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**** WARNING ** WARNING ** WARNING ** WARNING ****
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October 20, 2006

04-SM-1-61.2/64.9
04-1123U4
ACSTP-ER-1187(011)E

Addendum No. 5

Dear Contractor:

This addendum is being issued to the contract for construction on State highway in SAN MATEO COUNTY NEAR PACIFICA FROM 4.7 KM TO 1.0 KM SOUTH OF LINDAMAR BOULEVARD.

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 November 14, 2006.

This addendum is being issued to revise the Project Plans, the Notice to Contractors and Special Provisions, the Proposal and Contract and provide a copy of a supplemental Information Handout.

Project Plan Sheets 9, 29, 125, and 126 are revised. Half-sized copies of the revised sheets are attached for substitution for the like-numbered sheets.

Project Plan Sheets 353A, 353B, 353C, 353D, 353E, 353F, 353G and 353H are added. Half-sized copies of the added sheets are attached for addition to the project plans.

Project Plan Sheets 127 and 128 are deleted.

In the Special Provisions, Section 3, "AWARD AND EXECUTION OF CONTRACT," the fourth paragraph is revised as follows:

"Bids in which the number of working days bid for completion of the work exceed 1900 will be considered non-responsive and will be rejected."

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

"The Contractor shall pay to the State of California the sum of \$19,600 per day, for each and every calendar day's delay in finishing the work after expiration of the number of working days bid, until completion of the work."

In the Special Provisions, Section 5-1.16, "AREAS FOR CONTRACTOR'S USE," the following sentence is added to the beginning of the fifth paragraph as follows:

"Attention is directed to, "Mobilization," elsewhere in these special provisions."

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In the Special Provisions, Section 5-1.21, "ENVIRONMENTALLY SENSITIVE AREA," the following paragraph is added after the first paragraph:

"The boundaries of the Environmentally Sensitive Areas at the future south portal site have been established by the placement of Temporary Fence (Type ESA) and Temporary Perimeter Barrier (Type Frog). The Contractor shall not enter the Environmentally Sensitive Areas at the south portal site. Attention is directed to "CLEARING AND GRUBBING" elsewhere in these specifications."

In the Special Provisions, Section 5-1.17, "PAYMENTS," in the fourth paragraph, Item G is added as follows:

"G. Tieback Anchors"

In the Special Provisions, Section 5-1.18, "PROJECT INFORMATION," in the third paragraph, Item S is added as follows"

"S. Foundation Report for Retaining Wall No. 1 at the South End Cul-De-Sac"

In the Special Provisions, Section 8-1.03, "STATE-FURNISHED MATERIALS," in the second paragraph, Item K is added as follows:

"K. Hollow bars for micropiles, including couplers and drilling tips, will be furnished to the Contractor at 325 San Bruno Avenue, San Francisco, California 94703"

In the Special Provisions, Section 10-1.01, "ORDER OF WORK," the following paragraph is added after the third paragraph:

"Prior to beginning tunnel construction work at the south portal, the Contractor shall complete the diversion of public traffic to detour road B as shown on Stage 3 of the plans and complete rock bolting work on Blocks A through E as shown on the plans for South Portal Rock Bolt Details No. 1 and No. 2."

In the Special Provisions, Section 10-1.22, "MOBILIZATION," is revised as attached.

In the Special Provisions, Section 10-1.33, "CLEARING AND GRUBBING," the following paragraph is added after the third paragraph:

"Prior to February 15, 2007, at the future South Portal area and within the limits of the cut and cover tunnel and drainage system No. 6, the State will remove vegetation up to 100 mm in height above the ground surface. After February 15, 2007, the Contractor shall be responsible for maintaining this area so that vegetated ground cover shall not exceed 100 mm in height above the ground surface. Attention is directed to "Biological Monitoring/Compliance with Species Regulations" elsewhere in these special provisions.

In the Special Provisions, Section 10-1.59, "PILING," the subsection, "MICROPILING," is added after the third paragraph as attached.

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In the Special Provisions, Section 10-1.59, "PILING," the following is added after the last paragraph:

"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.

Full compensation for slurry, depositing concrete under slurry, test batches, inspection pipes, filling inspection holes and pipes with grout, drilling oversized cast-in-drilled-hole concrete piling, filling cave-ins and oversized piles with concrete, and redrilling through concrete, shall be considered as included in the contract prices paid per meter for cast-in-drilled-hole concrete piling of the types and sizes listed in the Engineer's Estimate, and no additional compensation will be allowed therefor."

In the Special Provisions, Section 10-1.605, "TIEBACK ANCHORS," is added as attached.

In the Special Provisions, Section 10-1.62, "REINFORCEMENT," in subsection, "EPOXY-COATED PREFABRICATED REINFORCEMENT," the following is added after the twentieth paragraph:

"Epoxy coated anchor bars shall be installed in polyvinyl chloride (PVC) schedule 80 plastic pipe as shown on the plans."

In the Special Provisions, Section 10-1.865, "MISCELLANEOUS METAL (RETAINING WALL)," is added as attached.

In the Proposal and Contract, the Engineer's Estimate Items 56, 61, 98, 114 and 147 are revised, Item 230 is deleted and Items 231, 232, 233, 234, 235 and 236 are added as attached.

To Proposal and Contract book holders:

Replace pages 5, 6, 7, 8, 10, 14 and add page 14A of the Engineer's Estimate in the Proposal with the attached revised pages 5, 6, 7, 8, 10, 14, and 14A of the Engineer's Estimate. The revised Engineer's Estimate is to be used in the bid.

Attached is a copy of the Information Handout entitled, "Foundation Report for Retaining Wall No. 1 at South End Cul-De-Sac."

