BLACKSTONE RIVER FISH PASSAGE RESTORATION PROJECT
MAIN STREET FISHWAY
PAWTUCKET, RHODE ISLAND

TECHNICAL SPECIFICATIONS FOR LOWER BLACKSTONE RIVER FISH PASSAGE PROJECT MAIN STREET DAM PAWTUCKET, RHODE ISLAND

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Prepared For:

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SECTION 01 10 13
SUMMARY OF THE WORK
(06/12)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Contract Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.2 CONTRACT DRAWINGS

Contract drawings for the Main Street Fishway are as follows:

DRAWING No. TITLE

T-1 TITLE SHEET

C-1 EXISTING CONDITIONS PLAN

C-2 PROPOSED SITE PLAN

C-3 CONSTRUCTION MANAGEMENT PLAN

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C-21 EXIT CHANNEL CONCRETE DETAILS

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E-1 ELECTRICAL DETAILS

1.3 DESCRIPTION

The "Work" of this contract is titled “Main Street Fishway” and is described in the Contract Documents, including the plans and specifications, and shall be referred to for detailed requirements of the work involved.

The Work generally includes, but is not limited to site work and construction of the fishway, downstream fish passage, and replacement trash rack system.

The Work shall include in the base bid all necessary labor, work, and equipment for the construction of the fishway as indicated in the documents.

The “Owner” referenced in the Contract Specifications shall refer to the Rhode Island Department of Environmental Management (RIDEM), all Owners of the dam and/or the city park on the left abutment of the dam looking in the downstream direction.

The Owner’s “Contracting Officer” (CO) referenced in the Contract Specifications shall refer to the Owner’s representative responsible for administering the construction contract.

The "Engineer" referenced in the Contract Specifications shall refer to the support representative provided by RIDEM.

The “Architect/Engineer” (A/E) referenced in the Contract Specifications shall refer to EA Engineering, Science, and Technology, Inc., the project design engineer for the Blackstone Fish Passage Restoration Project.

The Contractor will be required to complete the entire work ready for use within 360 days from the date of Notice to Proceed.

1.4 SCHEDULING THE WORK

The Contractor shall perform all work on site Monday through Friday between the hours of 7:00 AM and 7:30 PM. The Contractor may perform work at times other than those listed above with permission of the Engineer. The Contractor shall notify the Engineer a minimum of 48 hours in advance prior to performing any work outside the times listed.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 CONSTRUCTION OF THE MAIN STREET FISHWAY

The Contractor shall provide all labor, supervision, equipment, tools, testing devices, materials and material handling, security and accountability, and each and every item of expense necessary for the supply, fabrication, erection, installation and construction of the fishway structure. The Contractor shall provide all required submittals.

3.2 CONSTRUCTION INSPECTION

The Contractor's work shall be monitored periodically by the Engineer.

The owner anticipates that a full-time inspector will be assigned to this work. The Engineer will inspect the work at various times throughout the course of construction. In addition to the random Engineer inspections, the Contractor shall observe construction "hold points" to permit the Engineer to inspect the work of certain key elements of construction. The scope of each hold point inspection shall be discussed with the Contractor prior to the request for inspection. Hold point inspections will permit the Engineer to inspect the work of certain key elements of construction and provide the CO approval of the following:

a. Construction of access road(s) and temporary storage areas
b. Installation of erosion and sediment control structures
c. Construction Site Layout
d. Installation of cofferdam and dewatering system
e. Exposure of existing dam timber apron
f. Removal of existing dam timber
g. Final rock excavation
h. Installation of rock dowels
i. Surveyor’s layout of fishway and non-overflow section
j. Final placement of reinforcement
k. Placement of concrete
l. Installation and testing of rock anchors
m. Installation of non-overflow section weir gate
n. Installation of fishway exit isolation gate, V-trap, and eel Ladder
o. Installation of hydropower intake platform
p. Dewatering of hydropower intake bay
q. Hydropower intake foundation modification
r. Installation of downstream fish passage sluice
s. Installation of replacement trash racks
t. Final inspection (punchlist development)
u. Site restoration
v. Installation of plantings
w. Completion verification inspection.

An additional hold point before the application of concrete stain will permit the Rhode Island State Historic Preservation Officer to inspect the color, texture, special effects, and workmanship of the concrete mock-ups.

The Contractor shall keep the A/E informed concerning the work status and projected work schedule through regular communications. The A/E shall be notified by the Contractor in writing 2 to 3 calendar days prior to reaching each hold point previously designated by the Contractor. The Contractor shall reconfirm the inspection date 24 hours (not including Saturdays, Sundays, and legal holidays) before the scheduled hold point.

Rescheduling of a hold point and cancellation shall also be given in writing by the Contractor. The Contractor shall not cover any work related to the designated hold point until one of the following occurs:

a. The Contractor is authorized in writing to proceed after inspection by the A/E.
b. The hold point inspection is rescheduled by the Engineer to a later construction event.

c. The hold point inspection is waived in writing by the Engineer.

The Contractor shall submit a written request for Final Inspection (Exhibit 01 10 13 - A) 14 calendar days in advance of the planned completion date. After review of the Notice of Completion, the Engineer may reject the Notice for cause or schedule the Final Inspection. The Engineer will perform its Final Inspection on all phases of the work and develop a comprehensive punchlist, which will be provided to the Contractor.

The Completion Verification Inspection will be scheduled when the punchlist items identified during the Final Inspection have been corrected. The A/E may add new items to the punchlist at this inspection.

The Contractor is advised that the CO will not accept the work until the A/E determines that substantial completion has been achieved. Therefore, to minimize its risk of assessment of liquidated damages, the Contractor should schedule its work to be substantially complete in time to allow Final Inspection, punchlist work, and Completion Verification Inspection to occur in advance of the Contract Completion Date.

Nothing in this Section shall be construed to limit the Engineer's or Owner's right to inspect the work at any time.

--End of Section--

EXHIBIT 01 10 13 – A
FINAL INSPECTION

(On Contractor Letterhead)

NOTICE OF COMPLETION

Effective at (time) hours on (date) , work described under Contract No._____, Construction of the Main Street Fishway Project in Pawtucket, Rhode Island, will be substantially and usably complete with the following exceptions: (none) or (describe remaining work items). We request that the Final Inspection be arranged as soon as possible after the above date.

By: (Name of Contractor's Representative)

(Title of Contractor's Representative)

SECTION 01 20 00
MEASUREMENT AND PAYMENT
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The procedures applicable to the measurement of work accomplished and payment to the Contractor for both periodic progress payments and final payment are described in this section. This section specifies the method of measurement and payment for each bid item listed on the Base Bid Form. Items for work called for by the Contract Drawings and Specifications, but for which no bid item is described, shall be considered subsidiary to the cost of the related bid items. Cost for all work to be conducted under this contract shall be included under one of the bid items listed in Paragraph 1.2 Bid Items.

1.2 BID ITEMS

The scope of work included in each item and measurement and payment shall be as follows:

Bid Item 1: Mobilization/Demobilization

Work under this item shall consist of the mobilization and demobilization of the Contractor's forces and equipment necessary to perform the work required under the Contract. This item shall include all bonds, permits, insurance, administration, transportation to and from the site, operating supplies, detailed construction layouts, and coordination necessary for the Contractor to provide and maintain a construction force at the project site complete and ready to perform all work required under the Contract.

Mobilization/demobilization will be paid for at the contract lump sum price. Payment of the Contract Lump Sum amount will be made as the work proceeds and will be prorated based on the percentage of work under this item that has been completed. This payment shall be full compensation for all material, equipment, labor, disposal, and incidentals required to complete the work. Mobilization/demobilization shall not be more than 5% of the total bid.

Bid Item 2-1: Survey Requirements

Survey requirements will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for furnishing, placing, and maintaining construction layout stakes; channel baseline stakeout and grade verification; installation of permanent benchmarks; flagging of clearing limits and wetlands; and for all material, labor, equipment, tools, and incidentals necessary to complete the work. Payment of the Contract Lump Sum price will be prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating will be the number estimated to complete the work.

Bid Item 2-2: Intake Deck Demolition

Removal of the existing intake deck will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material removal, labor, equipment, tools, and incidentals necessary to complete the work to the limits indicated on the Project Drawings excluding diver support services.

Bid Item 2-3: Trash Rack Removal

Removal of the existing trash rack will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material removal, material disposal, labor,

equipment, tools, and incidentals necessary to complete the work to the limits indicated on the Project Drawings.

Bid Item 2-4: Intake Foundation Modification

Modification of the intake masonry foundation required for the downstream fish bypass sluice will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material removal, material disposal, concrete, steel reinforcement, labor, equipment, tools, and incidentals necessary to complete the work indicated on the Project Drawings.

Bid Item 3-1: Grout and Grout Bag Footings

Grout and grout bag footing for the fishway piers will be paid for at the Contract Unit price designated on the Bid Form for quantities calculated to the nearest cubic yard (CY). The payment will be full compensation for all material, concrete, grout bags, steel reinforcement, labor, equipment, tools, and incidentals necessary to complete the work excluding diver support services.

Bid Item 3-2: Precast Concrete Fishway Sections

Concrete footings and walls will not be measured but will be paid for at the Contract Lump Sum price. For the fishway and non-overflow section, the payment will be full compensation for all material, concrete, forms, steel reinforcement, water stops, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 3-3: Concrete Form Liners

Concrete form liners for the exterior walls of the fishway and non-overflow section will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to install the exterior wall forms for fishway.

Bid Item 3-4: Concrete Staining

Concrete staining of the exterior walls of the fishway and non-overflow section will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to stain the exterior walls of the fishway and non-overflow section.

Bid Item 3-5: Cast-in-place Concrete Exit Channel

Cast-in-place concrete will be paid for at the Contract Unit price designated on the Bid Form for quantities calculated to the nearest cubic yard (CY). For the fishway and non-overflow section, the payment will be full compensation for all material, concrete, forms, steel reinforcement, water stops, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 3-6: SHPO Approval of Concrete Staining and Form Lining

SHPO approval of concrete staining and form lining will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to create mock-up panels illustrating application of concrete stain and paving finishes.

Bid Item 3-7: Cast-in-place Concrete Fish Counting Station

Construction of the cast-in-place concrete fish counting station will be paid for at the Contract Unit price designated on the Bid Form for quantities calculated to the nearest cubic yard (CY). The payment will be full compensation for all material, concrete, forms, steel reinforcement, water stops, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 5-1: Fish Viewing Bottom Plate

Fabrication, painting, and installation of the aluminum fish viewing bottom plate will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 5-2: Miscellaneous Steel

Miscellaneous steel including concrete embedment plates and channels, walkway support beams, walkway grating and handrails, fishway trash racks, replacement intake deck steel, and miscellaneous hardware will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 5-3: Downstream Fish Bypass Sluice

The downstream fish bypass sluice as defined on the Project Drawings will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to procure materials, fabricate, paint, and install the steel sluice complete.

Bid Item 5-4: Aluminum Stoplogs

The aluminum stoplogs will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 5-5: Replacement Trash Rack Monorail

The replacement trash rack monorail will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 5-6: Fish Crowder, V-Trap, and Isolation Screens

The fish crowder, V-trap, and isolation screens as defined on the Project Drawings will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 6-1: Intake Timber Deck Replacement

Replacement of the intake timber deck will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 6-2: Baffles and Miscellaneous Hardware

Wooden baffles and miscellaneous hardware including the water level staff gages will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 6-3: Non-Metallic Replacement Trash Racks

Non-metallic replacement trash racks will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to procure, fabricate, and install six (6) plastic trash rack panels described on the Project Drawings. Three (3) panels will have a 1 inch clear spacing and three (3) panels will have a 2 inch clear spacing.

Bid Item 8-1: Acrylic Window and Backing Plate

Procurement and installation of the acrylic window and backing plate for the fish counting station will not be measured but will be paid for at the Contract Lump Sum Price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 8-2: Watertight Door

Procurement and installation of the watertight door will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 13-1: Eel Ladder

Fabrication and installation of the eel ladder will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 13-2: Eel Ladder Water Supply

The eel ladder water supply system including the pump, pump well, piping and hoses, spay header, hose, hose connection, valves, and miscellaneous hardware will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 13-3: Water Level Sensor

Procurement and installation of the water level sensor required to operate the fishway entrance gate will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 26: Electrical

Electrical will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 31-1: Clearing, Grubbing, and Excavation

Clearing, grubbing, and excavation will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for the removal and resetting of fences; selective tree trimming, felling, chipping, cutting and scar repair; removal and disposal tree stumps and roots, and excavation of bedrock overburden material required for construction of the fishway when not covered as a specific pay item in the Contract Documents; and, all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 31-2: Rock Removal and Disposal

Payment for excavation shall be made at the Contract Unit price designated on the Bid Form for quantities calculated to the nearest cubic yard (CY). Such payment will constitute full compensation for all labor, equipment, disposal, and all other items necessary and incidental to the performance of the work. Payment will not be made for excavation of any material used for purposes other than those designated.

Quantities for payment of excavation will be computed by the Method of Average End Areas, from the cross-sections of the original ground combined with cross-sections of the completed work. Excavation will always be measured in its original position. No liquids will be included in any measurement. No

measurement will be made for any additional excavation required to construct items other than those specified on the Contract Documents.

If scattered rock or boulders of 0.5 yd or larger volume are removed, any resulting undercutting approved by the Engineer will be measured for payment. Slides or breakages not attributable to the Contractor's negligence as determined by the Engineer will be measured and included in the final quantities for excavation.

Bid Item 31-3: Cofferdams and Dewatering

Temporary cofferdam, including installation of sheet pile, plastic liner, sand bags, removable pumping station(s), fractionalization tanks, and elements required by the approved dewatering plan during the construction period, will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Payment of the Contract Lump Sum price will be prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating will be the number estimated to complete the work.

Bid Item 31-4: Temporary Construction Access and Staging Areas

Installation and maintenance of stabilized construction entrance, access roads and staging/stockpile areas will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Payment of the Contract Lump Sum price will be prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating will be the number estimated to complete the work.

Bid Item 31-5: Barges, Cranes, and Miscellaneous Equipment

Barges, barge-mounted cranes, truck-mounted cranes, and other construction equipment required to complete all stages of construction will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals associated with the Contactor's equipment necessary to complete the work.

Bid Item 31-6: Erosion and Sediment Control

Erosion and sediment control will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. The maintenance, repair, resetting, and final removal of all erosion and sediment control devices will not be measured, but the cost will be incidental to the Contract price to construct the device unless otherwise specified in the Contract Documents. The erosion and sediment control manager will be considered incidental to erosion and sediment control items specified in the Contract Documents.

Bid Item 31-7: Mobilization of Rock Anchor Equipment

Mobilization of rock anchor equipment will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 31-8: Rock Anchors (60 Kip Design Load)

Rock anchors will be paid for at the Contract Unit price designated on the Bid Form per each rock anchor installed, tested, and accepted. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 31-9: Rock Anchors (150 Kip Design Load)

Rock anchors will be paid for at the Contract Unit price designated on the Bid Form per each rock anchor installed, tested, and accepted. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 31-10: Powerhouse Intake Sediment Removal and Disposal

Payment for sediment removal and disposal near the powerhouse intake shall be made at the Contract Unit price designated on the Bid Form for quantities calculated to the nearest cubic yard (CY). Such payment will constitute full compensation for all labor, equipment, disposal, and all other items necessary and incidental to the performance of the work.

Bid Item 32-1: Fences and Gates

Procurement and installation of the security fence and gates as shown on the Project drawings will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 32-2: Slater Mill Park Restoration

Restoration of the City of Pawtucket Park at Slater Mill including grass seeding and planting replacement trees will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 32-3: City of Pawtuxet Boat Ramp Restoration

Restoration of the City of Pawtucket Boat Ramp at Slater Mill and boat ramp improvement requested by the City will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 35-1: Fishway Entrance Weir Gate

The fishway entrance weir gate will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 35-2: Downstream Fish Bypass Sluice Multiple Section Gate

The downstream fish bypass multiple section gate will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Bid Item 41: Replacement Trash Rack Monorail Hoist

The replacement trash rack monorail hoist will not be measured but will be paid for at the Contract Lump Sum price. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

1.3 METHODOLOGY

Requests for progress payments and final payment shall be submitted by the Contractor and shall be validated by the Engineer to verify that the work for which payment is sought has been performed.

Payments by the Owner shall be made in accordance with the “Payments” clause of the contract.

The Contractor shall specify a cut-off date, to be the same date each pay period, for determining progress for invoicing purposes.

1.4 SUBMITTALS

The Contractor shall submit the following to the Engineer in accordance with Section 01 33 00 - Submittals. Submittals are for the record or approval, as indicated.

Schedule of Prices (Exhibit 01 20 00-A) shall be submitted within seven (7) calendar days after contract award and prior to mobilization at the project site shall be submitted to the Engineer for approval.

The following invoice submittals shall be transmitted monthly to the Engineer:

1. Invoice on Contractor's letterhead with Taxpayer I.D. number for approval
2. Schedule of Prices updated with progress percentages for approval
3. Statused Construction Schedule for the record
4. Statused Project S Curve for approval
5. Record drawing certification for the record
7. Certification that required copies of subcontractors' proofs of insurance are complete and current for the record
8. Release of Claims for the record (with final invoice only).

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 SCHEDULE OF PRICES

The Schedule of Prices shall be as specified in Exhibit 01 20 00-A.

The sum of the prices shall equal the total Contract fixed price. The line items in the Schedule of Prices shall correlate with other schedules and forms, including: Application for Payment form. The Schedule of Prices shall reflect each work activity comprising the work to be performed. Percent progress per activity shall represent the current status, as shown on the construction schedule and verified by the Engineer.

The Engineer may approve, disapprove, or require revisions to the Schedule of Prices. Subsequent revision to the Schedule of Prices must be approved by the Engineer. The Schedule of Prices shall be submitted at the earliest date, but no later than seven (7) days before the date scheduled for submittal of the initial Application for Payment.

Related work:

1. Documents affecting work of the Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and Section in Division 1 of these Specifications.
2. Schedule of values is required under Paragraph 4.8 of the General Conditions.
3. Schedule of values is required to be compatible with the "continuation sheet" accompanying applications for payment, as described in Section 01152.

3.1.1 Quality Assurance

The Contractor shall use required means to assure arithmetical accuracy of the sums described.

When so required by the Engineer, the Contractor shall provide copies of the subcontracts or other data acceptable to the Engineer.

3.2 FORM AND CONTENT

Use the Project Manual Table of Contents as a guide to establish the format.

1. Identification: Include the following:
    a. Project name and location;
    b. Name of the Architect/Engineer;
    c. Project Number;
    d. Contractor's name and address;
    e. Date of submittal.

Arrange the Schedule in tabular form with columns to indicate the following for each item:

1. Generic name;
2. Related Specification Section;
3. Change Orders (No.) that have affected value;
4. Dollar value.

Break Contract Sum down in enough detail to facilitate evaluation of Applications for Payment. Break subcontract amounts down into several line items. Round amounts off to the nearest dollar; the total shall equal the Contract Sum.

For each item where an Application for Payment includes products purchased or fabricated and stored, but not installed, provide separate line items for initial cost, each subsequent stage of completion, and installed value.

Each item in the Schedule of Prices and Application for Payment shall be complete including total cost and share of overhead and profit.

1. Temporary facilities and items are not direct cost of Work-in-place may be shown as separate line items or distributed as general overhead expense.

Update and resubmit the schedule when Change Orders or Construction Change Directives change the Contract Sum.

3.3 DETERMINATION OF PROGRESS

The Contractor and the Engineer shall jointly review all work prior to submission by the Contractor of its periodic payment invoice and periodic progress report and seek to report a consensus regarding the percent of total progress achieved during the period. If the Engineer is unable to physically travel to the project site, progress shall be determined by telephone. The invoice shall be submitted for a dollar amount reflecting the percent of progress achieved during the period.

Final determination of progress and payment to be made, whether or not the Contractor and Engineer reach agreement, shall be by the CO.

3.4 APPLICATIONS FOR PAYMENT

Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect/Engineer and paid for by the Owner.

Payment Application Times: Payment dates are indicated in the Agreement. The period covered by each application is the period indicated.

Payment Application Forms: Use AIA Document G 702-1983 and Continuation Sheets G 703-1983 as the form for the application.

Application Preparation: Complete every entry, including notarization and execution by person authorized to sign on behalf of the Owner. Incomplete applications will be returned without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
2. Include amounts of approved Change Orders and Construction Change Directives issued prior to the last day of the period covered by the application.
3. The Contractor is to review Payment items and draft Payment Request with Owner's on-site observer and the Architect/Engineer's field representative before forwarding to the Architect/Engineer.

Transmittal: Submit 6 executed copies of each application to the Architect/Engineer within twenty-four (24) hours; one copy shall be complete, including waivers of lien and similar attachments.

1. Transmit each copy with a transmittal listing attachments, and recording information related to the application.

Waivers of Lien: With each application, submit waivers of lien from each entity who may file a lien arising out of the Contract, and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested, prior to deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Waiver Delays: Submit each application with Contractor's waiver of lien for the period covered by the application.
4. Submit final Application for Payment with final waivers from every entity involved with performance of Work covered by the application who could be entitled to a lien.
5. Waiver Forms: Submit lien releases on forms provided by the Owner.

3.5 INITIAL APPLICATIONS FOR PAYMENT

Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include:

1. List of subcontractors;
2. List of suppliers and fabricators;
3. Schedule of Values;
4. Contractor's Construction Schedule (preliminary if not final);
5. List of Contractor's staff assignments;
6. Copies of building permits;
7. Copies of licenses from governing authorities;
8. Certificates of insurance and insurance polices;

9. Performance and payment bonds (if required).

3.6 APPLICATIONS FOR PAYMENT AT SUBSTATIONAL COMPLETION

Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. Administrative actions and submittals that precede or coincide with this application include:

1. Occupancy permits;
2. Warranties and maintenance agreements;
3. Test/adjust/balance records;
4. Maintenance instructions;
5. Change-over information related to Owner's occupancy;
6. Final cleaning;
7. Application for reduction of retainage, and consent of surety.

3.7 FINAL PAYMENT APPLICATION

Administrative actions and submittals which must precede or coincide with submittal of the final payment application include:

1. Completion of Project closeout requirements;
2. Completion of items specified for completion after Substantial Completion;
3. Transmittal of required Project construction records to the Owner;
4. Proof that taxes, fees and similar obligations have been paid.

3.8 INVOICING AND PAYMENT

Invoices shall be prepared as specified herein.

The Contractor shall invoice the Engineer on the Contractor's letterhead for approval prior to submittal to the Owner. Invoicing shall be based on the value of specific items in the Schedule of Prices, to which is applied the progress (percent completion) claimed for that item. All invoices shall be supported by a Schedule of Prices, statused Construction Schedule, and Project S Curve, Taxpayer I.D. number, and certification that record drawings are complete as of the invoice period.

Following approval by the Engineer, the Contractor shall submit its invoice for periodic progress payment to the Owner.

If satisfactory progress has not been made, the Owner may retain a maximum of 10 percent of the amount of the payment until satisfactory progress is achieved. Satisfactory progress will be determined by use of the project status curve, developed by the Contractor in accordance with Section 01 32 13 – Construction Schedules.

The Owner will pay the final amount due to the Contractor under this contract after:

1. Completion, final inspection, and acceptance of all work
2. Presentation of a properly executed invoice

3. Presentation by Contractor of a release of all claims against the Engineer and Owner arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically exempted from the operation of the release. Release of Claims (Exhibit 01 20 00-B) shall be the form of this release.

4. Deductions of any sums owed the Owner and permitted to be offset by law.

--End of Section--

EXHIBIT 01 20 00-A
SCHEDULE OF PRICES

Main Street Fishway

Bid Item #	Item Description	Bid Cost	Units	Bid Quantity	Invoice Quantity	Percent Complete	Invoice Amount This Period	Complete To Date
1	Mobilization/Demobilization		LS	1				
2-1	Survey Requirements		LS	1				
2-2	Intake Deck Demolition		LS	1				
2-3	Trash Rack Removal		LS	1				
2-4	Intake Foundation Modification		LS	1				
3-1	Grout and Grout Bag Footings		CY	70				
3-2	Precast Concrete Fishway Sections		LS	1				
3-3	Concrete Form Liners		LS	1				
3-4	Concrete Staining		LS	1				
3-5	Cast-in-place Concrete Exit Channel		CY	75				
3-6	SHPO Approval of Concrete Staining and Form Lining		LS	1				
3-7	Cast-in-place Concrete Fish Counting Station		CY	10				
5-1	Fish Viewing Bottom Plate		LS	1				
5-2	Miscellaneous Steel		LS	1				
5-3	Downstream Fish Bypass Sluice		LS	1				
5-4	Aluminum Stoplogs		LS	1				
5-5	Replacement Trash Rack Monorail		LS	1				
5-6	Fish Crowder, V-trap, and Isolation Screens		LS	1				
6-1	Intake Timber Deck Replacement		LS	1				
6-2	Baffles and Miscellaneous Hardware		LS	1				
6-3	Non-Metallic Replacement Trash Racks		LS	1				
8-1	Acrylic Window and Backing Plate		LS	1				
8-2	Watertight Door		LS	1				
13-1	Eel Ladder		LS	1				
13-2	Eel Ladder Water Supply		LS	1				
13-3	Water Level Sensor		LS	1				
26	Electrical		LS	1				
31-1	Clearing, Grubbing, and Excavation		LS	1				
31-2	Rock Removal and Disposal		CY	75				
31-3	Cofferdams and Dewatering		LS	1				
31-4	Temporary Construction Access & Staging Areas		LS	1				
31-5	Barges, Cranes, and Miscellaneous Equipment		LS	1				
31-6	Erosion and Sediment Control		LS	1				
31-7	Mobilization of Rock Anchor Equipment		LS	1				
31-8	Rock Anchors (60 Kip Design Load)		EA	4				
Bid	Item Description	Bid	Units	Bid	Invoice	Percent	Invoice	Complete

Item #		Cost		Quantity	Quantity	Complete	Amount This Period	To Date
31-9	Rock Anchors (150 Kip Design Load)		EA	17				
31-10	Powerhouse Intake Sediment Removal and Disposal		CY	450				
32-1	Fences and Gates		LS	1				
32-2	Slater Mill Park Restoration		LS	1				
32-3	City of Pawtucket Boat Ramp Restoration		LS	1				
35-1	Fishway Entrance Weir Gate		LS	1				
35-2	Downstream Fish Bypass Sluice Multiple Section Gate		LS	1				
41	Replacement Trash Rack Monorail Hoist		LS	1				
	Contract Total							
	Billed Through Previous Period							
	New Billing							

Main Street Fishway				
Item Description	Negotiated Cost	Percent Complete	Invoice Amount This Period	Complete to Date
Contract Total				
Performance Bond				
Billed Through Previous Period				
New Billing				

EXHIBIT 01 20 00-B
RELEASE OF CLAIMS

The undersigned contractor, pursuant to the terms of Contract No. _____between the Owner and said Contractor for the Main Street Fishway Project located at Pawtucket, Rhode Island, hereby releases the Owner from any and all claims arising under or by virtue of said contract or any modification or change thereof.

Witness the signature and seal of the undersigned this _____ day of _____.

WITNESS:	CONTRACTOR:
_____	_____
(Signature)	*(Print or Type)*
_____	_____
(Address)	*(Signature)*
	_____
	(Official Title)

SECTION 01 20 01
PROJECT MEETINGS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

To enable orderly review during progress of the Work, and to provide for systemic discussion of problems, the Architect/Engineer will conduct project meetings throughout the construction period.

1. Documents affecting work of this section include, but not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility and normally are not part of project meetings content.

1.2 QUALITY ASSURANCE

For those persons designated by the Contractor to attend and participate in project meetings, the Contractor shall provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.3 SUBMITTALS

To the maximum extent practicable, the Contractor shall advise the Architect/Engineer at least twenty-four (24) hours in advance of project meetings regarding items to be added to the agenda.

1. The Owner’s Representative will compile minutes of each project meeting, and will furnish three (3) copies to the Architect/Engineer and five (5) copies to the Owner.
2. Recipients of copies may make and distribute such other copies as they wish.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 ATTENDANCE

To the maximum extent practicable, the Contractor shall assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work.

The Owner's Representative and the Architect/Engineer's Representative shall be in attendance at these meetings.

Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

3.2 AGENDA

Weekly meeting agenda shall be held to:

1. Review, revise as necessary, and approve minutes of previous meetings.
2. Review progress of the Work since last meeting, including status of submittals for approval. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule.
3. Identify problems which impede planned progress.
4. Develop corrective measures and procedures to regain planned schedule.
5. Complete other current business.

3.3 MINUTES

The Owner’s Representative shall distribute minutes of project meetings within two (2) working days following the meeting date.

Unless published minutes are challenged in writing prior to the next regularly scheduled project meeting, they will be accepted as properly stating the activities and decisions of the meeting.

Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.

Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

--End of Section--

SECTION 01 20 02
PRECONSTRUCTION CONFERENCE
(06/12)

PART 1 - GENERAL

1.1 SCOPE

To help clarify construction contract administration procedures, the Engineer will conduct a Preconstruction Conference prior to start of the Work. The Contractor shall provide attendance by the designated personnel.

Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

For those persons designated by the Contractor, his subcontractors, and suppliers to attend the Preconstruction Conference, provide required authority to commit the entities they represent of solutions agreed upon in the Conference.

1.3 SUBMITTALS

To the maximum extent practicable, the Contractor shall advise the Engineer at least 24 hours in advance of the conference as to items to be added to the agenda.

The Engineer will compile minutes of the Conference, and will furnish three (3) copies of the minutes to the Contractor and five (5) copies to the Owner. The Contractor may make and distribute such other copies as he wishes.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.1 SCHEDULE

The Conference will be scheduled to be held within 15 working days after the Owner has issued the Notice to Proceed, but prior to actual start of the Work.

3.2 ATTENDANCE

Authorized representatives of the Contractor and major subcontractors shall attend.

The Engineer will advise other interested parties, including the Owner, and request their attendance.

3.3 AGENDA

The Contractor shall distribute data and discuss:

1. Organizational arrangement of the Contractor's forces and personnel, and those of subcontractors, materials suppliers, and the Engineer;
2. Channels and procedures for communication;
3. Construction schedule, including sequence of critical work;
4. Contract Documents, including distribution of required copies of Drawings and revisions;
5. Processing of Shop Drawings and other data submitted to the Engineer for review;
6. Processing of field decisions and Change Orders;
7. Rules and regulations governing performance of the Work; and
8. Procedures for safety and first aid, security, quality control, housekeeping, and related matters.

--End of Section--

SECTION 01 26 63
CHANGE PROCEDURE
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall comply with this procedure in the process of giving notification of change and preparing and submitting a proposal for adjustment due to a desired, perceived, or actual change in the work. Changes in the work, or period of performance of the work, may be directed in writing by the Engineer or may be requested by the Contractor. In either case, payment for work accomplished under a modification may not be made until a formal contract modification, incorporating the change into the contract, has been issued and executed. Therefore, it is incumbent upon the Contractor to comply fully with this procedure and to expedite the resolution of changes.

Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications. Changes in the Work are described further in Article 7 of the General Conditions.

1.2 CHANGE SUBMITTALS

When requested, the Contractor shall submit change requests with the following items to the Engineer for approval in accordance with Section 01 33 00 - Submittals:

a. Proposal cover letter on Contractor's letterhead

b. Detailed price proposal

c. Drawings or other explanatory data

d. Time extension statement with justification if any time extension is requested

1.3 COMPLIANCE

The Contractor shall take such measures as are needed to assure familiarity and compliance by its staff with these procedures. If change proposals are incomplete, unclear, or ambiguous or are not supported by adequate documentation, the data will be returned and the Contractor shall resubmit or supplement the proposal as requested by the Engineer. Delay resulting from the Contractor's noncompliance with this procedure shall not in itself constitute the basis for an extension in the time of performance under the contract.

1.4 PRODUCT HANDLING

The Contractor shall maintain a “Register of Bulletins and Change Orders” at the job site, accurately reflecting current status of all pertinent data. The Register shall be made available to the Engineer for review at his request.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PROCESSING CHANGES INITIATED BY THE OWNER

Should the Owner contemplate making a change in the Work or a change in the Contract Time of Completion, the Engineer will issue a "Bulletin" to the Contractor.

1. Bulletins will be dated and will be numbered in sequence.

2. The Bulletin will describe the contemplated change, and will carry one of the following instructions to the Contractor:

   a. Make the described change in the Work at no change in the Contract Sum and no change in the Contract Time of Completion;

   b. Make the described change in the Work, credit or cost for which will be determined in accordance with Paragraph 7.3.3 of the General Conditions;

   c. Promptly advise the Engineer as to credit or cost proposed for the described change. This is not an authorization to proceed with the change.

If the Contractor has been directed by the Engineer to make the described change in the Work at no change in the Contract Sum and no change in the Contract Time of Completion, but the Contractor wishes to make a claim for one or both of such changes, the Contractor shall proceed with the change and shall notify the Engineer, as provided for under Paragraph 7.3.6 of the General Conditions.

If the Contractor has been directed by the Engineer to make the described change subject to later determination of cost or credit in accordance with Paragraph 7.3.3 of the General Conditions, the Contractor shall:

1. Take measures as needed to make the change;

2. Consult with the Engineer and reach an agreement on the most appropriate method for determining credit or cost for the change.

If the Contractor has been directed by the Engineer to promptly advise her/him as to credit or cost proposed for the described change, the Contractor shall:

1. Analyze the described change and its impact on costs and time;

2. Secure the required information and forward it to the Engineer for review;

3. Meet with the Engineer as required to explain costs and, when appropriate, determine other acceptable ways to achieve the desired objective;

4. Alert pertinent personnel and subcontractors as to the impending change and, to the maximum extent possible, avoid such work as would increase the Owner's cost for making the change, advising the Engineer in writing when such avoidance no longer is practicable.

3.2 PROCESSING CHANGES INITIATED BY THE ENGINEER

The Engineer will initiate changes only in writing. The Owner will sign any Request for Proposal (RFP). This will establish a Proposed Change (PC) number, by which the change will be identified until such time as it may be incorporated into the contract by formal modification.

The Contractor may or may not be authorized to proceed with the changed work pending resolution of changes in the contract price or time of performance. If the work described in the RFP becomes critical to

the timely performance of the Contractor's work, a written request for a notice to proceed must be forwarded to the Owner immediately. The Owner will issue any notice to proceed. This unilateral modification to the contract may be subject to further negotiation regarding price and time for completion. Payment for changed work, covered by a unilateral modification, will not be made until a bilateral modification covering the changed work has been executed.

