Segmentally Constructed Bridges" of these special provisions.

If tower cranes are used on the piers, the Contractor shall submit complete calculations in accordance with "Submittals" following in this special provision. The calculations shall demonstrate that the pier construction stresses as shown in Table 8-1 of the AASHTO Guide Specifications are not exceeded.

(D) Pier Table Struts. The Contractor shall design and construct pier table struts at all piers shown on the plans to require struts. The pier table strut locations, forces and stiffnesses shown on the plans are based on the assumed construction sequence shown on the plans. If the Contractor changes the construction sequence, pier table struts may or may not be needed to reduce the construction stresses during erection of the superstructure. Attention is directed to the allowable construction stresses shown in Table 8-1 of the AASHTO Guide Specifications. Pier struts may only be supported on the tops of the pier footings. Pier struts will not be allowed off of the pier caps in the waters of the Carquinez Strait. The pier struts shall be designed in accordance with the requirements in Section 51-1.06, "Falsework," of the Standard Specifications and these special provisions. Connections shall be designed to carry tension and compression forces such that the superstructure and pile cap are not adversely affected locally or globally. Connections to the footing and superstructure shall be designed for 150% of the tension force shown on the plans and shall be actively pretensioned to 150% of the tension forces shown on the plans. Local strengthening of the pier tables and pile caps may be required to accommodate the Contractor's pier table struts. Pier table struts shall be placed to load the pile caps and the superstructure soffit as shown on the drawings. Any modifications of the structure needed to accommodate the Contractor's pier table struts, including supporting calculations, shall be submitted as a part of the pier strut submittal to the Engineer for review and approval in

accordance with "Submittals" following in this special provision. Intermediate height braces to the piers will be allowed provided all attachments are removed to a depth of 100 mm and the concrete surfaces of the piers repaired to the satisfaction of the Engineer. If the Contractor's construction sequence requires additional or different pier table struts than those shown on the plans, the pier table struts shall meet the same requirements as the struts specified herein.

(E) Temporary Counterweights. The construction sequence shown on the plans utilizes both temporary and permanent counterweights. The location and magnitude of the temporary counterweights are shown in the drawings. Temporary counterweights are placed to balance the unbalanced load on a pier during construction or to mitigate the unwanted long-term effects of creep on the structure.

Temporary counterweights are defined as non-structural dead weight temporarily applied to the superstructure during construction. The Contractor shall provide temporary counterweights at all locations as shown on the plans. The magnitude and locations of the temporary counterweights shown on the plans are based on the assumed construction sequence also shown on the plans. The Contractor's construction sequence may or may not require temporary counterweights. Should the Contractor's construction sequence require temporary counterweights, they will meet the requirements set forth herein. The weight the counterweight may be achieved by any means provided that the location of the center of gravity of the counterweight is placed at the location shown on the drawings with respect to distance from the center line of the pier. Methods of applying and attaching a temporary counterweight to the superstructure are the responsibility of the Contractor and must be approved by the Engineer. The temporary counterweight must be placed or attached to the structure in a manner such that the superstructure is not adversely affected. Ideally, the temporary counterweights should apply the load to the webs of the superstructure. Complete structural details and calculations of temporary counterweights shall be submitted to the Engineer for approval in accordance with "Submittals" below.

Submittals

The Contractor shall submit to the Resident Engineer's Office, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," calculations, manuals and working drawings of the Contractor's cast-in-place segmental cantilever construction method. For initial review, 6 sets of such plans, manuals and drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the said Office for final approval and for use during construction. The working drawings and calculations shall be signed by a civil engineer registered in the State of California with proven experience in the design and construction of concrete segmental bridges erected using balanced cantilever techniques. This may be a professional engineer who is an employee of the Contractor or a consulting engineer under contract to the Contractor. The Contractor may utilize more than one person or firm to provide these services. Minimum design experience documentation of at least three cast-in-place balanced cantilever segmentally constructed bridges with spans greater than 120 meters shall be submitted with the Contractor's plans and working drawings.

Working drawings as required in this section shall be separated into several submittal packages for review as outlined in the following table. Review times for each submittal package shall be cumulative. Required submittals relating to this section but not mentioned in the table below may be submitted as a part of any of the submittals mentioned in the table, but the Contractor should note that if they are submitted separately they shall be treated as a separate submittal with a separate review time. 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 the time shown in the following table after complete drawings and all support data are submitted. The Contractor shall also submit, on a biweekly basis, a Preferred Segmental Submittal Review List which lists the Contractor's preferred submittal review order and review dates necessary to meet the construction schedule.

Submittal Name	Review Time(weeks)
Contractor's Designer Qualifications	2
Form Traveler Design	4
Preliminary Segmental Construction Sequence Drawings	8
Hinge Construction(Hinges A and B)	6
Hinge Construction(Hinges C and D)	6
Hinge Construction(Hinge E)	6
Design Calculations(Initial Frame) (Super and Sub-Structure) and Working Drawings. Note: initial frame must be either Frame 2 or Frame 3.	20
Design Calculations(Subsequent Frames) (Super and Sub-Structure) and Working Drawings.	16
Temporary Counterweights	4
Pier Table Struts	4
Form Traveler Operation Manual	4
Geometry Control Plan and Manual	4
Camber Calculations and Casting Curves	6
Tower Cranes (if used)-Superstructure and Substructure Design Calculations	12
Closure Locking Device	4

Working drawings and calculations for the Contractor's cast-in-place segmental cantilever construction method shall include as a minimum:

(A) Form Travelers. Design calculations and detailed drawings of the form travelers; showing loading assumptions and stresses in principal members; component lists with weights; detailed descriptions of methods of assembly, installation, operation, maintenance and removal; and a list of the standards to which the materials will conform. The submittal shall also include:

(1) Method of support of form travelers.

(2) Method of attachment of form travelers to previously completed portions of the structure, including step-by-step procedures for moving the form travelers and tensioning the temporary post tensioning bars.

(3) Control of traveler deflection during casting. The Contractor shall submit a casting plan to the Engineer for approval, showing the sequence of placing of the concrete in the form traveler, and the special measures to be taken, if any, to ensure the integrity of the segments as cast. Particular attention shall be given to the deflection under load of the form traveler.

(4) Casting plan to minimize distortion of segments being cast.

(5) Loads imposed on the structure throughout casting and moving operations, including impact and lateral loads.

The above shall be summarized in an "Form Traveler Assembly and Operation Manual." This shall include a detailed step-by-step outline of each construction activity and related form traveler operation, to be followed by field personnel during each phase of superstructure construction.

(B) Design Calculations. Design calculations for construction procedures, as required in Section 10.2 of Division II Construction Specifications of the AASHTO Guide Specifications. In addition, full superstructure, pier and footing design calculations shall also be provided conforming to the following:

The Contractor shall submit full allowable stress and ultimate strength calculations conforming to Caltrans' Bridge Design Specifications, to the procedures currently employed by the State, and to the project specific design criteria titled: "Design Criteria, New Benicia Martinez Bridge, Contract 59S742, Revision 3, dated June 2000 by T.Y. Lin International/CH2M HILL." Upon written request by the Contractor, the Engineer will provide superstructure and substructure live load and seismic forces as well as the maximum unbalanced loading forces on the piers.

The calculations shall include but are not limited to:

1. Calculations showing that the pier concrete stresses due to unbalanced cantilever loading do not exceed allowable stresses shown in Table 8-1, "Allowable Tensile Stresses for Construction Load Combinations" of the AASHTO Guide Specifications. Calculations including the effects of construction sequence and history as well as the effects of temporary construction loads. Calculations shall reflect the Contractor's choice of using deck grinding or the option polyester concrete overlay. Stresses for each segment shall be calculated and reported for the following intermediate construction stages:

2.

a. immediately after placing concrete in each segment
b. immediately after stressing cantilever tendons
c. immediately after releasing and launching for travelers
d. immediately prior to, and after, placement of closure concrete
e. immediately prior to, and after, stressing of the first stage post-tensioning through the closure prior to release of the closure formwork
f. immediately after the release of the closure formwork
g. following completion of continuity post-tensioning tendons
h. following completion of span post tensioning tendons
i. prior to and after all steps during hinge C and D construction
j. prior to and after removal of all struts and temporary counterweights
k. before and after any jacking (if jacking is utilized)

(C) Working Drawings. Working drawings, as required in Section 10.3 of Division II Construction Specifications of the AASHTO Guide Specifications. In addition, the following working drawings shall be submitted:

(1) Details and calculations for any localized strengthening for concentrated supports, loads or reactions from any special erection equipment to be placed in locations not already allowed for in the contract plans.