Inquiries or questions in regard to this addendum must be communicated as a bidder inquiry and must be made as noted in the NOTICE TO CONTRACTORS section of the Notice to Contractors and Special Provisions.

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.

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This office is sending this addendum by UPS overnight mail to Proposal and Contract book holders to ensure that each receives it. A copy of this addendum is available for the contractor's use on the Internet Site:

http://www.dot.ca.gov/hq/esc/oe/weekly_ads/addendum_page.html

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
Office of Plans, Specifications & Estimates
Office Engineer

Attachments

10-1.22 MOBILIZATION

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

The Contractor shall perform necessary preparatory work to, furnish, install, and maintain a temporary field office trailer located 10 m left of the SB line from Station 117+00 to 117+20. This temporary field trailer shall be for the exclusive use of the Engineer's field staff, and shall hereafter be designated as the Engineer's field trailer. Preparatory work includes and is not limited to any site development, utility installation, and other items of work necessary for the placement and support of a trailer facility for the Engineer. Garbage and janitorial service shall also be provided on a twice-weekly basis.

The Engineer's field trailer shall be complete with all necessary service, utility connections, and equipment requirements in place 30 days prior to the start of construction work shown on Stage 3 of the contract plans. The Engineer's field trailer shall remain in-place until completion of all contract items of work related to both the south and north tunnels from portal (south) to portal(north) of the project.

The Engineer's field trailer shall be in accordance with the following requirements:

- A) Minimum exterior dimensions shall be: width 7.4 m length 18.3 m, and height (from floor to ceiling) 2.3 m. It shall be a double wide turn-key modular building. The modular building shall have installed seismic tiedowns.
- B) The turn-key modular building shall be new or in like new condition, less than 5 years old. Contractor will be responsible for all aspects of site preparation, delivery, set up, utility hook up, electrical plan and wiring, plywood backboard in network room, everything needed to bring voice and data service into the building, *fire sprinkler system, fire alarm system*, security monitoring system. This includes all code compliance, all applications, all permitting and all fees.
- C) Entire building, including all fixtures within, will be ADA compliant. Front entry / exit shall have new, galvanized or zinc coated, ADA compliant ramp and stairs with landing. Additional entry/exits shall have new galvanized or zinc coated stairs with landing. All building hardware, i.e., locks, door handles, light switches, etc., will be ADA compliant
- D) Fire extinguishers will be provided and mounted as required by Fire Marshall.
- E) Perimeter lighting on building exterior on each side of each building shall be provided. Exterior lighting shall be of wall pack type, 100 W each and operated on single photoelectric cell equipped with override switch
- F) It shall have internal walls and internal doors for two offices. Each office shall have interior dimensions of 3.4 m x 3.4 m.
- G) It shall have a dedicated storage room with locking door. The dedicated storage room shall have internal dimension of 2.4 m x 2.4 m.
- H) It shall have a dedicated network room with locking door. The dedicated network room shall have internal dimension of 2.4 m x 2.4 m. The network room shall have a dedicated air conditioning. The network room shall have two dedicated electrical circuits for to support the network equipment.
- I) There shall be at least two operable windows and doors in the open space area. There shall be one operable window in each office. All windows shall have locking devices for security, including security bars on the external window frame, operable by a release on the inside of the trailer meeting building and fire codes. All windows shall have security screens with steel bars with emergency kick release. The contractor shall provide window blind coverings on all windows. All doors shall contain two locks, a deadbolt and keyed doorknob that are certified ANSI Grade 1. Both locks shall be keyed the same. Bug screens shall be provided for all openings. Entrance / exit doors will be high quality metal sheet reinforced solid core doors, with panic bars. Interior doors shall have door stops, or bumpers at knob level, on all doors to protect walls.
- J) Ceiling tiles shall be Armstrong Acoustical Material, BP 755B 20, or of the same quality or better.
- K) It shall have a satisfactory floor with commercial grade sheet vinyl, a weatherproof roof, and be dustproof and wind-tight.
- L) It shall be provided with heating, ventilation and air conditioning equipment. The modular building shall contain an interior climate control system with ventilation ducts and outlets as prefabricated modular units. All thermostats to have locking covers, all working on same key, with no possible access without key Thermostats shall to be mounted in the large common areas, not in private offices.
- M) It shall be provided with satisfactory lighting. Fluorescent lighting units shall be provided with new light tubes. It shall also contain emergency inside lighting with all exits marked by lighted exits, according to State Code.
- N) The modular building shall have adequate gutters/directors over all entry/exits to prevent roof-water discharge at these points.