The Contractor shall prepare and submit its proposal for change to include as a minimum:

1. A cover letter referencing the PC number and citing the attachments, if any, that constitute the Contractor's total proposal
2. A detailed price proposal showing labor, construction equipment, and material quantities and prices at the lowest practical level of each element of the work
3. Any drawings, sketches, catalog cuts, samples, certifications, or other data required to be submitted by the Engineer or that is required to fully document the Contractor's work under the proposed change
4. A statement of the proposed change in the time of completion of the contract, together with all required justification for such a change
5. A statement to the effect that there is "no change in price and/or time of completion of the work under this contract as a result of this proposed change," if that is the case.

The Owner may accept the Contractor's proposal without negotiation. Alternatively, upon receipt of a proposal that is satisfactory in form, the Engineer may require negotiation with the Contractor to arrive at a fair and equitable change in the contract price and time of completion. Upon agreement, a contract modification will be issued by the Owner for the Contractor's execution.

3.3 PROCESSING CHANGES INITIATED BY THE CONTRACTOR

Should the Contractor feel that a change to the work under the contract, or to the contract itself, is necessary or desirable, it shall propose such a change to the Engineer. This proposed change shall include a clear and concise description of the proposed change, along with that information cited in 3.1 C above. Within a reasonable time, the Engineer will review the Contractor's proposal and determine if the proposed change is in the Owner's best interest. If so, the Contractor will be advised of this, and a PC number will be assigned to Contractor's proposal. The process of agreement and codification of the price and time of completion for the change is then identical to that in 3.2 above.

3.4 PROCESSING BULLETINS

Make written reply to the Engineer in response to each Bulletin.

1. State proposed change in the Contract Sum, if any.
2. State proposed change in the Contract Time of Completion, if any.
3. Clearly describe other changes in the Work required by the proposed change, or desirable therewith, if any.
4. Include full backup data such as subcontractor's letter of proposal or similar information.
5. Submit this response in single copy.

When cost or credit for the change has been agreed upon by the Owner and the Contractor, or the Owner has directed that cost or credit be determined in accordance with provisions of Paragraph 7.3.3 of the General Conditions, the Engineer will issue a **"Change Order"** to the Contractor.

3.5 PROCESSING CHANGE ORDERS

Change Orders will be dated and will be numbered in sequence.

The Change Order will describe the change or changes, will refer to the Bulletin or Bulletins involved, and will be signed by the Owner and the Engineer.

The Contractor shall provide the Owner with six signed copies of the Change Order.

Should the Contractor disagree with the stipulated change in Contract Sum or change in Contract Time of Completion, or both:

1. The Contractor promptly shall return three (3) copies of the Change Order, unsigned by him/her, to the Engineer with a letter signed by the Contractor and stating the reason or reasons for the Contractor's disagreement.
2. The Contractor's disagreement with the Change Order shall not in any way relieve the Contractor of their responsibility to proceed with the change as ordered and to seek settlement of the dispute under pertinent provisions of the Contract Documents.

3.6 EXECUTING CHANGED WORK

The Contractor is cautioned not to proceed with the work described in a proposed change until it is authorized to do so in writing by the Engineer.

3.7 CONTRACTOR DOCUMENTATION

The Contractor shall keep a log of RFPs, RFIs, and PCs.

--End of Section-

SECTION 01 32 13
SCHEDULE OF WORK
(06/12)

PART 1 - GENERAL

1.1 SCOPE

To assure adequate planning and execution of the Work so that the Work is completed within the number of calendar days allowed in the Contract, and to assist the Engineer in appraising the reasonableness of the proposed schedule and in evaluating progress of the Work, the Contractor shall prepare and maintain the schedule and reports described in this Section.

Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

Requirements for progress schedule are provided in the General Conditions.

Construction period is defined in Division 0.

"Day," as used throughout the Contract unless otherwise stated, means "calendar day."

1.2 QUALITY ASSURANCE

The Contractor shall perform data preparation, analysis, charting, and updating in accordance with standards approved by the Engineer.

The schedule as approved by the Engineer will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.

Should any activity not be completed within 15 days after the stated scheduled date, the Owner shall have the right to require the Contractor to expedite completion of the activity by whatever means the Owner deems appropriate and necessary, without additional compensation to the Contractor.

Should any activity be 30 days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.

Costs incurred by the Owner and by the Engineer in connection with expediting construction activities under this section shall be reimbursed by the Contractor.

It is expressly understood and agreed that failure by the Owner to exercise the option either to order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered to set a precedent for any other activities.

1.3 SUBMITTALS

The Contractor shall submit the following to the Engineer in accordance with Section 01 33 00 - Submittals. Submittals are for the record or approval as indicated.

A. Proposed construction schedule shall be submitted for approval within thirty (30) calendar days after receipt of Notice to Proceed; submit four (4) prints.

B. Periodic reports shall be submitted on the first working day of each month following the submittal described in Paragraph 1.3-B above, submit four prints of the schedule updated as

described in Part 3 of this Section.

C. Project status curve shall be submitted within five (5) calendar days after Notice to Proceed for approval.

D. Submit contract Daily Activity Reports to the Engineer for the record on a weekly basis.

E. Submit statused construction schedule and project status curve as backup to progress invoices.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PRELIMINARY ANALYSIS

Contents:

1. Show all activities of the Contractor under this Work for the period between receipt of the Notice to Proceed and submittal of schedule required under Paragraph 1.3-B above;
2. Show the Contractor's general approach to the Work;
3. Show cost of all activities scheduled for performance before submittal and approval of the schedule.

Submit in accordance with Paragraph 1.3-B above.

3.2 CONSTRUCTION SCHEDULE

The construction schedule shall show all work activities for completion of the work to be performed under this contract and will reflect the Contractor's general sequential approach to the work. The construction schedule will be in an arrow diagram, precedence diagram, or bar chart format. The minimum level of detail (number of activities) shall include the activities described in the Schedule of Prices, the inspection hold points set forth in Section 01 10 13 – Summary of the Work. The construction schedule shall demonstrate completion of all work within the period of performance of the contract in a reasonable and achievable manner.

All work in the powerhouse shall be limited to the July 1st to September 30th period and must be coordinated with the hydroplant operator.

3.3 PERIODIC REPORTS

As required under Section 1.3 above, the Contractor shall update the approved abatement and demolition schedule.

1. Indicate "actual" progress in percent completion for each activity;
2. Provide written narrative summary of revisions causing delay in the program, and as explanation of corrective actions taken or proposed.

3.4 REVISIONS

The Contractor shall make only those revisions to approved abatement and demolition schedule as are approved in advance by the Engineer.

3.5 PROJECT STATUS CURVE

The project status curve ("S"-shape curve) shall establish the relationship between construction progress versus contract time elapsed. This curve will be used to determine if the Contractor's progress is satisfactory to ensure timely completion.

3.6 PERIODIC SCHEDULE UPDATES

The Contractor shall support periodic payment requests with an approved construction schedule and project status curve with both marked to indicate progress. Submit updated schedule on or before noon every other Friday for subsequent two weeks. While the construction schedule and status curve may undergo periodic revisions as discussed below, the marked versions shall clearly show the progress history through the current invoice period.

When in the opinion of the Engineer, changes in the work occur that significantly affect the schedule, the Contractor shall submit a revised construction schedule and project status curve for approval. The revised construction schedule and project status curve shall be submitted within 10 calendar days after it is requested by the Engineer. The current approved construction schedule and project status curve shall be used as a baseline for progress reporting.

3.7 CONTRACT DAILY ACTIVITIES REPORT

The Contractor shall maintain a daily record of actions, events, and manpower utilized. This report shall be completed and submitted to the Engineer at the end of each week. Reports are to be complete and accurately describe actions and events.

3.8 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor believes it is entitled to an extension of the contract performance period, completion date, or any interim milestone date, furnish the following for a determination by the Engineer: justification, project schedule data, and supporting evidence as the Engineer may deem necessary. Submission of proof of excusable delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is a condition precedent to any approvals by the Engineer.

3.8.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Engineer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay, will not be a cause for an extension to the performance period, completion date or any interim milestone date.

3.8.2 Submission Requirements

Requests for change in contract completion date shall be in accordance with Section 00 33 00 – Submittals and shall include at a minimum:

a. A list of affected activities

b. A brief explanation of the causes of the change

c. An analysis of the overall impact of the changes proposed.

--End of Section--

SECTION 01 33 00
SUBMITTALS
(06/12)

PART 1 – GENERAL

1.1 SCOPE

This Specification section covers the preparation and submission of all shop drawings, samples, manufacturer's literature and brochures, installation instructions, and operation and maintenance manuals as specified herein and in the various sections of these Specifications.

1.2 QUALITY ASSURANCE

The Contractor will carefully review and coordinate all aspects of each item being submitted and verify that each item and the submittal for it conforms in all respects with the requirements of the Contract Documents. By affixing the Contractor’s signature to each submittal, certify that this coordination has been performed.

1.3 SUBMITTALS

1.3.1 Submittals Schedule

Within 15 days after award of Contract and before any items are submitted for approval, the Contractor shall submit to the Owner one copy and to the Engineering two copies for approval of the schedule described in Article 2.1 of this section.

1.3.2 Shop Drawings

The term "shop drawings" as used herein includes fabrication, erection and installation, layout, and setting drawings; concrete formwork drawings; lift drawings; lists or schedules of materials and catalogues and brochures; performance and test data; and all other drawings and descriptive data pertaining to materials and methods of construction as may be required to show that the materials, equipment, or systems and the positions thereof conform to the requirements of the Contract Documents.

When requested by the Engineer, shop drawings shall be accompanied by design computations.

Sheet sizes of shop drawings shall not exceed 30 x 42 in. Shop drawings shall be made to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work. The title block on all drawings shall bear the name of the Owner, and the name of the project, and shall include a space for the Owner's index number. There will be space for Engineer's review stamp and future revision column. All drawings shall be of sufficient quality to allow them to be electronically scanned by the Owner.

Types of prints required:

a. Initial Issue: Submit copies of each drawing on the initial issue:

1. Submit Shop Drawings in the form of s three (3) blackline prints of each sheet.
2. Blueprints will not be acceptable.

To Engineer three copies (rolled)

To Architect/Engineer one copy

b. Final Issue: Review comments of the Engineer will be shown on the sepia transparency when it is returned to the Contractor. Upon receiving the Engineer's comments on the drawings, revise drawings and reissue the drawings.

To Engineer three copies (rolled)

To Owner's CO one copy

To Architect/Engineer one copy

c. The Contractor shall maintain a complete set of construction drawings at the jobsite, clearly marked to reflect as-built conditions. Upon completion of the work, the Contractor shall submit these Record Drawings to the Engineer.

Manufacturer's literature, brochures, catalog cuts, and other pertinent printed matter or data shall be submitted in triplicate to the Engineer.

The Engineer will review shop drawings and schedules only for conformance with the design concept of the Project and for compliance with the Contract Documents and Contract Drawings. Contractor shall make any and all corrections required by the Engineer.

Shop drawings shall be reviewed and returned within ten (10) working days of receipt of drawings at jobsite.

Shop drawings and all supporting data, catalogs, or similar information shall be prepared by the Contractor or his suppliers and subcontractors but shall be submitted as instruments of the Contractor.

The Engineer's review of shop drawings will be general only and shall not relieve the Contractor from responsibility for errors and omissions of any sort, for deviations from Drawings or Specifications, or for conflict with the work of others that may result from such deviations. The Engineer's review of shop drawings will not relieve the Contractor of responsibility to complete the work in accordance with the requirements of the Contract Documents.

After Notice of Award, Contractor shall submit a Drawing Submittal Schedule to the Engineer. The Contractor's drawing schedule shall be brought up to date from time to time to show the latest changes, omissions, and additions. The Schedule will be based on Contractor's Construction Schedule and will show when the Contractor will submit the drawings and when he expects them to be returned so that construction activities shown on the Construction Schedule are not interrupted. There will be a minimum of three weeks between these two activities. Specific methods and routines for handling drawing reviews shall be established in advance within the general framework of the Contract Documents.

Work for which Contractor's submittals are required shall not be started until the submittals have been reviewed and accepted in writing by Engineer. Any revision by Contractor of a previously accepted submittal must be accepted in writing by Engineer before implementation.

1.3.3 Product Data

The Contractor shall submit to the Engineer product data for all items required by this specification to be furnished by the Contractor in accordance with the approved schedule.

1.3.4 Samples

The Contractor shall, at his expense, furnish the Engineer with samples of the various materials and finishes thereon specified as requiring samples in the various portions of this Specification and intended to be used on or in the work. Samples shall be sent to the office of the Engineer, carriage prepaid, unless otherwise specified by the Engineer or this Specification. Samples will be returned to the Contractor if requested, carriage collect.

Further requirements for the provision of samples:

A. Provide Sample or Samples identical to the precise article proposed to be provided. Identify as described under "Identification of submittals" below.

B. Number of Samples required:

1. Unless otherwise specified, submit Samples in the quantity which is required to be returned, plus one which will be retained by the Engineer.

2. By prearrangement in specified cases, a single Sample may be submitted for review and, when approved, be installed in the Work at a location agreed upon by the Engineer.

PART 2 - PRODUCTS

2.1 SUBMITTAL SCHEDULE

2.1.1 General

The Contractor will compile a complete and comprehensive schedule of all submittals anticipated to be made during progress of the work. The schedule will include each type of item for which the Contractor's installation drawings, Certificates of Compliance, guarantees, or other types of submittals as required by this Specification. Upon approval by the Engineer, this schedule will become part of the Contract, and the Contractor will be required to adhere to the schedule, except when specifically otherwise permitted. The submittals required by this Specification are summarized in the submittal summary table, Attachment 1 to this section.

2.1.2 Coordination

The Contractor shall coordinate the schedule with all necessary subcontractors and material suppliers to ensure their understanding of the importance of adhering to the approved schedule. The Contractor shall coordinate as required to ensure the grouping of submittals as described in Article 3.2

2.1.3 Revisions

The Contractor shall revise and update the schedule as necessary to reflect conditions and sequences. The Contractor shall submit revised schedules to the Engineer for approval.

2.2 AS-BUILT DRAWINGS

2.2.1 Scale and Measurements

Details and arrangements on all as-built drawings will be clearly dimensioned and sufficiently large to show all pertinent aspects of the item and its method of connection to the work.

2.2.2 Type of Prints Required

The Contractor shall submit all as-built drawings in the form of two prints of each sheet to the Engineer and one print of each sheet to the Owner.

2.3 MANUFACTURER'S LITERATURE

2.3.1 General

Where the contents of submitted literature from manufacturers include data not pertinent to the submittal, the Contractor shall clearly indicate which portion of the contents is not pertinent.

2.3.2 Number of Copies Required

The Contractor shall submit the number of copies that are required to be returned to the Contractor, plus two copies that will be retained by the Engineer. Upon approval of the Engineer, one copy of the material will be submitted to the Owner.

2.4 SUBSTITUTIONS

2.4.1 General

No deviations from this Contract or applicable federal, state, or local codes and standards will be accepted until approved by the Engineer. Deviations are considered departures from the requirements of this Contract. Uncorrectable nonconformances are considered to be conditions that cannot be corrected with the Contract requirements by rework or replacement.

The Contractor will promptly document and notify the Engineer of all deviations and nonconformances from the Purchase Order/Contract, such as applicable codes, contracts, or drawings.

2.4.2 Approval Required

The Contract is based on the standards of quality established in the Contract Documents.

All products proposed for use, including those specified by required attributes and performance, will require approval by the Engineer before being incorporated into the work.

Do not substitute materials, equipment, or methods unless such substitution has been specifically approved in writing for this work by the Engineer.

2.4.3 "Or Equal"

Where the phrase "or equal" or "or approved equal" occurs in the Contract Documents, do not assume that materials, equipment, or methods will be approved for this work by the Engineer.

The decision of the Engineer will be final.

2.5 CHANGES AND NONCONFORMANCES

2.5.1 General

No changes or nonconformances from contract drawings and specification will be accepted until approved by the Engineer.

PART 3 – EXECUTION

3.1 IDENTIFICATION OF SUBMITTALS

3.1.1 General

Consecutively number all submittals. Accompany each submittal with a letter of transmittal containing all pertinent information required for identification and checking of submittals. The Owner will receive a copy of all transmittals.

3.1.2 Internal Identification

On at least the first page of each copy of each submittal, and elsewhere as required for positive identification, clearly indicate the submittal number in which the item was included.

3.1.3 Resubmittals

When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new submittal number. On resubmittals, cite the original submittal number for reference.

3.1.4 Submittal Log

Maintain an accurate submittal log for the duration of the Work, showing current status of all submittals at all times. Make the submittal log available to the Engineer for her/his review upon request.

3.2 COORDINATION OF SUBMITTALS

3.2.1 General

Prior to submittal for approval, use all means necessary to fully coordinate all material including, but not necessarily limited to:

a. Determine and verify all interface conditions, catalog numbers, and similar data.

b. Clearly indicate all deviations from requirements of the Contract Documents.

3.2.2 Grouping of Submittals

Unless otherwise specified, make all submittals in groups containing all associated items to ensure that information is available for checking each item when it is received. Partial submittals without prior approval may be rejected as not complying with the provisions of the Contract Documents, and the Contractor will be strictly liable for all delays so occasioned.

3.3 TIMING OF SUBMITTALS

3.3.1 General

Make all submittals far enough in advance of scheduled dates for installation to provide all time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

3.3.2 Engineer's Review Time

In scheduling, allow 7 calendar days for review by the Engineer following its receipt of the submittal.

3.3.3 Delays

Delays caused by tardiness in the Contractor's submittals will not be an acceptable basis for extension of the Contract completion date.

3.4 ENGINEER'S REVIEW

3.4.1 General

Review by the Engineer may not be construed as a complete check but only that the general method of installation is satisfactory. Review will not relieve the Contractor from responsibility for errors that may exist.

3.4.2 Authority to Proceed

The notations "Approved" or "Approved as Revised" to authorize the Contractor to proceed with installation of the items so noted and will be subject to the revisions, if any required by the Engineer's review comments.

3.4.3 Revisions

Make all revisions required by the Engineer. If the Contractor considers any required revision to be a change, it will so notify the Engineer as provided for in Paragraph 12.3 of the General Conditions. No work associated with changes shall be initiated until the changes have been approved by the Engineer. Show each drawing revision by number, date, and subject in a revision block on the drawing. Make only those revisions directed or approved by the Engineer.

When a submittal has been reviewed by the Engineer, resubmittal for substitution of materials or equipment will be accompanied by an acceptable explanation as to why the substitution is necessary.

3.4.4 Reimbursement of Engineer's costs

In the event substitutions are proposed to the Engineer after the Contract has been awarded, the Engineer will record all time used by them and by their consultants in evaluation of each such proposed substitution.

Whether or not the Engineer approves a proposed substitution, the Contractor promptly upon receipt of the Engineer's billing shall reimburse the Engineer at the rate of two and three quarters (2.75) times the direct cost to the Engineer and her/his consultants for all time spent by them in evaluating the proposed substitution.

--End of Section--

SECTION 01 33 00
ATTACHMENT 1

SUBMITTAL SUMMARY TABLE

NOTES:

1. This table is intended to summarize all submittals required by the Contract. Where a submittal is called for in the Specification or Contract but is not itemized herein, the number of copies and distribution will be same as similar documents listed unless directed otherwise by the Engineer.

2. Legend:

   A – Approval Required
   R – Project Record

3. The number and type of documents submitted for all submittals that include drawings will be as specified in the Submittals and Substitutions section or related sections.

Specification Section	***Submittal Name***	***Required For***
01 20 00	**Measurement and Payment**	
	▪ Schedule of Prices	A
	▪ Monthly Invoices	A
01 20 01	**Project Meetings**	
	▪ Meeting Minutes	R
01 20 02	**Preconstruction Conference**	
	▪ Meeting Minutes	R
01 26 63	**Change Procedure**	
	▪ Change Requests	A
01 32 13	**Schedule of Work**	
	▪ Construction Schedule	A
	▪ Project Status Curve	A
	▪ Daily Activity Reports	R
01 33 00	**Submittals and Substitutions**	
	▪ Submittal Schedule	A
01 35 26	**Safety Requirements**	
	▪ Site Safety Representative	R
01 45 00	**Quality Control**	
	▪ Inspection/Testing Subcontractor Qualifications	A
	▪ Test Reports	R
	▪ Requests for Interpretation	R
01 50 00	**Construction Facilities and Temporary Controls**	
	▪ Personnel Log	R
01 60 00	**Material and Equipment**	
	▪ Complete Products List	A
	▪ Product Substitution Request	A
01 71 13	**Mobilization**	
	▪ Construction Site Layout Plan	A

Specification Section	*Submittal Name*	*Required For*
01 71 23	**Survey Requirements**	
	▪ Survey Qualifications	A
	▪ Measurement for Payment Surveys	R
	▪ Final Survey Record	R
01 77 00	**Closeout Procedures**	
	▪ Record Drawings	R
	▪ Record Specifications	R
01 78 00	**Warranties**	
	▪ Warranty Manual	R
02 41 16	**Intake Timber Deck Removal**	
	▪ Intake Deck Removal Plan	A
02 41 19	**Intake Foundation Modification**	
	▪ Foundation Modification Plan	A
03 00 00	**Concrete**	
	▪ Product Data	A
	▪ Coloring Material	A
	▪ Concrete Mix Design	A
03 11 13	**Concrete Formwork**	
	▪ Shop Drawings	
	▪ Product Data	
	▪ Form Liner Sample Panel	A
03 15 13	**Water Stop**	
	▪ Water Stop Product Data	A
03 21 00	**Reinforcing Steel**	
	▪ Shop Drawings	A
	▪ Certificates	R
03 35 19	**Concrete Staining**	
	▪ Stained Sample Panel	A
	▪ Samples of Standard Colors	R
	▪ Manufacturer’s Certification	R
	▪ Applicator’s References	R
03 60 00	**Grout**	
	▪ Testing Laboratory	A
	▪ Mix Design	A
	▪ Test Results	R
05 50 00	**Miscellaneous Metal Fabrications**	
	▪ Shop Drawings	A
	▪ Product Data	A
05 60 00	**Structural Steel, Miscellaneous Steel, and Embedments**	
	▪ Shop Drawing	A
	▪ Field Welding Procedures and Qualifications	A
06 13 33	**Intake Deck Timberwork**	
	▪ Shop Drawings	A
	▪ Test Reports	R
	▪ Certificates	R

Specification Section	*Submittal Name*	*Required For*
06 52 00	**Non-Metallic Trash Rack**	
	▪ Shop Drawings	A
	▪ Manufacturer's Qualifications	A
08 53 00	**Acrylic Windows**	
	▪ Product Data	A
	▪ Installation and Maintenance Manuals	R
	▪ Special Storage Requirements	R
	▪ Test Reports	R
	▪ Certificate of Compliance	R
08 60 00	**Watertight Door**	
	▪ Product Data	A
	▪ Shop Drawings	A
	▪ Calculations	A
	▪ Test Reports	R
09 90 00	**Painting**	
	▪ Shop Drawings	A
	▪ Installation Drawings	A
	▪ Manufacturer Product Data	R
09 96 56	**Epoxy Coating**	
	▪ Manufacturer's Product Data	R
	▪ Material Safety Data Sheets	R
13 60 00	**Eel Ladder**	
	▪ Pump Data	A
	▪ Shop Drawings	A
13 70 00	**Water level Sensor**	
	▪ Transducer Data	A
26 01 22	**Basic Electrical Requirements**	
	▪ Permit Certificates	R
	▪ Equipment Wiring Diagrams	A
26 05 19	**Insulated Wire and Cable**	
	▪ Manufacturer's Data	R
26 05 21	**Conduit**	
	▪ Manufacturer's Data	R
31 00 00	**Earthwork**	
	▪ Sediment Removal and Disposal Plan	A
31 23 16	**Rock Removal**	
	▪ Rock Excavation Plan	A
31 51 00	**Rock Dowels**	
	▪ Product Data	A
	▪ Installation Procedures	A
	▪ Manufacturer's Certificates	R
	▪ Equipment Calibration Certificates	R
	▪ Installation Records	R
31 68 13	**Rock Foundation Anchors**	
	▪ Shop Drawings	A
	▪ Product Data	R

Specification Section	*Submittal Name*	*Required For*
	▪ Design Computations	R
	▪ Test Reports	R
	▪ Certificates	R
32 31 19	**Fences and Gates**	
	▪ Product Data	A
	▪ Shop Drawings	A
35 20 16	**Gates and Operators**	
	▪ Shop Drawings	A
	▪ Product Data	A
	▪ Test Reports	R
41 22 23	**Monorail Hoist**	
	▪ Product Data	A
	▪ Installation Procedures	A
	▪ Manufacturer's Certificates	R
	▪ Equipment Calibration Certificates	R
	▪ Installation Records	R
	▪ Test Reports	R

SECTION 01 35 26
SAFETY REQUIREMENTS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall be responsible for compliance with the state and federal Occupational Safety and Health Act (OSHA) requirements when applicable.

1.2 SUBMITTALS

The Contractor shall submit the following to the Engineer in accordance with Section 01 33 00 – Submittals. Submittals are for the record or approval, as indicated.

Site Safety Representative designation, for the record.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 CONTRACTOR SAFETY REPRESENTATIVE

Prior to commencement of work at the site, the Contractor shall designate in writing the name of its representative who will ensure Contractor compliance with safety requirements.

3.2 COMPLIANCE

The Contractor shall comply with the requirements of the OSHA Manual.

The Contractor shall promptly correct any noncomplying work or conditions. The Contractor shall be responsible to ensure its work does not affect the safety of the public or employees of the Engineer. Neither the Engineer nor its representatives shall bear any responsibility for safety precautions at the project work site. If, however, in the opinion of the Engineer, a life-threatening condition exists, the Engineer will orally (to be confirmed in writing) require the Contractor to immediately suspend work in the affected area until the condition is corrected. Whenever the Contractor's operations may create a hazardous condition, it shall at its sole expense, furnish, install and maintain such flagmen, guards, fences, barricades, railings, lights, signs, or other devices necessary to prevent accidents, injury or damage to people and equipment.

The Contractor shall determine the location of the paramedic unit, medical facility or hospital nearest to the project site to be used for medical emergencies. The name, telephone number, location and a route map to these facilities shall be prominently posted at the project site. Telephone numbers of the local fire and police departments shall be prominently displayed.

3.3 EMERGENCY NOTIFICATION

In the event that significant flood flows endanger the site, adjacent properties, structures or downstream areas, the Contractor shall immediately evacuate the site and notify the Engineer and the Pawtucket Police Departments.

3.4 RECORD KEEPING

Contractor shall maintain all required OSHA records. Records of safety performance shall be available at the project site for inspection upon request of the Engineer or the state.

--End of Section--

SECTION 01 42 19
REFERENCE STANDARDS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This Section covers the reference standards used in this specification.

1.2 QUALITY ASSURANCE

When a standard is specified by reference, Contractor shall comply with the requirements and recommendations stated in that standard, except when requirements are modified by this Specification or applicable codes establish stricter standards.

Wherever a code or standard is dated in this Specification, the revision or edition in effect at the time the bids are received by Owner shall apply.

1.3 ABBREVIATIONS, NAMES, AND ADDRESSES OF ORGANIZATIONS

Contractor shall obtain copies of referenced standards direct from publication source, when needed for proper performance of the Work or when required for submittal by this Specification.

ACI: American Concrete Institute
P.O. Box 9094
Farmington Hills, Mi 48333

AISI: American Iron and Steel Institute
1133 15th Street, N.W., Suite 300
Washington, DC 20005

ASTM: American Society of Testing and Materials
1916 Race Street
Philadelphia, PA 19103

AWS: American Welding Society
550 N.W. LeJeune Road
Post Office Box 351040
Miami, FL 33135

BOCA: The BOCA National Building Code
Building Officials and Code Administrators International, Inc.
4051 West Flossmoor Road
Country Club Hills, IL 60477

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

--End of Section--

SECTION 01 45 00
QUALITY CONTROL
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This Section provides the requirements for Contract Quality Control pertaining to the Work including:

a. Quality control of products and workmanship

b. Manufacturer's instructions

c. Manufacturer's certificates and field services.

1.2 SUBMITTALS

When independent testing and/or inspection are required in other sections, submittals shall comply with the requirements of this Section and Section 01 33 00 – Submittals.

The Contractor shall submit to the Engineer for approval the name, address, telephone number, qualifications (including references with names and phone numbers), and items to be tested/inspected for each firm the Contractor plans to use. Approval of the firm is required prior to Contractor use of any material or construction methods that requires testing/inspection.

Test reports prepared by the independent testing firm shall be sent directly to the Engineer by the independent testing firm in the quantity of documents specified in Section 01 33 00 – Submittal Procedures, within three calendar days after the test results are determined.

Request for Interpretation (Exhibit 10 45 00 – C) shall be used when an interpretation is required in regards to the specifications and drawings.

1.3 WORKMANSHIP

The Contractor shall comply with industry standards of the region except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

The Contractor shall provide suitably qualified personnel to produce work of specified quality.

The Contractor shall secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

The Contractor shall provide finishes to match approved samples.

1.4 MANUFACTURER'S INSTRUCTIONS

The Contractor shall require compliance with instructions in full detail, including each step in sequence.

Should instructions conflict with the Contract Documents, the Contractor shall request clarification from the Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

When required in individual Specifications sections, the Contractor shall submit manufacturer's certificate, in duplicate, certifying that products meet or exceed specified requirements.

1.6 TESTING LABORATORY SERVICES

The Contractor shall employ and pay for services of an independent testing laboratory to perform the inspections, tests, and other services required by the individual Specification Sections. The testing laboratory selected shall be approved by the Engineer.

Upon completion of each test and/or inspection, promptly distribute copies of test or inspection reports to the Engineer, to governmental agencies requiring submission of such reports, and to such other persons as directed by the Engineer.

The services will be performed in accordance with the requirements of governing authorities and with specified standards.

The reports will be submitted to the Engineer in duplicate giving observations and results of the tests, indicating the compliance or non-compliance with specified standards and with the Contract Documents.

The Contractor shall cooperate with testing laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.

The Contractor shall notify the Engineer and the testing laboratory 24 hours prior to expected time for operations requiring testing services.

The Contractor shall make arrangements with the testing laboratory and pay for additional samples and tests for the Contractor's convenience.

1.7 MANUFACTURER'S FIELD SERVICES

When required in individual Specifications sections, have manufacturer provide a qualified representative to observe field conditions, conditions of surfaces and installation, quality of workmanship, and start-up of equipment as applicable and to make written report of observations and recommendations to the Engineer.

1.8 AUTHORITY OF ENGINEER

The Engineer or Owner's CO, with permission from the Owner, will decide all questions that may arise as to the quality and acceptability of materials furnished. All questions that may arise as to the interpretation of the Contract Drawing and Specifications shall be determined by the Engineer.

The Engineer will not be responsible for the Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and the Engineer will not be responsible for Contractor's failure to perform the work in accordance with the Contract Documents.

The Engineer will not be responsible for the acts or omissions of the Contractor or any subcontractors, of the agents or employees of any Contractor or subcontractor, or of any other persons at the site or otherwise performing any of the work.

1.9 DRAWINGS AND WORKING DRAWINGS

The approved Contract Drawing and Specifications on file in the office of the Engineer will show the location, detail, and dimensions of the work.

These Contract Drawings shall be supplemented by the Contractor with such additional working and detail drawings as may be found necessary to control adequately the work and its prosecution. The Contractor's drawings shall be furnished as specified in Section 01 33 00 - Submittals to allow the Engineer time to review the drawings. When requested, the Contractor shall furnish his basic calculations.

Working drawings for steel structures shall consist of shop detail, erection, and other working plans showing dimensions, sizes of material, details, and other information necessary for the complete fabrication and erection of the metal work. Working drawings for concrete structures shall consist of such detailed plans as may reasonably be required for the successful prosecution of the work, and which are not included in the Contract Drawing furnished by the Engineer. These may include plans for false work, bracing, centering and form work; masonry layout diagrams; and diagrams for bent reinforcement. Manufacturer's engineering data for prefabricated material, including that for false work and forms, shall be furnished with each set of drawings.

1.10 COORDINATION OF DRAWINGS AND SPECIFICATIONS

The Contractor shall take no advantage of any apparent error or omission in the Contract Drawings or Specifications. In the event the Contractor discovers such an error or omission, he shall immediately notify the Engineer. After consultation with the Engineer, the Engineer will make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the Contract Drawings and Specifications.

When general reference is made on the Contract Drawings or within the Specifications to any cited Standard Specifications, it shall refer to the current edition of such Specifications or the latest revision thereof or interim Specifications adopted and in effect on the date of Effective Date of Agreement. In the event of a conflict between the Contract Drawings and the specifications, the Engineer shall be notified to provide a clarification to the Contractor.

1.11 COOPERATION WITH UTILITIES

The Contractor will notify all utility companies, all pipe line owners, or other parties affected, and endeavor to have all necessary adjustments of the public or private utility fixtures, pipe lines, and other appurtenances within or adjacent to the limits of construction made as soon as practicable.

Water lines, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals, and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted are to be moved by the Contractor or his designated agents, except as otherwise provided for or in the Supplemental Conditions or as noted on the Contract Drawings. In the case of utility lines, the Contractor shall coordinate with the respective utilities for their removal and relocation.

Attention is directed to the possible existence of underground facilities not known to the Engineer or in a location different from that which is shown on the Contract Drawings. The Contractor shall take steps to ascertain the exact location of all underground facilities prior to doing work that may damage such facilities or interfere with their service.

PART 2 - PRODUCTS

2.1 PAYMENT FOR TESTING

The Contractor shall include within the Contract Sum an amount sufficient to cover all testing and inspecting required under this Section of these Specifications, and to cover all testing and inspecting required by governmental agencies having jurisdiction.

The Owner will pay for all testing and inspecting specifically requested by the Engineer over and above those described above.

When initial tests requested by the Engineer indicate non-compliance with the Contract Documents, costs of initial tests associated with that non-compliance will be deducted by the Owner form the Contract Sum, and subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and the costs thereof shall be paid by the Contractor.

PART 3 - EXECUTION

3.1 INDEPENDENT TESTING AND INSPECTION

The testing and/or inspection firm shall meet requirements specified herein.

Independent testing and inspection, when required by the contract, will be performed by an independent testing and/or inspection firm, hereinafter called "firm", under the authority of a professional engineer, licensed by the state in which the project is located and within the discipline for which the test and/or inspection is being made. The firm shall be Contractor's subcontractor. Unless otherwise specified herein, tests shall be performed in accordance with industry standards, all governmental agencies having jurisdiction, and provisions of the Contract Documents, “

When material is proposed for use which is specified to be either certified or tested, but cannot be identified with specific certification or test reports, the Engineer may, at his discretion, select random samples from the lot for testing.