(D) Hinge Construction.

1.) Hinges C and D: Design calculations, detailed drawings and method of erection and operation of the support platform indicated on the plans as being required, including, support platform weights and design loadings during lifting of the steel box girders and steel plate girders. Support platform weight and load application points shall be as shown on the plans. The support platform connecting adjoining cantilevers during construction of the closure segments should allow for independent movement of the two cantilever tips and thus, both translational and rotational capability. The platform shall be designed for all loads and movements of the superstructure including but not limited to: thermal and wind loads and movements as well as alignment loads. Erection systems (to lift the support platform and steel box girder into place) shall be developed which maintain the stresses and deflections within those anticipated by the construction sequence shown on the plans or the Contractor shall submit modifications to the structure necessary to accommodate the proposed erection procedure. Calculations shall also be provided for the Contractor's method of lifting, transporting and positioning the steel plate girders.

2.) Hinge E: Design calculations, detailed drawings and method of erection and operation of a support system, including, support system weights and design loadings and points of load application to the structure. The support system connecting adjoining cantilevers during construction of the hinge closure segments shall be designed for all loads and movements of the superstructure including but not limited to: thermal and wind loads and movements. The support system shall maintain the stresses and deflections within those anticipated by the plans or the Contractor shall submit modifications to the structure necessary to accommodate the proposed support system.

(E) Geometry Control Plan. A geometry control plan shall be submitted conforming to the requirements of Section 8.2, "Geometry Control" of the AASHTO Guide Specifications, including the adjusting procedure to be utilized should the structure, as erected, deviate from the required horizontal or vertical alignment. The plan shall be supported by detailed drawings and calculations as well as details of the survey equipment that will be used. Calculations shall include a review of stresses which will result from misalignment corrections.

The above shall be summarized in a "Geometry Control Manual."

The working drawings shall include detailed camber calculations, tables, and diagrams (Camber and Casting Curves), indicating the predicted elevation of all segment joints at each stage of construction. The calculations shall consider the exact construction equipment to be used and the schedule to be followed, and shall follow the assumptions stated on the plans. Cambers and deflections shall be such that the structure vertical profile, after all the final structural (dead load and prestressing) and time-dependent (creep and shrinkage)deformations have taken place (assumed in the design to occur in 10 years), will correspond to the final design elevations shown on the plans plus the residual shown on the plans. The residual camber has been added to the camber shown on the plans using a reversing parabola form. The working drawing shall include the procedure for measurement of construction camber, including the effects of temperature on the measurements. The camber values shall be of sufficient accuracy to allow the determination of the check point settings for accurately casting the segments. The preparation of camber values shall recognize all deviations from straight line and deformations due to time related deformations, dead load, erection loads, post-tensioning stresses including secondary moments, creep and shrinkage.

The camber working drawings shall also make allowance (or be capable of revision) for possible changes in the construction schedule. They shall provide a step-by-step process to be followed to correct the camber in the event the predicted camber is not being achieved. The above shall be summarized in the "Geometry Control Manual."

As a part of the camber working drawings, the Contractor shall develop casting curves for each cantilever, which should graphically show how the final camber will be achieved.

(F) Check Points. The Contractor shall prepare a table of elevations and alignments required at each stage of construction, at the check points listed below:

a. Two alignment lines located directly above the top of each box girder web shall be required to establish vertical grade and superelevation. The pier table shall have six vertical check points; two at the centerline of the pier; and two at each transverse joint at the end of the pier table. All typical segments shall have two vertical check points at the transverse joint at the free edge of the segment.

b. One alignment line located along the longitudinal centerline of the bridge shall be required to establish horizontal alignment. The pier table shall have three horizontal check points; one at the centerline of the pier; and two at each transverse joint at the end of the pier table. All typical segments shall have one horizontal check point at the transverse joint at the free edge of the segment.

c. All check points shall be placed as close to the transverse joint face of the segments as is practical.

Elevations and alignments shall be checked on each cantilever of a pier at each construction step, i.e., after setting the traveler (a post-launch/pre-pour survey), after casting the segment, after post tensioning of the segment tendons, and after moving of the form traveler on the opposite cantilever. All geometry control hardware cast into any segments, such as elevation bolts and alignment hairpins, shall remain in place for reference and backchecking purposes. They may be removed after all cantilevers in a the same frame have been completed and joined.

(G) Jacking Details. The horizontal jacking force of zero shown on the plans is based on the construction sequence shown on the plans and on achieving the material properties specified herein. Horizontal jacking may be required if the assumed concrete properties in the design that were verified by the Contractor's trial mixes can not be achieved in the field. This should become apparent during the Contractor's concrete quality control testing program. The Contractor shall have all the necessary jacking equipment available for jacking should it prove necessary. Design calculations and detailed drawings of the horizontal jacking indicated on the plans as being required, as directed by the Engineer or as proposed in by the Contractor in his construction sequence, shall be submitted for approval. Horizontal jacking includes, in particular, that required to push frames or cantilevers apart during superstructure construction. Jacking details and modifications of the structure therefor, shall be designed by the Contractor and submitted to the Engineer for approval.

(H) Pier Struts. Design calculations shall include, as a minimum, the maximum and minimum strut design forces, maximum pier unbalanced moments and stresses with corresponding pier axial loads, superstructure and pile cap calculations for receiving and anchoring strut loads, calculations for the pier struts. Drawings shall include all strut details including sequence of installation, stressing and removal details.

(I) Temporary Counterweights. Complete design calculations for the temporary counterweights shall be submitted. Such design calculations shall include, as a minimum, the mass of the counterweight, the maximum pier unbalanced moments and stresses with corresponding pier axial loads, and superstructure stresses resulting from placement of the counterweights. Drawings shall include all counterweight details including location, counterweight attachment and/or placement details (including proposed equipment such as cranes) with loaded area and removal details. The working drawings for the counterweights shall include a detailed description of the placement and removal schedule for the counterweights that is tied directly to the exact operations (such as concrete placements and form traveler advances) in the segment construction schedule.

(J) Permanent Counterweights. Permanent counterweights are defined as non-structural dead weight permanently applied within the superstructure during construction. The contractor shall provide permanent counterweights at all locations shown on the contract drawings. Permanent counterweight details shall conform to those shown on the contract drawings unless otherwise approved by the Engineer. Permanent counterweights shall be constructed using structural concrete, bridge (f'c=35 Mpa). The magnitude and location of the counterweight is based on the assumed construction sequence shown in the drawings. Different materials and details may be used to provide the magnitude of load at the location required consistent with the contract drawings upon approval of the Engineer. The Contractor's construction sequence may or may not require a permanent counterweight. Should the Contractor's construction sequence require permanent counterweights, these counterweights will meet the requirements set forth herein. All changes to structure details and all revisions to permanent counterweights will be subject to Engineer's approval. Any changes to the permanent counterweights proposed by the Contractor will require submittal of complete structural details and calculations to the Engineer for approval. When concrete is placed as permanent counterweight, it shall be placed and cured in lifts to prevent overloading the bottom slab. The Contractor shall submit placing plans for concrete used as permanent counterweight. The placing plans shall detail the left heights and the times between lifts.

(K) Thermal Movement and Rotation Control at Closure Segments. The Contractor shall have all span and continuity tendons loaded with strand and prepared for stressing (anchorage heads and wedges in place) prior to placing concrete for the closure pour. Closure pour concrete placement shall commence in the early morning and only when increasing temperatures are predicted for the remainder of the day. Prestressing of span, continuity and transverse tendons in the closure pours shall be at the direction of the Engineer. As soon as the closure pour concrete in the deck has achieved a strength of 17 Mpa, or 12 hours, whichever comes first, , two continuity tendons, one in each web, shall be stressed. The two pairs to be stressed shall be the longest continuity tendons that pass through the closure location. Subsequent continuity and span tendons shall be stressed in the order directed by the Engineer based on expected strength gain of the Concrete. The Contractor shall prepare a work plan for the closure concrete placement and subsequent stressing. The work plan shall include the proposed hourly time line and sequence of placing concrete, breaking of cylinders, and stressing of tendons.