- O) The modular building shall have an ADA compliant coffee bar area with cupboards installed above the coffee bar along with ADA compliant cupboards underneath. An exhaust fan ventilating to the outside of the building in the coffee bar area shall be provided. The ventilating fan shall its own on/off switch. The coffee bar area shall have at least two ground fault interrupt circuits. The coffee bar area shall have necessary drinking water for a planned occupancy of eight (8) people.
- P) Outside of Engineer's field trailer, the Contractor shall supply temporary a toilet facility, a portable wash station. Service for temporary toilet facility and portable wash station shall be at a minimum three times per week.
- Q) It shall be provided with necessary electrical outlets and electrical service to accommodate at a minimum, the following items, computers, copiers, printers, a microwave, coffee maker, and a refrigerator. All electrical outlets will have receptacles, be wired and ready for use/plug. Offices shall have electrical outlets with voice and data ports. Wiring for voice and data shall be CAT 5E. Open space shall have electrical boxes with receptacles, voice and data ports with covered code floor caps. All walls in the open space shall have electrical outlet receptacles with voice and data ports. All electrical outlets to contain receptacles, be wired and ready for use/plug, and be installed not less than 6 ft apart.
- R) Each office shall be furnished with a desk with locking drawers, one office chair, one filing cabinet and two bookshelves. Filing cabinet shall be four drawer, fire resistant steel filing cabinets with a lock with a class D or higher classification established by UL or Safe Manufacturers National Association. The open space area shall contain a total of six standard drafting tables with drafting chairs. Drafting tables shall be new and shall have minimum dimensions of 0.975 m wide x 1.83 m long. The open space area shall contain a conference table with chairs twenty (20) conference chairs. The conference table shall be a total surface area of 7.8 m². At the option of the Engineer, this conference area may be used for joint meetings between the Engineer and the Contractor.
- S) All surfaces will be cleaned before the Engineer field staff occupies the turn key modular building.
- T) The Contractor shall be responsible for all fees, permitting, insurance, and other costs associated with providing the modular turn key building.
- U) All repairs and maintenance will be provided by the Contractor including but not limited to replacement of HVAC filters every 90 days, replace of ballasts, and replacement of fluorescent light bulbs.
- V) The Contractor shall be responsible for meeting all State and Local codes, including applicable building code requirements in accordance with Title 24 of the California Code of Regulations, Department of Housing and Community Development (DOH), Division of the State Architect (DSA) or Department of Motor Vehicles (DMV).

MICROPILING

Micropiling consisting of state furnished hollow bars, including couplers and drilling tips, that is grouted in place through the hollow bar shall conform to the design requirements and layout shown on the plans and these special provisions.

State furnished hollow bar shall be all threaded, 103 mm outside diameter, 25 mm wall thickness, and 3 m in length per section.

Difficult micropile installation is anticipated due to the presence of hard rock.

Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. California Test 541 will not be required, nor will the grout be required to pass through a screen with a 1.8-mm maximum clear opening prior to being introduced into the grout pump. Grout shall contain at least 600 kg of cement per cubic meter. Grout shall be non-shrink type. Grout in micropiles shall be installed under at least one MPa of pressure.

Working Drawings

The Contractor shall submit complete project specific working drawings for the micropile system to the Division of Structure Design (DSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Working drawings for micropiling shall be 559 mm x 864 mm in size. For initial review, 10 sets of drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to DSD for final approval and use during construction. Within 3 weeks after final approval of the working drawings, one set of the corrected prints on 75-g/m sq. (minimum) good quality bond paper, 559 mm x 864 mm in size, prepared by the Contractor, shall be furnished to DSD.

Working drawings for micropiling shall show the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post on each drawing and calculation sheet. The pile vendor company name, address, and phone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right corner and shall contain a blank space in the upper right corner for future contract sheet numbers.

Working drawings for micropiles shall contain all information required for the construction and quality control of the piling, including the following:

- A. Information on space requirements for installation equipment that verify that the proposed equipment can perform at the site.
- B. Step-by-step procedure describing all aspects of pile installation including personnel, testing, and equipment to assure quality control. This step-by-step procedure shall be shown on the working drawings in sufficient detail so that the Engineer can monitor the construction and quality of these micropiles.
- C. Details for drilling a plumb and battered hole.
- D. Details of centralizers.
- E. Grout mix designs.
- F. Details and procedures involved in testing components, including grout.
- G. Details of equipment and operation for grouting. Details shall be included for monitoring grout quality, volume installed, and pressure during installation.
- I. Information on the minimum cure time and strength requirements of the pile system for test piles.

A supplement to the working drawings shall include the following:

- A. Construction details and structural details, and load test results from at least 3 previous successful installations by the proposed micropile Contractor. The installations shall be from 3 separate test sites. The installations shall be similar to those proposed for this contract.

The working drawings and supplement shall be stamped and signed by an engineer who is licensed as a Civil Engineer in the State of California. The Engineer will notify the Contractor in writing when the submitted working drawings and supplement have been determined to be complete. The Contractor shall allow the Engineer 30 working days to review the working drawing submittal after a complete set has been received.

No micropile shall be installed until the Engineer has approved, in writing, the working drawing submittal for micropiling.

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 conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Construction

Drill cuttings resulting from installing micropiling shall be disposed of in conformance with the provisions in Section 19-2.06, "Surplus Material," of the Standard Specifications. Material resulting from grouting micropiles shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, unless otherwise permitted in writing by the Engineer.

Drilling mud or chemical stabilizers shall not be used.

Foreign material dislodged or drawn into the hole during construction of the micropiles shall be removed. Loose material existing at the bottom of the hole after drilling operations are complete shall be removed prior to placing grout.

Grout shall be injected at the bottom of the pile.

A positive means of support shall be provided for maintaining the position of the pile until the grout has set.

Proof Testing

Proof load testing of micropiles shall conform to the following requirements:

- A. The Engineer will conduct proof micropile tests consisting of tension load testing.
- B. The Engineer will conduct proof tests after all the micropiles have been installed in a given footing. Ten percent of the piles in a given footing and not less than 2 per footing will be proof tested.
- C. The acceptance criterion for proof tension load testing of micropiles is as follows:
 1. The pile shall sustain the first tension test load applied which is equal to the nominal tension resistance, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of tension load testing.
- D. If a production micropile that is proof tested fails to meet the above acceptance criterion for testing, then that pile will be rejected, and all the other micropiles in that same footing will be tested. Rejected micropiling shall be replaced at a location approved by the Engineer. The Contractor shall submit to the Engineer for approval a plan for replacing piling or for installing additional micropiling that includes details for micropiling and footing modifications as required to provide the total micropiling support as shown on the plans. No extension of time or compensation will be made for the review of a plan for replacing or installing additional micropiling.