These samples shall be prepared in accordance with the referenced test specification and furnished by Contractor to the firm at Contractor's expense. The number of samples and tests will be at the discretion of the Owner’s Representative. The cost of testing the samples shall be solely the responsibility of Contractor.

3.2 WAIVER OF INSPECTION AND/OR TESTS:

Specified inspections and/or tests may be waived only by the specific approval of the Engineer, such waivers will be expected to result in credit to the Owner equal to normal cost of such inspection and/or test.

3.3 FIELD COMMUNICATIONS

The Engineer will use the following forms to document instructions, clarifications, notice of deficient work, and the like to the Contractor. This shall not be construed as limiting any other appropriate means of communication between the parties. The communications shall not be construed as authorizing work not included in the contract, except as approved corrective work, and shall not in any case constitute a basis for additional payment or time.

a. Field Adjustment Report (Exhibit 01 45 00-A). This form will be used to document minor deficiencies, clarifications, or other instructions.

b. Non-Compliance Notice (Exhibit 01 45 00-B) - This form will be used to document significant deficiencies in workmanship and/or material. The form will also document approval of corrective action. Contractor shall submit to the Engineer the proposed corrective actions for approval. Contractor shall provide engineering if requested by the Owner's Representative to show that the proposed corrective action is equivalent to the original requirements. The Owner's Representative will retain monies from progress payments until the corrective action is approved by the Engineer and the corrective work has been satisfactorily completed. The amount retained shall be determined by the Engineer to be sufficient to accomplish the corrective work including demolition, corrections, rework, and administrative costs.

c. Request For Interpretations (Exhibit 01 45 00-C) - This form will be used to inquire about an item of work insufficiently described or detailed in the contract documents and to seek an interpretation. The Owner's Representative will issue with reasonable promptness such written clarifications or interpretations of the requirements of the contract documents (in the form of Drawings or otherwise) as the Owner's Representative may determine necessary.

3.4 REQUIREMENTS

The requirements for sampling and testing or inspection are specified in the individual technical divisions of these specifications. Contractor shall maintain a complete and up-to-date file of all quality control documentation at the jobsite.

--End of Section--

EXHIBIT 01 45 00-A

CONSTRUCTION CONTRACT FIELD ADJUSTMENT REPORT

Contractor:		**Field Adj Number:**	
Construction Contract:		**Date:**	
Blackstone River Fish Passage Restoration Project			
Spec Paragraph and/or Drawing Number:		**Ref (Shop Dwg):**	

Description of Work Affected:

Reason for Adjustment:

***** THIS FIELD ADJUSTMENT SHALL NOT RESULT IN A CHANGE IN CONTRACT PRICE OR THE TIME FOR COMPLETION *****

Recommended By:			***Prime Contractor Agreement:***	***Owner's Rep Agreement***	
	Initials	Date	Date/Signature & Title:		Approved
Engineer					Disapproved
Owner				Date/Signature/Title	

EXHIBIT 01 45 00-B

NON-COMPLIANCE NOTICE

Project: **Blackstone River Fish Passage Restoration Project**

Location: **Main Street**

Contractor: _____

Contract Number: _____

Specification Section: Paragraph: Drawing Reference: Detail:

Nature of Nonconformance:

Signed by: Date: Date Response Needed:

Proposed Correction (Response):

Amount of Time for Correction:

[] Attachments

Response From: To: Date Rec'd: Date Ret'd:

Signed by: Date:

Copies: [] Owner [] Engineer [] _____ [] _____ [] _____ [] File

EXHIBIT 01 45 00-C

REQUEST FOR INTERPRETATION

Project: **Blackstone River Fish Passage Restoration Project**

R.F.I. Number:

From:

To:

Date:

Re:

Contract Number:

Location: **Slater Mill**

Specification Section:	Paragraph:	Drawing Reference:	Detail:

Request:

Signed by:

Response:

[] Attachments

Response From:	To:Date	Rec'd:	Date Ret'd:

Signed by: Date:

Copies: [] COTR [] A/E [] File

SECTION 01 50 00
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall furnish and install all required temporary facilities and site access as shown or specified herein plus such facilities and equipment required for proper performance of the requirements of the Contract Documents and Drawings. Throughout the construction period, the Contractor shall maintain the roadway and site in a standard of cleanliness as described in this Section.

The General Conditions (Special Provisions) and applicable portions of Division 1 of the specifications are a part of this section, which shall consist of all labor, equipment and materials necessary to complete all quality control work herein specified.

1.2 QUALITY ASSURANCE

Promptly upon award of the contract, the Contractor shall notify all pertinent personnel regarding requirements of this section.

The Contractor shall require that all personnel who will enter upon the Owner's property certify their awareness and familiarity with the requirements of this section.

The Contractor shall conduct daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.

In addition to the standards described in this Section, the Contractor shall comply with pertinent requirements agencies having jurisdiction.

1.3 SUBMITTALS

The Contractor shall maintain an accurate record of the names and identification of all persons entering upon the Owner's property in connection with the Work of this Contract, including times of entering and times of leaving, and submit a copy of the record to the Owner daily.

1.4 REFERENCED DOCUMENTS

Pertinent provisions of the following listed codes and standards shall apply to the Work of this Section, except as they may be modified herein, and are hereby made a part of this Specification to the extent required:

a. Associated General Contractors of America (AGC): Manual of Accident Prevention in Construction.

b. Building Officials and Code Administrators (BOCA): National Building Code

All required temporary facilities and equipment shall also be in accordance with applicable federal, state, county, and utility laws, rules, and regulations. Nothing in these Specifications shall be construed to permit work not conforming to the Agreement or the applicable laws and regulations.

1.5 ADMINISTRATION AND CONSTRUCTION YARD AREA

The contractor acknowledges that he has satisfied himself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Contract Drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint himself with available information will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

Contractor's operation areas are those areas assigned by Owner to Contractor for the various operational activities shown on the Contract Drawings. They will encompass all of the areas of construction activity, including work and storage areas. Contractor shall confine all operations to Owner's premises unless otherwise permitted by Owner.

Contractor shall, under regulations prescribed by Owner, use only established roads on Owner's premises or construct and use such temporary roadways as may be authorized by Owner. When curbs and sidewalks must be crossed, Contractor shall provide protection against damage and shall be obligated to replace or repair any damaged roads, curbings, and walkways at the Contractor's expense.

No parking of Contractor vehicles shall be allowed in any area of the Owner’s property except where the Owner has designated as the “Contractor’s Parking Area”.

Contractor shall provide and maintain adequate barricades, signs, lighting, personnel, and other control devices for the proper protection and control of operations and the safety of the public.

Contractor shall comply with any safety program required by Owner or Engineer. Such program will require filing of all accident and injury reports with Engineer and attendance at a weekly safety meeting by Contractor's supervisory personnel.

Contractor shall remove snow and ice from all work areas, laydown areas, parking lots, and walks, when necessary to ensure the safe and effective performance of the Work, at no additional cost to Owner.

1.6 STAGING AND STOCKPILE AREA

The Contractor shall construct staging and stockpile areas in accordance with the plans and at the locations shown on the plans. Fencing of materials or equipment will be required at this site. The Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area.

1.7 HOISTING FACILITIES

The Contractor shall provide hoisting facilities as required for the vertical movement of all materials. The Contractor shall comply with OSHA and other governing codes for all hoists, conveyors, and elevators and maintain the facilities in compliance with the law.

1.8 GUARDRAILS, DECK AND OTHER OPENINGS

Provide guardrails, barricades, handrails, and covers for decks, and other openings.

1.9 TRASH

Provide sufficient trash receptacles. Provide construction dumpster for all debris and packaging. Provide construction recycling of construction demolition where allowed and of excess new materials and packaging where allowed.

Collect and deposit debris in such collection facilities as necessary to separate recyclables from materials scheduled to be brought to legal dump sites.

Remove all debris from the job site on a regular basis. Do not allow trash and debris to accumulate or remain on site.

1.10 ACCESS ROADS

Contractor shall block public access to the site for the prosecution of the work. The Contractor shall provide all necessary scaffolding, platforms, ladders, ramps, chutes, temporary stairs, and all other access items. The Contractor shall maintain all access items in safe condition throughout the construction process. The Contractor shall construct temporary access roads suitable for the movement of construction equipment and vehicles. The locations and dimensions of the temporary access roads shall be as shown on the Contract Drawings. All temporary access roads shall have a stabilized construction entrance prior to connecting to public roads. Wheels of construction equipment shall be cleaned on the stabilized construction entrances prior to entrance onto public roads.

The Contractor shall maintain access roads in a sound condition and properly graded, free of ruts, washboard, potholes, ponding, ice, snow, mud, and soft material, and free of excavated material, construction equipment, and products and maintain access roads throughout the contract period to ensure unimpeded access at all times for construction vehicles.

Prior to demobilization, the Contractor shall remove temporary access roads and restore the underlying surfaces to their original condition. All vegetated areas disturbed for the purposes of constructing temporary access roads shall be seeded in accordance with Section 32 92 19 – Seeding.

1.11 TEMPORARY SANITARY FACILITIES

Contractor shall provide adequate temporary sanitary conveniences for the use of all employees and persons engaged in the Work including subcontractors, Owner, Engineer and their employees, as required by laws, ordinances, or regulations of public authorities having jurisdiction.

Toilet facilities shall be enclosed chemical toilets or water closets and urinals connected to a holding tank and shall meet with the approval of public authorities having jurisdiction. Open pit or trench latrines will not be permitted.

1.12 ELECTRICAL POWER

Contractor shall provide their own electrical power for construction purposes and shall also provide temporary indoor and outdoor lighting for construction operations.

1.13 TEMPORARY WATER

The Contractor shall provide and maintain water for its own domestic and construction use and that of the other contractors.

1.14 CONSTRUCTION EQUIPMENT

Contractor shall erect, equip, and maintain all construction equipment required for the Work in accordance with all applicable statutes, laws, ordinances, rules, and regulations of the Owner or other authority having jurisdiction.

Construction equipment and temporary work shall conform to all the requirements of state, county, and local authorities, OSHA, and underwriters that pertain to operation, safety and fire hazard. Contractor shall furnish and install all items necessary for conformity with such requirements, whether or not called for by these Specifications.

1.15 STORAGE BUILDINGS AND SHOPS

Contractor shall provide all temporary storage buildings and shop rooms that may be required at the site and in the administration and construction yard area for safe and proper storage of tools, materials, and equipment.

Contractor shall store construction materials and equipment within boundaries of designated areas. Storage of gasoline or similar fuels and explosives shall be confined within definite boundaries apart from buildings as approved by authorities having jurisdiction.

Contractor shall receive, unload, store, and provide all handling for all materials used in the Work.

1.16 FIRST-AID FACILITIES

Contractor shall provide and maintain first-aid equipment in the various work areas and shall provide for the treatment of minor injuries. Contractor shall designate personnel with proper qualifications to administer first aid. Contractor shall be responsible for making prompt arrangements with local hospitals for transportation and treatment of major injuries.

Contractor's first-aid facilities shall be made available to other contractor's and Owner's personnel.

1.17 NATURAL ENVIRONMENT

Contractor shall comply with all state and federal laws, rules, and regulations pertaining to the preservation and protection of the natural environment.

1.18 DISPOSAL OF MATERIALS

All material from required demolition, excess excavation, and any other debris shall become property of Contractor unless otherwise noted in this Specification. Material shall be disposed of at an approved offsite facility.

Contractor shall obtain all necessary permits for demolition debris disposal and shall send the permits or copies to Owner before any material is removed from the Site. The location of the disposal site and the manner of disposal will be subject to the prior acceptance of Owner.

1.19 SECURITY AT SITE

Contractor shall be responsible for site security.

1.20 TEMPORARY FIELD OFFICE

The Contractor shall provide a construction trailer to serve as the Owner's temporary field office. The trailer shall be equipped with electric utilities, internet connection, heat, and A/C. The construction trailer shall have an office and desk for the Owner's representative as well as an area for meetings (including table and chairs). The Owner's temporary field office shall be in a separate trailer, not a shared space in the Contractor's office.

1.21 TRAFFIC REGULATION

The Contractor shall furnish all materials and perform all work necessary to completely regulate traffic in the area of work being performed under the Contract.

The Contractor shall perform all work in such a manner as to provide safe passage at all times for the public with a minimum of obstruction to traffic.

The Contractor shall not close road or streets to passage without the permission of the proper authorities. Notify all police and fire departments of all scheduled detours and when road or streets are reopened.

1.22 OTHER TEMPORARY FACILITIES AND CONTROLS

The contractor shall provide all necessary safety precautions for the safe and proper removal of asbestos containing materials from the building prior to building demolition, including, but not limited to: guards, temporary supports, roof bracing, floor bracing, etc.

1.23 REMOVAL AT COMPLETION

Upon completion of the work, or prior thereto when so directed by the Owner, the Contractor shall remove all temporary facilities structures and installations, including all concrete foundations. Similarly, Contractor shall return all areas utilized for temporary facilities to their original, natural state.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

3.1.1 General

The Contractor shall retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or damage, and providing required protection of materials.

The Contractor shall not allow accumulation of scrap, debris, waste material, and other items not required for this Work.

The Contractor shall provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

3.1.2 Site

The Contractor shall inspect daily, and more often if necessary, the site and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.

The Contractor shall inspect weekly, and more often if necessary, all arrangements of materials stored on the site. The Contractor shall restack, tidy, or otherwise service arrangements to meet the requirements of subparagraph 3.1.1 above.

The Contractor shall maintain the site in a neat and orderly condition at all times.

3.1.3 Roadways

In addition to subparagraph 3.1.2 above, the Contractor shall inspect daily Broadway Avenue, Main Street, and Roosevelt Avenue and pick up all scrap, debris, nails, glass, and waste material which in the opinion of the Engineer, may be injurious or harmful to pedestrians or motor vehicles. Remove such items to the place designated for their proper storage prior to disposal.

3.2 FINAL CLEANING

"Clean," for the purpose of this section, and except as may be specifically provided otherwise, shall be interpreted as meaning free of demolition material, on or above the surface of the ground, and generally achieved by the sweeping, raking, and shoveling of material left by demolition machinery, vehicles, or disseminated by the wind.

Prior to completion of the Work, the Contractor shall remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in Section 3.1 above.

Unless otherwise specifically directed by the Engineer, the Contractor shall clean public roadways adjacent to the site and shall completely remove resultant debris.

--End of Section--

SECTION 01 60 00
MATERIAL AND EQUIPMENT
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This Specification Section includes the requirements for the transportation, handling, storage, and protection of materials and equipment as specified herein and in the various Sections of these Specifications. This Section also addresses the procedure for Contractor proposed product substitutions.

1.2 SUBMITTALS

The Contractor shall submit for approval:

a. Complete products list

b. Product substitution request.

1.3 MANUFACTURER REQUIREMENTS

In general, the Contractor shall receive, handle, and store materials and equipment in accordance with manufacturer's recommendations and in a manner which will protect such items from damage or deterioration.

PART 2 - PRODUCTS

2.1 GENERAL

Products include the material, equipment, and systems used on this Project.

The Contractor shall comply with the Specifications and referenced standards as minimum requirements.

2.2 TRANSPORTATION AND HANDLING

The Contractor shall receive, handle, and store materials and equipment supplied by him in a manner that will protect such items from damage or deterioration in accordance with procedures provided by manufacturers and Owner.

The Contractor shall promptly inspect the shipments to assure that the products comply with requirements, the quantities are correct, and the products are undamaged.

2.3 STORAGE AND PROTECTION

Materials and equipment shall be stored off the ground on blocking or pallets and shall be covered for protection from vandalism and weather damage.

Materials and equipment shall be stored, tested, and cleaned prior to use, in accordance with this Specification and all specific manufacturers' requirements. Damaged or nonconforming items shall be removed immediately to a separated storage area for expeditious removal from site.

The Contractor shall provide a secure outside storage area in the vicinity of the site. In addition, Contractor shall provide inside storage for components requiring special protection.

2.4 PRODUCTS LIST

The Contractor shall submit a complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

2.5 SUBSTITUTIONS

Substitutions will be considered only when a product becomes unavailable due to no fault of the Contractor or when deemed appropriate by the Engineer.

The Contractor shall document each request with complete data substantiating the compliance of the proposed substitution with the Contract Documents.

The request constitutes a representation that the Contractor:

a. Has investigated proposed product and determined that it meets or exceeds, in all respects, the specified product.

b. Will provide the same warranty for substitution as for the specified product.

c. Will coordinate installation and make other changes which may be required for the Work to be complete in all respects.

d. Waives claims for additional costs which may subsequently become apparent.

Substitutions will be considered when they are indicated or implied on shop drawings or product data submittals without separate written request, or when acceptance will require substantial revision of the Contract Documents.

The Engineer will determine acceptability of the proposed substitution, and will notify the Contractor of acceptance or rejection in writing within a reasonable time.

2.6 REJECTED MATERIALS AND DEFECTIVE WORK

Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work.

Any errors, defects, or omissions in the execution of work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.

The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect error, omission or act of the contractor or his employees, as determined by the Engineer, occurring previous to the final payment.

PART 3 - EXECUTION

Not Used

--End of Section--

SECTION 01 71 13
MOBILIZATION
(06/12)

PART 1 - GENERAL

1.1 SCOPE

Mobilization shall include delivery of all construction equipment, materials, supplies, appurtenances, facilities, and the like, staffed and ready for commencing and executing the work; and the subsequent demobilization and removal from the jobsite of said equipment, appurtenances, facilities, and the like upon completion of the Work.

Mobilization shall also include assembly and delivery to the jobsite of plant, equipment, tools, materials, and supplies necessary for the prosecution of the work which are not intended to be incorporated in the Work; the clearing of and preparation of the Contractor's work area; the complete assembly, in working order, of equipment necessary to perform the required work; personnel services preparatory to commencing actual work; and all other preparatory work required to permit commencement of the actual work on construction items for which payment is provided under the Contract.

1.2 SUBMITTALS

Refer to Section 01 33 00 – Submittals for submittal requirements.

The Contractor shall submit a plan to the Engineer for approval showing the proposed layout of the construction site, including fences, roads, parking, buildings, staging, and storage areas, within seven (7) days after the effective date of the Notice to Proceed.

1.3 DELIVERY

Delivery to the jobsite of construction tools, equipment, plant, temporary buildings, materials, and supplies shall be accomplished in conformance with local governing ordinances and regulations.

1.4 TOOLS AND SUPPLIES

Provide construction tools, equipment, materials, and supplies of the types and quantities necessary to facilitate the timely construction of the Work.

Provide personnel, products, construction materials, equipment, tools, and supplies at the jobsite at the time they are scheduled to installed or utilized.

1.5 DEMOBILIZATION

Upon completion of the Work, remove construction tools, apparatus, equipment mobile units and buildings, unused materials and supplies, plant, and personnel from the jobsite.

Restore all areas utilized for mobilization to their original, natural state, or when called for in the Contract Documents, complete such areas indicated.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

--End of Section--

SECTION 01 71 23
SURVEY REQUIREMENTS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This section describes construction-related surveying activities and associated requirements. The Contractor shall establish the exact position or location of all work control points. All work shall be referenced to and established from the control points, re-established where necessary, and maintained throughout the duration of the project.

1.2 DATUM

All survey work shall be performed using Rhode Island State Plane Coordinate System, NAD 83 (US survey feet). Vertical datum for all survey work shall be NGVD 29 datum. All design information depicted on the contract drawings is in Rhode Island State Plane Coordinates, NAD 83 (US survey feet) and referenced to NGVD 29, unless otherwise noted.

1.3 SURVEYOR

All survey work performed for the purposes of construction control, payment basis, or as-built documentation shall be performed by a qualified land surveyor currently registered in Rhode Island.

1.4 SUBMITTALS

1.4.1 Surveyor Qualifications

Prior to start of any survey work, Contractor shall submit name, address, telephone number, and qualifications of the surveyor, crew chief, superintendent and all other persons who are proposed to perform surveys or survey related duties on which measurement and payment shall be based, to the Engineer for approval. Upon request by the Engineer, Contractor shall submit documentation verifying the accuracy of the survey work.

1.4.2 Measurement for Payment Surveys

The Contractor shall submit a survey record with computations signed by the Surveyor and the Contractor’s field superintendent of measurement surveys conducted to determine quantities of unit cost work and percent of completed lump sum work for payment. All measurement surveys for elevation shall be to the nearest 0.1 feet plus or minus 0.02 feet and for horizontal distances shall be to plus or minus 0.1 feet.

1.4.3 Final Survey Record

The Contractor shall submit a final survey record with computations signed by the Surveyor, certifying that elevations and locations of site constructed features are in conformance, or nonconformance, with contract documents. Any nonconformance shall be subject to review and acceptance by the Engineer prior to final disposition (i.e., payment, corrective actions, etc.)

1.5 PROJECT RECORD DOCUMENTS

1.5.1 Survey Log

The Contractor shall maintain onsite a complete, accurate log of survey work as it progresses.

1.5.2 Record Documents

Upon completion of the work, the Contractor shall submit Record Documents to the Engineer under the provisions of Section 01 33 00 – Submittals.

PART 2 - PRODUCTS

2.1 SURVEYS

2.1.1 Control Surveys

Control surveys shall include surveys for the establishment of benchmarks and control points. All control surveys for elevation shall be plus or minus 0.01 feet and for horizontal control angles shall be to the nearest 20 seconds plus or minus 10 seconds and measured distances shall be to plus or minus 0.01 feet.

2.1.2 Measurement Surveys

Measurement surveys shall include surveys to verify as-built construction to the lines and grades indicated on the Drawings and to establish quantities for payment. All measurement surveys for elevation shall be to the nearest 0.1 feet plus or minus 0.02 feet and for horizontal distances shall be to plus or minus 0.1 feet.

2.2 MATERIALS

The Contractor shall provide all materials as required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else required. All material shall be of sound professional quality.

All lasers, transits, and other instruments shall be calibrated and maintained in accurate calibration throughout the execution of the work.

PART 3 - EXECUTION

3.1 SURVEY MONUMENTS

The Contractor shall protect existing monuments throughout the course of the project. The Contractor shall notify the Engineer immediately of loss, damage, or destruction of any survey monument. In the event of loss, damage, or destruction, the Contractor shall replace the monument(s) in kind with survey monument(s) of comparable or better accuracy. Replacement monuments shall be installed and located under the direction of a licensed land surveyor currently registered in Rhode Island. At his discretion, the Contractor may install additional survey monuments to support construction activities.

3.2 STAKEOUT AND EXISTING CONDITIONS SURVEYS

Prior to initiating any earthwork activities, the Contractor shall perform a stakeout survey to establish the limits of disturbance (LOD), baseline of construction, and grade stakes. No deliverables are required for the stakeout survey.

3.3 SURVEYS FOR MEASUREMENT AND PAYMENT

Contractor shall perform surveys to determine quantities of unit cost work and percent of completed lump sum work including surveys to establish measurement reference lines and shall notify the Engineer prior to starting work. Excavation and fill requiring measurement by volume shall be surveyed by measuring elevations along cross-sections spaced at a maximum of every 5 feet along the longitudinal direction of the excavation or fill or at break points in the horizontal alignment of the excavation or fill as needed to obtain a representative quantity estimate. Along each cross-section, elevations shall be measured at points of changes in slope. The Contractor's surveyor shall perform cross-section survey of the river channel before excavation begins to verify original grade elevations.

The Contractor's field superintendent shall sign the surveyor's field notes or shall keep duplicate field notes and shall calculate and certify quantities for payment purposes.

3.4 AS-BUILT SURVEY

The Contractor may perform survey activities as frequently as he deems necessary to control the project operations. However, at a minimum, the Contractor shall perform an as-built survey to document constructed conditions in all work areas under this contract. The as-built survey for each work area shall extend beyond the limits of the work to include a minimum of 50 feet of undisturbed adjacent area around the work area. The as-built survey shall conform to the National Map Accuracy Specifications and shall include, at a minimum, the following:

- Grade breaks;
- Ground spot elevations on a maximum 50-foot grid spacing;
- Buildings, bridges, slabs, and other permanent manmade features;
- Width and elevation of the fishway structure;
- Edges of marsh vegetation;
- Tree and brush lines; and
- Edges of riprap armoring;

For each of the above-listed items, the as-built survey shall include both existing and newly constructed items.

3.5 SURVEY DELIVERABLES

The Contractor shall provide to the Engineer the as-built survey for the entire project. The results of this survey shall be transmitted to the Engineer in both electronic (AutoCAD 2004 or more recent DWG file) and hard copy format. Each hard copy shall be D-size (24 in. x 36 in.) and shall contain a title block with the name and address of the Contractor. Each hard copy shall be stamped, signed, and dated by a licensed land surveyor currently registered in Rhode Island. The number of hard copies shall be in accordance with the requirements of Section 01 33 00 – Submittals specification. Both the electronic file and hard copies of the as-built survey shall depict surveyed site topography with 2.0-foot contours. Individual survey shots shall also be depicted along with the spot elevations and point descriptions (e.g., top slope,

toe slope, edge of flow constrictor, etc.). The electronic file of the as-built survey shall contain all of the line work depicted on the hard copies as well as the digital terrain model (DTM) that was used to generate the depicted contours.

--End of Section--

SECTION 01 77 00
CLOSEOUT PROCEDURES
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This Section specifies administrative and procedural requirements for the project closeout including, but not limited to:

a. Project record documents (as-built drawings) submittal.

b. Closeout requirements for specific construction activities are included in the General Conditions and appropriate Sections in Division 2 through 32.

c. To aid the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding the products incorporated into the Work, furnish and deliver the data described in this Section and in pertinent other Sections of these Specifications.

Throughout progress of the Work, the Contractor shall maintain an accurate record of changes in the Contract Documents, as described in Article 3.1 below. Upon completion of the Work, the Contractor shall transfer the recorded changes to a set of Record Documents, as described in Article 3.2 below.

Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications. “Substantial Completion” is defined in Paragraph 9.8.1 of the General Conditions.

1.2 QUALITY ASSURANCE

Prior to requesting inspection by the Engineer, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested inspection. The Contractor shall delegate the responsibility for maintenance of Record Documents to one person on the Contractor’s staff as approved by the Engineer.

The Contractor shall thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of the Specification and each sheet of the; Drawings and other Documents where such entry is required to show the change properly. Accuracy of records shall be such that future search for items shown in the Contract Documents may rely reasonably on information obtained form the approved Project Record Documents.

The Contractor shall make entries within twenty-four (24) hours after receipt of information that the change has occurred.

In preparing data required by this Section, the Contractor shall use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the extent needed for communicating the essential data.

1.3 PROCEDURE

The closeout procedure for final completion shall be:

1. Prepare and submit the notice required by the first sentence of Paragraph 9.10.1 of the General Conditions.

2. Verify that the Work is complete including, but not necessarily limited to, the items mentioned in Paragraph 9.10.2 of the General Conditions.
3. Certify that:
    a. Contract Documents have been reviewed;
    b. Work has been inspected for compliance with the Contract Documents;
    c. Work has been completed in accordance with the Contract Documents;
    d. Work is completed and ready for final inspection.
4. The Engineer will make an inspection to verify status of completion.
5. Should the Engineer determine that the Work is incomplete or defective:
    a. The Engineer promptly will so notify the Contractor, in writing, listing the incomplete or defective work.
    b. Remedy the deficiencies promptly, and notify the Engineer when ready for reinspection.
6. When the Engineer determines that the Work is acceptable under the Contract Documents, she/he will request the Contractor to make closeout submittals.

Contractor shall provide all warranties, receipts, certificates, and manifests.

The procedure for final adjustment of accounts shall be:

1. The Contractor shall submit a final statement of accounting to the Engineer, showing all adjustments to the Contract Sum.
2. If so required, the Engineer will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

1.4 SUBMITTALS

The Contractor shall comply with pertinent provisions of Section 01 33 00 - Submittals.

The Engineer's approval of the current status of Project Record Documents may be a prerequisite to the Engineer's approval of requests for progress payment and request for final payment under the Contract.

Prior to submitting each request for progress payment, the Contractor shall secure the Engineer's approval of the current status of the Project Record Documents.

Prior to submitting request for final payment, the Contractor shall submit the final Project Record Documents to the Engineer and secure his approval.

The Contractor shall submit two copies of a preliminary draft of the proposed Manual or Manuals to the Architect/Engineer for review and comments.

Unless otherwise directed in other Sections, or in writing by the Architect/Engineer, submit three copies of the final Manual to the Architect/Engineer prior to indoctrination of operation and maintenance personnel.

1.5 RECORD DOCUMENT SUBMITTALS

The Contractor shall not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer reference during normal working hours. Upon completion of the Work the Contractor shall transfer al recorded data to the final Project Record Documents.

In the event of loss of recorded data, use means necessary to again secure the data to the Engineer's approval.

1. Such means shall include, if necessary in the opinion of the Engineer, removal and replacement of concealing materials.
2. In such case, provide replacements to the standards originally required by the Contract Documents.

1.5.1 Record Drawings (As-Builts)

The Contractor shall maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. The Contractor shall mark the set to show the actual installation where the installation varies substantially from the work as originally shown. The Contractor shall mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, the Contractor shall record a cross-reference at the corresponding location on the Contract Drawings. The Contractor shall give particular attention to concealed elements that would be difficult to measure and record at a later date.

The Contractor shall organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set. Upon completion of work, the Contractor shall submit record drawings to the Engineer.

1.5.2 Record Specifications

The Contractor shall maintain one complete copy of the Project Manual, including addenda. The Contractor shall mark these documents to show substantial variations in actual work performed in comparison with the Specifications and modifications. The Contractor shall give particular attention to substitutions, selection of options, and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. The Contractor shall note related record drawing information and Product Data. Upon completion of the work, the Contractor shall submit record Specifications to the Engineer.

PART 2 - PRODUCTS

2.1 RECORD DOCUMENTS

2.1.1 Job Set

Promptly following receipt of the Owner's Notice to proceed, the Contractor shall secure from the Engineer at no charge to the Contractor one complete set of all Documents comprising the Contract.

2.1.2 Final Record Documents

Final Record Documents: At a time nearing the completion of the Work, the Contractor shall secure from the Engineer at no charge to the Contractor one complete reproducible set of all Drawings in the Contract.

2.2 INSTRUCTION MANUALS

Prepare instruction manuals in accordance with the provisions of this Section. The instruction manuals shall include at least the following:

1. Neatly typewritten index near the front of the Manual, giving immediate information as to location within the Manual of all emergency information regarding the installation.
2. Complete instructions regarding operation and maintenance of all equipment involved.
3. Complete nomenclature of all parts of all equipment.
4. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
5. Copy of all guarantees and warranties issued.
6. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.
7. Such other data as required in pertinent Sections of these Specifications.

PART 3 - EXECUTION

3.1 MAINTENANCE OF JOB SET:

Immediately upon receipt of the job set described in Paragraph 2.1.1 above, the Contractor shall identify each of the Documents with the title, **"RECORD DOCUMENTS - JOB SET."**

3.1.1 Preservation

Considering the Contract completion time, the probable number of occasions upon the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, the Contractor shall devise a suitable method for protecting the job set to the approval of the Engineer.

The Contractor shall not use the job set for any purpose except entry of new data and for review by the Engineer, until start of transfer to date to final Project Record Documents.

The Contractor shall maintain the job set at the site of Work as that site is designated by the by the Engineer.

3.1.2 Making entries on Drawings

An erasable colored pencil (not ink or indelible pencil) shall be used to clearly describe the change by graphic line and note as required.

All entries shall be dated.

A **"cloud"** drawn around the area or areas affected shall be used to call attention to the entry.

In the event of overlapping changes, use different colors for the overlapping changes.

The Contractor shall make entries in the pertinent other Documents as approved by the Engineer.

3.1.3 Conversion of Schematic Layouts

In some cased on the Drawings, arrangements of conduits, piping, ducts and similar items, is shown schematically and is not intended to portray precise layout.

Final physical arrangement shall be determined by the Contractor, subject to the Engineer's approval.

However, design of future modifications of the facility may require accurate information as to the final physical layout of items which are shown only schematically on the Drawings.

The Contractor shall show on the job set of Record Drawings, by dimension accurate to within one inch, and shall:

a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.

b. Show, by symbol or note, the vertical location of the item ("under slab," "in ceiling plenum," "exposed," and the like).

c. Make all identification sufficiently descriptive that it may be related reliably to the Specifications.

The Engineer may waive the requirements for conversion of schematic layouts where, in the Engineer's judgment, conversion serves no useful purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the Engineer.

3.2 FINAL PROJECT RECORD DOCUMENTS

The purpose of the final Project Record Documents is to provide information regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.

3.2.1 Approval of recorded data prior to transfer

Following receipt of the reproducible drawings, and prior to start of transfer of recorded data thereto, the Contractor shall secure the Engineer's approval for all required revisions.

3.2.2 Transfer of data to Drawings

The Contractor shall:

1. Carefully transfer change data shown on the job set of Record Drawings to the corresponding transparencies, coordinating the changes as required.

2. Clearly indicate at each affected detail and other Drawing a full description of changes made during construction, and the actual location of items.

3. Call attention to each entry by drawing a "cloud" around the area or areas affected.

4. Make changes neatly, consistently, and with the proper media to assure longevity and clear reproduction.

3.2.3 Transfer of data to other Documents

If the Documents other than the Drawings have been kept clean during progress of the Work, and if entries thereon have been orderly to the approval of the Engineer, the job set of those Documents other than the Drawings will be accepted as final Record Documents.

If any such Document is not so approved by the Engineer, the Contractor shall secure a new copy of that Document from the Engineer at the Engineer's usual charge for reproduction and handling, and carefully transfer the change data to the new copy to the approval of the Engineer.

3.2.4 Review and Submittal

The Contractor shall:

1. Submit the completed set of Project Record Documents to the Engineer.
2. Participate in review meetings as required.
3. Make required changes and promptly deliver the final Project Record Documents to the Engineer.

3.3 CHANGES SUBSEQUENT TO ACCEPTANCE

The Contractor has no responsibility for recording changes in the Work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

3.4 INSTRUCTION MANUALS

3.4.1 Preliminary

A preliminary draft of each proposed Manual shall be prepared by the Contractor.

The Manuals shall show general arrangement, nature of contents in each portion, probable number of drawings and their size, and proposed method of binding and covering.

The Contractor shall secure the Architect/Engineer's approvals prior to proceeding.

3.4.2 Final

The Contractor shall complete the Manuals in strictly accordance with the approved preliminary drafts and the Architect/Engineer's review comments.

3.4.3 Revisions

Following the indoctrination and instruction of operation and maintenance personnel, the Contractor shall review all proposed revisions of the Manual with the Architect/Engineer.

If the Contractor is required by the Architect/Engineer to revise previously approved Manuals, compensation will be made as provided for under "Changes" in the General Conditions.

--End of Section--

SECTION 01 78 00
WARRANTIES
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This Section specifies general administration and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.