A locking device shall hold the cantilevers rigidly in correct vertical, transverse and longitudinal alignment during placement of the closure concrete. The Contractor shall submit details of the device, design calculations and methods of operation of a locking device for locking adjoining cantilevers to prevent relative rotation or movement during placement of concrete in the closure segments. The Contractor shall have crews available to stress tendons every few hours for the two days following placement of closure pour concrete. As a minimum and in addition to the requirements elsewhere in these special provisions, the Contractor shall cast 6 sets of two concrete cylinders at each closure for use in determining strength gain of the closure pour concrete.

The Contractor's work plan and locking device details and calculations, as well as any other closure procedures shall be submitted in a "Cantilever Construction Closure Procedure Manual."

(L) Segment Construction Cycle. Full details of the proposed segment construction cycle, if this differs from that proposed on the plans, with time required for each separate operation.

(M) Tower Cranes. Where the Contractor elects to use tower cranes, design calculations shall include, as a minimum, the crane lifting capacity and self weight (with maximum counterweights), maximum loads applied from the crane to the structure, maximum pier unbalanced moments and stresses with corresponding pier axial loads, pile cap and pier calculations for receiving and anchoring the tower cranes. The calculations shall include the wind loading effects from the crane to the piers. Drawings shall include all details for attaching the cranes to the piers and footings including erection and removal details.

(N) Contractor's Experience. Details of the Contractor's experience, as required in "Contractor's Personnel" of these special provisions.

(O) Preliminary Segmental Construction Sequence Drawings. The Contractor shall submit preliminary construction sequence drawings showing the sequence and timing for constructing the segmental portions of the structure (including tie in dates for the cast-on-falsework portions of the bridge). The drawings shall be similar to the “Construction Sequence” sheets in the plans, including hinge construction sequence and methods, except that they shall also include time in accordance with the Contractor’s submitted Baseline Schedule. In presenting the segmental time schedule, a tree-type of diagram plot shall be used where time is shown on the y-axis and the bridge elevation on the x-axis with the construction steps shown schematically under each cantilever. The Contractor’s form traveler, support platform and counterweight weights as well as assumed pier strut locations shall also be shown.

The Engineer's review of the above data will in no way relieve the Contractor of responsibility for the efficacy and safety of the construction methods and equipment employed, and for conformity of the completed structure to the plans and specifications.

Construction Requirements

(A) Elevations and Alignment. Throughout construction, the Contractor shall check the elevations and alignment of the structure against his/her calculated values and maintain a record of these checks, and of all adjustments and corrections made. Elevation and alignment shall be recorded at each joint for each stage of erection.

Corrective action shall be taken should the structure deviate from the required horizontal alignment by more than 25 mm at any point.

The Contractor's attention is directed to the need to carefully control and monitor the vertical geometry of the segmental construction so that the final profile can be obtained by grinding. Vertical geometry shall be corrected back to theoretical at each segment during construction of the cantilevers except that the maximum slope change between any two consecutive segments shall not exceed 0.003 radians unless otherwise approved in writing by the Engineer. If actual measured elevations consistently vary from the Contractor's predicted elevations, and if, in the opinion of the Engineer, the required profile may not be satisfactorily met, the Engineer may order the Contractor to suspend all cantilever construction work and thoroughly review the camber calculations and material properties. Before restarting cantilever construction, the Engineer and the Contractor's Engineer shall reach a consensus as to the cause of the deviations and the Contractor shall propose necessary adjustments. A record shall be furnished to the Engineer for review by the Engineer at the time each check is made. The Contractor shall also produce and maintain on a daily basis a graphical plot of the vertical and horizontal "as cast" alignments along each vertical and horizontal control line to an exaggerated scale in order to highlight variations. These shall be depicted against both the theoretical geometric vertical and horizontal alignments and casting curves on a continuous layout of an entire unit of the bridge between expansion joints. This plot shall be maintained in good condition and updated on a daily basis so that it may be used and referenced during construction of the cantilevers. The Contractor shall be responsible for correcting any misalignment at no additional cost to the State.

(B) Construction Sequence. The structural design has been based upon the construction sequence shown on the plans and described hereunder. Any proposal by the Contractor to depart from this sequence will require the prior approval of the Engineer, and shall be accompanied by design calculations and detailed drawings, supporting all proposed deviations in accordance with these special provisions. Changes, such as, but not limited to, additional reinforcement and changes in location of reinforcement, necessary to implement the change in construction sequence, after approval by the Engineer, shall be made at the Contractor's expense. The Contractor’s attention is also directed to the requirements of "Cost Reduction Incentive Proposal for Cast-in-Place Segmentally Constructed Bridges," of these special provisions.

The construction sequence assumed for the structural design, is shown on the plans, and is generally as follows:

(1) The pier table is first cast, and stressed transversely and the transverse tendons grouted. Grouting must be performed and shall have obtained a compressive strength of 30 MPa before the form travelers are erected onto the pier.

(2) Starting from the pier segment, cantilever segments are cast alternately to either side of the pier, creating two cantilevers out-of-balance by half a segment length. The transverse and cantilever tendons in the segments are stressed, in order, after each segment has reached a compressive strength of 25 MPa.

(3) Before the closure segment between adjoining cantilevers is cast, a locking device is installed to bring the cantilever ends into vertical, transverse and longitudinal alignment; and to maintain them rigidly in that position.

(4) The closure segment is then cast. Span tendons are stressed as soon as allowed by the Engineer and as the closure concrete gains strength. Subsequently, the transverse and continuity tendons are stressed, in order.

(5) After the closure segment compressive strength has reached 25 MPa the locking device is removed.

Exceptions to this general construction sequence are noted on the plans.

(C) Segment Construction Cycle. A fifteen calendar day cycle has been assumed for casting two segments one to each side of a pier (12 calendar day average cycle per pair of segments over the full cantilever lengths at a pier). The following points should be noted:

(1) In general and unless otherwise noted on the construction sequence shown on the plans, a segment may not be cast on one side of a pier until the opposite segment, already cast, has been stressed and released from the form traveler.

(2) The Contractor may propose a different segment construction cycle. Any cycle must take account of the need to keep a pair of cantilevers in balance about the pier. In general and unless otherwise shown on the construction sequence shown on the plans, cantilevers may not be out-of-balance by more than half a segment length.

(D) Sequence for Casting each Segment. The anticipated sequence for casting each segment is as follows:

(1) The traveler is moved forward and into place, carrying the bottom slab soffit form and web outside forms.
(2) Reinforcement and ducts are placed in the bottom slab and webs.
(3) Web inside forms, bottom slab upper form and top slab soffit form are moved forward and into place.
(4) Reinforcement and ducts are placed in the top slab.
(5) Concrete is placed.

Dimensional tolerances for concrete are given in Table 9 - 1 of Division II of the AASHTO Guide Specifications.

Concrete shall be placed into the forms in accordance with the Contractor's casting plan and in such a manner as to prevent cracking due to form deflection and rotation at the intersection of concrete elements (joints). In addition, concrete shall be placed from the end of the form back towards the existing segment or pier table so that it maximizes deformation of the form traveler and minimizes the tendency of the joint with the existing segment to open.

(E) Segment Deck Finish. The top surface of segments shall receive an ordinary surface finish(prior to grinding), as specified in Section 51-1.18A, Ordinary Surface Finish," of the Standard Specifications. Bleed water or laitance shall be removed from the surface and wasted outside the forms; the concrete surface shall not be worked until the bleed water and laitance are removed from the surface.

The Contractor shall furnish a straight edge at least 600 mm longer than the segment to be used while finishing the deck of the segments. All deck surface irregularities greater than 6 mm indicated by straightedging longitudinally and transversely on the segment shall be corrected while the concrete is still in the plastic stage. Attention is also directed to "Bridge Deck Finish" elsewhere in these special provisions.

(F) Closure Segments. It is expected that the Contractor will align cantilevers to be joined by adjusting cambers as the cantilevers progress. Should the Contractor propose another method of cantilever alignment, however, any proposal shall be supported by design calculations and detailed drawings, which demonstrate to the Engineer's satisfaction that the structure and construction equipment will not be overloaded.

The ends of adjoining cantilevers must be held in rigid alignment during casting and curing of the closure segment by a "locking device" that prevents relative vertical, transverse, or longitudinal movement or rotation.

(G) Form Travelers. Form travelers shall be designed to carry the weight of segments before they are stressed and released, and to transfer this load to the previously erected portions of the structure. They shall fit closely to the previously erected segments so as to make smooth joints. They should shield the structure from rain, and permit work to continue during inclement weather. The form travelers must be capable of adjustment during casting or they must be sufficiently stiff, so as to limit the deflection/distortion of the segments as they are cast. The Contractor shall submit his/her proposed method of anchorage to the Engineer for approval, and show that it will not overload the structure. Any holes required in the structure shall be filled after use with an approved nonshrink grout, to the satisfaction of the Engineer.