The Contractor shall notify the Engineer, in writing, not less than 10 days in advance of drilling or driving the piles to be load tested.

The bottom of footing excavation shall be dewatered and made level before pile load testing. The excavation shall be kept dewatered during load testing.

Unless otherwise specified or shown on the plans, steel plates welded to the load test and anchor piling shall conform to the requirements in ASTM Designation: A 709/A 709M, Grade 36 [250], and shall be welded to the piling in conformance with the requirements in AWS D1.1.

The Engineer will require not more than 7 working days to perform pile load tests at each test location.

Measurement and Payment

Micropiles will be measured and paid for by the unit.

The contract unit price paid for micropile shall include full compensation for furnishing all labor, materials (except for state furnished materials), tools, equipment, and incidentals, and for doing all the work involved in constructing micropiles, including drilled holes, grout, cutting of hollow bars, and disposing of materials resulting from pile installation, 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 excavation of pile load test sites, for maintaining a level and dewatered test site, and for backfilling and completely restoring the test sites shall be considered as included in the contract unit price paid for micropiles, and no additional compensation will be allowed therefor.

No payment will be made for micropiles which are damaged either during installation or after the micropiles are complete in place. No payment will be made for additional excavation, backfill, concrete, reinforcement, nor other costs incurred from footing enlargement resulting from replacing rejected micropiles.

10-1.605 TIEBACK ANCHORS

Anchors at the retaining wall, consisting of holes drilled in foundation material, grouted steel bars or strands, and anchorage assemblies, and testing of installed anchors shall conform to the details shown on the plans, the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications, and these special provisions.

Foundation recommendations are included in the "Materials Information" available to the Contractor in conformance with the provisions in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

The Contractor shall determine the bond length necessary to meet acceptance criteria specified herein.

The submittal of reduced prints of corrected original tracings will not be required for tieback anchor installations.

In fabricating, handling, shipping, and placing tieback anchors, adequate care shall be taken to avoid damage to the sheathing. Damage to the sheathing caused by handling and fabrication prior to tieback anchor installation shall be repaired or replaced as determined by the Engineer. Repair procedure for the sheathing shall be included in the working drawings.

MATERIALS

Whenever "member" is referred to in Section 50, "Prestressing Concrete," of the Standard Specifications, it shall be considered to mean tieback anchor.

Structural steel for the tieback retaining wall shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions. Structural steel shall consist of the anchorage assembly. The anchorage assembly shall be galvanized as indicated on the plans. The provisions of "Welding Quality Control" of these special provisions shall not apply to the weld between the steel tube and the bearing plate of the anchorage assembly for tiebacks. Those provisions shall apply to all other welds of structural steel for tieback retaining walls.

Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. Fine aggregate may be added to the grout mixture of portland cement and water used outside of the grouted sheathing in drilled holes which are 200 mm or greater in diameter, but only to the extent that the cement content of the grout is not less than 500 kg per cubic meter of grout. Fine aggregate, if used, shall conform to the provisions in Section 90-2, "Materials," and Section 90-3, "Aggregate Gradings," of the Standard Specifications.

The plastic sheathing for tieback anchors shall conform to one of the following: polyvinyl chloride (PVC) sheathing, high density polyethylene (HDPE) sheathing, or polypropylene sheathing.

Corrugated plastic sheathing shall be PVC or HDPE. The width of corrugations, the distance between corrugations, and the height of corrugations of corrugated plastic sheathing shall be approximately the same.

PVC sheathing may be used for corrugated sheathing and smooth sheathing for bar tendons. PVC sheathing shall conform to ASTM Designation: D 1784, Class 13464-B. Corrugated PVC sheathing shall have a nominal wall thickness of 1.0 mm. HDPE sheathing may be used for corrugated sheathing and smooth sheathing for bar tendons. HDPE sheathing shall have a density between 940 kg/m³ and 960 kg/m³ as measured in accordance with ASTM Designation: D 792, A-2. Corrugated HDPE sheathing shall have a nominal wall thickness of 1.5 mm for sheathing with an outside diameter of 75 mm or greater, and a nominal thickness of 1.0 mm for sheathing with an outside diameter less than 75 mm, with a tolerance of minus 0.25-mm.

HDPE sheathing may be used for the smooth sheathing encapsulating individual strands of strand type tendons. Smooth HDPE sheathing for encapsulating strands shall have a minimum wall thickness of 1.0 mm. Polypropylene sheathing may be used for the smooth plastic sheathing encapsulating individual strands of strand type tendons. Polypropylene sheathing shall have a density between 900 kg/m³ and 910 kg/m³. Smooth polypropylene sheathing shall have a minimum wall thickness of 1.0 mm.

The smooth sheathing for the unbonded length of the individual strands shall have sufficient strength to prevent damage during construction operations and shall be watertight, chemically stable without embrittlement or softening, and nonreactive with concrete, steel, or corrosion inhibiting grease. Smooth plastic sheathing, including joints, shall be watertight.

The corrugated sheathing, including joints, shall have sufficient strength to prevent damage during construction operations and shall be grout-tight and watertight, chemically stable without embrittlement or softening, and nonreactive with concrete, steel, or corrosion inhibiting grease.

The transition between the corrugated plastic sheathing and the anchorage assembly shall be an approved detail that allows stressing to the design force without evidence of distress in the corrugated plastic sheathing.