General closeout requirements are included in Section "Project Closeout."

Specific requirements for warranties for the work and products and installations that are specified to be warranted are included in the individual Sections of Divisions 2 through 32.

Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.2 DEFINITIONS

1.2.1 Standard Warranties

Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Engineer.

1.2.2 Special Warranties

Special warranties are written required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Engineer.

1.3 WARRANTY REQUIREMENTS

1.3.1 Related Damages and Loses

When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for corrections of warranted Work.

1.3.2 Reinstatement of Warranty

When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

1.3.3 Replacement Cost

Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Engineer has benefited from use of the Work through a portion of its anticipated useful service life.

1.3.4 Owner's Recourse

Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights and remedies.

1.3.5 Rejection of Warranties

The Engineer reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents. The Engineer reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

The Contractor shall submit the following in accordance with conditions of the Contract and Division 1 specification Section 01 33 00 – Submittals.

1.4.1 Standard Warranties

Submit written warranties prior to the date certified for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request.

When a designated portion of the Work is completed and occupied or used by the Engineer, by separate agreement with the Contractor during the construction period, the Contractor shall submit properly executed warranties to the Engineer within 15 days of completion of that designated portion of the work.

1.4.2 Special Warranties

When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, a written document shall be prepared by the required parties. A draft shall be submitted to the Engineer for approval prior to final execution.

Refer to individual Sections of Divisions 1 through 32 for specific content requirements, and particular requirements for submittal of special warranties.

1.4.3 Form of Submittal

At Final Completion, the Contractor shall compile two copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Specifications.

Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

a. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of product, and the name, address and telephone number of the installer.

b. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.

1.5 WARRANTY PERIOD

All warranties required by the Contract documents shall commence on the date of Final Acceptance.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

--End of Section--

SECTION 02 41 16
INTAKE DECK REPLACEMENT
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This work shall consist of the removal, offsite disposal, and replacement of the existing timber deck at the Pawtucket Hydroplant intake including steel frames and planking, and any part thereof, as specified in the Contract Documents and on the Engineer's drawings.

The Contractor shall document all steel component sizes prior to ordering replacement steel and timber. The Contractor shall replace all components of the intake deck and stoplog guides in accordance with the Engineer's drawings.

1.2 QUALITY ASSURANCE

The Contractor shall use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.3 SUBMITTALS

The Contractor shall submit a plan to remove and replace the existing timber deck to dewater the powerhouse intake for installation of the replacement trash racks and to construct the concrete non-overflow section as shown on the Engineer's drawings.

Prior to demolition which effects structural safety, the Contractor shall submit written request to the Engineer for permission to proceed with demolition. Should conditions of the Work, or schedule, indicate a required change of materials or methods for cutting and patching, the Contractor shall so notify the Engineer and secure his/her written permission and the any required Change Order prior to proceeding, if necessary.

The Contractor shall submit written notice to the Engineer designating the time the Work will be uncovered, to provide for the Engineer's observation.

PART 2 - PRODUCTS

2.1 MATERIALS

For replacement of items removed, the Contractor shall use materials complying with pertinent sections of these specifications.

2.2 COATINGS

All steel materials shall be coated with a black epoxy paint in accordance with Section 09 96 56 – Epoxy Coating.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

The Contractor shall inspect existing conditions of the intake deck, including elements subject to movement or damage during cutting, excavating, patching, and backfilling.

After uncovering the work, conditions affecting installation of new work shall be inspected and documented by the Contractor.

If uncovered conditions are not as anticipated, the Contractor shall immediately notify the Engineer and secure needed directions.

The Contractor shall not proceed until unsatisfactory conditions are corrected.

The Contractor shall not damage any work of the completed construction contract, and if accidentally damaged, marred, or otherwise affected, the Contractor shall completely repair, rebuild and refurbish any work effected.

3.2 PREPARATION PRIOR TO CUTTING

The Contractor shall provide required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the Work.

3.3 PERFORMANCE

The Contractor shall perform required timber demolition and timber deck replacement as required under pertinent other sections of these Specifications.

The Contractor shall fit and adjust products to provide finished installation complying with the specified tolerances and finishes.

3.4 PATCHING

The Contractor shall patch all areas with new materials to match existing surrounding conditions. All surfaces for patching of areas with new materials shall be properly prepared. The Contractor shall provide a listing of materials and methods of application and preparation, to the Engineer, for approval prior to start of the work, including all areas to be worked and reworked.

3.5 DECK REMOVAL

The Contractor shall schedule the timber deck removal and replacement as one of the first items of work for construction of the downstream fish bypass sluice and installation of the replacement trash racks. While disassembling the deck, the materials shall not be deposited or allowed to fall into the stream channel. Salvaged materials shall become the property of the Contractor and removed from the site. Timber planking that can be used for restoring the timber deck shall be properly stored and protected from damage during construction. When materials are sold by the Contractor and are removed by the purchaser, it shall be done only during daylight working hours and in company with a Contractor's representative.

3.6 PREVENTION

The Contractor shall be responsible for protecting all structures and utilities from any damage during removal of the existing timber deck, including its foundation, footings, or any part thereof. Particular care shall be exercised to only remove the intake deck components and to assure that no undue strain or movement is produced on the remaining portion of dam or building. The Contractor shall be responsible for the protection of the dam and building and shall repair portions of the retaining walls that become unstable or displaced as the result of the Contractor's operations at no additional cost to the owner.

3.7 SCHEDULE

Removal and replacement of the intake deck shall be scheduled during low flow periods, typically June 15 – September 30. The Contractor shall coordinate work with the Pawtucket Hydropower plant operator. The Contractor shall be responsible for reimbursing the Pawtucket Hydropower for lost power generation for all work by the Contractor outside of the June 15 – September 30 period.

--End of Section--

SECTION 02 41 19
INTAKE FOUNDATON MODIFICATIONS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This work shall consist of the removal and offsite disposal of the masonry building foundation and the existing trash racks, as shown on the Contract Drawings. The stone foundation has to be modified to accommodate the downstream fish passage sluice where it exits the intake structure as shown on the Contract Drawings. The Contractor shall provide all labor, staging, materials, and equipment to temporarily support the foundation, sawcut the foundation stones, remove stone material and install the new concrete liner around the opening.

The Pawtucket Hydropower plant will make the stoplogs available to the Contractor for dewatering the intake forebay.

1.2 REFERENCES

Not Used

1.3 SUBMITTALS

The Contractor shall submit to the Engineer a foundation modification plan for approval. The plan shall clearly define how the work shall proceed and all of the precautions that will be used to assure that the integrity of the buildings are maintained.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 FOUNDATION MODIFICATION

The Contractor shall schedule the foundation modifications subsequent to the intake deck replacement such that the stoplogs can be employed to dewater the brick tunnel and the forebay. The Contractor shall be responsible for installing the Pawtucket Hydropower stoplogs at the intake entrance and dewatering the intake forebay to maintain the work area in the forebay in a dry condition throughout the duration of the work. The Contractor shall be responsible for coordinating access to the intake with the hydroplant operator. The Contractor shall make every effort to minimize the time required to complete the foundation modifications to allow the hydroelectric plant to return to operation and minimize lost power.

While removing the foundation material, the materials shall not be deposited or allowed to fall into the stream channel. Salvaged materials shall become the property of the Contractor and removed from the site. When materials are sold by the Contractor and are removed by the purchaser, it shall be done only during daylight working hours and in company with a Contractor's representative.

3.2 DOWNSTREAM FISH SLUICE SUPPORT SYSTEM

The Contractor shall document the foundation wall stone masonry and rubble wall geometry at the downstream bypass sawcut through the wall prior to installation of the concrete support around the foundation hole and installation of the sluice anchor system and provide to Engineer for evaluation of

design assumptions. The Contractor shall only install the fish sluice anchor system after authorization by the Engineer.

The sluice anchors shall be embedded to a minimum depth of 3ft. This embedment requires a 3 ft- 3 inch hole which will verify the thickness of the stone masonry blocks. If necessary, the anchor length will be adjusted to ensure the anchor head is in the middle of a stone block and that at least 3 ft of wall is engaged by the anchors.

The top anchor bolt on each fish sluice hanger (six) will be tested using the Test Jack Tensioning method. The test jack system shall be designed to span the granite block in which the anchor is being tested is located to allow testing of the bond strength of the anchor and the integrity of the wall to withstand the anchor forces. All other wall anchor bolts (18) will be tested by the Torque Tensioning method. All bolts will be tensioned to 15 kips, which is twice the expected maximum tension.

3.3 PREVENTION

The Contractor shall be responsible for protecting all structures and utilities from any damage during modification of the existing stone foundation, or any part thereof. Particular care shall be exercised to only remove that portion of the foundation needed for construction of the downstream fish bypass sluice and to assure that no undue strain or movement is produced on the remaining portion of the foundation. The Contractor shall be responsible for the stability of all structures and shall remove and replace portions of the building walls that become unstable or displaced as the result of the Contractor's operations at no additional cost to the owner.

3.4 SCHEDULE

Modifications to the intake foundation and installation of the replacement trash racks and support system shall be scheduled during low flow periods, typically June 15 – September 30. The Contractor shall coordinate work with the Pawtucket Hydropower plant operator. The Contractor shall be responsible for reimbursing the Pawtucket Hydropower for lost power generation for all work by the Contractor outside of the June 15 – September 30 period.

--End of Section--

SECTION 03 00 00
CONCRETE
(06/12)

PART1 - GENERAL

1.1 SCOPE

The Contractor shall construct all concrete footings and walls for the fishway and non-overflow section, including all material, concrete, forms, steel reinforcement, water stops, labor, equipment, tools, and incidentals necessary to complete the work. Cast-in-place and precast concrete units shall conform to the requirement of this section and the following related sections:

Section 03 11 13 Concrete Formwork

Section 03 15 13 Waterstops

Section 03 21 00 Reinforcing Steel

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318/318R Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 150 Portland Cement

ASTM C 33 (2003) Concrete Aggregates

ASTM C 231 (2004) Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C 39 (1993a) Compressive Strength of Cylindrical Concrete Specimens

ASTM C 233 (2004) Standard Test Method for Air-Entraining Admixtures for Concrete

ASTM C 309 (2006) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

ASTM E 329 (2005b) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

ASTM C 143/C 143M (2003) Slump of Hydraulic Cement Concrete

1.3 UNIT PRICE – BASIS OF MEASUREMENT AND PAYMENT

1.3.1 Basis of Measurement

Cast-in-place concrete shall be measured to the nearest 0.5 cubic yard installed.

Precast concrete items will not be measured but will be paid for at the Contract Unit price for the following bid items:

3-5 Cast-in-place Concrete Exit Channel

3-7 Cast-in-place Concrete Fish Counting Station

1.3.2 Basis of Payment

The payment will be full compensation for all material, concrete, forms, steel reinforcement, water stops, labor, equipment, tools, and incidentals necessary to complete the work at the Contract Unit prices for:

3-5 Cast-in-place Concrete Exit Channel

3-7 Cast-in-place Concrete Fish Counting Station

The payment for precast concrete units will be full compensation for all material, concrete, forms, steel reinforcement, water stops, labor, equipment, tools, and incidentals necessary to complete the work at the Contract Lump Sum price.

1.4 PRECAST UNITS

Precast concrete units shall be designed and fabricated by an experienced and acceptable precast concrete manufacturer who has been, for at least three (3) years, regularly and continuously engaged in the manufacture of precast concrete work similar to that indicated on the drawings. The Contractor shall coordinate precast work with the work of other trades.

Design calculations for precast units shall be prepared and sealed by a registered professional engineer licensed in the State of Rhode Island and shall be submitted to the Engineer for approval prior to fabrication. The precast concrete units shall be designed for the range of hydrostatic and earthquake forces expected at the site. Calculations shall show the analysis of the precast units for various loading conditions including the 100-year flood and seismic event, and lifting stresses, and shall include design of lifting devices.

Drawings furnished by the precast concrete producer shall be submitted to the Engineer and the Owner's Representative for approval. These drawings shall show complete design, installation, and construction information in such detail as to enable the Engineer and the Owner's Representative to determine the adequacy of the proposed units for the intended purpose. The drawings shall include details of steel reinforcement size and placement, as appropriate.

Precast concrete units shall be fabricated in accordance with the overall dimensions shown on the approved drawings.

1.5 SUBMITTALS

1.5.1 Product Data

Manufacturer's catalog data shall be submitted to the Engineer for approval and shall include printed instructions for admixtures, bonding agents, epoxy-resin adhesive binders, and concrete curing compounds. The data shall include

a. Concrete Aggregates

b. Portland Cement

c. Ready-Mix Concrete

d. Form Facing Materials

e. Reinforcement Materials

f. Joint Materials

g. Water-Vapor Barrier Subgrade Cover

h. Bonding Materials

i. Concrete Curing Materials

j. Coloring Materials

1.5.2 Design Data

Mix design data for each class of Ready-Mix Concrete shall be submitted to the Engineer for approval at least 15 calendar days prior to start of specified work.

1.5.3 Test Reports

Concrete test reports shall be submitted to the Engineer for the project record. Each report shall identify:

a. Slump

b. Air Entrainment

c. Compressive Strength

d. Certificates

e. Concrete Design Mixes

f. Concrete Aggregates

1.5.4 Manufacturer's Instructions

Installation instructions shall indicate the manufacturer's recommended method and sequence of installation for the following items:

a. Admixtures

b. Bonding Materials

c. Waterstops

1.5.5 Calculations and Drawings

Calculations and drawings for precast concrete units shall be submitted to the Engineer and the Owner's Representative for approval prior to fabrication of the units

1.6 QUALIFICATIONS FOR CONCRETE TESTING SERVICE

Concrete testing shall be performed by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency shall meet the requirements of ASTM E 329.

1.7 CONCRETE SAMPLING AND TESTING

Testing by the Contractor shall include sampling and testing concrete materials proposed for use in the work. Quality control testing during construction shall be responsibility of the Contractor.

The following shows the minimum number of tests per sample of concrete. The concrete shall be sampled a minimum of once per concrete pour. The Contractor or Engineer may request further testing.

REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Slump	ASTM C 143/C 143M	Once per sample
Air content	ASTM C 231	Once per sample
Compressive strength	ASTM C 39/C 39M	One specimen tested at 7 days, and three specimens tested at 28 days

1.8 CONCRETE DESIGN MIXES

Mix proportions for each concrete class shall be determined to satisfy the required testing.

The proportions of the aggregates shall be such as to produce a concrete mixture that works readily into the corners and angles of the forms and around reinforcement when consolidated, but does not segregate or exude free water during consolidation.

Before the concrete is placed, the Contractor shall furnish the Engineer, for approval, a statement of the materials and mix proportions (including admixtures, if any) intended for use. The statement shall include evidence satisfactory to the engineer that the materials and proportions will produce concrete conforming to this specification. The materials and proportions stated shall constitute the "job mix." After a job mix has been approved, neither the source, character, or grading of the aggregates nor the type or brand of cement or admixture shall be changed without prior notice to the Engineer. If such changes are necessary, no concrete containing such new or altered material shall be placed until the Engineer has approved a revised job mix.

1.9 GENERAL REQUIREMENTS

1.9.1 Strength Requirements

Concrete for all work shall have a 28-day compressive strength of 4,000 pounds per square inch.

1.9.2 Air Entrainment

All concrete shall contain from 4 to 7 percent total air.

1.9.3 Special Properties

Concrete may contain other admixtures, such as water reducers, super-plasticizers, or set retarding agents to provide special properties to the concrete, if approved.

1.9.4 Slump

Slump shall be within the following limits when no admixtures are added: 1 inch minimum and 4 inches maximum.

PART 2 - PRODUCTS

2.1 CONCRETE AGGREGATES

Fine and coarse aggregates shall conform to ASTM C 33.

2.2 PORTLAND CEMENT

Cement shall conform to ASTM C 150, Type II. One brand and type of cement shall be used for formed concrete having exposed-to-view finished surfaces.

2.3 AIR-ENTRAINING ADMIXTURES

Air-entraining admixtures shall conform in accordance with ASTM C 233.

2.4 CURING MATERIALS

If moist curing is to be used, curing materials shall be burlap or impervious sheets. If a curing compound is to be used to retard the loss of water instead of moist curing, non-formed surfaces or exposed surfaces shall use a liquid membrane forming compound and formed surfaces shall use a curing compound suitable for vertical surfaces. All curing compounds shall meet the requirements of ASTM C 309. Unless otherwise specified, the liquid-forming compound shall be type 2.

2.5 EMBEDDED ITEMS

Embedded items shall be of the size and type indicated or as needed for the application.

2.6 FORM MATERIALS

Forms for concrete surfaces shall be metal, plywood, or hardboard capable of producing the required surface without adverse effect on the concrete. Form coating shall be non-staining form oil or form release agent that will not adversely affect the concrete surfaces or impair subsequent applications to the concrete. Form ties shall be metal, factory-fabricated, and shall be equipped with cones, she-bolts or other devices that permit their removal to a depth of at least 1 inch without injury to the concrete. Ties designed to break off below the surface of the concrete shall not be used without cones.

Exterior surfaces of the fishway and the downstream fish passage sluice shall be formed lined to match the stone pattern on the existing retaining wall adjacent to the fishway. The Contractor shall submit a sample of the form liner to the Engineer for approval by the Owner at least 30 days prior to installation of the forms.

2.7 CONCRETE TINTING

The concrete shall be tinted to match the stone color on the existing retaining wall adjacent to the fishway. The Contractor shall submit a sample of the tinting to the Engineer for approval by the Owner at least 30 days prior to installation of the first concrete pour.

2.8 REINFORCEMENT AND WATERSTOPS

Reinforcement shall be as specified in Section 03 21 00 – Concrete Reinforcement.

Waterstops shall be as specified in Section 03 15 13 – Water Stops.

2.9 WATER

Water shall be potable.

2.9.1 Coloring

The concrete mix shall include a coloring agent that will tint concrete resulting in a color that matches the existing stonework on the river retaining wall at the location of the fishway. The Contractor shall provide color samples to the engineer for approval. The Contractor shall construct mock-up panels of application of the concrete coloring with same materials for use in the work. The mock-ups shall be constructed at a location determined by the Engineer and shall be a minimum size of 48 inches by 48 inches. Mock-ups shall be approved by the Engineer and SHPO for color, texture, special effects, and workmanship before application of concrete stain. Approved mock-ups will be the standard for color, texture, special effects, and workmanship of concrete stain.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES

Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Conduit and other similar items shall be in place and clean of any deleterious substance. Surfaces shall be moist but without free water when the concrete is placed. Formwork shall be mortar-tight, properly aligned, and adequately supported to produce concrete conforming accurately to the indicated shapes, lines, and dimensions and with surfaces free of offsets, waviness, or bulges. Unless otherwise shown, exposed external corners shall be chamfered or beveled by moldings placed in the forms. Form surfaces shall be thoroughly cleaned and coated before each use. Forms shall be removed at a time and in a manner that will not injure the concrete.

3.2 INSTALLATION OF REINFORCEMENT AND WATERSTOPS

Reinforcement shall be fabricated to the required shapes and accurately positioned and secured in place in accordance with Section 03 21 00 - Concrete Reinforcement.

Waterstops shall be installed in accordance with Section 03 15 13 - Water Stops.

3.3 INSTALLATION OF EMBEDDED ITEMS

Embedded items shall be free from oil, loose scale or rust, and paint. Embedded items shall be installed at the locations indicated and required to serve the intended purpose.

3.4 BATCHING, MIXING AND TRANSPORTING CONCRETE

The work shall conform to ACI 318/318R part Construction Requirements, except as otherwise specified.

3.5 CONCRETE PLACEMENT

Concrete shall be handled from mixer to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 20 inches thick. Concrete to receive other construction shall be screeded to the proper level to avoid excessive shimming or grouting.

3.6 CONSOLIDATION

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 8000 vibrations per minute, and the head diameter and amplitude shall be appropriate for the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then withdrawn slowly. The use of form vibrators must be specifically approved. Vibrators shall not be used to transport concrete within the forms.

3.7 WEATHER LIMITATIONS

Special protection measures, approved by the Engineer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. Concrete shall not be mixed nor placed when the daily minimum atmospheric temperature is less than 40 degrees Fahrenheit. The use of accelerators or antifreeze compounds is not allowed. The temperature of the concrete placed during warm weather shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. In no case shall the placing temperature exceed 95 degrees F.

3.8 CONSTRUCTION JOINTS

All construction joints shall have water stops and shall be watertight.

3.9 FINISHING CONCRETE

3.9.1 Formed Surfaces

Fins and loose material shall be removed. Unsound concrete, voids over 1/2 inch in diameter, holes produced by the removal of form ties, and tie-rod bolt holes shall be cut back to solid concrete, reamed, brush-coated with cement grout, and filled solid with a stiff Portland cement and sand mortar mix. Patchwork shall finish flush with adjoining concrete surfaces in texture and color. Patchwork shall be cured for 72 hours.

3.9.2 Unformed Surfaces

All unformed surfaces shall be given a float finish. Screeding shall be followed immediately by darbying or bull floating before bleeding water is present to bring the surface to a true, even plane. After the concrete has stiffened to permit the operation and the water sheen has disappeared, it shall be wood floated.

3.9.3 Form Liner

Form lines in the concrete surfaces shall be stained with a darker color than the concrete to represent joints in stones. The stain tint shall match the color of the stone joints on the existing retaining wall adjacent to the fishway. The Contractor shall submit a sample panel with the form liner and staining to the Engineer for approval by the Owner at least 30 days prior to installation of the first concrete pour.

3.10 CURING AND PROTECTION

3.10.1 General

Immediately after placement, concrete shall be protected from premature drying extremes in temperatures, rapid temperature change, mechanical injury and injury from rain and flowing water. Air and forms in contact with concrete shall be maintained at a temperature above 40 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period.

3.10.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period. If water or curing materials used stains or discolors concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned. When wooden forms are left in place during curing, they shall be kept wet at all times. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Horizontal surfaces shall be cured by covering with waterproof paper, polyethylene sheet, polyethylene-coated burlap or saturated burlap.

Potable water containing no sugar shall be used to moist cure concrete for a minimum of 7 days. Continue additional curing for a total period of 21 days. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval by the Engineer. Cure structures submerged in fresh water for a minimum of 12 hours prior to submerging. Cure structures submerged in seawater for a minimum of 7 days prior to submerging.

3.10.3 Curing Compounds

Exposed concrete, except at construction joints, may be coated with the approved curing compound instead of moist curing. The compound shall be sprayed on the moist concrete surface as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs, and finishing of that surface are completed. The compound shall be applied at a uniform rate of not less than 1 gallon per 175 square feet of surface and shall form a continuous adherent membrane over the entire surface. Curing compound shall be thoroughly mixed before applying and continuously agitated during application. Curing compound shall not be applied to a surface requiring bond to subsequently placed concrete, such as reinforced steel or other embedded items. If the membrane is damaged during the curing process, the damaged area shall be resprayed at the rate of application specified above. Any surface covered by the membrane shall not be trafficked unless protected by water.

3.11 PRECAST CONCRETE UNIT INSTALLATION

The Contractor shall provide adequate access to the site to facilitate hauling, storage and proper handling of the precast concrete products.

The Contractor shall:

(1) Install precast concrete products to the lines and grades shown in the Contract Documents or otherwise specified.

(2) Lift products by suitable lifting devices at points provided by the precast concrete producer.

(3) Install products in accordance with the precast concrete producer's instructions.

(4) Field modifications to the product will not relieve the precast producer of liability even if such modifications do not result in the failure of the product.

Where water tightness is a necessary performance characteristic of the precast concrete product's end use, watertight joints, connectors and inserts shall be used to ensure the integrity of the entire system.

--End of Section--

SECTION 03 11 13
CONCRETE FORMWORK
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall design, fabricate, and install all forms to construct the fishway and non-overflow section. All concrete surfaces shall have a Class A finish in accordance with ACI 347-04. All exterior surfaces shall have form liners that replicate the stone pattern on the adjacent masonry walls above the riverbank.

1.2 REFERENCES

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 347 (2004) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (2004) Basic Hardboard

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA PS 1 (1995) Voluntary Product Standard for Construction and Industrial Plywood

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 1074 (2004) Standard Practice for Estimating Concrete Strength by the Maturity Method

ASTM C 1077 (2008a) Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

ASTM C 31/C 31M (2008b) Standard Practice for Making and Curing Concrete Test Specimens in the Field

ASTM C 39/C 39M (2005e1e2) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

ASTM C 578 (2008b) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

1.3 DESIGN REQUIREMENTS

The design, engineering, and construction of the formwork shall be the responsibility of the Contractor. Design formwork shall be in accordance with methodology of ACI 347 for anticipated loads, lateral

pressures, and stresses. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete. Forms shall comply with the tolerances specified in Section 03 00 00 – Concrete. However, for surfaces with an ACI Class A surface designation, the allowable deflection for facing material between studs, for studs between walers, and walers, between bracing shall be limited to 0.0025 times the span. The formwork shall be designed as a complete system with consideration given to the effects of cementitious materials and mixture additives such as fly ash, cement type, plasticizers, accelerators, retarders, air entrainment, and others. The adequacy of formwork design and construction shall be monitored prior to and during concrete placement as part of the Contractor's approved Quality Control Plan.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 – Submittal Procedures:

a. Shop Drawings

Drawings showing details of formwork, including dimensions of fiber voids, joints, supports, studding and shoring, and sequence of form and shoring removal, shall be submitted to the Engineer for approval at least 14 days either before fabrication onsite or before delivery of prefabricated forms.

b. Product Data

The Contractor shall submit the following product data to the Engineer for approval at least 14 days either before fabrication onsite or before delivery of prefabricate forms:

1) Form Materials

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

2) Form Releasing Agents

Manufacturer's recommendation on method and rate of application of form releasing agents.

3) Sample Panels

After shop drawings have been reviewed, sample panels for Class A finish with applied architectural treatment shall be built on the project site.

One sample unit of fiber voids prior to installation of the voids.

4) Test Reports

The Contractor shall submit field inspection reports for concrete forms and embedded items.

5) Certificates

Certificates attesting that fiber voids conform to the specified requirements.

1.5 SAMPLE PANELS

Panels shall be of sufficient size to contain joints and shall be not less than 6 feet long and 4 feet wide. The panels shall be of typical wall thickness and constructed containing the full allocation of reinforcing steel that will be used in the structure, with the forming system that duplicates in every detail the one that will be used in construction of the structure. The same concrete mixture proportion and materials, the same placement techniques and equipment, and the same finishing techniques and timing shall be used that are planned for the structure. Construction of Class A finish will not be permitted until sample panels have been approved. Sample panels shall be protected from construction operations in a manner to protect approved finish, and are not to be removed until all Class A finish concrete has been accepted.

1.6 STORAGE AND HANDLING

Fiber voids shall be stored above ground level in a dry location. Fiber voids shall be kept dry until installed and overlaid with concrete.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

2.1.1 Forms for Class A Finish

Forms for Class A finished surfaces (as defined by ACI 347-04) shall be plywood panels conforming to APA PS 1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form Panels. Forms for round columns shall be prefabricated seamless type.

2.1.2 Forms for Class B Finish

This class of finish shall apply to all surfaces except those specified to receive Class A. Forms for Class B finished surfaces shall be plywood panels conforming to APA PS 1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels. Forms for round columns shall be prefabricated seamless type. Steel lining on wood sheathing will not be permitted.

2.1.3 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Provide solid backing for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 in. in diameter. Terminate the embedded portion of metal ties not less than 2 inches from any concrete surface exposed to water. Removable tie rods shall be not more than 1 ½ inches in diameter. Plastic snap ties may be used in locations where the surface will not be exposed to view.

2.1.4 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds. If

special form liners are to be used, the Contractor shall follow the recommendation of the form coating manufacturer.

2.1.5 Fiber Voids

Fiber voids shall be the product of a reputable manufacturer regularly engaged in the commercial production of fiber voids. The voids shall be constructed of double faced, corrugated fiberboard. The corrugated fiberboard shall be fabricated of standard paper liners, impregnated with paraffin, and laminated with moisture resistant adhesive, and shall have a board strength of 275 psi. Voids which are impregnated with paraffin after construction, in lieu of being constructed with paraffin impregnated fiberboard, are acceptable. Voids shall be designed to support not less than 1000 psf. To prevent separation during concrete placement fiber voids shall be assembled with steel or plastic banding at 4 ft on center maximum, or by adequate stapling or gluing as recommended by the manufacturer.

2.2 FIBER VOID RETAINERS

Polystyrene rigid insulation shall conform to ASTM C 578, Type V, VI, or VII, square edged. Size shall be 1 ½ inches thick by 16 inches in height by 3 feet in length, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Formwork

Forms shall be constructed true to the structural design and required alignment. Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03 31 00.00 – Cast-in-Place Structural Concrete and Section 03 31 01.10 – Cast-in-Place Concrete for Civil Works and conforming to construction tolerance given in Table 1. The alignment and stability of the forms shall be continuously monitored during all phases to assure the finished product will meet the required surface class [or classes] specified. Failure of any supporting surface either due to surface texture, deflection or form collapse shall be the responsibility of the Contractor as will the replacement or correction of unsatisfactory surfaces. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. When forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of defects which would impair the quality of the resulting concrete surface. All surfaces of used forms shall be cleaned of mortar and any other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a non-staining bond breaker.

3.1.2 Fiber Voids

Voids shall be placed on a smooth firm dry bed of suitable material, to avoid being displaced vertically, and shall be set tight, with no buckled cartons, in order that horizontal displacement cannot take place. Each section of void shall have its ends sealed by dipping in paraffin, with any additional cutting of voids at the jobsite to be field dipped in the same type of sealer, unless liners and flutes are completely impregnated with paraffin. Joints shall be sealed with a moisture resistant tape having a minimum width of 3 inches. If voids are destroyed or damaged and are not capable of supporting the design load, they shall be replaced prior to placing of concrete.

3.2 CHAMFERING

All exposed joints, edges and external corners shall be chamfered by molding placed in the forms unless the drawings specifically state that chamfering is to be omitted or as otherwise specified. Chamfered joints shall not be permitted where earth or rockfill is placed in contact with concrete surfaces. Chamfered joints shall be terminated 12 in. outside the limit of the earth or rockfill so that the end of the chamfers will be clearly visible.

3.3 COATING

Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.4 FORM REMOVAL

The minimal time required for concrete to reach a strength adequate for removal of formwork without risking the safety of workers or the quality of the concrete depends on a number of factors including, but not limited to, ambient temperature, concrete lift heights, type and amount of concrete admixture, and type and amount of cementitious material in the concrete. It is the responsibility of the Contractor to consider all applicable factors and leave the forms in place until it is safe to remove them. In any case, forms shall not be removed unless the minimum time requirements below are met, except as otherwise directed or specifically authorized. When conditions are such as to justify the requirement, forms will be required to remain in place for a longer period. All removal shall be accomplished in a manner which will prevent damage to the concrete and ensure the complete safety of the structure. Where forms support more than one element, the forms shall not be removed until the form removal criteria are met by all supported elements.

Formwork for walls, columns, sides of beams, gravity structures, and other vertical type formwork not supporting the weight of concrete shall not be removed in less than 24 hours after concrete placement is completed.

3.5 INSPECTION

Forms and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

TABLE 1 TOLERANCES FOR FORMED SURFACES

1. Variations from the plumb:	
a. In the lines and surfaces of columns, piers, walls and in arises	1/4 inch in any 10 feet of length Maximum for entire length--1 inch
b. For exposed corner columns, control-joint grooves, and other conspicuous lines	1/4 inch in any 20 feet of length Maximum for entire length--1/2 inch
2. Variation for the level or from the grades indicated on the drawings:	

a. In slab soffits, ceilings beam soffits, and in arises, measured before removal of supporting shores	1/4 inch in any 10 feet of length 3/8 inch in any bay or in any 20 feet of length Maximum for entire length--3/4 inch
b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines	1/4 inch in any bay or in any 20 feet of length Maximum for entire length--1/2 inch
3. Variation of the linear building lines from established position in plan	1/2 inch in any 10 feet 1 inch maximum
4. Variation of distance between walls, columns, partitions	1/4 inch per 10 feet of distance, but not more than 1/2 inch in any one bay, and not more than 1 inch total variation
5. Variation in the sizes and locations of sleeves, floor openings, and wall opening	Minus 1/4 inch, Plus 1/2 inch
6. Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls	Minus 1/4 inch, Plus 1/2 inch
7. Footings:	
a. Variation of dimensions in plan	Minus 1/2 inch, plus 2 inches when formed or plus 3 inches when placed against unformed excavation
b. Misplacement of eccentricity	2 percent of the footing width in the direction of misplacement but not more than 2 inches
c. Reduction in thickness	Minus 5 percent of the specified thickness
8. Variation in steps:	
a. In a flight of stairs	Riser--1/8 inch Tread--1/4 inch
b. In consecutive steps	Riser--1/16 inch Tread--1/8 inch

--End of Section--

SECTION 03 15 13
WATERSTOPS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall provide and install all waterstops required for construction joints in the fishway and non-overflow section footings and walls

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 111 Inorganic Matter or Ash in Bituminous Materials

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 480/A 480M General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

ASTM B 152 Copper Sheet, Strip, Plate, and Rolled Bar

ASTM B 152M Copper Sheet, Strip, Plate, and Rolled Bar (Metric)

ASTM B 370 Copper Sheet and Strip for Building Construction

ASTM D 4 Bitumen Content

ASTM D 6 Loss on Heating of Oil and Asphaltic Compounds

ASTM D 412 Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension

ASTM D 471 Rubber Property - Effect of Liquids

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 513 (1974) Specifications for Rubber Waterstops

COE CRD-C 572 (1974) Specifications for Polyvinylchloride Waterstops

1.3 SUBMITTALS

The Contractor shall submit the following items to the Engineer for approval:

Shop Drawings

Waterstops--Shop drawings and fabrication drawings provided by the manufacturer or prepared by the Contractor.

Product Data

Waterstops--Manufacturer's literature, including safety data sheets, for waterstops. Follow manufacturer's recommended instructions for installing waterstops and for splicing non-metallic waterstops.

PART 2 - PRODUCTS

2.1 WATERSTOPS

Waterstops shall conform to one of the following types:

a. Flexible Metal

Copper waterstops shall conform to ASTM B 152 and ASTM B 370, 060 soft anneal temper and 20 oz mass per sq ft sheet thickness. Stainless steel waterstops shall conform to ASTM A 167 and ASTM A 480/A 480M, UNS S30453 (Type 304L), and 20 gauge thick strip.

b. Non-Metallic Materials

Non-metallic waterstops shall be manufactured from a prime virgin resin; reclaimed material is not acceptable. The compound shall contain plasticizers, stabilizers, and other additives to meet specified requirements. Rubber waterstops shall conform to COE CRD-C 513. Polyvinylchloride waterstops shall conform to COE CRD-C 572. Hermoplastic elastomeric rubber waterstops shall conform to ASTM D 471.

c. Non-Metallic Hydrophilic

Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water shall conform to ASTM D 412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness shall be 50 minimum on the Type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F shall be 3 to 1 minimum.

d. Preformed Elastic Adhesive

Preformed plastic adhesive waterstops shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler, and shall contain no solvents, asbestos, irritating fumes or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength.