Form traveler operations shall be in accordance with the "Form Traveler Operation Manual," described in these special provisions. Before erecting any traveler, the Contractor's Engineer shall inspect the traveler and shall certify in writing that all components are undamaged and in proper working order, that the traveler substantially conforms to the working drawings, and that the material and workmanship are satisfactory for the purpose intended. Any deficiency shall be corrected to the satisfaction of the Engineer before erecting the traveler. A copy of this certification shall be available at the site of the work at all times.

The construction schedule and sequence assumed by the Engineer utilizes five(5) sets of form travelers (5-pairs working in tandem). The Engineer will consider construction with fewer sets of form travelers after review of the Contractor’s design calculations and detailed drawings, supporting all proposed changes in accordance with these special provisions. Changes, such as, but not limited to, additional reinforcement and changes in location of reinforcement or the use of significantly different concrete material properties than assumed, necessary to implement the change in number of form travelers, after approval by the Engineer, shall be made at the Contractor's expense. The Contractor’s attention is also directed to the requirements of "Cost Reduction Incentive Proposal for Cast-in-Place Segmentally Constructed Bridges," of these special provisions.

(H) Stressing and Grouting. Stressing and grouting operations shall conform to the requirements elsewhere in these special provisions and the Standard Specifications.

(I) Sequence. The sequence of segment erection indicated on the plans was prepared for design purposes only. It is the Contractor's responsibility to determine the sequence which will best enable him/her to construct the bridge within the time permitted, and in accordance with the plans and specifications.

(J) Night Work. Night work will be permitted provided the Engineer is satisfied that operations will be performed safely and with no lowering of construction standards, and gives his approval. The Contractor shall submit his/her proposals for lighting of the work area to the Engineer for review.

(K) Embedded Ducts. All embedded post-tensioning ducts shall be secured to the reinforcement at intervals not to exceed 750mm. Small diameter ducts and very flexible ducts may require closer tying.

(L) Bar Reinforcing. Rearrangement of bar reinforcing steel to pass prestress ducts in segmental construction may be permitted upon approval of the Engineer. In no case shall bar reinforcing be cut or removed to permit proper alignment of the post-tensioning ducts. Any bar that cannot be fabricated to clear the ducts shall be replaced by additional bars with adequate lap lengths and details shall be submitted to the Engineer for approval.

(M) Curing and Stripping. Segments shall be cured in accordance with the requirements of Section 90-7.03, "Curing Structures," of the Standard Specifications except that the forms-in-place method need not be used. Curing compound shall be applied to all newly exposed surfaces of the box (interior and exterior) within 2 hours of breaking the forms and advancing the form traveler or interior form.

(N) Temporary Deck Access Openings. Temporary deck access openings for the Contractor's convenience shall conform to the details shown on the plans. Opening locations and number of openings shall be subject to the approval of the Engineer.

TEMPORARY HINGE TIEDOWNS

Temporary hinge tiedowns at Pier 17, 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, unless otherwise directed by the Engineer.

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.

Tiedowns shall be constructed at the locations shown on the plans and stressed to the force levels shown on the plans. 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 until the supported span in the adjoining frame of Contract 006061 and Hinges A and B are constructed.

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 nonshrink grout 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. Temporary hinge tiedowns will be measured and paid for on a unit basis, based on the number of tendon anchors provided.

The contract price paid for temporary hinge tiedown, including furnishing, installing, maintaining and removing the tiedowns, and including additional concrete, reinforcement, earthwork, and any materials to be left in place, but excluding ducts cast into the Pier 17 footing, shall be considered as included in the contract unit price paid for temporary hinge tiedown and no separate payment will be made therefor.

Full compensation for furnishing and installing the temporary hinge tiedown ducts within the Pier 17 footing, including any additional reinforcement required by the prestressing system, and for filling the ducts with nonshrink grout after the ducts are not longer needed, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge footing and no separate payment will be made therefor.

COST REDUCTION INCENTIVE PROPOSALS FOR CAST-IN-PLACE PRESTRESSED BOX GIRDER BRIDGES CONSTRUCTED ON FALSEWORK

Except as provided herein, cast-in-place prestressed box girder bridges constructed on falsework 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.

For cost reduction incentive proposals regarding the cast-in-place segmentally constructed portion of the bridge, the contractor's attention is directed to "Cost Reduction Incentive Proposals For Cast-In-Place Segmentally Constructed Bridges" of these special provisions.

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 Resident Engineer's Office at 4585 Pacheco Blvd., Suite 200 Martinez, California 94553. 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 10 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 and the project specific design criteria titled: "Design Criteria, New Benicia Martinez Bridge, Contract 59S742, Revision 2, dated September 1, 1998 by T.Y. Lin International/CH2M HILL." 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 amount and location of reinforcing steel, and (3) the amount and location of prestressing force in the superstructure. The strength of the concrete used may be increased but the strength employed for design or analysis shall not exceed 45 MPa.

Modifications proposed to the minimum amount of prestressing force which must be provided 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. 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 constructed on falsework 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.

COST REDUCTION INCENTIVE PROPOSALS FOR CAST-IN-PLACE SEGMENTALLY CONSTRUCTED PRESTRESSED BOX GIRDER BRIDGES

Except as provided herein, cast-in-place segmentally constructed prestressed box girderbridges 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 the cast-in-place segmentally constructed portion of the bridge, the proposals shall be in accordance with the provisions of 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. Cost reduction incentive proposals for segmentally constructed structures may require partial or full redesign of the bridge superstructure and/or the bridge substructure.

Prior to submitting a cost reduction incentive proposal(CRIP) the Contractor shall make a conceptual submittal and presentation sufficient for the Engineer to judge the quality of the CRIP to be proposed. As a minimum the conceptual submittal shall include:

(1) A detailed description of the construction method or proposed change, with conceptual drawings and preliminary design calculations.
(2) Itemization of redesigns necessary to accommodate the change or method in accordance with the project specific design criteria and these special provisions.
(3) A construction schedule showing completion of the project within the required number of working days.
(4) Evidence of the Contractor's experience using the method, if applicable.
(5) An estimate of the net construction cost savings and/or time savings (in number of working days saved).

Conceptual design submittals shall be made in accordance with the requirements for submitting CRIPs of this special provision except that all conceptual submittals shall be made in 10 copies. The review time for a conceptual design submittal shall be 2 weeks. If the Contractor's conceptual design submittal is approved by the Engineer, the Contractor may submit the CRIP in accordance with the requirements of this special provision. Approval of a conceptual submittal in no way constitutes approval nor guarantees future approval of the Contractor's CRIP.

At the time the 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 Resident Engineer's Office at 4585 Pacheco Blvd., Suite 200, Martinez, California 94553. When notified in writing by the Engineer, the Contractor shall submit 12 sets of the CRIP plan revisions and calculations to said Office 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 Resident Engineer's Office .

Each CRIP shall be submitted prior to completion of 10 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 10 weeks for the review of a CRIP. In addition, the Contractor shall allow a minimum of 16 weeks per frame for the review of a CRIP which includes changes to the segment length. 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 and the project specific design criteria titled: "Design Criteria, New Benicia Martinez Bridge, Contract 59S742, Revision 3, dated January 2000 by T.Y. Lin International/CH2M HILL." 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 as follows:

(A) Segment Length. Variation in segment length shall consider the changes in the amount of prestressing and its distribution and layout, transverse rib location, camber and required reinforcing changes. Continuity of reinforcing across construction joints shall be maintained.

(B) Post-Tensioning System or Method. Any different system (prestressing tendon size, layout and anchorage size) or method, to receive consideration, must have been used successfully in multi-span, cast-in-place prestressed concrete segmental bridges. Evidence of such use shall be submitted to the Engineer for review. Prestress losses shall also account for time dependent losses arising from creep and shrinkage of concrete and relaxation of prestressing steel to be calculated based on the construction schedule. Whatever the system, cantilever, span, continuity and top slab tendons must all be provided; at least 1/2 of the total post-tensioning force in closure segments must be derived from tendons continuous over the entire span. Local changes in the dimensions of elements (such as anchorage blisters) of the structure to accommodate a different system or method will be permitted. The thickness of primary structural elements shall not be reduced. Additionally, the external dimensions of the structure shall not be altered. Attention is also directed to the requirements in "Prestressing Concrete" of these special provisions.