Additional requirements for tiebacks with strand type tendons are as follows:

- A. The strand anchorage assembly shall include an approved permanent type wedge retaining device. Where high strength bolts are a part of the device, the tensile capacity of the high strength bolts shall be 0.3 times the ultimate strength of the strands.
- B. The individual strands of a tendon, except for the bonded length, shall be fully coated with corrosion inhibiting grease and then encapsulated by a smooth HDPE or polypropylene sheath. The corrosion inhibiting grease shall fill all space between strand wires and shall encapsulate the strand giving an encasement diameter at least 0.12-mm greater than the diameter of the bare strand. The sheath shall be hot melt extruded onto the strand or shall be shop applied by an approved method that assures that all spaces between the sheath and the strand and between the strand wires are filled with corrosion inhibiting grease.
- C. The corrosion inhibiting grease shall provide a continuous nonbrittle film of corrosion protection to the prestressing steel and lubrication between the strand and the sheathing, shall resist flow from the sheathing, shall be chemically stable and nonreactive with the prestressing steel, sheathing material, and concrete, and shall be organic with appropriate polar, moisture displacing, and corrosion inhibiting additives.
- D. The corrosion inhibiting grease shall have the physical properties listed in Table 3.2.1 of the Post Tensioning Manual, Fourth Edition, by the Post Tensioning Institute and as modified below. At least 40 days before use, a sample from the lot to be used and test results shall be provided for the corrosion inhibiting grease.

Test	Requirements	ASTM Designation:
Water Soluble Ions: Nitrates	10 ppm max.	D 3867
Corrosion Test: 5% Salt Fog @ 38° C. 125 µm coating on 76 mm x 152 mm Q panel Type S, 1000 hrs min.	Grade 7 or better	B 117, D 610
Compatibility with sheathing: Hardness change & volume change of polymer after exposure to grease 40 days at 66° C.	15% max. 10% max.	D 4289, except use D 792 for density

- E. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, shall be furnished to the Engineer certifying that the corrosion inhibiting grease complies with the requirements herein if sample and test results are not provided for the lot used.

CONSTRUCTION

Tieback anchors shall be installed in accordance with the manufacturer's recommendations. In case of a conflict between the manufacturer's recommendations and these special provisions, these special provisions shall prevail.

Water and grout from tieback anchor construction operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into landscaping, gutters, or other drainage facilities. Excessive amounts of water shall not be used in any of the drilling and the tieback anchor installation procedures.

Tieback anchor steel shall be protected prior to completion of all grouting against rust, corrosion and physical damage in conformance with the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications. In addition, there shall be no evidence of distress in the plastic sheathing or crushing of the cement grout within the pregouted sheathing.

The tieback anchorage assembly shall be protected against rust, corrosion, and physical damage prior to completion of all grouting of enclosure or encasement in concrete.

The tieback anchor installation method selected by the Contractor shall be sufficient to achieve the loadings specified herein. Holes for tieback anchors shall be drilled in the foundation to a depth sufficient to provide the necessary bond length beyond the minimum unbonded length shown on the plans.

Tieback anchorage holes shall be drilled by either the rotary or rotary percussion drilling method.

The diameter of the drilled hole shall be large enough to provide a minimum of 25 mm grout cover within the bonded length of the tendon. Centralizers shall be used within the bonded length of the tendon.

Pregrouting shall occur at least 48 hours before placing the tendon in the drilled hole.

Prior to installing each anchor assembly into the drilled hole, the anchor assembly shall be clean and free of oil, grease, or other extraneous substances, and any damage to the sheathing shall be repaired or replaced.

Grout for all stages of tieback construction shall be injected at the low end of the void being filled and shall be expelled at the high end until there is no evidence of entrapped air, water, or diluted grout. The grout shall be placed using grout tubes, unless another method is approved by the Engineer. The quantity of the grout and the grout pressures shall be recorded.

After placing initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

Additional requirements for tiebacks with bar type tendons are as follows:

- A. The bar tendons in the unbonded area shall be sheathed with smooth sheathing that extends into the steel tube of the permanent tieback anchorage assembly, as shown on the plans. For this portion of smooth sheathing there is no minimum wall thickness and the sheathing shall be either PVC or HDPE.
- B. In addition, bar tendons shall be sheathed full-length with corrugated sheathing. The annular space between the bar and the corrugated sheathing shall be pregouted prior to placing the tendons in the drilled hole. The bar shall be centered in the sheathing.
- C. There shall be a seal between the smooth sheathing and the corrugated sheathing at the top and bottom of the length of smooth sheathing.
- D. For bar tendons, the initial grout in the drilled hole may be placed before or after insertion of the bar tendon.
- E. For drilled holes 150 mm in diameter or less, the initial grout outside of the corrugated sheathing shall extend to within 150 mm of the end of the steel tube of the anchorage assembly. Grout in the unbonded length shall not be placed under pressure. For drilled holes greater than 150 mm in diameter, the initial grout outside of the corrugated sheathing shall be within the limits of the bonded length. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

Additional requirements for tiebacks with strand type tendons are as follows:

- A. The Contractor shall have the option of using Alternative A or Alternative B as shown on the plans for tieback tendons.
- B. For Alternative A and Alternative B, strand tendons shall be sheathed with corrugated sheathing. The individual strands within the bonded length shall be separated by spaces so that the entire surface of each strand is bonded in the grout. The maximum spacing of strand spacers shall be 1.50 m. The strand spacers shall be plastic and of a construction and strength that will provide support for the individual strands during construction operations.
- C. For Alternative A, the bonded length of the tendon shall be sheathed with corrugated sheathing and pregouted full length of the corrugated sheathing before placing the tendon in the hole. The corrugated sheathing shall lap the smooth sheathing on the strands 600 mm. For this alternative, the initial grout in the drilled hole may be placed before or after insertion of the strand tendon.
- D. For Alternative B, the tendon shall be sheathed full length with corrugated sheathing and pregouted a minimum length of 600 mm before placing the tendon in the hole. After placing the tendon into the drilled hole and before placing initial grout in the drilled hole, the grout shall be injected at the low end of the corrugated sheathing and the grout shall be expelled at the high end until there is no evidence of entrapped air, water, or diluted grout.
- E. For Alternative A and Alternative B, anchors in holes of 150 mm diameter and smaller shall be initially grouted to within 150 mm of the end of the steel tube. Grout in the unbonded length shall not be placed under pressure. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.
- F. For Alternative A and Alternative B, anchors in holes of greater than 150 mm diameter shall be initially grouted within the bond length. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