2.1.1 Chemical Composition

The chemical composition of the sealing compound shall meet the requirements shown below:

PERCENT BY WEIGHT

COMPONENT	MIN.	MAX.	TEST
Bitumen (Hydrocarbon plastic)	50	70	ASTM D 4
Inert Mineral Filler	30	50	AASHTO T 111
Volatile Matter		2	ASTM D 6

2.1.2 Adhesion under Hydrostatic Pressure

The sealing compound shall not leak at the joints for a period of 24 hours under a vertical 6 foot head pressure. In a separate test, the sealing compound shall not leak under a horizontal pressure of 10 psi which is reached by slowly applying increments of 2 psi every minute.

2.1.3 Sag of Flow Resistance

Sagging shall not be detected when tested as follows: Fill a wooden form 1 inch wide and 6 inches long flush with sealing compound and place in an oven at 135 degrees F in a vertical position for 5 days.

2.1.4 Chemical Resistance

The sealing compound when immersed separately in a 5% solution of caustic potash, a 5% solution of hydrochloric acid, 5% solution of sulfuric acid and a saturated hydrogen sulfide solution for 30 days at ambient room temperature shall show no visible deterioration.

PART 3 - EXECUTION

3.1 WATERSTOPS

Waterstops shall be installed in accordance with the manufacturer's instructions at the locations shown to form a continuous water-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Any waterstop punctured or damaged shall be repaired or replaced. Exposed waterstops shall be protected during application of form release agents to avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Waterstops shall be continuous with no splices permitted.

--End of Section--

SECTION 03 21 00
REINFORCING STEEL
(06/12)

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318/318R	Building Code Requirements for Structural Concrete and Commentary
ACI 318M	Building Code Requirements for Structural Concrete and Commentary (Metric)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 615/A 615M	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

1.2 SUBMITTALS

a. Shop Drawings

Reinforcement - Detail drawings showing reinforcing steel placement, schedules, sizes, grades, and splicing and bending details shall be submitted to the Engineer for approval. Drawings shall show support details including types, sizes and spacing.

b. Certificates

Reinforcing Steel - Certified copies of mill reports attesting that the reinforcing steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified herein, prior to the installation of reinforcing steel shall be submitted to the Engineer for the project record.

1.3 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 - PRODUCTS

2.1 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615/A 615M, Grade 60, sizes as indicated.

2.2 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

PART 3 - EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life and safety. Wire tie ends shall face away from the forms.

3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other enforcement or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete.

--End of Section--

SECTION 03 35 19
CONCRETE STAINING
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall provide for exterior concrete surfaces of the fishway and the non-overflow sections as defined on the project drawings.

1.2 RELATED SECTIONS

Section 03 30 00 – Cast-in-Place Concrete

Section 03 11 13 – Concrete Formwork

1.3 SUBMITTALS

The following items shall be submitted to the Engineer in accordance with Section 01 33 00) – Submittals:

a. Product Data: Manufacturer's product data, including surface preparation and application instructions shall be submitted for the project records.

b. Samples: Manufacturer's samples of standard colors shall be submitted for color selection approval.

c. A stained sample panel shall be submitted to approval.

d. Manufacturer's Certification: Manufacturer's certification that materials comply with specified requirements and are suitable for intended application shall be submitted for the project records.

e. Applicator's Project References: Applicator's list of successfully completed concrete staining projects, including project name and location, name of architect, and type and quantity of concrete stains applied, shall be submitted for the record.

1.4 QUALITY ASSURANCE

1.4.1 Applicator's Qualifications

The Applicator shall have been regularly engaged for the preceding 3 years in application of concrete stains of similar type to that specified. The Applicator shall employ persons trained for application of concrete stains.

1.4.2 Mock-ups

The Contractor shall construct mock-ups of application of concrete stain and illustrating paving finishes, using same materials for use in the work. The mock-ups shall be constructed at a location determined by the Engineer and shall be a minimum size of 48 inches by 48 inches. Mock-ups shall be approved by the Engineer and SHPO for color, texture, special effects, and workmanship before application of concrete stain. Approved mock-ups will be the standard for color, texture, special effects, and workmanship of concrete stain.

1.4.3 Pre-application Meeting

The Contractor shall convene a pre-application meeting before start of application of concrete stain. All parties directly affecting the work of this section, including the Contractor, Engineer, Applicator, and manufacturer's representative shall attend to the meeting to review surface preparation, application, protection, and coordination with other work.

1.5 DELIVERY, STORAGE, AND HANDLING

All materials shall be delivered to the site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

Materials shall be stored in clean, dry area indoors in accordance with manufacturer's instructions out of direct sunlight and kept from freezing.

Materials shall be protected during handling and application to prevent contamination or damage.

1.6 ENVIRONMENTAL REQUIREMENTS

Concrete stain shall not be applied when air or surface temperatures are below 40 degrees F (4 degrees C) or above 90 degrees F (32 degrees C) or when rain, snow, or excessive moisture is expected during application or within 24 hours after application.

Concrete sealer shall not be applied when air or surface temperatures are below 45 degrees F (7 degrees C) or above 80 degrees F (27 degrees C) during application or within 24 hours after application. Concrete sealer shall not be applied when rain, snow, or excessive moisture is expected during application or within 24 hours after application.

PART 2 - PRODUCTS

2.1 MANUFACTURER

The concrete stain manufacturer product data sheet clearly identifies that the stain is intended for the specified use with exposure to rain and variable river conditions.

2.2 MATERIALS

Concrete stain shall be a penetrating, reactive stain that produces unique color effects in finished cementitious surfaces to simulate natural shadings and aged appearance of stone or masonry. The stain shall create a chemical reaction within the concrete substrate, slightly etching concrete surface. The stain shall not contain hydrochloric acid.

The stain colors shall match the color of the joints between the existing stone in the river wall adjacent to the fishway at and a location defined by the Engineer.

The manufacturer shall provide a detergent that is a biodegradable, natural, citrus-based, enzyme solvent cleaner for the stain. The detergent shall be free of acids and petroleum-based chemicals.

The manufacturer shall provide a color value reducer to reduce color value and for removal of unwanted spills and over-spray.

The manufacturer shall provide a concrete sealer that for exterior use matches the finish to be defined by the Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

The Contractor shall examine surfaces to receive concrete stain and notify the Engineer of conditions that would adversely affect application. Surface preparation or application shall not begin until unacceptable conditions are corrected.

3.2 SURFACE PREPARATION

Adjacent areas, adjoining walls, and landscaping shall be protected from contact with concrete stain.

Surfaces to be stained shall be prepared in accordance with manufacturer's instructions.

Prior to staining the Contractor shall place, finish, and cure concrete as specified in Section 03 30 00.

Dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, adhesives, sealers, and other surface contaminants which could adversely affect application of concrete stain shall be removed and the concrete thoroughly cleaned using detergent.

New concrete shall be cured the minimum time recommended by the manufacturer a minimum of 14 days before application of concrete stain or longer if recommended.

The Contractor shall verify that new concrete has cured and non-compatible liquid curing materials were not used.

Concrete surfaces shall be uniformly cleaned and dried before application of concrete stain.

3.3 MIXING

The concrete stain shall be thoroughly mixed concrete stain before use in accordance with manufacturer's instructions.

The color value of concrete stain shall be reduced by blending with color value reducer recommended by the manufacturer.

3.4 APPLICATION

The concrete stain shall be applied in accordance with manufacturer's instructions at locations indicated on the Drawings.

Splashes, drips, and puddles of concrete stain on the surface shall be immediately brushed out.

Color, textures, special effects, and workmanship shall be matched to approved mock-ups.

Concrete sealer shall be applied in accordance with manufacturer's instructions after substrate has thoroughly dried.

Concrete sealer shall be applied uniformly over stained surfaces.

3.5 PROTECTION

The Contractor shall protect completed concrete stain and concrete sealer application from rain, snow, and excessive moisture for a minimum of 24 hours and damage during the remainder of construction.

--End of Section--

SECTION 03 60 00
GROUT AND GROUT BAGS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This work shall consist of providing all labor, submittals, materials, and equipment necessary for installation of the concrete grout bags and leveling plates for the fishway pier foundations, rock anchors, and rock dowels to anchor the downstream fish bypass sluice to the stone foundation, as shown on the Contract Drawings.

1.2 REFERENCES

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31 (2006) Making and Curing Concrete Test Specimens in the Field

ASTM C 39 (2006) Compressive Strength of Cylindrical Concrete Specimens

1.3 BASIS OF MEASUREMENT AND PAYMENT

1.3.1 Basis of Measurement

Grout and grout bags will be measured to the nearest 0.5 cubic yard installed.

1.3.2 Basis of Payment

The payment will be full compensation for all material, concrete, grout, grout bags, labor, equipment, tools, and incidentals necessary to complete the work at the Contract Unit price per cubic yard installed.

1.4 SUBMITTALS

All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures specification.

The name and address of the testing laboratory shall be submitted to the Engineer at least two weeks prior to intended use.

Design of grout mixes shall be submitted to the Engineer at least two weeks prior to intended use.

One copy of test results from all tests conducted on materials shall be submitted to the Engineer as soon as available.

1.5 QUALITY ASSURANCE

Samples shall be obtained for strength tests.

Suitability of fabric design shall be demonstrated by injecting the proposed mortar mix into three 24-in. long by approximately 6-in, diameter fabric sleeves under a pressure of not more than 15 psi, which shall be maintained for not more than 10 minutes. A 12-in. long test cylinder shall be cut from the middle of each cured test specimen.

Three standard 6 in. x 12 in. concrete compressible strength test cylinders shall be made of the proposed mortar grout mix. Test cylinders shall be made and cured in accordance with ASTM C 31.

Grout cylinders shall be tested for compressive strength in accordance with ASTM C 39. The average 7-day compressive strength of the fabric form test cylinders shall be at least 20 percent higher than that of companion test cylinders made in accordance with ASTM C 31. All testing shall be conducted by a laboratory approved by the Engineer.

The Engineer shall be notified immediately if compressive strength is less than specified.

One copy of all test reports shall be provided to the Engineer as soon as the results are available.

PART 2 - PRODUCTS

2.1 GROUT MIX

Grout shall consist of 846 lb/yd^3 Type II Portland cement.

Pea gravel shall consist of rounded bank-run, non-angular gravel with the smallest axis ranging from 2-8 mm in length.

Unless otherwise specified, grout shall have a 28-day compressive strength of 3,500 psi.

Grout for all work shall contain from 6 ± 1 percent total air.

2.2 GROUT BAGS

Grout bags shall be made of a high strength water permeable fabric of nylon and Cordura. Each bag shall be provided with a self-closing inlet valve to accommodate insertion of the concrete pumping hose. A minimum of two valves shall be provided for bags more than 20-feet long. Seams shall be folded and double stitched.

Fabric shall exhibit the following properties in both warp and fill directions:

TEST PROPERTY	TEST METHOD	SPECIFICATION LIMITS
Tensile Strength, min	D 1682, Grab Method	400 lb/in.
Tear Strength, min	D 2262, Tongue Method	90 lb

PART 3 - EXECUTION

3.1 ROCK EXCAVATION

Working directly in the area that is to be covered with grout bags, the Contractor shall remove any debris and sediment on the bedrock surface and co

nduct a thorough inspection of the rock surface. Rock shall be excavated employing underwater techniques for the piers foundations that cannot be dewatered, or in the dry for areas above high tide level and behind the cofferdam, to the limits defined on the Contract Drawings. The results of the survey shall be submitted to the Engineer with the rock excavation plan for approval, as required be SECTION 31 23 16.

3.2 LEVELING PLATE INSTALLATION

After the completion of the rock removal, the Contractor shall install the leveling pad grout bags as detailed on the project plans. The bags shall be positioned and filled so that they adequately close the existing opening and exit from conveying flow in its entirety, as detailed on the project plans.

3.3 GROUT INSTALLATION

Grout should be mixed and placed using a suitable grout mixer and grout pump. A holdover tank equipped with an agitator shall be provided. Mixer, truck and pump capacities shall be compatible to permit continuous grouting; the grout pump should be capable of grouting the hole in 20 minutes or less.

The contractor should pump the grout into the hole around rock dowels to the full depth of the hole such that the final position of the rock dowel is in the center of the hole.

The dowel should not be disturbed for a minimum of 24 hours to allow the grout to set.

--End of Section--

SECTION 05 50 00
MISCELLANEOUS METAL FABRICATIONS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall fabricate and install the fishway exit bottom plate, crowder, V-Trap, aluminum stoplogs, ladders, and stairways as specified on the Project Drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA 46 (1978) Standards for Anodized Architectural Aluminum

AA DAF-45 (2003) Designation System for Aluminum Finishes

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 180 (2000; R 2004) Corrugated Sheet Steel Beams for Highway Guardrail

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2005) Code of Standard Practice for Steel Buildings and Bridges

AISC 350 (2005) Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings

AISC 360 (2005) Specification for Structural Steel Buildings, with Commentary

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2005) Minimum Design Loads for Buildings and Other Structures

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE A10.3 (2006) Operations -- Safety Requirements for Powder Actuated Fastening Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2006; Errata 2006) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.2 (1987; R 2005) Square and Hex Nuts (Inch Series)

ASME B18.21.1 (1999; R 2005) Lock Washers (Inch Series)

ASME B18.21.2M (1999; R 2005) Lock Washers (Metric Series)

ASME B18.22.1 (1965; R 2003) Plain Washers

ASME B18.22M (1981; R 2005) Metric Plain Washers

ASME B18.52.1 (1996; R 2005) Square and Hex Bolts and Screws Inch Series

ASME B18.6.2 (1998; R 2005) Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws: Inch Series

ASME B18.6.3 (2003) Machine Screws and Machine Screw Nuts

ASTM INTERNATIONAL (ASTM)

ASTM A 1011/A 1011M (2006b) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

ASTM A 123/A 123M (2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153/A 153M (2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 283/A 283M (2003) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

ASTM A 307 (2004e1) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM A 36/A 36M (2005) Standard Specification for Carbon Structural Steel

ASTM A 467/A 467M (2001) Standard Specification for Machine Coil and Chain

ASTM A 47/A 47M (2004) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process

ASTM A 475 (2003) Standard Specification for Zinc-Coated Steel Wire Strand

ASTM A 48/A 48M (2003) Standard Specification for Gray Iron Castings

ASTM A 500	(2003a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 53/A 53M	(2006a) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 653/A 653M	(2006a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 687	(1993) Standard Specification for High-Strength Non-headed Steel Bolts and Studs
ASTM A 780	(2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 786/A 786M	(2005) Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates
ASTM A 924/A 924M	(2006) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B 108	(2006) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B 209	(2006) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 209M	(2006) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B 221	(2006) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 221M	(2006) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM B 26/B 26M	(2005) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B 429/B 429M	(2006) Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
ASTM D 1187	(1997; R 2002e1) Asphalt-Base Emulsions for Use as Protective Coatings for Metal
ASTM D 2047	(2004) Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine

ASTM E 488	(1996; R 2003) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM E 814	(2002) Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM F 1267	(2001) Metal, Expanded, Steel
ASTM F 1679	(2000) Standard Test Method for Using a Variable Incidence Tribometer

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(2004) Alkyd Anti-Corrosive Metal Primer

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 521	(2001) Pipe Railing Manual
NAAMM MBG 531	(2000) Metal Bar Grating Manual
NAAMM MBG 532	(2000) Heavy Duty Metal Bar Grating Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2006; Errata 2006) Standard for Portable Fire Extinguishers
NFPA 101	(2006) Life Safety Code, 2006 Edition
NFPA 211	(2006) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(2004e1) Power Tool Cleaning
SSPC SP 6	(2000; E 2004) Commercial Blast Cleaning

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.27	Fixed Ladders

1.3 SUBMITTALS

The following shall be submitted to the Engineer for approval in accordance with Section 01 33 00 – Submittal Procedures:

a. Shop Drawings

1) Fabrication drawings of steel stairs
2) Floor gratings, installation drawings

3) Handrails, installation drawings
4) Ladders, installation drawings
5) Embedded angles, channels and plates, installation drawings

Fabrication drawings shall show layout(s), connections to structural system, and anchoring details as specified in AISC 303.

b. Product Data

1) Floor gratings and roof walkways
2) Handrails
3) Ladders
4) Steel stairs
5) Stoplogs (aluminum)
6) Viewing plate (aluminum)

1.4 QUALIFICATION OF WELDERS

Welders shall be qualified in accordance with AWS D1.1/D1.1M. Procedures, materials, and equipment of the type required for the work shall be used.

1.5 DELIVERY, STORAGE, AND PROTECTION

Materials shall be protected from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. The Contractor shall remove and replace damaged items with new items.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

ASTM A 36/A 36M

2.1.2 Structural Tubing

ASTM A 500

2.1.3 Steel Pipe

ASTM A 53/A 53M, Type E or S, Grade B

2.1.4 Fittings for Steel Pipe

Standard malleable iron fittings ASTM A 47/A 47M

2.1.5 Gratings

Metal bar type grating NAAMM MBG 531[NAAMM MBG 532].

2.1.6 Anchor Bolts

ASTM A 307, where exposed, shall be of the same material, color, and finish as the metal to which applied.

2.1.6.1 Expansion Anchors

Provide ¾ in. diameter expansion anchors. Minimum concrete embedment shall be 5½ in. Design values listed shall be as tested according to ASTM E 488.

2.1.6.2 Lag Screws and Bolts

ASME B18.52.1, type and grade best suited for the purpose.

2.1.6.3 Toggle Bolts

ASME B18.52.1

2.1.6.4 Bolts, Nuts, Studs and Rivets

ASME B18.2.2 and ASTM A 687 or ASTM A 307

2.1.6.5 Screws

ASME B18.52.1, ASME B18.6.2, and ASME B18.6.3

2.1.6.6 Washers

Plain washers shall conform to ASME B18.22M (ASME B18.22.1). Beveled washers shall be provided for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.2M (ASME B18.21.1).

2.1.6.7 Aluminum Alloy Products

Shall conform to ASTM B 209M(ASTM B 209) for sheet plate, ASTM B 221M(ASTM B 221) for extrusions and ASTM B 26/B 26M or ASTM B 108 for castings, as applicable. Provide aluminum extrusions at least 1/8-in. thick and aluminum plate or sheet at least 0.050-in. thick.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A 123/A 123M, ASTM A 153/A 153M, ASTM A 653/A 653M or ASTM A 924/A 924M, Z275 (G90), as applicable.

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation shall be galvanized, unless indicated otherwise.

2.2.2 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A 780 or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat surfaces to which a stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste, and spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.2.3 Shop Cleaning and Painting

2.2.3.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete shall be free of dirt and grease. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints, but coat with rust preventative applied in the shop.

2.2.3.2 Pretreatment, Priming and Painting

Apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions.

2.2.4 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.2.5 Aluminum Surfaces

2.2.5.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.2.5.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings finish, medium, AA DAF-45, or AA 46. Unless otherwise specified, all other aluminum items shall have standard mill finish. The thickness of the coating shall be not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF-45. Items to be anodized shall receive a polished satin finish.

2.2.5.3 Viewing Bottom Plate

The viewing bottom plate shall have an epoxy coating meeting the requirements of Section 09 96 56.

2.3 FLOOR GRATINGS AND WALKWAYS

Steel grating shall be designed in accordance with NAAMM MBG 531 for bar type grating or manufacturer's charts for plank grating. Steel floor gratings shall have a black epoxy coating in accordance with Section 09 90 00.

Floor gratings shall be designed to support a stress load of 200 pounds per square foot for the spans indicated, with maximum deflection of L/240.

Edges of grating shall be banded with bars of the same size as the bearing bars. Banding shall be welded in accordance with the manufacturer's standard for trim. Tops of bearing bars, cross or intermediate bars shall be in the same plane and match grating finish.

Gratings shall be anchored to structural members with bolts, toggle bolts, or expansion shields and bolts.

2.4 HANDRAILS

Handrails shall be designed to resist a concentrated load of 250 lbs in any direction at any point of the top of the rail or 20 lbs per foot applied horizontally to top of the rail, whichever is more severe. The same size rail and post shall be provided. Pipe collars shall have the same material and finish as the handrail and posts.

Steel handrails, including inserts in concrete, shall be railings of 2 inches nominal size and shall have a black epoxy coating in accordance with Section 09 90 00.

Joint posts, rail, and corners shall be fabricated by one of the following methods:

(1) Flush-type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8-in. hexagonal-recessed-head setscrews.

(2) Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Butt railing splices and reinforce them by a tight fitting interior sleeve not less than 150 mm (6 inches) long.

(3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

2.5 LADDERS

Vertical ladders shall be fabricated conforming to Section 7 of 29 CFR 1910.27 and shall have 2 ½- by 3/8-in. steel flats for stringers and ¾-in. diameter steel rods for rungs. Rungs shall not be less than 16 in. wide, spaced 1-ft. apart, plug welded or shouldered and headed into stringers. Ladders shall be installed so that the distance from the rungs to the finished wall surface will not be less than 7 in. Heavy clip angles shall be riveted or bolted to the stringer and drilled for not less than two ½-in. diameter expansion bolts. Intermediate clip angles shall be provided at less than 48 in. on centers.

2.6 STEEL STAIRS

Steel stairs shall be complete with stringers, risers, grating treads, landings, columns, handrails, and necessary bolts and other fastenings. Steel stairs and accessories shall have a black epoxy coating in accordance with Section 09 90 00.

2.6.1 Design Loads

Stairs shall be designed to sustain a live load of not less than 200 pounds per square foot), or a concentrated load of 100 pounds applied where it is most critical. Design and fabrication of steel stairs, other than a commercial product shall conform to AISC 360 or AISC 350.

2.6.2 Materials

Steel stairs shall have welded construction, except that bolts may be used where welding is not practicable. Screw or screw-type connections are not permitted. Stair materials shall be:

a. Structural Steel: ASTM A 36/A 36M

b. Gratings for Treads and Landings: NAAMM MBG 531 grating; ASTM A 653/A 653M, Z275 (G-90) for steel; ASTM B 209M (ASTM B 209) for aluminum. Provide gratings with nonslip nosings. Slip resistance shall exceed a static coefficient of friction, both wet and dry, of 0.5 as tested in accordance with ASTM F 1679.

c. Grating shall be supported on angle cleats welded to stringers or treads with integral cleats, welded or bolted to the stringer. Exposed ends shall be closed and stairs shall have all exposed joints formed to exclude water.]

d. Before fabrication, the Contractor shall obtain necessary field measurements and verify drawing dimensions.

e. Metal surfaces shall be clean and free from mill scale, flake rust and rust pitting prior to shop finishing. Permanent connections shall be welded. Welds shall be finished flush and smooth on surfaces that will be exposed after installation.

2.7 FISH CROWDER

The fish crowder and V-trap shall be ASTM A 36 structural steel and shall have a black epoxy coating in accordance with Section 09 90 00.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Items shall be installed at locations indicated, according to manufacturer's instructions. The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item,

even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

The Contractor shall provide anchorage where necessary for fastening miscellaneous metal items securely in place. Non-ferrous attachments shall be provided for non-ferrous metal.

3.4 WELDING

The Contractor shall perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.5 FINISHES

3.5.1 Dissimilar Materials

Where dissimilar metals are in contact, surfaces shall be protected with a coat conforming to MPI 79 to prevent galvanic or corrosive action. Aluminum surfaces in contact with concrete, mortar, masonry, wood, or absorptive materials subject to wetting shall be protected with ASTM D 1187, asphalt-base emulsion.

3.5.2 Field Preparation

Rust-preventive coating shall be removed just prior to field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, shall be free of rust, grease, dirt and other foreign matter.

3.5.3 Environmental Conditions

The Contractor shall not clean or paint surface when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than 5 degrees F above the dew point of the surrounding air or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Engineer.

3.6 HANDRAILS

Toeboards and brackets shall be installed where indicated. Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

Handrails shall be installed by means of base plates bolted to stringers or structural steel frame work. Rail ends by steel pipe flanges shall be anchored by expansion shields and bolts.

3.7 LADDERS

Ladders shall be secured to the adjacent construction with the clip angles attached to the stringer. Ladders secured to concrete with at least ½-in. diameter expansion bolts. Intermediate clip angles shall be installed 48 in. on center. Brackets shall be installed as required for securing of ladders welded or bolted to structural steel or built into the concrete.

3.8 STEEL STAIRS

Anchor bolts, grating fasteners, washers, and all parts or devices necessary for proper installation of steel stairs shall be provided and installed by the Contractor. Lock washers shall be provided under nuts.

--End of Section--

SECTION 05 60 00
STRUCTURAL STEEL, MISCELLANEOUS STEEL, AND EMBEDMENTS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

Furnish, fabricate, deliver, and erect structural steel, miscellaneous steel and the embedments as shown on the Engineer's Contract Drawings and as specified herein, including the fishway trash rack, stoplog guides, intake deck structural steel supports, and miscellaneous steel.

1.2 RELATED WORK

All steel material to be used for the project.

1.3 REFERENCES

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC Specification	Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings
AISC Code	Code of Standard Practice for Steel Buildings and Bridges
AISC Manual	Manual of Steel Construction

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36	Structural Steel
ASTM A 123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 653	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 924	Steel Sheet, Metallic-Coated by the Hot-Dip Process

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1	Filler Metal Specifications through A5-23
AWS D1.1	Structural Welding Code – Steel

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP1	Solvent Cleaning

SSPC SP5 White Metal Blast Cleaning

SSPC SP6 Commercial Blast Cleaning

SSPC SP10 Near-White Blast Cleaning
SSPC PA1 Shop, Field, and Maintenance Painting

SSPC PS12 Guide to Zinc - Rich Coating Systems

1.4 SHOP WELDING

The Contractor shall be responsible for the inspection and verification of all shop welding to the requirements of Sections 6, 8, and 9 of AWS D1.1.

A visual inspection is the minimum inspection required.

The shop weld inspection shall be by an AWS Certified Inspector, or Assistant Welding Inspector(s), under the supervision of the AWS Certified Inspector. Alternatively, implement a program for self-certification of welding inspectors, provided the program is written and is supervised by an AWS Certified Inspector in compliance with the requirements of AWS D1.1, Sections 6 and 8. Copies of the written Weld Inspection Program, including the Inspector's certification records, shall be filed and be available to the Engineer if requested.

1.5 FIELD WELDING

The Contractor shall be responsible for the fabrication/erection inspection of all field welding to the requirements of Sections 6, 8, and 9 of AWS D1.1.

A visual inspection is the minimum inspection required.

The verification inspection of field welding will be performed by the Contractor's Testing Laboratory.

1.6 INSPECTION

The Contractor shall be responsible for inspecting and testing the following items:

a. Final bolt torquing
b. Field welding operations.

1.7 SUBMITTALS

The Contractor shall comply with the provisions of Section 01 33 00 - Submittals. Submittals shall include:

a. Shop Drawings

   The Contractor shall submit shop detail and erection drawings for structural steel embedments to the Engineer for approval.

b. Field Weld Procedures and Qualifications

   The Contractor shall submit qualifications of all welders and procedures employed by the Contractor for all field welding performed under this Specification.

1.8 PRODUCT HANDLING

1.8.1 Provisions for Storage

Items shall be handled in a manner which is consistent with safe and sound material handling practices.

Items shall be stored outdoors in an area designated by the owner which is well drained and reasonably removed from the actual construction area and traffic so that damage from construction equipment is minimized. All items shall be stored on cribbing or equivalent to avoid trapping water and to allow air circulation. Bolts, nuts, and washers, if packaged to exclude moisture, may be stored outdoors on cribbing.

1.8.2 Shipping Requirements

For all items, packaging shall be adequate to prevent contamination, mechanical damage or deterioration during the field storage period which is estimated to be several months. Structural steel members shall be cleaned and painted as specified and identified by erection marks. Bolts, nuts, and washers shall be shipped in closed containers.

PART 2 - PRODUCTS

2.1 MATERIALS

All materials shall be new and shall be:

a. Structural Steel, Miscellaneous Steel, Embedments, Plate Attachments and Flat or Round Bar Anchors: ASTM A36

b. Bolts and Fasteners: AISI 316 Stainless Steel

c. Shop Paint: As specified in SECTION 09 90 00 PAINTING.

d. All steel items shall be galvanized, and when practicable shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123, ASTM A 653, or ASTM A 924, as applicable.

2.2 DESIGN AND WORKMANSHIP

The AISC Specification and Code are hereby incorporated into this section and shall apply except as otherwise specified or approved in writing by the Engineer.

The fishway support brackets shall be fabricated as shown on the drawings. Shop drawings shall be submitted as per SECTION 01 33 00 SUBMITTALS. After fabrication, sections shall be surface prepped and coated as specified herein.

2.3 MISCELLANEOUS STEEL

Other items of miscellaneous steel, unless covered by other sections of this specification, shall be fabricated as shown on the Engineers' Contract Drawings.

2.4 WELDING

All welding, welding procedures and qualifications, and welder qualifications shall be in accordance with AWS D1.1 and the additional requirements herein. One copy of all welding procedures and qualifications shall be filed and be available to the Engineer if requested. Welders qualified to ASME IX are considered acceptable for AWS D1.1 work.

All welding shall be in strict accordance with these procedures, and shall be made by a qualified welder.

All welds shall be visually inspected to the requirements of Sections 6, 8, and 9 AWS D1.1.

2.5 SURFACE PREPARATION AND PROTECTIVE COATINGS

All steel material herein shall be cleaned and coated or galvanized as required herein.

Any conflict between this specification and the requirements or instructions of the SSPC, or the coating manufacturers, shall be brought to the Engineer's attention for written resolution.

Coatings shall be applied in accordance with the requirements of SSPC PA1, supplemented by requirements of the coating manufacturer and application requirements of this specification.

Surfaces adjacent to edges of joints to be welded shall be kept free of paint within 4 in. of the edge, the unpainted weld area being protected with one coat of Carbo-Weld 11 manufactured by the Carboline Co., St. Louis, MO. This protective coating need not be removed prior to welding. Such surfaces shall, subsequent to welding, be prepared and coated in the same manner as specified for the appropriate standard painting system.

PART 3 - EXECUTION

3.1 ERECTION

The recommendations and procedures prescribed under Section 7, Erection, of the AISC Code shall govern the erection work unless otherwise specified herein.

3.2 FIELD BOLTING

Installation of high strength bolts shall conform to the RCSC specification.

A minimum of one washer per bolt shall be placed under the part turned when tightening A325 or A490 bolts.

All bolts in any connection shall be installed with all nuts on the same side unless interferences will not permit. Field connections in other than a vertical plane shall be installed with nuts on the lower side.

Attachments to concrete shall be made in the manner shown on the Contract Drawings. Where drilled-in anchors are indicated on the Contract Drawings, the anchors shall be installed as shown on the Contract Drawings and in accordance with the manufacturer's instructions.

3.3 FIELD WELDING

Field welding shall conform to the requirements for shop welding in Paragraph 2.4 herein.

The Contractor shall submit the qualifications of all welders and procedures employed by the Contractor for field welding performed under this Specification.

3.4 FIELD PAINTING

The Contractor shall provide touch-up and top coating of all vendor furnished material after installation in accordance with Section 09 90 00 - Painting.

--End of Section--

SECTION 06 13 33
INTAKE DECK TIMBERWORK
(06/12)

PART 1 – GENERAL

1.1 SCOPE

The Contractor shall provide all materials, labor, and equipment necessary to replace the timber intake deck at the inlet to the hydroelectric project.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA C2	(2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA M4	(2002) Standard for the Care of Preservative-Treated Wood Products
AWPA M6	(1996) Brands Used on Forest Products
AWPA P2	(2001) Standard for Creosote Solutions
AWPA P5	(2005) Standard for Waterborne Preservatives

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M	(2008) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-P-21035	(Rev B; Notice 2) Paint, High Zinc Dust Content, Galvanizing Repair (Metric)

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-W-410	(Rev E) Wire Rope and Strand

1.3 SUBMITTALS

The following shall be submitted to the Engineer for approval in accordance with Section 01 33 00 – Submittal Procedures:

a. Shop Drawings

Dam timberwork - The Contractor shall submit drawings of treated timber showing dimensions of cut, framed, or bored timbers for the project record.

b. Test Reports - Test reports shall be submitted for the project record, including:

Timber preservative inspection
Delivery inspection list

c. Certificates – Certificates shall include:

MSDS and CIS

1.4 DELIVERY AND STORAGE

Untreated timber and lumber material shall be open stacked on skids at least 12 in. above ground in a manner that will prevent warping and allow shedding of water. Treated timber and lumber material shall be close-stacked in a manner that will prevent long timbers or pre-framed material from sagging or becoming crooked. Ground under and within 5 feet of such piles shall be kept free of weeds, rubbish, and combustible materials. Materials from weather shall be protected. Treated timber shall be handled with ropes or chain slings without dropping, breaking outer fibers, bruising, or penetrating surface with tools. Cant dogs, peaveys, hooks, or pike poles shall not be used. Timber and hardware shall be protected from damage.

1.5 QUALITY ASSURANCE

1.5.1 MSDS and CIS

Material Safety Data Sheets (MSDS) and Consumer Information Sheets (CIS) associated with timber preservative treatment shall be provided. Contractor shall comply with all safety precautions indicated on MSDS and CIS.

1.5.2 Timber Preservative Inspection

An inspection report shall be submitted by an independent inspection agency for approval by the Engineer stating that offered products complying with applicable AWPA Standards shall be identified on each piece by the quality mark of an agency accredited by the Board of Review of the American Lumber Standard Committee.

1.5.3 Delivery Inspection List

The Contractor shall field inspect and submit a verification list of each treated timber member and each strapped bundle of treated lumber indicating the wording and lettering of the quality control markings, the species and the condition of the wood. The Contractor shall not incorporate materials damaged in transport from plant to site. All preservative-treated wood shall be visually inspected to ensure there are no excessive residual materials or preservative deposits. Material shall be clean and dry or it will be rejected due to environmental concerns.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Lumber and Timbers

2.1.1.1 Solid Sawn

Solid sawn lumber and timbers shall be stress-rated Southern Pine or Douglas Fir-Larch, with a stress rating 1,200 psi and identified by the grade mark of a recognized association or independent inspection agency using the specific grading requirements of an association recognized as covering the species used. The association or independent inspection agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used.