(C) Modification of the structure to accommodate alternative construction methods and equipment will be permitted; only necessary modifications will be permitted. The overall dimensions of the structure (including, but not limited to, the box girder depth and span lengths) shall not be altered. Additionally, the thicknesses of the elements of the structure (including, but not limited to, slab depths and web thicknesses) shall not be reduced. Changes in the construction sequence and/or the number of form travelers will not be considered to be a CRIP.

(D) Modification of the structure to accommodate alternative construction methods and equipment will be permitted; only necessary modifications will be permitted. The overall dimensions of the structure (including, but not limited to, the box girder depth, span lengths and location of fixed and expansion piers) shall not be altered. Additionally, the thicknesses of the elements of the structure (including, but not limited to, slab depths and web thicknesses) shall not be reduced.

(E) Number of Form Travelers: the Contractor may propose using fewer than five sets of form travelers. Proposals will only be considered provided the same project completion date is achieved. Additionally, it is anticipated that the cambers shown on the plans will have to be recalculated and that the resulting change in sequence may require partial redesign of the superstructure and/or substructure by the Contractor.

No modifications will be permitted in (1) the foundation type, (2) the use of lightweight concrete in the superstructure (3) the transverse rib spacing or (4) the exterior dimensions of columns. 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 conceptual CRIP submittals and CRIPs for cast-in-place segmentally constructed prestressed box girderbridges 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.

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.

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

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

NONSHRINK GROUT

This work shall consist of cleaning the surfaces and furnishing, placing and finishing nonshrink grout. Nonshrink grout shall be placed in accordance with the details shown on the plans and these special provisions.

The nonshrink grout shall be a nonmetallic and nongas-liberating flowable fluid containing natural aggregate, Portland Cement and additives and requiring only the addition of water. Grout shall contain a minimum of 390 kg of cement per cubic meter. Nonshrink grout shall be premeasured and prepackaged by the manufacturer, and shall be suitable for baseplate and foundation grouting. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures. One hour after mixing, the grout shall pass through a flow cone with continuous flow. Nonshrink grout shall conform to the requirements of ASTM Designation: C 1107-91, and the following additional requirements:

Property	Requirement	Test
Shrinkage	0.0%	ASTM C 827
Expansion	0.0%min., 4.0% max.	ASTM C 827
Fluid Consistency	20-30 seconds at 5 to 38 deg C	CORPS-CRD-611-81
1-day compressive strength	24 Mpa (3500 psi. min.)	ASTM C 109
3-day compressive strength	35 Mpa	ASTM C 109
28-day compressive strength	52 Mpa	ASTM C 109

Nonshrink grout shall be formulated for minimum initial set time of 4 hours and minimum final set time of 6 hours at 21C). The materials, prior to use, shall be stored in a cool, dry environment. Grout shall be free from chlorides and other corrosion-causing chemicals. Grout shall be designed for an air content of 4 to 6 percent.

Mix water shall conform to the requirements of Section 90-2.03, "Water," of the Standard Specifications. Cold water shall be used in hot weather conditions to maintain the mixed grout temperature from 7^{o}C to 32^{o}C.

Nonshrink grout shall be mixed and placed in accordance with the requirements of the manufacturer, these special provisions and as approved by the Engineer.

The quantity of water to be blended with the dry component, shall be within the limits recommended by the manufacturer. The quantity of water shall be the least amount required to produce a flowable or fluid batter as required for the application, and as approved by the Engineer.

Before using nonshrink grout material, a minimum of 20 kilograms shall be submitted to the Engineer for testing. The Contractor shall allow 45 days for the testing. Additionally, the Contractor shall submit for approval, specific printed manufacturer's product data, curing methods and proposed methods for keeping the surface wet prior to grout application for each nonshrink grout location. Non-shrink properties shall not be based on gas or gypsum expansion.

Cleaning the contact surfaces of existing concrete shall be accomplished by abrasive blast cleaning the concrete and any exposed reinforcing steel, as necessary, to remove all rust, paint, grease, asphalt or other foreign materials. A minimum of 3 mm of concrete shall be removed, Steel contact surfaces shall be cleaned by methods approved by the Engineer to remove all rust, paint, grease, or other foreign materials. Immediately prior to placing the nonshrink grout, the surfaces shall be recleaned by air blasting, or by other approved means, as necessary to remove any debris which has accumulated during construction or after abrasive blast cleaning. Prior to grouting all concrete contact surfaces shall be kept constantly wet for a period of 24-hours. The surface temperature of the areas to be covered shall be between 7C and 32C when the nonshrink grout is placed. Methods proposed to heat said surfaces are subject to approval by the Engineer. The condition of the concrete contact surface shall be saturated surface-dry when the nonshrink grout is placed.

Forms shall be nonabsorbent, water tight and shall conform to the requirements of Section 51-1.05, "Forms," of the Standard Specifications. Forms shall extend 50 mm higher than the top surface of the grout to be placed.

Nonshrink grout shall be cured just after initial set by flooding with water to the top of the form or temporary dam built to pond water above the surface of the newly placed grout. The water level shall be maintained above the top level of the grout for a period of 48 hours. After 48 hours of ponding, the nonshrink grout shall be sprayed with two coats of curing compound (1) of Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

Field evaluation of nonshrink grout: The Contractor shall provide a flow cone and cube molds with restraining plates onsite. Three 50 mm by 50 mm cubes shall be made by the Contractor for each 0.5 cubic meter of nonshrink grout used. Restraining caps shall be provided for the cube molds in accordance with CRD-C-621-83. Store cubes at 21C. Nonshrink grout cubes shall test equal to or greater than minimum 28-day strength. Test reports for cubes shall be submitted to the Engineer for approval.

Nonshrink grout used in prestressing anchorage blockouts within the footings and used between the piles and the steel ring forms in the precast footings forms shall be extended by adding properly graded, dust-free, hard, 13 mm diameter rounded aggregate supplied by the grout manufacturer. Nonshrink grout extended with aggregate shall be internally vibrated. Calcareous aggregate made from soft limestone shall not be used. Mix proportions shall be in conformance with manufacturer's written recommendations. The extended grout/aggregate mix shall meet the specified strength requirements for nonshrink grout.

Full compensation for furnishing, placing, testing and finishing nonshrink grout, including cleaning surfaces and applying bonding agent(if required elsewhere in these special provisions or on the plans), and water curing shall be considered as included in the contract price paid for various work items involved and no additional compensation will be allowed therefor.

CURING

The bridge deck on the pier tables and all portions of the segmentally cast superstructure shall be cured in accordance with the provisions in Section 90-7.03, "Curing Structures," of the Standard Specifications except that a total of 14 days of cure by the water method shall be used instead of 7 days.

PRECAST PIER FOOTING FORMS

Precast pier footing forms shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Attention is directed to "Falsework," "Nonshrink Grout," "Prestressing Concrete," "Mass Concrete," "Steel Structures" and "Epoxy-coated Reinforcing Steel" of these special provisions. Precast pier footing forms may be precast off-site, cast-in-place on-site on falsework above the maximum high tide line, or cast-in-place to grade within a cofferdam (Piers 6, 16 and 17).

All form ties, spacers, support chairs and hangers used to support bar reinforcing steel in the forms for the precast pier footing forms shall be non-ferrous. Mortar block spacers shall not be used against any surface exposed to seawater or within the splash zone. Plastic coated and epoxy coated ferrous products will not be allowed. Wall spacers shall the clip-on wheel type or other suitable spacers designed to minimize contact with the forms. Where form ties or form spacer ties are used in the pier footings, they shall have a waterstop midway along their length. All interior and top surfaces of the precast pier footing forms shall be cleaned of surface laitance and curing compound before placing footing concrete inside the forms. Interior and top surfaces shall be roughened in accordance with "Concrete Structures" of these special provisions. No more than four hours prior to placing concrete within the precast pier footing forms, the Contractor shall thoroughly wash the interior and top of the form walls and the bottom of the footing form with clean potable water to remove salts that may have accumulated. Washing shall be accomplished by spraying all concrete surfaces water from a 50 mm diameter fire hose or by pressure washing using high pressure water jets. The Contractor shall remove all standing water from the footing form prior to placing concrete into the form. All handling or anchoring hardware which will remain permanently within 100 mm of exposed portions of the precast pier footing forms shall be fabricated of stainless steel conforming to ASTM A-276, Type 316 in the annealed or cold worked condition. When male fittings are removed for inserts, the cavity shall first be cleaned of all grease or wax and then coated with an epoxy bonding agent before being filled with nonshrink grout conforming to these special provisions. Bonding agent shall be applied in conformance with manufacturer's written instructions.