Testing

All tiebacks shall be load tested by either a performance test or a proof test. Load testing shall be performed against a temporary waler which bears against existing soil. The permanent waler shall either attain a compressive strength of 22 MPa or cure for 7 days before loading. Bearing pads shall be kept a minimum of 300 mm away from the edges of the drilled hole. Temporary walers shall remain the property of the Contractor. The magnitude of applied test loads shall be determined with a calibrated pressure gauge or a load cell. Movements of the end of the tieback, relative to an independent fixed reference point, shall be measured and recorded to the nearest 0.025 mm at each load increment during the load tests. The Contractor shall perform the measuring and recording and shall furnish the Engineer copies of the recorded movements.

A minimum of 3 tiebacks shall be performance tested. The Engineer shall determine the location of the tiebacks to be performance tested.

The performance test or proof test shall be conducted by measuring the test load applied to the tieback and the tieback end movement during incremental loading and unloading of the anchor in accordance with the loading schedule. The test load shall be held constant for 10 minutes. During the test load hold, the movement of the end of the tendon shall be measured at 1, 2, 3, 4, 5, 6, and 10 minutes. If the total movement between one minute and 10 minutes exceeds one mm, the test load shall be held for an additional 50 minutes. Total movement shall be measured at 15, 20, 25, 30, 45, and 60 minutes. If the test load is held for 60 minutes, a creep curve showing the creep movement between one minute and 60 minutes shall be plotted as a function of the logarithm of time.

LOADING SCHEDULES		
PERFORMANCE TEST		PROOF TEST
	(CONT'D)	
AL	AL	AL
0.25T	0.25T	0.25T
AL	0.50T	0.50T
0.25T	0.75T	0.75T
0.50T	1.00T	1.00T
AL	1.25T	1.25T
0.25T	AL	1.50T (TEST LOAD)
0.50T	0.25T	AL
0.75T	0.50T	
AL	0.75T	
0.25T	1.00T	
0.50T	1.25T	
0.75T	1.50T (TEST LOAD)	
1.00T (CONT'D)	AL	
T = Design force for the anchor shown on the plans		
AL = Alignment load		

For performance and proof tests, each increment of load shall be applied in less than one minute and held for at least one minute but not more than 2 minutes or as specified above. The observation period for the load hold shall start when the pump begins to apply the last increment of load.

The jacking equipment, including the tendon movement measuring system, shall be stable during all phases of the tieback loading operations.

All tiebacks not performance tested shall be proof tested. If 1.5 times the design force cannot be obtained, the tieback shall be redesigned and replaced. Tieback anchors shall not be retested, unless the tieback bond length is post-grouted after the unacceptable test.

A performance tested tieback is acceptable if:

- A. The measured elastic movement exceeds 0.80 of the theoretical elongation of the unbonded length plus the jacking length at the maximum test load; and
- B. The creep movement between one and 10 minutes is less than 1.0 mm.

A proof tested tieback is acceptable if:

- A. The pattern of movements is similar to that of adjacent performance tested tiebacks; and
- B. The creep movement between one and 10 minutes is less than 1.0 mm.

Performance tested or proof tested tiebacks which fail to meet acceptance criterion B will be acceptable if the maximum load is held for 60 minutes and the creep curve plotted from the movement data indicates a creep rate of less than 2.0 mm for the last log cycle of time.

Lock-off

After successful testing of the tiebacks, the tiebacks shall be tensioned against the structure and locked off at a load equal to 0.75 T. The lock-off force is the load on the jacks which is maintained while the anchor head or anchor nuts on the tieback are permanently set. Immediately after lock-off, a lift-off test shall be performed to demonstrate that the specified lock-off force was obtained. Adjustments in the shim thickness shall be made if required to maintain the specified lock-off force.

For strand tendons, the permanent wedges shall be fully set in the anchor head while the tendon is stressed to the test load of 1.50 T, and then locked off at the lock-off force by removal of the shims or other appropriate means.

Grouting to the level of secondary grouting to the dimensions shown on the plans shall be completed only after successful testing and lock-off has been completed. At least 24 hours after the secondary grout has set, the remaining void in the steel tube and bearing plate shall be filled with grout. Grout shall be injected at the low end and expelled at the high end until there is no evidence of entrapped air or water. A minimum grout head of 600 mm shall be maintained until the grout has set.

MEASUREMENT AND PAYMENT

No payment will be made for tiebacks which do not pass the specified testing requirements.

Tieback anchors will be measured and paid for by the unit, and the number for payment will be determined by the requirements of the details shown on the plans.

The contract unit price paid for tieback anchor shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the tieback anchors, including special measures taken to contain grout in the drilled hole, testing, and furnishing and installing anchorage assemblies, complete in place, including repair or replacement of sheathing as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.865 MISCELLANEOUS METAL (RETAINING WALL)

Miscellaneous metal (retaining wall) shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Miscellaneous metal (retaining wall) shall consist of the miscellaneous bridge metal items listed in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications, and the following:

A. Anchor plates and nuts

Anchor plates shall conform to the requirements of ASTM Designation: A 36/A36M.