2.1.1.2 Preservative Treatment

Lumber and timbers shall be fabricated before preservative treatment. Each piece of treated lumber or timber shall be branded, by the producer, in accordance with AWPA M6. Wood to be used in contact with salt water or salt water splash shall be treated in accordance with AWPA C2 (Material Subject to Marine Borer Exposure) with water-borne preservative. The Contractor shall be responsible for the quality of treated wood products.

2.1.2 Hardware

Bolts shall be provided with necessary nuts and washers, timber connectors, drift pins, dowels, nails, screws, spikes, and other fastenings. Bolts and nuts shall conform to ASTM A 307. Cast-iron ogee, malleable iron washers, or plate or cut washers shall be provided where indicated. Bolts shall have washers under nut and head. Timber connectors and other metal fastenings of type and size as necessary shall be provided. All hardware shall be hot-dip galvanized.

2.1.2.1 Zinc-Coating

Steel shall be galvanized by the hot-dip process in accordance with ASTM A 123/A 123M or ASTM A 153/A 153M, as applicable.

PART 3 - EXECUTION

3.1 CONSTRUCTION

The Contractor shall match the construction method to the maximum extent possible. The Contractor shall cut, bevel, and face timbers prior to plant preservative treatment. Protective equipment shall be provided for personnel fabricating, field treating, or handling materials treated with creosote or water-borne salts.

3.1.1 Framing

Lumber and timber shall be cut and framed so that joints will fit over contact surface and timbers and piles secured in alignment. Open joints are unacceptable. Shimming is not allowed. Holes for drift pins and dowels shall be bored with a bit 1/16-in. less in diameter than the pin or dowel. Holes for truss rods or bolts shall be bored with a bit 1/16-in. larger in diameter than rod or bolt. Holes for lag screws shall be bored in two parts, with the lead hole for shank the same diameter as shank and the lead hole for the

threaded portion approximately two-thirds of the shank diameter. Holes in small timbers for bolt or wire spikes shall be bored with a bit of the same diameter or smallest dimension of the spike to prevent splitting. Counterbores shall be used for countersinking wherever smooth faces are required.

3.1.2 Planking

Decking shall be consistent with the existing timber dam construction which is a double plank system supported by timber frames. Unless otherwise indicated, lay plank with heart side down and with tight joints. Spike each plank to each joist or nailing strip with at least two spikes. Provide spikes at least 4 inches greater than the thickness of plank. Place spikes at least 2 ½ in. from edges of the plank. Cut ends of planks parallel to center line of pier. Grade planks as to thickness and lay so that adjacent planks vary less than 1/16 in.

3.2 FIELD TREATMENT

3.2.1 Timberwork

Cuts, bevels, notches, refacing, and abrasions made in the field in treated timbers shall be field treated in accordance with AWPA M4, MSDS and CIS. Wood preservatives are restricted use pesticides and shall be applied according to applicable standards. Cuts and abrasions shall be trimmed before field treatment. Depressions or openings around bolt holes, joints, or gaps, including recesses formed by counterboring, shall be painted with preservative treatment used for timber.

--End of Section--

SECTION 06 52 00
NON-METALLIC TRASH RACKS
(06/12)

PART 1 – GENERAL

1.1 SCOPE

The Contractor shall procure and deliver to the site non-metallic replacement trash racks manufactured by Hydrothane Products Inc., or equal, as shown on the project drawings, and as recommended by the trash rack manufacturer. Horizontal tie rods shall be located for attachment to steel support frame, or an alternate detail for attaching bars to the frame shall be submitted to the Engineer for approval.

The Contractor shall furnish all labor, equipment, and materials to completely install non-metallic trash racks and the structural steel supports as described in this section and as shown on the Contract Drawings, including schedules, notes, and details to show size and locations of trash rack components, typical connections, and types of material required.

Fabrication of new non-metallic trash racks shall be done by an Engineer-approved fabricator.

1.2 RELATED DOCUMENTS

The general provisions of the Contract, including General Conditions, Supplementary Conditions (if any), and General Requirements, apply to the work specified in this Section.

1.3 RELATED WORK SPECIFIED ELSEWHERE

Section 05100 - Structural and Miscellaneous Steel Specifications

1.4 DESIGN

Design of the trash racks shall meet the following requirements:

a. The arrangement shall conform to the intake structure detailed on the Drawings.

b. Clear openings between the bars shall be 1 in. on three panels and 2 in. on three.

c. Horizontal tie rods shall not interfere with vertical raking.

d. Vertical bar depth shall be 4 in.

e. Vertical bars shall have rounded upstream and downstream edges.

f. Deflection under a 9.5-ft differential head shall not exceed ¾ in. or result in permanent displacement of trash rack bars.

Contractor to verify that trash rack is compatible with the existing trash rake: Atlas Polar Hydrorake System Model ST8000.

1.5 SUBMITTALS

1.5.1 Manufacturer's Qualifications

A summary of the Fabricator's qualifications shall be submitted to the Engineer for the project record, including the following:

a. Corporate history

b. A list of at least five similar projects, including a description of the work and names and contact information for clients who are familiar with the work

c. Name of an engineer, registered in the State of Rhode Island, either employed by or retained by the fabricator to certify the design of the trash racks.

1.5.2 Shop Drawings

The Contractor should submit to the Engineer for approval shop drawings, sealed by a professional engineer registered in the State of Rhode Island, including complete details and schedules for fabrication and assembly of trash racks.

The Contractor should provide drawings and directions for installation of trash racks and connection to the support framing.

1.6 DELIVERY, STORAGE, AND HANDLING

All systems, subsystems, and structures shall be shop fabricated and assembled into the most cost-effective and practical size suitable for shipping. The trash racks shall be shipped palletized and banded.

Materials shall be delivered to the site at such intervals to insure uninterrupted progress of the work.

All materials and equipment necessary for the assembly and installation of the trash rack and appurtenant items shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping, or damage of any kind to the materials.

All materials, items, and fabrications shall be identified and marked for installation and field assembly.

PART 2 – PRODUCTS

2.1 MATERIALS

Materials used in the manufacturer of the non-metallic trash racks shall be virgin stock of the best quality and shall be free from all defects and imperfections that might affect the performance of the finished product.

The non-metallic trash racks bars and spacers shall be manufactured of High Molecular Weight (HMW-HD) polyethylene by profile extrusion. The HMW-HD polyethylene shall be extruded such that the resulting shape assures uniformly rounded edges in both the leading and trailing edges. The polyethylene shall be manufactured to incorporate antioxidants and proven to be resistant to UV radiation and petroleum for at least 30 years. UV inhibitors shall consist of 2% carbon black. Polyethylene shall have a minimum elongation at break of 600% as determined by ASTEM D638.

All exposed surfaces shall be smooth, true to form, and free of imperfections.

The material shall resist corrosion, adhesion of frazil and anchor ice, zebra mussels, and all other marine growth.

The following material properties shall apply to the trash rack bars and spacers:

Property	ASTM Method	Minimum
Density at 23 C	D792	0.953 g/cc
Hardness Rockwell 'R'	D785	64 R
Tensile Strength @ yield	D638	3,800 psi
Flexural Modulus	D790	190,000 psi
Elongation at Break @ 50 mm/min.	D638	600%
1% Secant Modulus	D790B	1206.6 Mpa
Notched Izod Impact (0.125)	D256	13.50 ft-lb/in
Enviro. Stress Crack Res	D1693	1000 hr

Horizontal tie rods shall be protruded fiberglass rod with smooth, un-machined finished mid-sections and threaded ends.

The following material properties shall apply to the horizontal tie rods:

Property	ASTM Method	Minimum
Tensile Strength	D638	90000 psi min
Tensile Modulus	D638	5.0 x 10^6 psi min
Flexural Strength	D790	100000 psi min
Flexural Modulus	D790	6.0 x 10^6 psi min
Short Beam Shear	D2344	5,000 psi min
Compressive Strength	D695	60,000 psi min
24 Hour Water Absorption	D570	0.24% max
Density	D792	0.065 – 0.075 lbs/in^3
Izod Impact	D256	40 ft lbs/in min
Arc Resistance	D495	140 seconds min
Coef of Thermal Expansion	D696	5.5 x 10^6 in/in/F
Dielectric Strength	D149	35 KV/in min

Trash racks shall be furnished with all hardware necessary for attachment to the rack support structure as indicated on the Drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

The Contractor shall install trash racks in accordance with Drawings and trash rack fabricator instructions directed by the Engineer.

--End of Section--

SECTION 08 53 00
ACRYLIC WINDOWS
(06/12)

PART 1 – GENERAL

1.1 SCOPE

The Contractor shall design, procure, fabricate, and deliver one acrylic viewing window and one acrylic backing plate to be installed in the Main Street Fishway counting station. The windows will be designed to meet the requirements specified within this specification and as shown on the Engineer's drawings.

1.2 RELATED WORK

Documents affecting the work of this Section include, but are not necessarily limited to, the Sections in Division One and the following sections of this Specification:

Section 05 60 00 - Structural Steel, Miscellaneous Steel, and Embedments

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. These documents also apply to all work performed by subcontractors. If there is, or seems to be, a conflict between this section and a referenced document, the matter will be referred to the Engineer. The latest issue of each document at the time of bid submittal will be applicable to this section.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A320, Grade B8, Type 304	Stainless Steel
ASTM A320, Grade B8, Type 304	Stainless Steel Bolts and Screws
ASTM A194, Grade 3, Type S01 for nuts; and Grade 6F, Type 416 for washers	Stainless Steel Nuts and Washers

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97-1	Glass or Plexiglass

1.4 SUBMITTALS

The following shall be submitted to the Engineer for approval in accordance with Section 01 33 00 – Submittal Procedures:

a. Product data for all components of window system

b. Installation and Maintenance manuals

c. Special storage requirements

d. Test reports

e. Certificate of Compliance

1.5 INSTALLATION INSTRUCTIONS

The Contractor shall submit to the engineer four preliminary (for review and approval) and ten final copies of the installation instructions for the windows furnished. All final instructions will be certified by the manufacturer as applicable to the equipment furnished and will be specifically identified, such as by serial number.

1.6 SUBSUPPLIERS

To the extent that they apply, the Contractor will impose on each of his subsuppliers the complete requirements of this specification. He will be directly responsible that all subsuppliers are completely aware of all of these requirements and that they abide thereby.

1.7 QUALITY ASSURANCE

No deviation or nonconformance from this specification or applicable federal, state, and local codes and standards invoked by this specification will be accepted until approved by the Engineer. Deviations are considered departures from any requirement of this specification. Uncorrectable nonconformances are considered to be conditions which cannot be corrected within the specification requirements by rework or replacement.

The Contractor will promptly document and notify the Engineer of all deviations and nonconformances from the specification. Further engineering, manufacturing, or fabrication after detection of any deviation or nonconformance prior to the Engineers' approval will be at the Contractor's risk. No departure from this specification will be binding on any party until an addendum or revision to the specification has been issued by the Engineer.

PART 2 - PRODUCTS

2.1 GENERAL DESIGN CRITERIA

2.1.1 Structure Interface

The window assemblies will be designed to operate in the spaces and dimensions shown on the Engineer's Drawings.

2.1.2 Environment

Each window assembly will be designed for an outdoor, underwater nonhazardous environment.

2.1.3 Standard Commercial Products/Assemblies

The Contractor will utilize standard commercial products/assemblies in the design of the windows provided all components of the window assemblies meet the requirements of this specification. Standard

2.2 MATERIALS

Products that contain asbestos are prohibited. This prohibition includes items such as packings or gaskets even though the item is encapsulated or the asbestos fibers are impregnated with binder material.

2.3 COUNTING STATION WINDOWS

This section relates to the design, material of construction, procurement, fabrication, and furnishing of the counting station windows as shown on the Engineer's drawings.

Each window assembly shall consist of glazing and stainless steel frames and clamps according to manufacturer's specifications.

The glazing will be either tempered plate glass in accordance with ANSI Z97-1 or Plexiglas. Glazing will be sealed into the frame with a Hypalon gasket.

All window assemblies will be designed with a factor of safety of 10. For Plexiglas windows, deflection at the center of the glazing is limited to 1 mm of the short dimension.

PART 3 - EXECUTION

3.1 SHOP TESTING

The completely assembled window will be shop inspected for proper seal integrity. The window assembly will be tested at 1 ½ times the maximum pressure.

3.2 WINDOW INSTALLATION

The Contractor shall correct any misalignment or other problem. The installation will be subject to witnessing by the Engineer prior to acceptance. Any problems with the window assemblies resulting from errors in fabrication will be corrected at the Contractor's expense.

--End of Section--

SECTION 08 60 00
WATERTIGHT DOOR
(06/12)

PART 1 – GENERAL

1.1 SCOPE

Provide watertight door factory assembled with frame and all operating components in accordance with contract specifications and approved drawings. Watertight door shall be as manufactured by Walz & Krenzer, Inc. (203-267-5712) or approved equal.

1.2 QUALITY ASSURANCE

Comply with the provisions of the following (as applicable):

AISC "Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings".
The Aluminum Assoc. "Aluminum Design Manual".
AWS Structural Welding Code D1.1, D1.2, D1.3, D1.6
ASME Structural Welding Code Section IX
ASME Appendix VIII of Section VIII, Div. 1 – liquid penetrant testing of welds
FEMA Bulletin 3-93, #102 & #114
ASTM A36, D2000
Steel Structural Painting Council (SSPC) SP10, SP71
American Iron and Steel Institute (AISI) CL 304, 316, 316L

1.3 SUBMITTALS

The Contractor shall submit for approval:

A. Manufacturers Data: Submit installation and maintenance manuals for watertight door.
B. Shop Drawings: Submit shop drawings approved by licensed Professional Engineer for door including dimensional plans, elevations, sections, details for all mountings and connections, and parts list.
C. Calculations: Submit calculations approved by licensed Professional Engineer verifying the watertight door's ability to withstand the design pressure loading.
D. QA Submittals: Submit test/inspection reports showing compliance with specified quality assurance requirements.

1.4 QUALIFICATIONS

Manufacturer shall present evidence attesting to at least five years successful experience in the design and manufacture of similar closures.

1.5 QUALITY ASSURANCE

All welding shall be performed in accordance with the requirements of applicable AWS or ASME standards.

Contractor shall perform shop chalk test to ensure 100% watertight/airtight seal. Compression and inflatable gasket closures to be shop chalk tested. Lip seal gasket closures to be shop leakage tested.

PART 2 - PRODUCTS

Watertight door shall be model WT-FD-1 as manufactured by Walz & Krenzer or approved equal.

2.1 MATERIALS

Panel and frame shall be ASTM A-36 steel.

Securing dogs shall be stainless steel with bronze wedges.

Quick-acting handwheels and/or levers shall be stainless steel.

Gasket shall be ASTM D2000 GR DE neoprene gasket, 25 duro with fully molded corners.

Securing dogs– stainless steel dog assemblies with bronze wedges. Dogs on flush side of door to be recessed, and operable via T-wrench. For higher pressure applications, high strength bronze dogs will be used.

Hinges shall include bronze oil-impregnated thrust bearing and stainless steel hinge pins.

Finish shall be mild steel blasted to near white metal per SSPC-SP-10. Primed with one coat of inorganic zinc primer.

2.2 DESIGN

Frames shall have 2" sill.

Operating mechanism: individual dogs or drop bolts for infrequent use. Quickacting handwheels or levers for more frequent use.

2.3 QUALITY ASSURANCE

Contractor shall perform shop operational test.

Contractor shall perform shop chalk test for ensure 100% watertight/airtight seal.

All welding shall be performed in accordance with the requirements of the applicable AWS or ASME standards.

Liquid Penetrant Test (optional for critical applications only): Welds in the “potential” leak path shall be liquid penetrant inspected in accordance with Appendix VIII of Section VIII of ASME Code Div. 1

Hydrostatic Test (optional for critical applications only): Provide hydrostatic test data certifying that the closure furnished, or a closure of similar design, has been satisfactorily tested to verify that it will withstand the designed hydrostatic pressure with no visible leakage.

PART 3 - EXECUTION

3.1 FABRICATION

Edge of panel and knife-edge of frame to be flat with 1/8” with a maximum deviation of 1/16” in a 6’ length.

Knife-edge on frame to be ground to a 3/32” radius with surface roughness not to exceed 125 micro inches.

The finished product shall be rigid, neat in appearance, and free from all defects, warps, and buckles. All exposed joints and corners shall be well rounded.

All butt welds in frame to be full penetration welds.

3.2 INSTALLATION

Install watertight door in accordance with manufacturer’s instructions and approved shop drawings.

After installation, perform field operational and field chalk test per manufacturer’s instructions to verify installation and watertight integrity of door.

Finish paint (if applicable) after installation.

3.3 WARRANTY

Watertight door shall operate satisfactorily and be free of defects in material and workmanship for a period of not less than one year from the date of delivery.

--End of Section--

SECTION 09 90 00
PAINTING
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall furnish and apply protective coating materials for all field coating work. The coating work includes, but is not necessarily limited to, furnishing labor, equipment, material and services to:

a. Furnish all coating materials meeting the requirements addressed under subsection 2.1.

b. Furnish all tools, equipment and instruments.

c. Furnish all labor including supervision for applying the coating systems and all other attendant activities such as masking and protective coverings, warehousing, dispensing, mixing and thinning coating materials, and cleanup work normally done by painters. Application of coating materials includes, but is not limited to any disturbed areas of the existing deck and access gates.

1.2 RELATED WORK

Documents affecting the work of this Section include, but are not necessarily limited to, the Sections in Division One and the following sections of this Specification:

Section 05 60 00 - Structural Steel, Miscellaneous Steel, and Embedments

1.3 QUALITY ASSURANCE

1.3.1 Codes and Standards

Following is a list of applicable documents relating to the work in this Section. If there is, or seems to be, a conflict between this section and referenced document, the matter shall be referred to the Engineer.

Identity	Complete Title
STEEL STRUCTURE PAINTING COUNCIL (SSPC)	
SSPC SP1	Surface Preparation Specification, No. 1, Solvent Cleaning
SSPC SP2	Surface Preparation Specification, No. 2, Hand Tool leaning
SSPC SP3	Surface Preparation Specification, No. 3, Power Tool Cleaning
SSPC SP5	Surface Preparation Specification, No. 5, White Metal Blast Cleaning
SSPC SP6	Surface Preparation Specification, No. 6, Commercial Blast Cleaning
SSPC SP10	Surface Preparation Specification, No. 10, Near-White Cleaning
SSPC PA1	Paint Application Specification, No. 1, Shop, Field, and Maintenance Painting
SSPC PA2	Method for Measurement of Dry Paint Thickness with Magnetic Gages

CFR STANDARDS

Code of Federal Regulations Title 29-Labor, Subtitle B Regulations Relating to Labor, Chapter XVII, Occupational Safety and Health Administration, Department of Labor: Part 1910 - Occupational Safety and Health Standards and Part 1926 - Safety and Health Regulations for Construction

1.3.2 Definitions

The following terms used in this Section are defined as follows:

The term "Exposed Surface" shall mean a surface which in its final condition of construction is exposed to the view of people performing routine duties or using the area for its normal functions.

The term "Substrate" shall mean the parent surface being coated, i.e., steel, etc.

The term "Spot Priming" shall mean field prime painting previously uncoated (i.e., not shop primed) surfaces of a net contiguous area of less than 25 sq ft or having an average minor dimension less than 6 in (e.g., a weld seam).

The terms "Topcoats/Finish Coats" are used interchangeably and shall mean the coat or coats which are applied over the prime coat or seal coat on steel or over the surfacer, filler, or seal coat on concrete.

The term "Dry Film Thickness (DFT)" shall mean the thickness of a coating or coatings, when dry, as measured in accordance with SSPC-PA2 or with a scratch-type gage, read in mils (0.001 in).

The term "Wet Film Thickness (WFT)" shall mean the thickness of a wet coating immediately after its deposition and prior to the evaporation of any volatile constituents; read in mils (0.001 in) with a WFT gage or as computed based on coverage.

The terms "Hiding/Shadow-Through" shall mean the property of paint that enables it to obliterate beyond recognition any background over which it may be applied. Gloss differences resulting from non-uniform absorption does not constitute and unacceptable condition.

The term "Runs" shall mean heavy V-shaped or pencil-shaped vertical buildups on the surface of a coating which are perceptible by touch.

The term "Sags" shall mean heavy U-shaped buildups or horizontal lips on the surface of coatings which are perceptible by touch. Long sags are referred to as "curtains."

The term "Batch" shall mean a uniquely identifiable lot of material manufactured under controlled conditions.

1.3.3 Inspections and Tests

The Contractor shall perform and require its vendors and subcontractors to perform sufficient tests and inspections to assure the materials and installation are of good quality. Records of these tests and inspections shall be maintained in the Contractor's file.

In addition, the Engineer shall have the right, at all reasonable times, to inspect the Contractor's work, material, equipment, or inspection procedures, as applicable to the work covered by this specification to confirm that the specified requirements are being complied with. The Contractor shall provide all tools, instruments, etc., necessary to facilitate these inspections.

1.4 SUBMITTALS

The Contractor shall submit copies of the coating material manufacturer's invoices for the project records showing the name, color, catalog number, etc., and quantity furnished for each type of coating material purchased for use on the project.

1.5 PRODUCT HANDLING

1.5.1 Shipping Requirements

Deliver all materials in original unbroken containers and/or packages with the manufacturer's labels intact, clearly indicating the brand, type, quality of paint and/or related materials contained therein, and expiration date.

1.5.2 Provisions for Storage

The materials, including coatings and associated thinners and cleanup solvents, applied under or otherwise used in performing the work covered by this specification, shall be stored in strict accordance with the coating manufacturer's instructions.

Containers shall remain sealed as delivered by the coating manufacturer until required for use; containers which have ruptured during storage shall be discarded. Material which has exceeded its expiration date shall not be used.

1.5.3 Receipt Inspection

The Contractor shall perform the following inspections. Material containers shall be examined upon delivery. Any evidence of leaks, broken seals, freezing or other damage that may have resulted in any loss of the constituents by volatilization or otherwise shall be cause for rejection. Containers shall be delivered with labels intact and completely legible.

1.5.4 Protection of Surfaces and Installations

Protect all finished surfaces and/or installations not requiring painting by the use of suitable coverings, adequately overspread and/or taped in place. Protect finished metals, hardware, fixtures, and other objects adjacent to those being painted.

Take special care to protect porous surfaces such as concrete and similar surfaces.

Keep flammable materials in covered metal containers.

Provide firefighting equipment in paint storage areas in accordance with state and local safety requirements.

1.5.5 Weather Conditions

Do not perform any painting and/or finishing work when the ambient temperature is 50° F and below, unless adequate means are provided to maintain a temperature of not less than 50° F during work operations and at least 48 hours thereafter. Except, that inorganic zinc primers may be applied when the ambient temperature is as low as 40° F.

Do not apply exterior paint or finish on damp surfaces or in rainy weather.

1.5.6 Safety Considerations

The safety practices, procedures, policies, and requirements set forth in the CFR Standards shall be implemented by those responsible for performing the work specified herein. Chapter 13 of Industrial

Maintenance Painting by P.E. Weaver, A NACE publication, outlines features regarding safety and ventilation which are of assistance in implementing these requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

Brand name manufacturers for all painting shall be approved by the owner.

Each coating material and thinner container shall be labeled with the product designation. Labels for coating containers shall bear an expiration date.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

3.1.1 General

As the initial step in preparing surfaces for painting, remove loose or otherwise deleterious surface contaminants, tapes, tags, markings, rust preventives and weld prep materials by a method which will assure positive removal, i.e., which will not disperse the contaminants over the surface. Solvent wiping in accordance with SSPC-SP1 is acceptable for removal of residual grease, oil, etc. Trisodium phosphate and/or detergent are acceptable cleansers for removal of grime and foreign matter other than grease or oil. Chlorinated solvent shall not be used. Solvents and the solvent cleaning medium shall be maintained clean and fresh.

The Contractor shall prohibit air blasting where such operations could have a detrimental effect on equipment or personnel in the area.

Prevent fallout from cleaning operations from being deposited on adjacent surfaces which are ready for painting and freshly painted surfaces. Where deleterious material may be deposited as a result of normal construction activities, a prepared surface shall either be protected or coated immediately.

The quality, volume, and velocity of ventilating air used during surface preparation and afterward to maintain the substrate in the prepared condition until the coating is applied shall be in accordance with Part 1926.55 of the CFR Standards and as required to assure adequate visibility and proper evacuation of effluents without being detrimental to the prepared surface.

Prior to applying subsequent coats, and after any required spot-priming, surfacer, filler or touch up and patching material has been applied, previously coated surfaces shall be cleaned of all visual deleterious matter which may have accumulated during the course of construction.

3.1.2 Power Tool Cleaning

Where power tool cleaning in accordance with SSPC-SP3 is specified, power wire brushing is unacceptable since it tends to polish a surface instead of providing a suitable surface texture. Acceptable power tools/tool attachments are as follows:

a. 3M "Roto-Peener"

b. 3M "Scotch Brite Clean'n Strip Discs"

c. Power Needle Gun or any other tool that imparts an acceptable surface texture.

3.1.3 Touch-Up/Priming

Areas from which shop primer was omitted, as well as damaged portions of previously applied prime coats shall be prepared and primed per the appropriate SPS designated in the Painting Schedule as required to result in a uniform, integral prime coat prior to finish painting.

Damaged coating material which is not completely adhering shall be removed. The substrate in the damaged area shall be cleaned to bright metal.

When repairing localized damage, surface preparation and cleaning shall be carried back into the surrounding integral film to a point where the paint film at the outside edge of the damaged area is completely intact and adherent.

After surface preparation has been completed and before the application of coating materials, solvent wipe the entire surface in accordance with the requirements of SSPC-SP1.

3.2 MIXING AND THINNING

Mixing and thinning shall conform to the requirements of Section 3.4 of SSPC PA1 and to the coating manufacturer's instructions, except as otherwise required herein.

Paint shall not be used which has skinned, gelled, separated or otherwise deteriorated in the container or in the pot to the extent that the skin cannot be strained off or if normal thinning will not restore the paint to its intended viscosity, uniformity, and consistency. All paint shall be strained after mixing.

Only those brand name and substitute thinners recommended by the coating manufacturer shall be used for thinning.

3.3 COATING APPLICATION

Coatings shall be applied in accordance with the requirements of Section 3.5 of SSPC PA1 as supplemented by the technical requirements of this specification and the instructions of the coating manufacturer.

Spot touch-up priming shall be accomplished before rust has formed on the cleaned surface. The prepared spot or area shall be cleaned with a cleaning solvent and allowed to dry completely before applying topcoat materials. Touch-up materials for spot priming shall be brush applied.

Provide the heating, ventilating and, if required, dehumidification equipment necessary to maintain the required ambient conditions prior to cleaning and as long after application as necessary for proper cure of the coating, i.e., until the coating is ready to be exposed to the intended service environment.

Surfaces which have been prepared and touched up as required and are ready for painting shall be painted as soon as practicable after the spot priming or touch-up coating material has thoroughly dried, so as to minimize the chance of recontaminating the prepared surface.

Subsequent finish coats, if required, shall be applied only after the previously applied coat has been allowed to dry for the necessary dry-to-recoat interval.

All coats shall have smooth, streamline surfaces relatively free of dryspray, overspray, orange peel, and other significant surface defects. Such imperfections, if visible at a distance of 5 ft or more, shall be repaired.

Coatings shall be applied within the ambient condition parameters established in Sections 3.5.1.2 through 3.5.1.4 of SSPC PA1, except as otherwise required or permitted herein.

Appropriate precautions shall be taken to prevent coatings being applied in one area from dripping or drifting onto previously coated surfaces. Suitable protective coverings shall be used when applying materials, particularly when spraying adjacent to surfaces which are subject to damage from drifting paint. Paint spots and fogging from sprays shall be removed from surfaces affected in accordance with cleanup procedures approved by the Contractor.

Application equipment shall be kept clean and free of contaminants or residues which could detract from the appearance or integrity of the deposited film.

When using brushes for touch-up or spot priming of nuts, bolts, clips, corners, crevices, etc., work the coating into the substrate vigorously, filling pockets and cracks with the coating.

3.4 COVERAGE

Sufficient material quantity and craftsmanship shall be employed so that the entire surface is visually covered without skips, shadow-through or thin spots and relatively free of craters. The ability of a single finish coat to afford the required hiding depends on the type of material and the method of application. Gloss differences resulting from non-uniform absorption do not, per se, constitute failure to achieve the intended hiding.

--End of Section--

SECTION 09 96 56
EPOXY COATING
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The work of this section will include applying epoxy coating to the trash rack and the board on the floor in the collection area.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4258 Surface Cleaning of Concrete
ASTM D 4259 Abrading Concrete

1.3 SUBMITTALS

The following shall be submitted shall be submitted to the Engineers for approval in accordance with Section 01 33 00 - Submittals:

a. Product Data

b. Product Data Sheets and Material Safety Data Sheets (MSDS)

1.4 QUALITY ASSURANCE

1.4.1 Manufacturing Qualifications

The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.

1.4.2 Contractor Qualifications

Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM and NACE (National Association of Corrosion Engineers) standards and the protective coating manufacturer's recommendations.

1.4.3 Installation

Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

1.5 DELIVERY, STORAGE, AND HANDLING

All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.

Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.

Condition the specified product as recommended by the manufacturer.

1.6 JOB CONDITIONS

1.6.1 Environmental Conditions

Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application is temperature 40°F (5°C).

1.6.2 Protection

Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

1.7 WARRANTY

Applicator shall warrant all work against defects in materials and workmanship for a period of one (1) year, unless otherwise noted, from the date of final acceptance of the project. Applicator shall, within a reasonable time after receipt of written notice thereof, make good defects in materials or workmanship which may develop during said one (1) year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the Owner.

PART 2 – PRODUCTS

2.1 MANUFACTURER

Carboguard 891 Epoxy manufactured by Carboline Company, 350 Hanley Industrial Court, St. Louis, MO 63144-1599, or approved equal.

2.2 MATERIAL

High solids, high-build potable water coating two-component epoxy, certified to meet requirements of ANSI/NSF std. 61.

Product type Cycloaliphatic Amine cured epoxy

Color White – floorboard

Grey - trashracks

Solids Content (vol %) 75%

Mix Ratio 1:1

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

Concrete must be cured 28 days at 75 °F and 50% humidity or equivalent. Prepare surfaces in accordance with ASTM D4258 Surface Cleaning of Concrete, ASTM D4259 Abrading Concrete and manufacturers specifications. Substrate must be clean, sound, and free of surface contaminants. Remove dust, laitance, grease, oils, curing compounds, form release agents and all foreign particles by mechanical means. All surfaces must be saturated surface dry (SSD), with no standing water at time of application.

Temperature of the surface to be coated should be maintained between 50 deg F and 120 deg F during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, care should be taken to apply the coating when the surface temperature is falling versus rising.

3.2 MIXING AND APPLICATION

Application procedures shall conform to the recommendations of the manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.

Before spraying all surfaces with the epoxy coating, grooves, rough areas, difficult-to-spray areas, and repair areas as specified shall be striped with the specified epoxy coating to a nominal 10 mil thickness or greater as necessary to provide proper topcoating and protective coverage. Striping can be accomplished by spray application in accessible areas; and, hand-mixing product or spray followed by scrub-striping with a good-quality bristle brush in difficult-to-spray areas.

The spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials in accordance with coating manufacturer’s requirements and shall be regularly maintained and in proper working order.

The protective coating material must be spray applied by a Certified Applicator of the protective coating manufacturer.

Specified surfaces shall be coated with a minimum of two coats of Carboguard 891 or approved equal epoxy to achieve a minimum dry film thickness of 8 to 12 mils. Coating shall be free of runs and sags. Each coat of the protective coating should occur as soon as the basecoat becomes tack free, but no later than the recoat window for the specified product. Additional surface preparation procedures will be required if this recoat window is exceeded.

3.3 CLEANING

Upon completion of work, the coating applicator shall remove surplus material. All spills shall be removed and the work area shall be free from rubbish, debris, etc. caused by application of the coating. The work area shall be clean and free from blemish.

--End of Section--

SECTION 13 60 00
EEL LADDER
(06/12)

PART 1 - GENERAL

1.1 SCOPE

Work included in this Section consists of furnishing, fabricating, and installing the eel ladder and eel ladder water supply system, specified herein and shown on the Contract Drawings, and as needed for a complete and proper installation. The Contractor shall provide all labor, materials, and equipment to install the eel ladder, including steel supports, electric cable trays, wood, substrate, plastic mesh, water supply pump, pump stilling, spray header, hoses, and all components necessary for an operational eel ladder.

1.2 REFERENCES

American Welding Society (AWS) - D l.1 - Structural Welding Code - Steel.

1.3 SUBMITTALS

The following shall be submitted to the Engineers for approval in accordance with Section 01 33 00 - Submittals:

a. Product Data:

Manufacturer's data sheets for the pump

Manufacturer’s Operating and Maintenance Manual for the pump

b. Shop Drawings:

Submit plan, elevation and section drawings as necessary to depict eel ladder metal work specified in this section. Drawings may include, but are not limited to:

- Eel ladder fabrication drawings
- Eel ladder supports fabrication drawings
- Pump stilling well fabrication drawings

1.4 QUALITY ASSURANCE

The Contractor shall comply with the requirements of :

- Section 05 60 00 – Structural Steel, Miscellaneous Steel, and Embedments
- Section 26 01 22 – General Electrical Provisions
- Section 09 00 00 - Painting

1.5 DELIVERY, STORAGE, AND HANDLING

The Contractor shall store products in manufacturer's unopened packaging until ready for installation. The Contractor shall store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 EEL LADDER

The eel ladder sections shall be fabricated from electric cable tray, plywood, and substrate as shown on the Contract Drawings. The plywood shall be bolted to the cable tray support frame with stainless steel bolts, washers, and nuts. The substrate shall be Enkamat (Product no. 7222) and shall be stapled to the plywood. The plastic mesh shall be fastened to the sides of the cable tray support system.

Manufacturer’s product data for the cable tray and Enkamat substrate shall be submitted to the Engineer for approval.

Eel ladder sections shall be fabricated according to dimensions and elevations shown on the Contract Drawings. Shop drawings shall be submitted to the Engineer for approval.

All welds shall be in strict accordance with American Welding Society (AWS) standards and the Structural Welding Code.

All welds shall be ground flush and prepared for finish.

2.2 EEL LADDER SUPPORTS

Eel ladder supports brackets shall be fabricate from A 36 Grade 60 Gates steel. The brackets shall be fabricated according to dimensions and elevations shown on the Contract Drawings. Shop drawings shall be submitted to the Engineer for approval.

All welds shall be in strict accordance with American Welding Society (AWS) standards and the Structural Welding Code.

All welds shall be ground flush and prepared for finish.

The support brackets shall have a galvanized finish.