The Contractor shall ensure that precast pier footing forms are at all times handled, stored, transported, and secured in a manner that will not cause damage to the forms.

Design of the precast pier footing forms was done by the Engineer for the load cases and support conditions shown on the plans only. Continuous falsework support around the perimeter of each pile penetration has been assumed in the design of the precast pier footing forms. No allowance was made in the design for lifting, towing or other transportation and handling loads which the precast pier footing forms may be subject to. Should the Contractor elect to tow or lift the footing forms, or to support the footing forms other than as specified, all required modifications shall be the responsibility of the Contractor. Any modifications to the precast pier footing forms shall be supported by the submittal of complete calculations and details.

The Contractor shall develop and submit for review, structural calculations addressing all phases of fabrication, transportation (towing, barging, lifting etc.), and installation of the precast pier footing forms. All handling and support calculations for "normal" load cases shall be based on working stress design assuming 50 percent impact on dead load with zero tension in the concrete slab unit. "Normal" loads include fluid hydrostatic loads, tidal action (current and rise/fall), dead loads, and construction live loads. Calculations for "extreme" load cases such as those that include impact or loss of support from wave action, and wind loads shall be based on working stress design with tension in the concrete slab unit limited to 0.5 times the square root of the specified compression strength (MPa).

Working drawings and calculations for the precast pier footing forms shall be submitted to the Resident Engineer's Office for approval in accordance 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 footing forms and the intended methods of transporting and positioning the footing forms at the site, including details of seals and covers necessary for transporting the footing forms and any rearrangements or addition of the reinforcing steel or any other item from those shown on the plans. For initial review, 5 sets of drawings and calculations shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to Resident Engineer's Office for final approval and use during construction.

The working drawings and supplemental complete calculations shall be prepared for each size of footing form. 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 the name of the structure as shown on the contract plans, District-County-Route, bridge number, and contract number. The engineer'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 and working drawings shall be stamped and signed by an engineer who is registered as a civil engineer registered in the State of California. The Contractor shall allow the Engineer 4 weeks to review the drawings and calculations for the precast pier footing forms after a complete set has been received.

MEASUREMENT AND PAYMENT

Measurement and payment for concrete in structures shall conform to the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for roughening existing concrete surfaces to a full amplitude of approximately 6 mm, where shown on the plans, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for furnishing and installing access opening covers in soffits of new cast-in-place box girder bridges shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for furnishing and installing plastic pipe located at vertical drains used behind retaining walls and bridge abutments, including horizontal or sloping drains , including excavation and backfill involved in placing the plastic pipe, shall be considered as included in the contract price paid per cubic meter for the various items of concrete work involved and no separate payment will be made therefor.

Lightweight structural concrete will be measured and paid for in accordance with the provisions in Section 90-11, "Measurement and Payment," of the Standard Specifications.

Full compensation for the Contractor's Lightweight Concrete Quality Control Plan, including furnishing and placing the practice placement of lightweight concrete, disposal of the sample cubes, taking and disposing of reserve cylinders for each segment, sampling and testing of lightweight concrete with independent laboratory testing 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.

Full compensation for all measures required to control heat of hydration in mass concrete in accordance with these special provisions, including modeling and monitoring of mass concrete, preparing thermal control plans, monitoring and recording temperature information, pre-cooling of materials, designing and furnishing post-cooling systems(whether used or not) and epoxy injection of thermal cracking shall be considered as included in the contract price paid per cubic meter for the various types of concrete shown on the plans, and no separate payment will be made therefor. No payment will be made for mass concrete placements rejected by the Engineer.

Full compensation for furnishing and placing PVC sleeves at future barrier and transit rail attachments, as shown on the plans and as specified in these special provisions, shall be considered as included in the contract price paid per cubic meter for the various types of concrete shown in the Engineer's estimate and no separate payment will be made therefor.

Full compensation for furnishing and placing PVC sleeves in concrete for future electrical conduits, as shown on the plans and as specified in these special provisions, shall be considered as included in the contract price paid per cubic meter for the various types of concrete in the Engineer's estimate and no separate payment will be made therefor.

Full compensation for removing and disposing of expanded polystyrene from formed areas of joints, as specified in these special provisions and as directed by the Engineer, shall be considered as included in the contract price paid per cubic meter for the various types of concrete shown on the plans and no separate payment will be made therefor.

Full compensation for furnishing and installing waterstops, including embedded wire and/or grommeted holes, as shown on the plans and as specified in these special provisions, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge footing and precast pier footing forms and no additional compensation will be allowed therefor.

Precast pier footing forms will be measured and paid for by the cubic meter as precast pier footing forms. No payment will be made for any portion of the forms in excess of the dimensions shown on the plans. The contract unit price paid per cubic meter for precast pier footing forms shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, including reinforcing and prestressing steel as required, and for doing all work involved in constructing, furnishing and transporting precast pier footing forms complete, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

Full compensation for steel rings, welded headed bar reinforcement, for washing with fresh water and draining the precast pier footing forms thereafter shall be considered as included in the contract price paid per cubic meter for precast pier footing forms and no additional compensation will be allowed therefor. For payment purposes of bar reinforcing and welded headed bar reinforcement, where the plans show bar reinforcement with or without welded heads that is required to be partially cast in to the precast pier footing forms, full compensation for the entire length of the bar reinforcement including the length protruding and for any welded head that is attached to the bar but outside the concrete limits of the precast pier footing forms shall be considered as included in the cost per cubic meter for precast pier footing form and no additional compensation will be allowed therefor.

Full compensation for furnishing working drawing and calculations for the precast pier footing forms and for doing all the work associated with constructing, transporting, erecting and supporting the precast pier footing forms, including providing non-ferrous bar reinforcing support chairs, spacers, and form ties, shall be considered as included in the contract price paid per cubic meter for precast pier footing form and no additional compensation will be allowed therefor.

Full compensation for any auxiliary ties or support bars for securing post tensioning ducts shall be considered as included in the contract unit prices paid for the various items of work and no additional compensation will be allowed therefor.

Full compensation for segmentally constructing the superstructure as shown on the plans, including submitting Contractor Qualifications, traveler details, geometry and camber control plans, for furnishing and use of all form travelers, locking devices, and other temporary works and equipment, relocation of conflicting bar reinforcing, addition of bar reinforcing as required to eliminate conflicts, horizontal jacking of the superstructure, and all other submittals required by this special provision shall be considered as included in the contract unit prices paid for the various items of work and no additional compensation will be allowed therefor.

Full compensation for any changes to the structure necessitated by the Contractor’s change in segmental construction sequence or in the number of form travelers to be used, including all submittals relating to those change(s) required by these special provisions shall be considered as included in the contract unit prices paid for the various items of work and no additional compensation will be allowed therefor.

10-1.96 TEMPORARY RETAINING WALL

A temporary retaining wall shall be constructed to provide access.

The Contractor shall submit to the Engineer, for approval, working drawings and design calculations for the proposed temporary retaining wall at **21.7 m RT. BM 43+50 to 21.7 m RT. BM 45+40**. Such 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 drawings shall be submitted at least 8 weeks in advance of the time the Contractor begins construction of the retaining wall.

Attention is directed to Section 5-1.02, "Plans and Working Drawings" of the Standard Specifications. Working drawings for the retaining wall shall include, but not be limited to:

1. Descriptions and values of all loads
2. Stress sheets
3. Shop details
4. Erection and removal plans
5. Equipment lists
6. Other details as necessary

The Contractor shall allow 4 weeks after complete drawings and all support data are submitted to the Engineer for the review of any temporary retaining wall plans.

The Contractor may revise approved temporary retaining wall drawings provided sufficient time is allowed for the Engineer's approval before construction begins on the revised portions. Such additional time will not be more than that which was originally allowed. Construction of the temporary retaining wall shall not begin until the drawings for the temporary retaining wall have been approved by the Engineer.

The existing slope behind the temporary wall shall remain the same with a slope no steeper than 1:2

After the adjacent construction activity has been completed and the temporary retaining wall is no longer needed to allow access for equipment, the Contractor shall remove the temporary retaining wall and restore the contour to its original 1:2 slope.