ENGINEER'S ESTIMATE
04-1123U4

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
41 (S)	040281	TUNNEL EXCAVATION AND SUPPORT (CATEGORY II, ALONG CENTER)	M	77		
42 (S)	040282	TUNNEL EXCAVATION AND SUPPORT (CATEGORY III)	M	569		
43 (S)	040283	TUNNEL EXCAVATION AND SUPPORT (CATEGORY IV)	M	222		
44 (S)	040284	TUNNEL EXCAVATION AND SUPPORT (CATEGORY V)	M	57		
45 (S)	040285	ENLARGED TUNNEL EXCAVATION AND SUPPORT (CATEGORY II)	M	15		
46 (S)	040286	ENLARGED TUNNEL EXCAVATION AND SUPPORT (CATEGORY II, ALONG SOUTH)	M	44		
47 (S)	040287	ENLARGED TUNNEL EXCAVATION AND SUPPORT (CATEGORY IV)	M	21		
48 (S)	040288	ENLARGED TUNNEL EXCAVATION AND SUPPORT (CATEGORY V)	M	32		
49 (S)	040289	CROSS PASSAGE TUNNEL EXCAVATION AND SUPPORT (CATEGORY I)	M	95		
50 (S)	040290	CROSS PASSAGE TUNNEL EXCAVATION AND SUPPORT (CATEGORY II)	M	38		
51 (S)	040291	CROSS PASSAGE TUNNEL EXCAVATION AND SUPPORT (CATEGORY IV)	M	38		
52 (S)	040292	EMERGENCY VEHICLE CROSS PASSAGE EXCAVATION AND SUPPORT	M	19		
53 (S)	040293	SOUTH EQUIPMENT CHAMBER EXCAVATION AND SUPPORT	M	32		
54 (S)	040294	CENTER EQUIPMENT CHAMBER EXCAVATION AND SUPPORT	M	23		
55	040295	EQUIPMENT CHAMBER ACCESSES	M	14		
56 (F)	192037	STRUCTURE EXCAVATION (RETAINING WALL)	M3	435		
57 (F)	192055	STRUCTURE EXCAVATION (SOIL NAIL WALL)	M3	820		
58 (F)	040296	STRUCTURE EXCAVATION (SOUTH PORTAL)	M3	2950		
59 (F)	040297	STRUCTURE EXCAVATION (NORTH PORTAL)	M3	13 400		
60 (F)	040298	STRUCTURE EXCAVATION (VENTILATION OUTLET)	M3	48		

ENGINEER'S ESTIMATE
04-1123U4

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
61 (F)	193013	STRUCTURE BACKFILL (RETAINING WALL)	M3	400		
62 (F)	193028	STRUCTURE BACKFILL (SOIL NAIL WALL)	M3	110		
63 (F)	040299	STRUCTURE BACKFILL (SOUTH PORTAL)	M3	3060		
64 (F)	040300	STRUCTURE BACKFILL (NORTH PORTAL)	M3	4820		
65 (F)	040301	STRUCTURE BACKFILL (VENTILATION OUTLET)	M3	25		
66	BLANK					
67 (S)	197060	SOIL NAIL ASSEMBLY	M	12 020		
68	BLANK					
69	040303	BORE HOLE FOR CONDUIT/VENT DUCTS	M	43		
70	198001	IMPORTED BORROW	M3	640		
71 (F)	040304	GEOSYNTHETIC REINFORCED EMBANKMENT	M2	15 200		
72 (S)	040305	TUNNEL MONITORING SYSTEM	LS	LUMP SUM	LUMP SUM	
73 (S)	200002	ROADSIDE CLEARING	LS	LUMP SUM	LUMP SUM	
74	BLANK					
75 (S)	039042	EROSION CONTROL (NETTING)	M2	11 100		
76 (S)	203003	STRAW (EROSION CONTROL)	TONN	25		
77 (S)	203014	FIBER (EROSION CONTROL)	KG	4100		
78 (S)	203021	FIBER ROLLS	M	3000		
79 (S)	203024	COMPOST (EROSION CONTROL)	M3	30		
80 (S)	039043	MYCORRHIZAL INOCULUM	KG	580		

ENGINEER'S ESTIMATE
04-1123U4

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
81 (S)	203026	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	5		
82 (S)	039044	PURE LIVE SEED (EROSION CONTROL)(TYPE 1)	KG	480		
83 (S)	039045	PURE LIVE SEED (EROSION CONTROL)(TYPE 2)	KG	5		
84 (S)	203061	STABILIZING EMULSION (EROSION CONTROL)	KG	740		
85	250401	CLASS 4 AGGREGATE SUBBASE	M3	760		
86	260201	CLASS 2 AGGREGATE BASE	M3	17 670		
87	260301	CLASS 3 AGGREGATE BASE	M3	3670		
88	280000	LEAN CONCRETE BASE	M3	2070		
89	290201	ASPHALT TREATED PERMEABLE BASE	M3	260		
90	390102	ASPHALT CONCRETE (TYPE A)	TONN	7250		
91	390106	ASPHALT CONCRETE (OPEN GRADED)	TONN	410		
92	394040	PLACE ASPHALT CONCRETE DIKE (TYPE A)	M	150		
93	394046	PLACE ASPHALT CONCRETE DIKE (TYPE D)	M	320		
94	394049	PLACE ASPHALT CONCRETE DIKE (TYPE F)	M	190		
95	401000	CONCRETE PAVEMENT	M3	4056		
96	404092	SEAL PAVEMENT JOINT	M	4120		
97 (S)	040306	ROCK BOLT	EA	12		
98 (F)	510060	STRUCTURAL CONCRETE, RETAINING WALL	M3	240		
99 (F)	040307	STRUCTURAL CONCRETE, FINAL LINING	M3	23 670		
100 (F)	040308	STRUCTURAL CONCRETE, TRANSITION BARRIER SLAB	M3	8		