2.3 EEL LADDER WATER SUPPLY SYSTEM

The eel ladder supply system will consist of a pump, pump stilling well, hoses, piping, header pipe, and valves, as shown on the Contract Drawings. The power supply for the pump will be the 220V, 100 A service located near the Main Street bridge. An underground cable will be installed from the service to the fishway access walkway. A junction box will be located at this point where the power cable will be then be installed in conduit along the walkway to a second junction box. This box will be mounted on the

handrail with a locked door. A disconnect switch and a plug for the power cable on the pump will be installed in this box.

The pump will have a ½ HP maximum rating and will be capable of delivering 5 gpm to the eel ladder header pipe. A flexible rubber hose will connect the pump discharge to the eel ladder header. The header will include a ball valve to bypass flow and control flow to the header. The Contactor shall provide the pump Operating and Maintenance Manual prior to the Substantial Completion Inspection.

The pump will be installed in a stilling well located as shown on the Contract Drawings. The stilling well will be constructed with PVC piping components and galvanized steel brackets. The stilling well will have a threaded cap to allow the pump will be disconnected and removed from the stilling well during periods when the eels are not migrating upstream.

PART 3 - EXECUTION

3.1 INSTALLATION

The Contractor shall install the eel ladder and water supply system in accordance with the Contract Drawings. The water supply pump shall be installed in accordance with the manufacture's recommendations.

3.2 PROTECTION

The Contractor shall protect installed products until completion of project and shall touch-up, repair, or replace damaged products before Substantial Completion.

--End of Section--

SECTION 13 70 00
WATER LEVEL SENSOR
(06/12)

PART 1 - GENERAL

1.1 SCOPE

Work included in this section consists of furnishing, fabricating, and installing the water level sensor and stilling well, specified herein and shown on the Contract Drawings, needed for operating the fishway entrance weir gate. The Contractor shall provide all labor, materials, and equipment needed for complete and proper installation of the stilling well and water level sensor, including steel supports, control power conduit and cable, and operational testing of the fishway weir gate.

1.2 REFERENCES

American Welding Society (AWS) - D l.1 - Structural Welding Code - Steel.

1.3 SUBMITTALS

The following shall be submitted shall be submitted to the Engineer for approval in accordance with Section 01 33 00 - Submittals:

Product Data

Manufacturer's data sheets for the water level sensor

Manufacturer’s Operating and Maintenance Manual for the water level sensor

1.4 QUALITY ASSURANCE

The Contractor shall comply with the requirements of

- Section 05 60 00 – Structural Steel, Miscellaneous Steel, and Embedments
- Section 26 01 22 – General Electrical Provisions
- Section 09 00 00 - Painting

1.5 DELIVERY, STORAGE, AND HANDLING

The Contractor shall store products in manufacturer's unopened packaging until ready for installation. The Contractor shall store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 WATER LEVEL SENSOR

The water level sensor will be used to control the fishway entrance gate. The sensor shall be a 4-20 mA water level transducer SonTek Model 0008890, or approved equal. Contact information for SonTec is:

Mr. Thomas Opishinski
Interactive Oceanographic
81 Shippee Road
East Greenwich, RI 02818-1028
401-398-0871

The transducer shall be fully submersible with 50 ft of cable and a Quick-Connect cable assembly. The transducer shall have a 35-ft range and shall be able to operate at 5-30°C.

Manufacturer's product data for the water level sensor shall be submitted to the Engineer for approval.

2.2 WATER LEVEL SENSOR STILLING WELL

The water level sensor stilling well shall be fabricated according to dimensions and elevations shown on the Contract Drawings. Shop drawings shall be submitted to the Engineer for approval. The stilling well shall be PVC pipe material.

Supports brackets shall be fabricate from A 36 Grade 60 stainless steel. The brackets shall be fabricated according to dimensions and elevations shown on the Contract Drawings. Shop drawings shall be submitted to the Engineer for approval.

All welds shall be in strict accordance with American Welding Society (AWS) standards and the Structural Welding Code.

All welds shall be ground flush and prepared for finish.

The support brackets shall have a galvanized finish.

2.3 FISHWAY ENTRANCE WEIR GATE OPERATOR

The fishway entrance weir gate manufacturer will be responsible for designing the control logic system for the weir gate. The gate manufacturer will be providing a control box with a motor starter and control system for the gate. The gate control system will take the 4-20 mA signal from the water level transducer to set the gate at a prescribed set point. A power transformer will be located in control box to provide control power for the water level sensor. During the winter, the water level sensor will be removed and appropriately stored.

The weir gate actuator system will be designed to open or close the gate to four (4) specific elevations:

Tide El. (ft)	Gate El.(Ft)
<0.0	-4.0
0.0<h<2.0	-2.0
2.0<h<4.0	0.0
>4.0	+2.0

The transducer will have set points at El. 0.0 ft, El. 2.0 ft, and El. 4.0 ft on the ascending and descending tides to set these gate positions.

PART 3 - EXECUTION

3.1 INSTALLATION

The Contractor shall install the water level sensor and stilling well in accordance with the Contract Drawings.

3.2 PROTECTION

The Contractor shall protect installed products until completion of project and shall touch-up, repair, or replace damaged products before Substantial Completion.

--End of Section--

SECTION 26 01 22
GENERAL ELECTRICAL PROVISIONS
(06/12)

PART 1 - GENERAL

1.1 CONTRACTOR RESPONSIBILITIES

The Contractor shall be responsible for all work in this section of the specification. The Contractor will terminate the power supply cable for the eel ladder pump and the fishway entrance weir gate operator at a 220V, 100-A circuit breaker located south of the Slater Mill Dam, as shown on the Contract Drawings, and route conduit and cable to point not to exceed 15 feet from the eel pump and 15 feet from the entrance weir gate operator.

1.2 WORK INCLUDED

General Requirements specifically applicable to Division 26, in addition to Division 1 provisions.

The General and Mechanical Conditions for the construction of this project shall be part of the Electrical Specifications. The Electrical Contractor shall examine drawings relating to work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project.

The work covered by this Specification consists of furnishing all materials, labor, installation, supervision, equipment and appurtenances, tools, transportation, permits, and services to perform all electrical work, including all temporary and permanent work, complete in place in an approved operating condition, including all tests and adjustments, in strict accordance with this Specification and/or applicable drawings. It is the intent of this Specification and referenced electrical drawings to ensure that the systems to be furnished are installed complete in every respect. The Contractor shall furnish all materials, equipment, and labor needed and usually furnished in connection with such work, whether specifically mentioned or not. All material and equipment shall be handled, stored, and installed in accordance with this Specification and manufacturer’s instructions.

The facility and its appurtenances, clearances, and electrical provisions have been planned to be legal, adequate, and suitable for the installation of the equipment specified under this Section. The Owner will not assume any increases in cost resulting from different requirements peculiar to a particular make or type of equipment, and any such incremental costs shall be included in this section.

Electrical equipment and raceways are shown diagrammatically on drawings accompanying this specification. The Contractor shall be responsible for the field routing of conduit and placement of equipment. The Contractor shall further be responsible for avoiding an interference with equipment operation or maintenance. Conduit runs shall be parallel with the building lines and arranged in an orderly and neat fashion.

The Contractor shall be responsible for determining from the Engineer’s drawings, diagrams, drawings of the existing plant and by field observations the quantities of materials required for the electrical installation work.

The Contractor shall be responsible for testing all cable and equipment to guarantee that the system if free of any grounds, is electrically continuous, and is functioning correctly.

1.3 REFERENCES

Electrical facilities shall be designed, selected, and installed and all wiring and equipment shall conform to the requirements of this specification, the National Electric Code (NEC), Occupational Safety and Health Act (OSHA), National Electrical Contractors Association (NECA) Standard of Installations, National Electrical Safety Code (NESC), and to the latest standards, when applicable, of the National Electric Manufacturers Association (NEMA), Institute of Electrical and Electronic Engineer (IEEE), American National Standards Institute (ANSI,) National Fire Protection Association (NFPA), and Insulated Cable Engineers Association (ICEA).

All applicable federal, state, and local codes, laws, and requirements shall govern the work.

1.4 SUBMITTALS

The Contractor shall submit inspection and permit certificates under provisions of Section 01 33 00.

At final inspection, a test shall be made and the entire system shall be demonstrated to operate in accordance with the requirements of this specification. The Contractor shall furnish all instruments and personnel required for the test and make a record of the results.

The Contractor shall submit a certificate of final inspection and acceptance from authority having jurisdiction.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

The Contractor shall provide a complete electrical system as described herein and as shown on the drawings. This system will include, but shall not be limited to: conduit, cable, and junction boxes.

PART 3 – EXECUTION

3.1 WORKMANSHIP

Install work using procedures defined in NECA Standard of Installation.

The extent of work is as described in this Specification and shown on the drawings.

--End of Section—

SECTION 26 05 19
INSULATED WIRE AND CABLE
(06/12)

1.1 SCOPE

The Contractor shall provide and install all underground cable, conduit, and wiring to power the eel ladder water supply pump, the fishway entrance weir gate operator, and the replacement trash rack monorail hoist.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA WC 70	(1999; Errata 2001) Standard for Non-Shielded Power Cable 2000 V or Less for the Distribution of Electrical Energy

1.3 SUBMITTALS

The Contractor shall submit cable manufacturing data in accordance with Section 01 33 00 – Submittal Procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

Cables shall be furnished on reels or coils. Each cable and the outside of each reel or coil, shall be plainly marked or tagged to indicate the cable length, voltage rating, conductor size, and manufacturer's lot number and reel number. Each coil or reel of cable shall contain only one continuous cable without splices. Cables for exclusively dc applications, as specified in Paragraph “High Voltage Test Source”, shall be identified as such. Shielded cables rated 2,001 volts and above shall be reeled and marked in accordance with Section I of AEIC C8 or AEIC CS8, as applicable. Reels shall remain the property of the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Wire

2.1.2 Rated Circuit Voltages

All wire and cable shall have minimum rated circuit voltages in accordance with NEMA WC 70.

2.1.3 Conductors

2.1.3.1 Material for Conductors

Conductors shall conform to all the applicable requirements of NEMA WC 70, as applicable, and shall be annealed copper. Copper conductors may be bare, or tin- or lead-alloy-coated, if required by the type of insulation used.

2.1.3.2 Size

Minimum wire size shall be No. 12 AWG for power and lighting circuits; No. 10 AWG for current transformer secondary circuits; No. 14 AWG for potential transformer, relaying, and control circuits; No. 16 AWG for enunciator circuits; and No. 19 AWG for alarm circuits. Minimum wire sizes for rated circuit voltages of 2,001 volts and above shall not be less than those listed for the applicable voltage in NEMA WC 70, as applicable.

2.1.3.3 Stranding

Conductor stranding classes cited herein shall be as defined in NEMA WC 70, as applicable. Lighting conductors No. 10 AWG and smaller shall be solid or have Class B stranding. Any conductors used between stationary and moving devices, such as hinged doors or panels, shall have Class H or K stranding. All other conductors shall have Class B or C stranding, except that conductors shown on the drawings, or in the schedule, as No. 12 AWG may be 19 strands of No. 25 AWG, and conductors shown as No. 10 AWG may be 19 strands of No. 22 AWG.

2.1.3.4 Conductor Shielding

Conductor shielding conforming to NEMA WC 70 shall be used as applicable. Strict precautions shall be taken after application of the conductor shielding to prevent the inclusion of voids or contamination between the conductor shielding and the subsequently applied insulation.

2.1.3.5 Separator Tape

Where conductor shielding, strand filling, or other special conductor treatment is not required, a separator tape between conductor and insulation is permitted.

2.1.4 Insulation

2.1.4.1 Insulation Material

Provided insulation shall be a cross-linked thermosetting polyethylene (XLPE) type, meeting the requirements of NEMA WC 70, as applicable, or an ethylene-propylene rubber (EPR) type meeting the requirements of NEMA WC 70. For shielded cables of rated circuit voltages above 2,000 volts, the following provisions shall also apply:

a. XLPE, if used, shall be tree-retardant.

b. Insulation shall be chemically bonded to conductor shielding.

c. The insulation material and its manufacturing, handling, extrusion and vulcanizing processes, shall all be subject to strict procedures to prevent the inclusion of voids, contamination, or other irregularities on or in the insulation. Insulation material shall be inspected for voids and contaminants. Inspection methods, and maximum allowable void and contaminant content shall be in accordance with Section B of AEIC C8 or AEIC CS8, as applicable.

d. Cables with repaired insulation defects discovered during factory testing, or with splices or insulation joints, are not acceptable.

2.1.4.2 Insulation Thickness

The insulation thickness for each conductor shall be based on its rated circuit voltage.

a. Power Cables/Single-Conductor Control Cables, 2,000 Volts and Below - The insulation thickness for single-conductor cables rated 2,000 volts and below shall be as required by NEMA WC 70, as applicable. Some thicknesses of NEMA WC 70 will be permitted only for single-conductor cross-linked thermosetting polyethylene insulated cables without a jacket. NEMA WC 70 ethylene-propylene rubber-insulated conductors shall have a jacket.

b. Multiple-Conductor Control Cables - The insulation thickness of multiple-conductor cables used for control and related purposes shall be as required by NEMA WC 70, as applicable.

2.1.5 Jackets

All cables shall have jackets meeting the requirements of NEMA WC 70, as applicable, and as specified herein. Individual conductors of multiple-conductor cables shall be required to have jackets only if they are necessary for the conductor to meet other specifications herein. Jackets of single-conductor cables and of individual conductors of multiple-conductor cables, except for shielded cables, shall be in direct contact and adhere or be vulcanized to the conductor insulation. Multiple-conductor cables and shielded single-conductor cables shall be provided with a common overall jacket, which shall be tightly and concentrically formed around the core. Repaired jacket defects found and corrected during manufacturing are permitted if the cable, including jacket, afterward fully meets these specifications and the requirements of the applicable standards.

2.1.5.1 Jacket Material

The jacket shall be one of the materials listed below. Polyvinyl chloride compounds will not be permitted. Variations from the materials required below will be permitted only if approved for each specific use, upon submittal of sufficient data to prove that they exceed all specified requirements for the particular application.

a. General Use

(1) Heavy-duty black neoprene (NEMA WC 70).
(2) Heavy-duty chlorosulfonated polyethylene (NEMA WC 70).
(3) Heavy-duty cross-linked (thermoset) chlorinated polyethylene (NEMA WC 70).

b. Accessible Use Only, 2,000 Volts or Less - Cables installed where they are entirely accessible, such as cable trays and raceways with removable covers, or where they pass through less than 3 meters(10 feet) of exposed conduit only, shall have jackets of one of the materials specified in above paragraph GENERAL USE, or the jackets may be of one of the following:

(1) General-purpose neoprene (NEMA WC 70).
(2) Black polyethylene (NEMA WC 70).
(3) Thermoplastic chlorinated polyethylene (NEMA WC 70).

2.1.5.2 Jacket Thickness

The minimum thickness of the jackets at any point shall be not less than 80 percent of the respective nominal thicknesses specified below.

a. Multiple-Conductor Cables - Thickness of the jackets of the individual conductors of multiple-conductor cables shall be as required by NEMA WC 70, and shall be in addition to the conductor insulation thickness required by Column B of Table 3-1 of the applicable NEMA publication for the insulation used. Thickness of the outer jackets or sheaths of the assembled multiple-conductor cables shall be as required by NEMA WC 70.

b. Single-Conductor Cables - Single-conductor cables, if non-shielded, shall have a jacket thickness as specified in NEMA WC 70. If shielded, the jacket thickness shall be in accordance with the requirements of NEMA WC 70.

2.1.6 Metal-Clad Cable

2.1.6.1 General

The metallic covering shall be interlocked steel tape, conforming to the applicable requirements of NEMA WC 70. If the covering is of ferrous metal, it shall be galvanized. Copper grounding conductor(s) conforming to NEMA WC 70 shall be furnished for each multiple-conductor metal-clad cable. Assembly and cabling shall be as specified in the paragraph “Cabling”. The metallic covering shall be applied over an inner jacket or filler tape. The cable shall be assembled so that the metallic covering will be tightly bound over a firm core.

2.1.6.2 Jackets

Metal-clad cables may have a jacket under the armor, and shall have a jacket over the armor. Jackets shall comply with the requirements of NEMA WC 70. The outer jacket for the metal-clad cable may be of polyvinyl chloride only if specifically approved.

2.2 CABLE IDENTIFICATION

2.2.1 Color-Coding

Insulation of individual conductors of multiple-conductor cables shall be color-coded in accordance with NEMA WC 70, except that colored braids will not be permitted. Only one color-code method shall be used for each cable construction type. Control cable color-coding shall be in accordance with NEMA WC 70. Power cable color-coding shall be black for Phase A, red for Phase B, blue for Phase C, white for grounded neutral, and green for an insulated grounding conductor, if included.

2.2.2 Cabling

Individual conductors of multiple-conductor cables shall be assembled with flame-and moisture-resistant fillers, binders, and a lay conforming to NEMA WC 70, except that flat twin cables will not be permitted.

Fillers shall be used in the interstices of multiple-conductor round cables with a common covering where necessary to give the completed cable a substantially circular cross section. Fillers shall be non-hygroscopic material, compatible with the cable insulation, jacket, and other components of the cable. The rubber-filled or other approved type of binding tape shall consist of a material that is compatible with the other components of the cable and shall be lapped at least 10 percent of its width.

2.2.4 Dimensional Tolerance

The outside diameters of single-conductor cables and of multiple-conductor cables shall not vary more than 5 percent and 10 percent, respectively, from the manufacturer's published catalog data.

PART 3 - EXECUTION

3.1 INSTALLATION INSTRUCTIONS

The following information shall be provided by the cable manufacturer for each size, conductor quantity, and type of cable furnished:

a. Minimum bending radius, in inches - For multiple-conductor cables, this information shall be provided for both the individual conductors and the multiple-conductor cable.

b. Pulling tension and sidewall pressure limits, in pounds.

c. Instructions for stripping semiconducting insulation shields, if furnished, with minimum effort without damaging the insulation.

d. Upon request, compatibility of cable materials and construction with specific materials and hardware manufactured by others shall be stated. Also, if requested, recommendations shall be provided for various cable operations, including installing, splicing, terminating, etc.

3.2 TESTS, INSPECTIONS, AND VERIFICATIONS

3.2.1 Cable Data

Manufacture of the wire and cable shall not be started until all materials to be used in the fabrication of the finished wire or cable have been approved by the Engineer. Cable data shall be submitted for approval including dimensioned sketches showing cable construction, and sufficient additional data to show that these specifications will be satisfied.

3.2.2 Inspection and Tests

Inspection and tests of wire and cable furnished under these specifications shall be made by and at the plant of the manufacturer. The Engineer may perform further tests before or after installation. Testing in general shall comply with NEMA WC 70. Specific tests required for particular materials, components, and completed cables shall be as specified in the sections of the above standards applicable to those materials, components, and cable types. Tests shall also be performed in accordance with the additional requirements specified below.

The Engineer may at any time make visual inspections, continuity or resistance checks, insulation resistance readings, power factor tests, or dc high-potential tests at field test values. A cable's failure to

pass these tests and inspections, or failure to produce readings consistent with acceptable values for the application, will be grounds for rejection of the cable.

The Contractor shall furnish results of tests made. No wire or cable shall be shipped until authorized. Lot number and reel or coil number of wire and cable tested shall be indicated on the test reports.

--End of Section--

SECTION 26 05 21
LOW-VOLTAGE CABLE CONDUIT
(06/12)

PART 1 – GENERAL

1.1 SCOPE

The Contractor shall provide rigid steel, hot-dipped galvanized, with threaded connections electrical conduit.

1.2 REFERENCES

AMERICAN NATIONAL STANDARDS INSTITUTE

ANSI C80.1 Rigid Steel Conduit, Zinc-Coated

1.3 SUBMITTALS

The Contractor shall submit manufacturer product data in accordance with Section 01 33 00.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Rigid steel conduit, zinc-coated, manufactured in accordance with the requirements of ANSI C80.1-1966 and UL-6.

PART 3 – EXECUTION

3.1 GENERAL

Conduit runs are shown diagrammatically on the drawings. The Contractor shall be responsible for field routing conduit in a neat and clean manner in order to minimize interference with the operation or maintenance of other equipment. The Contractor shall be responsible for reconciling any conduit installation that does not comply with this requirement.

3.2 INSTALLATION

a. All conduits shall be galvanized rigid. No conduit shall be less than ¾ in.

b. Conduit hubs or sealing locknuts shall be used for fastening conduit to cast boxes and for fastening conduit to sheet metal enclosures.

c. All conduit runs shall be electrically continuous.

d. Suitable conduit caps shall be used to protect installed conduit against entrance of dirt and moisture.

e. Moisture traps shall be avoided where possible; where unavoidable junction boxes shall have drain fittings at conduit low point.

f. Conduit shall be installed in accordance with NECA Standard of Installation.

g. Conduit shall be arranged to maintain headroom and present a neat appearance.

h. Adequate clearance shall be maintained between conduit and piping.

i. Conduit shall be at square using saw or pipe cutter; deburr cut ends.

j. No more than the equivalent of three 90-degree bends between boxes shall be installed. Conduit bodies shall be used to make sharp change in direction, as around beams.

k. Conduit supports shall be arranged to prevent distortion of alignment by wire pulling operations. Conduit shall be fastened using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

l. Conduit shall be grouped in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Space shall be provided for 25 percent additional conduit.

m. Conduits shall be run parallel with the building lines.

n. Conduit shall not be fastened with wire or perforated pipe straps. All wire used for temporary conduit support during construction shall be removed before conductors are pulled.

o. Conduit shall be run to the shoulder of fittings and couplings and fastened securely.

--End of Section--

SECTION 26 05 23
LOW-VOLTAGE CABLE BOXES
(06/12)

PART 1 – GENERAL

1.1 SCOPE

The Contractor shall provide and install all outlet boxes and pull and junction boxes as shown on the Project Drawings.

1.2 REFERENCES

NATIONAL ELECTRIC MANUFACTURERS ASSOSCIATION (NEMA)

ANSI/NEMA OS1	Sheet steel outlet boxes, device boxes, covers, and supports
NEMA 250	Enclosures for electrical equipment (1000 V maximum)

PART 2 – PRODUCTS

2.1 OUTLET BOXES

Surface-mounted outlet boxes in wet areas shall be cast iron with cast iron cover and neoprene gasket.

In dry areas, outlet and switch boxes shall be galvanized sheet steel with steel cover plates.

Sheet metal outlet boxes shall be ANSI/NEMA OS1, galvanized steel, with ½-in. male fixture studs, where required.

Cast boxes shall be cast iron, deep-type gasketed cover, threaded hubs.

2.2 PULL AND JUNCTION BOXES

Sheet metal boxes shall be ANSI/NEMA OS1 galvanized steel.

Cast metal boxes for outdoor and wet location installation shall be NEMA 250, Type 4, flat-flanged, surface-mounted, junction box, UL listed as raintight, galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

Pull and junction boxes shall be cast iron or sheet steel. Steel boxes shall be hot-dipped galvanized or shall have manufacturer's standard gray enamel or primer finish over phosphatized surfaces inside and out. All boxes shall be sized in accordance with NEC or larger to ensure that minimum bending radius of cable is not exceeded; NEC gauge (but a minimum of 16 gauge), constructed to me the area classification in which they are installed. Boxes shall be seam-free or have continuous-welded seams with cover gaskets as required. Boxes exposed to rain or in wet locations shall be NEMA 4X.

Covers for pull boxes shall be secured with machine screws.

Boxes shall be located and installed to allow access.

PART 3 – EXECUTION

3.1 ELECTRICAL BOX INSTALLATION

Electrical boxes shall be provided as shown on drawings and as required for splices, taps, wire pulling, equipment connections, and code compliance.

Electrical boxes shall be installed to maintain headroom and to present neat mechanical appearance.

Boxes shall be supported independently of conduit except for cast boxes that are connected by two rigid metal conduits, both supported within 12 in. of box.

General locations for the 120-volt maintenance receptacles and 480-volt welding receptacles appear on the drawings. The exact location shall be determined by the Contractor.

--End of Section--

SECTION 31 00 00
EARTH WORK
(06/12)

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall provide all labor, materials, and equipment to prepare the site for construction of the fishway, including clearing and grubbing of the site, excavation, stockpiling, and disposal of soil and rock overburden materials in the river, and placement of riprap in disturbed areas that are subject to erosion.

1.2 REFERENCES

Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D4632	Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D4833	Test Method for Puncture Resistance of Geotextiles
ASTM D4491	Test Method for Water Permeability of Geotextiles
ASTM D4751	Test Method for Determining Apparent Opening Size of Geotextiles
ASTM D4533	Test Method for Index Trapezoidal Tearing Strength of Geotextiles

1.3 UNIT PRICE – BASIS OF MEASUREMENT AND PAYMENT

1.3.1 Basis of Measurement

Sediment and debris removal and disposal from the powerhouse intake (Bid Item 31-10) shall be measured to the nearest 0.5 cubic yard. All other earthwork required to complete the project shall not be measured but included in other Lump Sum pay items.

1.3.2 Basis of Payment

The payment for sediment and debris removal and disposal from the powerhouse intake, Bid Item 31-10, will be full compensation for all excavation, disposal, labor, equipment, tools, and incidentals necessary to complete the work at the Contract Unit price.

1.4 SUBMITTALS

The contractor shall submit a sediment removal and disposal plan to the engineer for approval prior to initiating work. The plan shall address all permit conditions and shall identify the disposal location.

1.5 DELIVERY, STORAGE AND HANDLING

Site preparation, excavation, and material stockpiling and disposal shall be performed in a manner to minimize disturbance to the construction site and impacts on the river water quality.

PART 2 - PRODUCTS

2.1 GEOTEXTILE FILTER FABRIC

Geotextile filter fabric shall be used under all areas where riprap slope protection is required. The geotextile filter fabric shall meet the following requirements:

Tensile strength: 200 lbs
Burst strength: 350 lbs
Puncture strength: 70 lbs
Permeability: 0.02 cm/sec
Elongation at failure: 30%
Minimum lap length:24 in

2.2 MATERIAL FOR RIPRAP

2.2.1 Bedding Material

Bedding material for all areas requiring riprap protection shall be sand, gravel, or crushed rock, well graded, with a maximum particle size of 2 inches. Material shall be composed of tough, durable particles. Fines passing the 75 micrometers No. 200 standard sieve shall have a plasticity index less than six.

2.2.2 Rock

Rock fragments sufficiently durable to ensure permanence in the structure and the environment in which it is to be used. Rock fragments shall be free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. The inclusion of more than trace 1 percent quantities of dirt, sand, clay, and rock fines will not be permitted.

All riprap shall be Class 1 and shall meet the following specifications:

Size	% of Total Weight Smaller Than Given Size
16"	90 - 100
12"	30 - 50
6"	0 - 10

The placement of riprap shall begin with the toe. The larger stones shall be placed in the toe and along the outside edges of the limits of the slope and channel protection. The rip-rap shall be placed with suitable equipment in such a manner as to produce a reasonable graded mass of stones with zero drop height. The placing of stones that cause excessive segregation is not allowed.

PART 3 - EXECUTION

3.1 SITE PREPARATION

Unless indicated otherwise, the Contractor shall remove trees, stumps, logs, shrubs, brush and vegetation and other items that would interfere with construction operations within the limits of work line. The Contactor shall remove only those trees that are within the footprint of the fishway. Care shall be taken during construction to minimize damage to living trees in the construction area. Stumps shall be entirely removed and matted roots and roots over 2 inches in diameter shall be grubbed out to at least 18 inches below existing surface.

Following site clearing and stripping of potential organic soils and subsoil, most of the excavated soil is anticipated to generally consist of existing fill materials. The topsoil may be reusable as backfill material in landscaped areas. The excavated existing fill soils may be utilized as common backfill material for landscape areas in the park that have to be restored and where a raise in grade is necessary. Care should be taken to protect materials stockpiled for on-site reuse from moisture and other adverse conditions. Prior to the start of construction, moisture density relationships should be performed on representative soil samples to allow for an evaluation for the reuse of the soil as a backfill material within the landscape and as foundation backfill and to establish compaction characteristics and associated moisture requirements.

3.2 EXCAVATION

Every type of material encountered within the limits of the fishway lines, grades, and elevations indicated on the drawings shall be excavated to expose bedrock for the fishway foundation. Grading shall be completed in accordance with the typical sections shown. Excavation shall be performed in a manner and sequence that will provide proper drainage at all times.

Due to the proximity of the river, open cut excavation techniques will require an adequate dewatering system to control water inflow and lower groundwater 2 feet below the bottom of any excavation. Work in the river will be inside a cofferdam and the dewatering system requirements are defined in Section 31 23 19. Excavations and trenching shall be performed in accordance with OSHA regulations.

3.3 POWERHOUSE INTAKE SEDIMENT REMOVAL

The Contractor shall remove and properly dispose of accumulated sediment at the powerhouse intake to allow for installation of the new trash rack and bedrock overburden at the fishway support piers. Excavated sediments shall be properly dewatered prior to disposal in accordance with the permit conditions provided as Attachments to the project bid documents. All sediment shall be transported to an acceptable disposal location.

3.4 BACKFILLING

Fishway structure foundation mat will be poured directly on bedrock and backfill is not anticipated.

3.5 RIPRAP

Geotextile filter fabric and the appropriate bedding material shall be installed where in areas where riprap slope protection is required prior to placing riprap.

Riprap stones shall be placed and distributed such that there will be no large accumulation of either the larger or smaller stone in any given area.

--End of Section--

SECTION 31 23 16
ROCK REMOVAL AND DISPOSAL
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This work shall consist of the removal and disposal of existing concrete and rock materials associated with the installation of the fishway and non-overflow section, as specified in the project plans or as directed by the Engineer.

1.2 UNIT PRICE – BASIS OF MEASUREMENT AND PAYMENT

1.2.1 Basis of Measurement

Rock excavation (Bid Item 31-2) will be measured to the nearest 0.5 cubic yard removed.

1.2.2 Basis of Payment

The payment will be full compensation for all rock removal and disposal, labor, equipment, tools, and incidentals necessary to complete the work at the Contract Unit price.

1.3 SUBMITTALS

The contractor shall submit a rock excavation plan to the engineer for approval prior to initiating work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 REMOVAL OF DAM MATERIALS

Prior to the start of concrete and rock removal, the Contractor shall mark off the area to be removed and obtain approval of the proposed area from the Engineer. The Contractor shall remove material to a depth sufficient for the proposed structure.

Removal of the dam material may require the use of hand operable mechanical equipment to aide in breaking up pieces into suitable sizes for removal by hand. All removal of materials shall be to the elevations depicted on the plans, unless otherwise specified in the Contract Documents or as directed by the Engineer. Blasting will not be permitted. If piles, grillages, or cribbing materials are encountered as part of the dam materials, they shall be cut off and removed to the above limits.

3.2 USE OF REMOVED MATERIAL

Stone, brick or concrete material may be broken and used in the work. The broken material will be considered as rock in conformance with SECTION 31 00 00 – Earth Work. Material determined to be

unsuitable by the Engineer shall be disposed of as excess or unsuitable material at no additional cost to the Owner.

3.3 PROTECTION OF RETAINED MASONRY

Retained sections of the dam and river wall that are damaged due to the Contractor's operations as determined by the Engineer shall be repaired or replaced in a manner acceptable to the Engineer at no additional cost to the Owner. Connecting edges and surfaces shall be cut to lines specified in the Contract Documents or as directed by the Engineer.

--End of Section--

SECTION 31 23 19
DEWATERING
(06/12)

PART 1 - GENERAL

1.1 SCOPE

Work included in this section consists of installation and removal of the temporary cofferdam, specified herein, and/or as shown on the Contract Drawings, and as needed for a complete and proper installation. Equipment access ramps shall be constructed within the limits of the cofferdam. Contractor shall extend hydroplant water level sensor stilling well to north side of cofferdam as approved by hydroplant owner.

The Contractor shall be responsible for coordinating work with the hydroplant owner. The hydroplant owner will control flow over dam and maintain the headpond at dam crest to the reasonable extent possible by operation of hydraulic turbines. However, maximum turbine capacity is 1,200 cfs and river flows greater than the turbine capacity overtop the dam. In addition, if the turbines trip, the portion of the dam outside of the cofferdam will be instantaneously overtopped.

The Contractor shall be responsible for monitoring changes in river conditions and turbine operation that are beyond the hydroplant operator's control. The Contractors safety plans shall address dam overtopping and procedures necessary to assure safety of workers.

1.2 SUBMITTALS

The Contractor shall submit a dewatering plan in accordance with Section 01 33 00 – Submittals. The dewatering plan shall define the procedures proposed for dewatering of the project site to meet the RIDEM permit conditions. The procedures shall include a detailed description of the methods, material, and equipment to be used for each operation, and the sequence of operations. All equipment associated with installation of the cofferdam shall be covered under this specification and shall be identified in the dewatering plan.

The Contractor's dewatering plan shall be approved by the Engineer and the Owner.

1.3 GENERAL INFORMATION

USGS flow data for the Blackstone River at Pawtucket can be found at:

http://waterdata.usgs.gov/nwis/dv/?site_no=01113895&agency_cd=USGS&referred_module=sw

USGS flow data for the Blackstone River at Woonsocket can be found at:

http://waterdata.usgs.gov/nwis/dv/?site_no=01112500&agency_cd=USGS&referred_module=sw

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

The Contractor shall provide all dewatering necessary to keep the construction and work areas dry. The Contractor shall design, install, operate, and maintain an adequate system. The system shall be of sufficient size and capacity to maintain a dry condition without delays to construction operations.

2.2 COFFERDAMS

Cofferdams shall be designed a Professional Engineer registered in Rhode Island using accepted and professional methods of design and engineering consistent with the best modern practice. The cofferdam design shall be identified as part of the dewatering plan.

PART 3 - EXECUTION

3.1 DEWATERING PROCEDURE

Prior to dewatering the cofferdam the Contractor shall extend the stilling well for the hydroplant water level sensor to a location on the riverside of the cofferdam. The modifications to the water level sensor stilling well shall be approved by the hydroplant operator.

A temporary cofferdam structure with pumps shall be provided to allow construction of the fishway. The cofferdam shall be designed and constructed in accordance with approved materials and procedures. When no longer needed for water control, all dewatering facilities shall be removed as the Contractor's property.

The area behind the cofferdam shall be pumped out in a manner that will minimize impacts on water quality and siltation into the river.

Any water that is pumped and discharged from the excavation as part of the Contractor’s water handling shall be filtered by approved method prior to its discharge into receiving water or drainage system.

Under no circumstances shall the Contractor discharge water directly to the area designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream or waterway after filtering by an approved method.

3.2 COFFERDAMS

Cofferdams shall have a minimum crest elevation 1.5-ft above high water levels shown on the Contract Drawings to prevent flooding of the excavated areas at the fishway. All dimensions and elevations shall be verified by the Contractor.