The contract lump sum price paid for temporary retaining wall shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the temporary retaining wall and inspection elements, including earthwork, piles, footings, 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 a temporary retaining wall shall be considered as included in the contract lump sum price for temporary retaining wall and no separate payment will be made therefor.

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Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	020627	ELECTRONIC MOBILE DAILY DIARY COMPUTER SYSTEM DATA DELIVERY	LS	LUMP SUM	LUMP SUM	
2	020628	MODIFY MONITORING WELLS	EA	1		
3	020629	ABANDON MONITORING WELLS	EA	2		
4	020630	REMOVE ABANDONED 51 MM GAS LINE	M	210		
5	020631	REMOVE 254 MM WATER LINE (ASBESTOS)	M	230		
6 (S)	020632	ROADWAY EXCAVATION (HAZARDOUS)	M3	1290		
7 (S)	020633	ROADWAY EXCAVATION (CONTAMINATED)	M3	4220		
8	020634	TIME RELATED OVERHEAD	LS	LUMP SUM	LUMP SUM	
9	070010	PROGRESS SCHEDULE (CRITICAL PATH)	LS	LUMP SUM	LUMP SUM	
10	020635	TRANSPORTATION FOR ENGINEER	LS	LUMP SUM	LUMP SUM	
11	071322	TEMPORARY FENCE (TYPE CL-1.8)	M	660		
12	048467	TEMPORARY HINGE TIEDOWN	EA	6		
13	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM	LUMP SUM	
14	074020	WATER POLLUTION CONTROL	LS	LUMP SUM	LUMP SUM	
15	020636	NON-STORM WATER DISCHARGES	LS	LUMP SUM	LUMP SUM	
16	020637	TEMPORARY SILT FENCE	M	480		
17	020638	TEMPORARY COVER	M2	6000		
18	020639	TEMPORARY DRAINAGE INLET PROTECTION	EA	15		
19	020640	TEMPORARY CONCRETE WASHOUT FACILITY	LS	LUMP SUM	LUMP SUM	
20	020641	TEMPORARY FENCE (TYPE ESA)	M	130		

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Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
21	020642	TEMPORARY ENTRANCE/EXIT	EA	6		
22	020643	FIBER ROLL CHECK DAM	EA	8		
23	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM	LUMP SUM	
24	129000	TEMPORARY RAILING (TYPE K)	M	25		
25	129510	TEMPORARY RETAINING WALL	LS	LUMP SUM	LUMP SUM	
26	150608	REMOVE CHAIN LINK FENCE	M	290		
27	020644	REMOVE CHAIN LINK FENCE (TYPE CL-1.8 WITH EXTENSION ARM AND 3-BARBED WIRES)	M	250		
28	150710	REMOVE TRAFFIC STRIPE	M	1120		
29	150713	REMOVE PAVEMENT MARKING	M2	60		
30	150744	REMOVE ROADSIDE SIGN (WOOD POST)	EA	1		
31	150745	REMOVE ROADSIDE SIGN (METAL POST)	EA	1		
32	152396	RELOCATE SIGN PANEL	EA	1		
33	152604	MODIFY INLET	EA	1		
34	160101	CLEARING AND GRUBBING	LS	LUMP SUM	LUMP SUM	
35	190101	ROADWAY EXCAVATION	M3	13 200		
36	BLANK					
37 (F)	048429	STRUCTURE EXCAVATION (BRIDGE)(HAZARDOUS)	M3	170		
38 (F)	048430	STRUCTURE EXCAVATION (BRIDGE)(CONTAMINATED)	M3	95		
39 (F)	192008	STRUCTURE EXCAVATION (TYPE A)	M3	8830		
40 (F)	048431	STRUCTURE EXCAVATION (TYPE A) (SLAG AND CINDER)	M3	2500		

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Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
41 (F)	192020	STRUCTURE EXCAVATION (TYPE D)	M3	1030		
42 (F)	048432	STRUCTURE EXCAVATION (TYPE D)(CONTAMINATED)	M3	86		
43 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	M3	1430		
44 (F)	048433	STRUCTURE BACKFILL (BRIDGE) (LOW PERMEABLE) (0.7 MPA)	M3	2200		
45 (F)	048434	STRUCTURE BACKFILL (BRIDGE) (LOW PERMEABLE) (6.9 MPA)	M3	371		
46 (F)	193114	SAND BACKFILL	M3	2770		
47	194001	DITCH EXCAVATION	M3	90		
48	020645	IMPORTED BORROW (50-MM LIGHTWEIGHT AGGREGATE)	M3	370		
49	020646	IMPORTED BORROW (25-MM LIGHTWEIGHT AGGREGATE)	M3	45		
50	203001	EROSION CONTROL (BLANKET)	M2	440		
51	020647	FIBER ROLLS	M	970		
52	203003	STRAW (EROSION CONTROL)	TONN	5.6		
53	203014	FIBER (EROSION CONTROL)	KG	880		
54	203024	COMPOST (EROSION CONTROL)	KG	2650		
55	203045	PURE LIVE SEED (EROSION CONTROL)	KG	90		
56	203056	COMMERCIAL FERTILIZER (EROSION CONTROL)	KG	290		
57	203061	STABILIZING EMULSION (EROSION CONTROL)	KG	200		
58	250401	CLASS 4 AGGREGATE SUBBASE	M3	140		
59	260301	CLASS 3 AGGREGATE BASE	M3	620		
60	290201	ASPHALT TREATED PERMEABLE BASE	M3	30		

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Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
61	390155	ASPHALT CONCRETE (TYPE A)	TONN	1120		
62	390165	ASPHALT CONCRETE (OPEN GRADED)	TONN	25		
63	BLANK					
64	394002	PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA)	M2	60		
65 (S)	490658	750 MM CAST-IN-DRILLED-HOLE CONCRETE PILING	M	381		
66 (S)	048435	2.2 M CAST-IN-DRILLED-HOLE CONCRETE PILING (ROCK SOCKET)	M	2220		
67 (S)	490672	2.5 M CAST-IN-DRILLED-HOLE CONCRETE PILING	M	4065		
68 (S)	048436	2.5 M PERMANENT STEEL CASING	M	4460		
69 (S)	048437	2.6 M CAST-IN-DRILLED-HOLE CONCRETE PILING	M	291		
70 (S)	048438	INSTALL SEISMIC MONITORING CASING	LS	LUMP SUM	LUMP SUM	
71 (S)	048439	PRESTRESSING HIGH STRENGTH ROD	LS	LUMP SUM	LUMP SUM	
72	BLANK					
73	BLANK					
74	510000	SEAL COURSE CONCRETE	M3	1606		
75	048442	TEST BLOCKS	LS	LUMP SUM	LUMP SUM	
76 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	M3	19 700		
77 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	M3	27 000		
78 (S-F)	048443	PRECAST PIER FOOTING FORM	M3	7740		
79 (F)	048444	STRUCTURAL CONCRETE, LIGHTWEIGHT	M3	41 600		
80 (F)	510086	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	M3	68		

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Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
81 (F)	048445	STRUCTURAL CONCRETE, FENDER	M3	730		
82	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	13		
83	510504	MINOR CONCRETE (PIPE ENCASEMENT)	M3	10		
84 (F)	511064	FRACTURED RIB TEXTURE	M2	1660		
85 (S)	515050	GRIND BRIDGE DECK	LS	LUMP SUM	LUMP SUM	
86 (S)	048446	PTFE SPHERICAL BEARING (395 MM DIA)	EA	2		
87 (S)	048447	PTFE SPHERICAL BEARING (530 MM DIA)	EA	2		
88 (S)	048448	PTFE SPHERICAL BEARING (600 MM DIA)	EA	2		
89 (S)	048449	PTFE SPHERICAL BEARING (815 MM DIA)	EA	2		
90 (S)	048450	HINGE C AND D BEARING (TYPE I)	EA	16		
91 (S)	048451	HINGE C AND D BEARING (TYPE II)	EA	4		
92 (S)	048452	ELASTOMERIC BUMPERS	LS	LUMP SUM	LUMP SUM	
93 (S)	048453	JOINT SEAL (MR 20 MM)	M	25		
94 (S)	519132	JOINT SEAL ASSEMBLY (MR 321 MM - 400 MM)	M	25		
95 (S)	048454	JOINT SEAL ASSEMBLY (MR 900 MM)	M	25		
96 (S)	048455	JOINT SEAL ASSEMBLY (MR 1000 MM)	M	79		
97 (S-F)	520102	BAR REINFORCING STEEL (BRIDGE)	KG	21 930 000		
98 (S-F)	520110	BAR REINFORCING STEEL (EPOXY COATED) (BRIDGE)	KG	4 600 000		
99 (S-F)	048456	WELDED HEADED BAR REINFORCEMENT	EA	89 500		
100 (S-F)	048457	WELDED HEADED BAR REINFORCEMENT (EPOXY COATED)	EA	37 700		