ENGINEER'S ESTIMATE
04-1123U4

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
101 (F)	040309	STRUCTURAL CONCRETE, FINAL LINING ABUTMENT	M3	3060		
102 (F)	040310	STRUCTURAL CONCRETE, FINAL LINING INVERT ARCH	M3	5640		
103 (F)	040311	STRUCTURAL CONCRETE, FINAL LINING INVERT SLAB	M3	520		
104 (F)	040312	STRUCTURAL CONCRETE, PORTAL	M3	2200		
105 (F)	040313	STRUCTURAL CONCRETE, PORTAL INVERT SLAB	M3	1060		
106	510413	CLASS 1 CONCRETE (BOX CULVERT)	M3	320		
107 (F)	510501	MINOR CONCRETE	M3	3770		
108 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	75		
109	510522	MINOR CONCRETE (PIPE COVER)	M3	50		
110	039046	MINOR CONCRETE (ARTIFICIAL ROCKWORK)	M2	680		
111	039047	ARCHITECTURAL TREATMENT (TEXTURED CONCRETE)	M2	230		
112	040314	TUNNEL ARCHITECTURAL WORK	LS	LUMP SUM	LUMP SUM	
113 (S-F)	518201	MASONRY BLOCK WALL	M2	25		
114 (S-F)	520103	BAR REINFORCING STEEL (RETAINING WALL)	KG	21 460		
115 (S-F)	520106	BAR REINFORCING STEEL (EPOXY COATED)	KG	35 800		
116 (S-F)	520107	BAR REINFORCING STEEL (BOX CULVERT)	KG	46 900		
117 (S-F)	040315	BAR REINFORCING STEEL (FINAL LINING)	KG	2 331 000		
118 (S-F)	040316	BAR REINFORCING STEEL (TRANSITION BARRIER)	KG	250		
119 (S-F)	040317	BAR REINFORCING STEEL (PORTAL)	KG	736 200		
120 (F)	040318	SHOTCRETE (SOIL NAIL WALL)	M3	290		

ENGINEER'S ESTIMATE
04-1123U4

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
141	680931	150 MM PERFORATED PLASTIC PIPE UNDERDRAIN	M	150		
142	680932	150 MM NON-PERFORATED PLASTIC PIPE UNDERDRAIN	M	16		
143	680933	200 MM PERFORATED PLASTIC PIPE UNDERDRAIN	M	2290		
144	040324	200 MM NON-PERFORATED PLASTIC PIPE UNDERDRAIN	M	220		
145	040325	150 MM PERFORATED PVC DRAIN PIPE	M	2140		
146	040326	250 MM PERFORATED PVC DRAIN PIPE	M	5050		
147	681132	GEOCOMPOSITE DRAIN	M2	495		
148	681990	FILTER FABRIC	M2	6740		
149	682040	CLASS 2 PERMEABLE MATERIAL	M3	170		
150	682045	CLASS 3 PERMEABLE MATERIAL	M3	510		
151	690167	450 MM CORRUGATED STEEL PIPE DOWNDRAIN (2.77 MM THICK)	M	17		
152	692385	450 MM ANCHOR ASSEMBLY	EA	5		
153	700617	DRAINAGE INLET MARKER	EA	17		
154	700858	900 MM BITUMINOUS COATED CORRUGATED STEEL PIPE INLET (2.77 MM THICK)	M	5.8		
155	039050	CORRUGATED STEEL PIPE RISER (TYPE I)	EA	1		
156	039051	TRANSVERSE DOUBLE GRATED LINE DRAIN	M	17		
157	039052	CORRUGATED STEEL PIPE RISER (TYPE II)	EA	1		
158	039053	JACKED 900 MM WELDED STEEL PIPE (9.53 MM THICK)	M	77		
159	705336	450 MM ALTERNATIVE FLARED END SECTION	M	2		
160	BLANK					

ENGINEER'S ESTIMATE
04-1123U4

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
221 (S)	040337	WATER MAINS	LS	LUMP SUM	LUMP SUM	
222 (S)	040338	HEATING AND VENTILATION OF TUNNEL ANCILLARY SPACES	LS	LUMP SUM	LUMP SUM	
223 (S)	040339	LEACH WATER SYSTEM	LS	LUMP SUM	LUMP SUM	
224	994650	BUILDING WORK	LS	LUMP SUM	LUMP SUM	
225	BLANK					
226	040474	MISCELLANEOUS PORTALS CANOPY ITEMS	LS	LUMP SUM	LUMP SUM	
227	690171	600 MM CORRUGATED STEEL PIPE DOWNDRAIN (2.77 MM THICK)	M	2		
228	692386	600 MM ANCHOR ASSEMBLY	EA	2		
229	721024	ROCK SLOPE PROTECTION (1/4 T, METHOD B)	M3	96		
230	BLANK					
231	040481	MICROPILE	EA	144		
232 (S)	500050	TIEBACK ANCHOR	EA	33		
233 (S-F)	010806	BAR REINFORCING STEEL (ANCHOR BAR)	KG	700		
234 (F)	750502	MISCELLANEOUS METAL (RETAINING WALL)	KG	650		
235	839401	CONCRETE BARRIER	M	103		
236	999990	MOBILIZATION	LS	LUMP SUM	LUMP SUM	