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Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
101 (S-F)	550203	FURNISH STRUCTURAL STEEL (BRIDGE)	KG	289 400		
102 (S-F)	550204	ERECT STRUCTURAL STEEL (BRIDGE)	KG	289 400		
103 (F)	560218	FURNISH SIGN STRUCTURE (TRUSS)	KG	20 680		
104 (S-F)	560219	INSTALL SIGN STRUCTURE (TRUSS)	KG	20 680		
105	562004	METAL (RAIL MOUNTED SIGN)	KG	700		
106	566011	ROADSIDE SIGN - ONE POST	EA	11		
107 (S-F)	048458	REINFORCED RECYCLED PLASTIC LUMBER	M3	790		
108 (S)	590115	CLEAN AND PAINT STRUCTURAL STEEL	LS	LUMP SUM	LUMP SUM	
109	620907	300 MM ALTERNATIVE PIPE CULVERT (TYPE C)	M	30		
110	620909	450 MM ALTERNATIVE PIPE CULVERT	M	45		
111	650079	900 MM REINFORCED CONCRETE PIPE	M	80		
112 (S-F)	048459	3660 MM CORRUGATED STEEL PIPE	M	85		
113	681135	100 MM PLASTIC PIPE (EDGE DRAIN)	M	15		
114	705334	300 MM ALTERNATIVE FLARED END SECTION	EA	3		
115	705336	450 MM ALTERNATIVE FLARED END SECTION	EA	2		
116	721009	ROCK SLOPE PROTECTION (FACING, METHOD B)	M3	40		
117	020648	SUB-GRADE ENHANCEMENT FABRIC	M2	380		
118	729010	ROCK SLOPE PROTECTION FABRIC	M2	85		
119	731501	MINOR CONCRETE (CURB)	M3	2		
120	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	M3	120		

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Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
121 (F)	750001	MISCELLANEOUS IRON AND STEEL	KG	108		
122 (S-F)	750501	MISCELLANEOUS METAL (BRIDGE)	KG	29 430		
123 (S-F)	750505	BRIDGE DECK DRAINAGE SYSTEM	KG	13 600		
124 (S)	048460	MISCELLANEOUS METAL (MAINTENANCE ACCESS)	LS	LUMP SUM	LUMP SUM	
125 (S)	048461	MISCELLANEOUS METAL (MOVABLE INSPECTION PLATFORMS)	LS	LUMP SUM	LUMP SUM	
126	800386	CHAIN LINK FENCE (TYPE CL-1.2, VINYL-CLAD)	M	35		
127	800391	CHAIN LINK FENCE (TYPE CL-1.8)	M	900		
128	020649	CHAIN LINK FENCE (TYPE CL-1.8, WITH EXTENSION ARM AND 3-BARBED WIRES)	M	250		
129 (F)	048462	FIBERGLASS GRATING	M2	260		
130 (F)	048463	FIBERGLASS REINFORCED PLASTIC DOOR FRAME	EA	11		
131	802584	0.9 M CHAIN LINK GATE (TYPE CL-1.8)	EA	1		
132	802594	2.7 M CHAIN LINK GATE (TYPE CL-1.8)	EA	1		
133	802596	3.7 M CHAIN LINK GATE (TYPE CL-1.8)	EA	1		
134	802672	4.9 M CHAIN LINK GATE (TYPE CL-1.8)	EA	2		
135	802676	7.3 M CHAIN LINK GATE (TYPE CL-1.8)	EA	1		
136 (S)	048464	CONSTRUCTION SURVEYING	LS	LUMP SUM	LUMP SUM	
137 (F)	810110	SURVEY MONUMENT	EA	29		
138 (S-F)	833033	CHAIN LINK RAILING (TYPE 7 MODIFIED)	M	166		
139 (S-F)	833090	TUBULAR HANDRAILING (MODIFIED)	M	182		
140 (F)	833128	CONCRETE BARRIER (TYPE 25 MODIFIED)	M	4594		

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Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
141	020650	CRASH CUSHION (REACT 350.9)	EA	1		
142 (S)	840515	THERMOPLASTIC PAVEMENT MARKING	M2	150		
143 (S)	840561	100 MM THERMOPLASTIC TRAFFIC STRIPE	M	5750		
144 (S)	840562	150 MM THERMOPLASTIC TRAFFIC STRIPE	M	110		
145 (S)	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	420		
146 (S)	840564	200 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	850		
147 (S)	840568	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	170		
148 (S)	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	2250		
149 (S)	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	790		
150 (S)	860297	SIGNAL AND LIGHTING (CITY)	LS	LUMP SUM	LUMP SUM	
151 (S)	020651	TRAFFIC OPERATIONS SYSTEM	LS	LUMP SUM	LUMP SUM	
152 (S)	020652	ELECTRICAL FACILITIES 1	LS	LUMP SUM	LUMP SUM	
153 (S)	020653	ELECTRICAL FACILITIES 2	LS	LUMP SUM	LUMP SUM	
154 (S)	020654	ELECTRICAL FACILITIES 3	LS	LUMP SUM	LUMP SUM	
155 (S)	020655	ELECTRICAL FACILITIES 4	LS	LUMP SUM	LUMP SUM	
156 (S)	020656	ELECTRICAL FACILITIES 5	LS	LUMP SUM	LUMP SUM	
157 (S)	020657	ELECTRICAL FACILITIES 6	LS	LUMP SUM	LUMP SUM	
158 (S)	020658	ELECTRICAL FACILITIES 7	LS	LUMP SUM	LUMP SUM	
159 (S)	020659	ELECTRICAL FACILITIES 8	LS	LUMP SUM	LUMP SUM	
160 (S)	020660	ELECTRICAL FACILITIES 9	LS	LUMP SUM	LUMP SUM	

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Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
161 (S)	020661	PIER 3 SUBSTATION CONDUIT LAYOUT	LS	LUMP SUM	LUMP SUM	
162 (S)	020662	CONDUIT LAYOUT IN PIERS 6 THROUGH 8	LS	LUMP SUM	LUMP SUM	
163 (S)	020663	CONDUIT LAYOUT IN PIERS 9 THROUGH 15	LS	LUMP SUM	LUMP SUM	
164 (S)	020664	PIER 3 SUBSTATION GROUNDING LAYOUT	LS	LUMP SUM	LUMP SUM	
165 (S)	020665	MARINE NAVIGATIONAL AIDS SYSTEM	LS	LUMP SUM	LUMP SUM	
166	869072	SEISMIC MONITORING SYSTEM	LS	LUMP SUM	LUMP SUM	
167	048465	HEALTH MONITORING SYSTEM	LS	LUMP SUM	LUMP SUM	
168	048466	HEALTH MONITORING SYSTEM (SHIPPING CHANNEL SPAN)	LS	LUMP SUM	LUMP SUM	
169	020666	RELOCATE PARK FACILITIES	LS	LUMP SUM	LUMP SUM	
170	994629	RELOCATE TRAILER	LS	LUMP SUM	LUMP SUM	
171	994650	BUILDING WORK	LS	LUMP SUM	LUMP SUM	
172	BLANK					
173 (S)	048520	LOAD TEST PILE	LS	LUMP SUM	LUMP SUM	
174 (S)	048521	PRESTRESSING CAST-IN-PLACE CONCRETE	LS	LUMP SUM	LUMP SUM	
175 (S)	048522	OVER REAM AND FILL (2.8 M MINIMUM DIAMETER)	M	681.4		
176 (S)	048523	OVER REAM AND FILL (3.2 M MINIMUM DIA)	M	19..2		
177	BLANK					
178	192007A	ACCESS CHANNEL DREDGING	M3	31 000		
179	203026	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	3		
180 (F)	192003	STRUCTURE EXCAVATION (BRIDGE)	M3	380		

ENGINEER'S ESTIMATE
04-006034

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
181	999990	MOBILIZATION	LS	LUMP SUM	LUMP SUM	

TOTAL BID: _____