The cofferdam shall be constructed in accordance with approved construction methods and procedures. Installation and removal of the cofferdams shall be scheduled during periods when the flow is less than 750 cfs. The Engineer reserves the right to conduct inspections as required to verify compliance. When work in the area is substantially complete, the cofferdams shall be removed.

Earth and rock materials and all other materials, including synthetic materials, sheet piling and structural steel, remain the property of the Contractor and shall be disposed of offsite.

--End of Section --

SECTION 31 25 00
SOIL SURFACE EROSION CONTROL
(06/12)

PART 1 - GENERAL

1.1 SCOPE

Work included in this Section consists of furnishing and placing temporary erosion and pollution control devices, specified herein, and/or shown on the Contract Drawings, and as needed for a complete and proper installation. All erosion control work is to be done in conformance with all federal, state and local permits and regulations.

1.2 QUALITY ASSURANCE

The Contractor shall comply with the Rhode Island Soil Erosion and Sediment Control Handbook

PART 2 - PRODUCTS

2.1 MULCH

Mulch shall consist of cured hay. When air dried in the loose state, the contents of a representative bale shall lose not more than 15 percent of the resulting air dry weight of the bale. It shall be free from primary noxious weed seeds and rough or woody material.

Staples shall be of No. 11 (or heavier) plane iron wire, made from lengths of at least 12 inches each.

2.2 HAY BALES

Hay bales for erosion control shall consist of rectangular shaped bales of hay or straw weighing at least 40 pounds per bale. They shall be free from primary noxious weed seeds and rough or woody materials.

2.3 SILT FENCE FILTER FABRIC

Filter fabric barriers shall meet the following criteria:

Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester, or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to the following requirements.

Physical Property	Requirement
Filtering Efficiency	75% (minimum)
Maximum Opening Size	U.S. Sieve #20
Tensile Strength at 20% (maximum) Elongation*	Extra Strength - 50 lbs./lin.in. (minimum) Standard Strength - 30 lbs./lin.in. (minimum)
Flow Rate	0.3 gal./sq.ft./min. (minimum)

*Requirements reduced by 50 percent after six months of installation.

Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0° F to 120° F.

Burlap shall be 10 ounces per square yard fabric.

Stakes for filter barriers shall be 1" x 2" wood (preferred) or equivalent metal with a minimum length of 3 feet.

2.4 CRUSHED STONE

Crushed stone for the stabilized construction entrance shall be ASTM C-33, Size No. 2 or 3.

PART 3 - EXECUTION

3.1 MULCH

Mulching shall be done immediately after each area has been properly prepared. When seed is sown prior to placing the mulch, the mulch shall be placed on the seeded areas within 48 hours after seeding. Hay that has been thoroughly fluffed shall be applied at approximately, but not to exceed 3 tons per acre unless ordered. Blowing chopped mulch will be permitted when authorized. Authorization will be given when it can be determined that the mulch fibers will be of such length and applied in such a manner that there will be a minimum amount of matting that would retard the growth of plants. Hay mulch should not be so thick that a person standing cannot see ground through the mulch. Matted mulch or bunches shall be removed and disposed.

In order to prevent its being blown away, after the mulch has been spread to the required depth, a light covering of loose branches, a system of pegs and strings, or other approved method shall be employed. Unless otherwise ordered, such means of control shall be removed prior to the acceptance of the Project.

All baling wire or rope, such as that used in the shipment of mulch, shall be disposed of outside the limits of the Project.

3.2 SILT FENCE FILTER BARRIER

This sediment barrier may be constructed using burlap or standard strength synthetic filter fabric. It is designed for low or moderate flows not exceeding 1 cfs.

Silt fence filter barrier shall be installed as shown on the Contract Drawings.

Burlap or standard strength synthetic filter fabric shall be purchased in a continuous roll and cut to the length of the barrier to avoid the use of joints (and thus improve the strength and efficiency of the barrier).

The stakes shall be spaced a maximum of 3 feet apart at the barrier location and driven securely into the ground (minimum of 8 inches).

A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of stakes and up slope from the barrier.

The filter material shall be stapled to the wooden stakes, and 8 inches of the fabric shall be extended into the trench. Heavy duty wire staples at least 1/2 inch long shall be used. Filter material shall not be stapled to existing trees.

The trench shall be backfilled and the soil compacted over the filter material.

If a filter barrier is to be constructed across a ditch line or swale, the barrier shall be of sufficient length to eliminate end flow, and the plan configuration shall resemble an arc or horseshoe with the ends oriented up slope.

Filter barriers shall be removed when they have served their useful purpose, but not before the up slope area has been permanently stabilized.

The Contractor shall maintain areas mulched or matted until the completion of the Contract.

3.3. HAY BALES FOR EROSION CONTROL

Hay bales shall be placed as required to provide for temporary control of erosion or pollution or both. They shall be staked with the required stakes. Upon acceptance of the Contract, the bales shall be left in place unless released to the Contractor.

Hay bales shall be replaced every 90 days or as directed by the Engineer.

3.4 STABILIZED CONSTRUCTION ENTRANCE

A stabilized construction entrance shall be installed at the parking lot on the east side of the Blackstone River. The stabilized entrance shall be at least 10 ft wide extending at least 50 ft from the roadway. Each side of the stabilized entrance will have a 25-ft radius curvature from the roadway to the entrance.

--End of Section--

SECTION 31 51 00
ROCK DOWELS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This item consists of the furnishing of all labor, materials, and equipment required to place untensioned, fully resin-grouted, rock dowels to anchor the fishway slab to bedrock.

The rock dowels shall be grouted full-length in rock with attached steel plates, washers, and nuts as shown on the Drawings, or as directed by the Engineer.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM A36 Standard Specifications for Structural Steel

ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars

ASTM F432 Roof and Rock Dowels and Accessories for Concrete Reinforcement

1.3 QUALIFICATIONS

Installer shall be experienced in the work of this section with a minimum of 2 years experience installing grouted rock dowels.

The foreman or supervisor for each Rock Doweling Crew shall be an individual with a minimum of 5 years of experience supervising and installing grouted rock dowels, rock dowels, and ground anchors in underground conditions, including installation of dowels at least 10 feet in length.

PART 2 – PRODUCTS

2.1 ROCK DOWELS

Rock dowels shall be nominal 1 inch in diameter (#8 bar) conforming to ASTM A615 Grade 60. The rock dowels shall be supplied in 10-foot lengths. Longer dowels shall be supplied as directed by the Engineer.

2.2 GROUT

The rock dowel grout shall be in accordance with Section 03 60 00.

PART 3 – EXECUTION

3.1 DRILLING ROCK DOWEL HOLES

Just prior to drilling holes for rock dowels, the area to be supported shall be inspected and scaled as required to assure safety and to provide adequate faces to seat the bearing plates. Two (2) inch diameter holes for installation of rock dowels shall be drilled into the rock at the locations and to minimum depths as shown on the Drawings or as directed by the Engineer.

Rotary percussion-type drilling equipment capable of reaching a rock surface at least 8 feet beyond the design excavation line shall be used to perform the drilling.

Drilled holes shall be blown clear with compressed air or water introduced at the back of the hole to remove all drill cuttings, sludge, and debris immediately before installation of the grout.

3.2 INSTALLATION OF ROCK DOWELS

Dowel stickout shall not protrude into the clearance envelope.

Rock dowels shall be installed immediately after the hole is drilled. The Contractor shall not drill a series of holes before attempting to install rock dowels.

The exposed ends (i.e., tails) of rock dowels shall be cut off at a distance 6 inches below the finished elevation of the concrete as shown on the drawing. The cut shall be made by mechanical means and not using a torch, and shall be cut perpendicular to the axis of the bar.

Dowels shall not be disturbed for at least 24 hours to allow the grout to set.

Dowels which are not firmly held in position by the grout shall be replaced at no additional cost. The tail of an unacceptable dowel shall be cut off flush at the rock surface. The replacement dowel shall be located as directed by the Engineer.

--End of Section--

SECTION 31 68 13
ROCK FOUNDATION ANCHORS
(06/12)

PART 1 - GENERAL

1.1 WORK INCLUDED

This work consists of furnishing all labor, materials and equipment necessary to properly install and test rock anchors and accessories at locations shown on the Contract Drawings. The work includes providing adequate bond length and stressing length to meet the requirements specified herein and shown on the Contract Drawings, providing materials and equipment for, and installing rock anchors to carry the two design loads of 60 kips and 150 kips, prestressing all rock anchors, and testing rock anchors as specified herein.

1.2 UNIT PRICES – BASIS OF MEASUREMENT AND PAYMENT

1.2.1 Basis for Measurement

Mobilization and demobilization of all equipment necessary to drill rock anchors will not be measured, but will be paid for at the Contract Lump Sum Price.

1.2.2 Basis for Payment

The payment for Mobilization and Demobilization will be full compensation for all transport of equipment and materials to the site including the construction of temporary work platforms, if required at the Contract Lump Sum Price.

The payment for the 60 and 150 kip capacity rock anchors will be full compensation for all drilling, installation, proof tests, performance tests, and for all material, labor, and incidentals necessary to complete the work at the Contract Unit Price per each anchor installed, tested and accepted.

1.3 REFERENCES

Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

A36 Standard Specification for Structural Steel
A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless
A722 Standard Specification for Uncoated High Strength Steel Bars for Prestressed Concrete
C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
C150 Standard Specification for Portland Cement

POST-TENSIONING INSTITUTE (PTI)

Recommendations for Prestressed Rock and Soil Anchors, Latest Issue

1.4 SUBMITTALS

Submittals during construction shall be made in accordance with General and Special Provisions.

Shop drawings shall be submitted for review not less than 20 days prior to proceeding with the work.

Shop drawings shall include, but not be limited to:

a. Rock Anchor Schedule giving:
   Rock anchor number
   Load for each rock anchor
   Type and size of rock anchor
   Bonded length, and
   Stressing length

b. A drawing of the rock anchor system and corrosion protection including:
   Centralizers and their location
   Anchorage, and
   Anchorage, bonded length and stressing length corrosion protection system

c. Calculations: Design calculations shall be submitted for review. Design calculations shall include a determination of the bonded length for each rock anchor and sizing of anchor base plates.

d. The Contractor shall indicate a detailed description of the means and methods to be used to access the rock anchor locations. This should also include a sequence of construction for these rock anchors.

The Contractor shall also submit the following information for review not less than 20 working days prior to the commencement of rock anchor installation:

a. Prestressing steel bar manufacturer's mill test reports for the rock anchors.

b. Applicable literature from cement grout suppliers giving details on setting times as a function of temperature, strength gain with time, and recommended storage, mixing and placement procedures.

c. Applicable manufacturer certification and/or literature for anchorage fittings and accessories:

d. Detailed description of the proposed procedures, including specific makes and models of equipment to be used for drilling, placing, grouting, and post-tensioning rock anchors.

e. Detailed description of proposed procedures and applicable manufacturer's literature for the equipment to be used for testing rock anchors, including but not limited to the following:

(1) The description shall include diagrams showing the arrangement of the testing equipment relative to the rock anchor and anchorage hardware, the method for locking-off the required transfer load, and calibration data for the system of jack and gauges.

(2) The calibration of the testing equipment shall have been performed by a certified independent testing laboratory no more than twenty working days prior to the initial testing on site of rock anchors and shall be presented in the form of gauge pressure vs. actual jack force.

During grouting operations, the following data shall be recorded by the Contractor and submitted:

a. Type of mixer and grout pump
b. Type of grout
c. Water/grout ratio
d. Types of additives and their concentrations in mix
e. Grout injection pressure
f. Test sample strength
g. Volume of grout placed

The Contractor shall also submit a report to the Owner's Representativewithin 20 working days after completion of the rock anchor work. The report shall contain as-built drawings showing the locations of the rock anchors, total rock anchor lengths, stressing lengths and bonded lengths.

A manufacturer's Material Safety Data Sheet (MSDS) must be submitted, when applicable.

1.5 QUALITY ASSURANCE

The work on the project shall be performed in accordance with the latest issue of "Recommendations for Prestressed Rock and Soil Anchors", Post-Tensioning Institute, Phoenix, Arizona.

The Contractor shall submit records documenting a minimum of five (5) years experience in rock anchor installation and a minimum of five (5) previous rock anchor projects of similar or greater scope as qualification for this project. Names of individuals (with address, affiliation, title, and telephone number) who can attest to the adequacy of the work done on those projects shall also be submitted.

The Contractor shall not install rock anchors until the Engineer has reviewed the sequence of installation for all rock anchors.

The Contractor shall install rock anchors to within one degree from vertical.

The Contractor shall install rock anchors within two inches of the required location unless otherwise directed by the Engineer.

1.6 DEFINITIONS

The following terms used in this Section are defined as follows:

Rock Anchor: A high strength steel bar, fitted with an anchorage at one end and an anchor device permitting force transfer to the ground on the other end.

Anchorage: Portion of the rock anchor, including anchor head, and anchor plate, which is used to transfer load from the structure to the rock anchor.

Bonded Length: Portion of rock anchor which transfers the tensile force from the rock anchor to the ground. The bonded length shall begin a minimum of 15 feet below the rock line.

Stressing Length: Portion of rock anchor which is in smooth sheathing. The stressing length shall include the portion of the anchor from the lock off point to the top of the bedrock plus an additional 15-foot length drilled into the bedrock.

Smooth Sheathing: Enclosure around stressing length to prevent permanent bond between the prestressing steel and the surrounding grout and to provide corrosion protection.

1.7 DELIVERY, STORAGE AND HANDLING

All rock anchors and components shall be handled and stored in such a manner as to avoid corrosion and physical damage.

Damage, such as abrasions, cuts, nicks, welds, weld spatters or heavy corrosion and pitting, will be a cause for rejection of the element. Rejected elements shall be replaced at no cost to the Owner in terms of either material replacement or resulting time delays.

1.8 JOB CONDITIONS

Limited variations from the patterns or locations shown on the Contract Drawings will be permitted to accommodate local conditions, subject to review of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Steel Tendons

Tendons for rock anchors shall be continuously threaded Grade 150 steel bars conforming to ASTM A722.

The sheath encapsulating the tendons shall be able to safely withstand deformations occurring during transportation, installation, stressing, testing, and transferring load to the tendons.

The bonded length of a tendon for a rock anchor shall not be less than 10 feet for the 60 kip capacity anchor and not less than 25 feet for the 150 kip capacity anchor.

The stressing length of a tendon for rock anchors shall be not less than the length required for the anchor to extend from the lock off location to the top of bedrock plus an additional 15 feet into the bedrock.

The stressing length of permanent rock anchors shall be protected with smooth sheaths that are filled with anti-corrosion grease, heat-shrink sleeves, and secondary grout after stressing.

A corrugated plastic sleeve shall encapsulate the entire length of the tendon. The smooth sheath shall cover the stressing length. A Portland cement grout shall completely cover the tendon within the corrugated sleeve. A suitable end cap shall be securely fastened at the end of the corrugated sleeve.

2.1.2 Plastic Sheathing/Sleeves

Smooth sheathing/sleeves shall be seamless polyethylene having a minimum wall thickness of 60 mils. The materials shall be free of water soluble chlorides and other ingredients which might enhance corrosion, hydrogen embrittlement or stress corrosion of the prestressing steel. The plastic shall be non-reactive with the grout and its ingredients.

Corrugated sheeting shall be polyvinyl chloride having a minimum wall thickness of 30 mils.

The plastic sheathing/sleeve shall be gas and water-tight, resistant against chemical attacks and aging.

2.1.3 Steel

Steel, except steel tendons, shall conform to the requirements of ASTM A36.

2.1.4 Grout

FOSROC 10-35 TEKROC P shall be used for rock anchors.

Grout bags which have been in storage more than 90 days shall not be used.

Grout bags shall be kept under cover and in a dry condition.

The lowest practical water grout ratio with acceptable workability shall be used.

Prior to testing anchors, verify that the grout has sufficient strength to transfer the rock anchor load to the ground.

Expansive admixtures may not be added to the grout.

Water for mixing grout shall be potable, clean and free of injurious quantities of substances known to be harmful to Portland cement or prestressing steel.

Mix grout in accordance with the manufacturer’s recommendations.

2.1.5 Centralizers

Centralizers shall be placed at five foot intervals so that no less than 0.5 inches of grout cover is achieved along the tendon.

Centralizers may be made of any material, except wood, that is not deleterious to the prestressing steel or plastic sheath.

Centralizers shall permit the free flow of grout.

2.1.6 Miscellaneous Steel Hardware

Steel plates shall conform to ASTM A36.

All bolts, nuts and washers shall conform to the tendon manufacturer's specifications.

Trumpets shall conform to ASTM A53, with a minimum wall thickness of 0.20 inches.

All anchorage components shall develop at least 95 percent of the minimum guaranteed ultimate strength of the tendon.

2.2 EQUIPMENT

Equipment for mixing grout shall be a high speed colloidal mixer with shearing action.

PART 3 - EXECUTION

3.1 PREPARATION

Tendons shall be fabricated in accordance with reviewed Shop Drawings and shall be free of dirt, detrimental rust, or other deleterious substances.

The bonded length shall be degreased prior to installation. No solvent residue shall remain on the tendon.

3.2 CONSTRUCTION CONTROL

The rock anchor shall be properly inspected before placement into the borehole. While inserting the rock anchor into the hole, it shall be protected from any damage, especially damage to the corrosion protection media.

Rock anchors shall be inserted freely to the prescribed length in the hole. They shall not be driven into the hole or cut off for insertion.

In no case shall the stressing length of a rock anchor be shortened to less than the minimum length previously defined.

The tendon shall be concentric in the hole.

Grout pressure shall be measured at the point of injection. The grout gate mechanism shall be cleaned prior to delivery to the site and periodically during the project to prevent clogging.

Grout components shall be mechanically mixed for 5 to 10 minutes to ensure proper dispersion of grout mix.

The established water grout ratio shall be accurately controlled.

Pumping and injection of the grout shall commence immediately after mixing.

Grouting shall continue until the returning grout escaping from the hole is of the same composition as grout being injected.

The trumpet shall extend well over the tendon sheathing. It shall remain undamaged during placement and stressing. The tendon shall not contact the trumpet at the bearing plate.
Prior to testing anchors, verify that grout has sufficient strength to transfer the anchor load to the ground.

3.3 INSTALLATION

The hole for rock anchors shall be drilled at locations indicated on the Contract Drawings.

The hole diameter shall be determined by the Contractor to produce the required load capacities. The rock anchor hole shall extend one foot beyond the tendon length to be installed.

The Contractor shall be responsible for maintaining an obstruction-free and open hole for grouting the rock anchor. The Contractor shall be solely responsible for determining the drilling method, grouting pressures, and rock anchor bonded length, subject to the provisions stated herein and review by the Engineer. The Contractor shall design the bonded length to satisfy the rock anchor testing acceptance criteria in accordance with the design loads. This bonded length shall not be less than previously defined. The grouting pressure and grouting method shall be based on consideration of existing ground conditions.

The drilling method used shall:

1. Cause minimum disturbance to the surrounding ground and not result in any ground loss.

2. Not result in collapse of the hole during drilling.

3. Maintain the position and inclination of the drilled hole, allow the hole to reach the design depth, and produce the design diameter of the drilled hole.

Before installation of the grout or anchor, the bonded length of each hole shall be cleaned of all debris by a method reviewed by the Engineer.

The Contractor shall immediately revise his operations to prevent reoccurrence of obstructed or otherwise unsatisfactory holes and modify rock anchor installation procedures as required. Temporary casing shall be used if the hole tends to collapse during drilling or placement of the anchor. The temporary casing shall be withdrawn as grout is placed.

Grout shall be injected at the lowest point of the rock anchor hole. Grouting shall proceed such that the hole is filled without formation of air voids, grouting progressively from the bottom to top.

The grout in the stressing length zone shall be the same as that for the bonded length zone. The stressing length grouting shall be done by gravity-flow or low pressure pumping. Grout shall terminate one foot before the anchor plate area prior to stressing and testing. Final grouting up to the anchor plate shall be

completed upon completion of testing and stressing. The Contractor shall provide the fittings or components needed to accomplish this.

The grouting equipment shall be capable of continuous mixing and shall produce a grout free of lumps. The grout pump shall be equipped with a grout pressure gauge at the nozzle capable of measuring at least 150 psi or twice the actual pressure used.

If grout loss from the drilled hole exceeds three times the volume of the annular space between the drilled hole and rock anchor, then rock anchor installation shall be discontinued and the tendon removed from the hole and cleaned. The Contractor shall fully pressure grout the drilled hole with a cement grout at a pressure of at least 5 psi above hydrostatic pressure, redrill the hole 24 hours after the grout sets, and install rock anchors as described herein above.

The Contractor may, at his option, conduct a water pressure test in the drilled hole prior to grouting. When water loss is greater than 0.25 gallons per mixture at a pressure of at least 5 psi above hydrostatic pressure (within the bonded length of the drill hole) measured for at least 10 minutes, then the drilled hole shall be pressure grouted as described above.

A grout pad shall be placed under the bearing plate to level the plate prior to stressing and testing.

3.4 ROCK ANCHOR TESTING

Each rock anchor shall be tested.

Copies of all test results and graphs shall be transmitted to the Construction Manager as each test is completed.

Rock anchors shall be tensioned by direct pull with a hollow ram hydraulic jack of a model recommended by the anchor manufacturer, so mounted as to prevent bending of the rock anchor. Tensioning of a rock anchor shall not commence until the cement grout has set.

Jacks shall have ram travel at least equal to theoretical elastic elongation of the stressing length plus the bonded length at the maximum test load. A pressure gauge shall be used with each jack. Gauges shall be calibrated with a single jack. All gauges shall be accurate enough to read 100 psi changes in pressure. For performance tests, the jack used shall have two (2) calibrated gauges: a master gauge and a back-up gauge. The pump shall be capable of applying each load increment in less than 60 seconds.

For the performance tests, the master gauge and back-up gauge shall be connected to the same pressure hose between the pump and jack and be used to measure the applied loads. If the load measured by the master gauge and back-up gauge differ by more than ten (10) percent, the jack, master gauge and back-up gauge shall be recalibrated as a unit at no expense to the Owner.

The weight of the jack shall be supported externally and not by the tendon.

Use a dial gauge, with 0.001 inch precision, aligned perpendicular to the loading head to measure elongation of the tendon. The dial gauge shall be supported on an independent reference point and shall be in contact with the tendon head or an extension of the tendon head.

All testing shall be performed in the presence of the Engineer. Notice shall be given to the Engineer not less than 48 hours prior to the start of a test.

Maintain each load increment or decrement for at least 1 minute, or until movement ceases.

3.4.1 Performance Test:

Performance tests shall be performed on the first rock anchor installed at each major structure prior to delivery of remaining anchors to confirm design.

The performance tests will include stressing and monitoring a rock anchor. During testing, rock anchor movement, measured at the anchor head, shall be monitored for each load increment to the nearest 0.001 inch from an independent, fixed reference point. The loading sequence shall be as follows:

Cycle	Load
1	AL
	0.25 P
	AL
2	0.25 P
	0.50 P
	AL
3	0.25 P
	0.50 P
	0.75 P
	AL
4	0.25 P
	0.50 P
	0.75 P
	1.00 P
	AL
5	0.25 P
	0.50 P
	0.75 P
	1.00 P
	AL
6	0.25 P
	0.50 P
	0.75 P
	1.00 P
	1.20 P
	1.33 P
	(Hold) to Lock-off Load

P = Design Load (as shown on Contract Drawings)
AL = Alignment Load = 0.05P

The lock-off load shall be as shown on the Contract Drawings.

The maximum test load shall be held for 10 minutes. Total movements with respect to a fixed reference point shall be recorded at 1 minute, 2, 3, 4, 5, 6 and 10 minutes. If the total movement between 1 minute and 10 minutes exceeds 0.040 inches, the test load shall be held for an additional 50 minutes. Total movements shall be recorded at 15 minutes, 20, 25, 30, 40, 50 and 60 minutes.

The Engineer will plot the tendon head movement vs. load for each load increment. He will also plot the creep movement for the load-hold stage as a function of the logarithm of time. The Engineer will review these data from each performance test to determine whether the rock anchor is acceptable.

Where, in the opinion of the Engineer, significant differences are indicated from previous performance tests, run additional performance tests on the next adjacent rock anchor to be installed.

3.4.2 Proof Test

All rock anchors not performance tested shall be proof tested. The requirements for loading and monitoring for proof tests are the same as for performance tests, except that the load sequence shall be as shown in the following:

P = Design Load
AL = Alignment Load (0.05P)

AL
0.25 P
0.50 P
0.75 P
1.00 P
1.20 P
1.33 P (Hold)
Adjust test load to lock-off load

For proof tests, maintain the maximum proof load for 10 minutes. The jack shall be repumped as necessary in order to maintain a constant load. Anchor movement shall be measured and recorded at 1 minute, 2, 3, 4, 5, 6 and 10 minutes. If the anchor movement exceeds 0.04 inches between 1 and 10 minute readings, maintain the maximum proof load for an additional 50 minutes. Total movements shall be recorded at 15, 20, 25, 30, 40, 50 and 60 minutes.

3.4.3 Lift-Off Readings

After applying the lock-off load to the rock anchor and prior to removing the jack, a lift-off load reading shall be made. The load determined from the lift-off reading shall be within 5 percent of the specified lock-off load. If the load is not within 5 percent of the lock-off load, the anchorage shall be reset and another lift-off reading shall be made.

3.5 ACCEPTANCE CRITERIA

The following three criteria shall be satisfied:

1. Displacement of the tendon head shall be greater than 0.8 PL_S/AE where,

   P = applied load

   L_S = length from jack pulling head to bottom of stressing length

   A = total cross sectional area of steel tendons

   E = modulus of elasticity of steel tendons

2. Displacement of the tendon shall be less than $P (L_{S+}L_b/2)AE$ where,

   L_b = bonded length of tendon

3. Creep per log cycle $(d_2-d_1)/\log (t_2/t_1)$ shall be less than 0.04 inch between the 1 and 10 minute readings and less than 0.08 inch between the 6 and 60 minute readings, where,

   d_1 = measured displacement at time t_1

   d_2 = measured displacement at time t_2

   t_1 = time of first displacement measurement

   t_2 = time of second displacement measurement

Rock anchors not meeting Criterion 1 shall not be incorporated into the structure and shall be replaced at no cost to the Owner. Those not meeting Criteria 2 or 3 may be accepted to work at loads less than design values; the acceptable load for these rock anchors will be determined by the Engineer. When additional anchors are needed due to anchors not meeting Criteria 2 or 3, the additional anchors shall be installed at no cost to the Owner.

3.6 RECORD OF WORK

Documentation of all work done shall be recorded accurately and completely. This shall include drilling of the rock anchor hole, water testing, grouting, testing and stressing of rock anchors, equipment used for testing and their calibration data, type of steel tendons, materials and procedures used for corrosion protection of anchors.

--End of Section--

SECTION 32 31 19
FENCES AND GATES
(06/12)

PART 1 – GENERAL

1.1 SCOPE

Work included in this Section consists of furnishing and placing of fences and gates, specified herein, and/or shown on the Contract Drawings, and as needed for a complete and proper installation.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D l.1 Structural Welding Code - Steel.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 - Submittals:

a. Product Data:

Manufacturer's data sheets on each product to be used, including:

- Preparation instructions and recommendations
- Storage and handling requirements and recommendations
- Installation methods.

b. Shop Drawings:

Submit plan, elevation and section drawings as necessary to depict ornamental metalwork specified in this section. Drawings may include, but are not limited to:

- Individual component placement and dimensions
- Finished appearance of panel, railing, or other fabrication
- Finish Schedule
- Contract Drawings coordination schedule.

c. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

d. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.

All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.

The Contractor shall provide a mock-up for evaluation of surface preparation techniques and application workmanship.

The Contractor shall refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

The Contractor shall store products in manufacturer's unopened packaging until ready for installation. The Contractor shall store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

The Contractor shall provide fences and gates as indicated on the drawings. The fence and gate will have $2\ ^{7}/_{16}$" x $5\ ^{3}/_{16}$" mesh with 1" x $^{1}/_{8}$" main bar such as METRO manufactured by AMETCO, or approved equal. Security fences and gates shall be mounted according to manufacturer's instructions and shall have a black finish. The Owner will provide product data to the Contractor for procurement of the fence and gate.

Manufacturer's product data shall be submitted to the Engineer for approval.

2.2 GATES, HARDWARE, AND HINGES

Gates shall be 4 ft wide and shall include all hardware and hinges. The gates shall have pickets, finials, and frame members similar to the security fence.

2.3 PICKETS, FRAMES, AND CRESTS

Fence shall be steel pickets with finials. Pickets shall be ¾-in. steel bars spaced at 3 in. on-center. Pickets shall be 96 in. high.

2.4 FABRICATION

Panels and components shall be fabricated according to dimensions and locations noted on the Drawings.

All welds shall be in strict accordance with American Welding Society (AWS) standards and the Structural Welding Code.

All welds shall be ground flush and prepared for finish.

PART 3 - EXECUTION

3.1 EXAMINATION

Installation shall not begin until substrates and surfaces have been properly prepared.

3.2 PREPARATION

Surfaces shall be thoroughly cleaned prior to installation. Surfaces shall be prepared using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

The Contractor shall install finished units in accordance with the fabricator's recommendations.

3.4 PROTECTION

The Contractor shall protect installed products until completion of project and shall touch-up, repair, or replace damaged products before Substantial Completion.

--End of Section--

SECTION 32 92 19
SEEDING
(06/12)

PART 1 - GENERAL

1.1 SCOPE

This work shall consist of seeding for all areas designated to receive specialized seeding as specified in the Contract Drawings.

Prior to the planting of any stock, the Contractor shall have previously added 4 in. of topsoil to the entire planting area.

Permanent Seeding shall be performed from April 1 to May 31 or from August 1 to September 10. Dormant seeding may be completed from November 1 to December 15.

1.2 RELATED WORK

The following section provides specifications for mulching that is required with all seeding.

Section 31 25 00 – Soil Surface Erosion Control

Water used in the planting, establishing, or caring for vegetation shall be free from any substance that is injurious to plant life.

1.3 SEED

For all disturbed upland areas of the site that require permanent seeding, including the staging and stockpile and site access area and other disturbed ground not within the wetland areas, the Permanent Upland Seeding shall consist of the seed mix following:

Botanical Name	Common Name	Form	% of Mix / Rate
Festuca rubra	Red Fescue	Seed	32.3%/10.0 lbs/ac
Poa compressa	Canada bluegrass	Seed	32.3%/10.0 lbs/ac
Lolium perenne	Perennial ryegrass	Seed	32.3%/10.0 lbs/ac
Agrostis alba	Red top	Seed	3.3%/1.0 lbs/ac

PART 2 - EXECUTION

2.1 SEEDING

Permanent upland seeding to be applied at a rate of 31 lbs/ac.

Equipment shall consist of spreaders and hydroseeders or other equipment approved by the engineer for applying materials either in a wet or dry form. All equipment shall be calibrated before application to the satisfaction of the Engineer so that materials are applied accurately and evenly to avoid misses and overlaps.

Hydroseeders shall display maximum capacity in gallons (liters) and be equipped with an agitation system capable of keeping all the solids in a state of suspension. The mixture shall be directed upward into the air so droplets will fall in a uniform spray to avoid erosion or runoff. Mechanical seeders shall be capable of placing seed at the specified rate. Hydroseeders and spinner spreaders shall not be used during periods of high winds or rain.

No fertilizer of any kind shall be added during the seeding operation.

Mulch shall be placed on the seeded areas within 48 hours after seeding.

--End of Section--

SECTION 32 93 43
TREES
(06/12)

PART 1 - GENERAL

1.1 SCOPE

Planting of trees that have to be removed for construction of the fishway is not anticipated. However, the Contractor shall replace in kind all trees that may be damaged during construction.

This section covers specifications regarding acquisition and handling of trees, placement and installation, post planting maintenance, and performance criteria.

As soon as practicable following final grading of areas designated to receive trees, the Contractor shall furnish, place and install containerized trees and shrubs of acceptable type and quality to replace damaged trees. The trees shall be located as determined by the Owner and directed by the Engineer.

The Contractor shall be responsible for furnishing, installation, establishment, protection, and maintenance of trees and shrubs until complete site demobilization. The Contractor shall be responsible for the in-kind replacement of any and all installed trees that does not successfully establish during the specified warranty period.

PART 2 - PRODUCTS

2.1 TREES

Replacement trees shall be of the type, size, and quantity directed by the Engineer.

Requests for substitutions shall be submitted by the Contractor in writing to the Engineer for approval. All trees shall derive of stock native to the Northeast United States, east of Ohio and north of 39.5 degrees north latitude; local ecotypes are preferred.

Trees shall be protected during shipment and delivery to prevent desiccation or excessive damage to the branches or leaves. At a minimum the following guidelines for shipping containers shall be met:

a) Container-grown trees shall be delivered in containers sufficiently rigid to hold root ball shape and protect trees and shrubs from damage during shipping.

b) Containerized trees shall be identified with durable waterproof, u-v stabilized labels, and weather-resistant ink stating the correct plant name and size.

Plant material and other products shall be inspected by the Engineer upon arrival at the jobsite for conformance with the contract documents. Any unacceptable materials shall immediately be removed by the Contractor from the jobsite and replaced at no additional cost to the Owner. The following guidelines shall be used by the engineer to evaluate the quality of plant material received from the nursery supplier:

Containerized trees shall be vigorous, healthy plants having healthy and branched root systems. If in leaf, plants shall be free from disease with no leaf damage, chlorosis, or wilting and no insect damage, sun-scald injury, or broken stems or branches. If dormant, stems shall be pliable and exhibit healthy cambium. Plants with brittle stems, unhealthy cambium or broken branches will not be accepted.

Trees not installed on the day of arrival at the site shall be stored in appropriate designated areas as directed by the Engineer. Trees and shrubs shall be kept moist by the Contractor and shall be protected from exposure to wind and shall be shaded from the sun.

Trees shall be furnished in sizes indicated; larger sizes than specified are generally acceptable.

Four inches of well-aged organic mulch is to be spread around the plantings as a top dressing over clean topsoil. Mulch can be shredded and composted hardwood mulch (usually a mixture of hardwood chips, twigs, and leaves) or composted organic matter. Uncomposted matter or fresh (green) wood, twigs, clippings, or other waste is not acceptable.

2.2 FERTILIZER

Fertilizer shall be commercial grade tablet or granular release (8- to 14-month) variety such as Osmocote 18-5-11, Agriform 20-10-5, or approved equal. Fertilizer shall be provided by the Contractor and application methods and rates determined based on laboratory analysis of soils provided by the contractor.

Plant material and fertilizers shall be provided by a nursery which procures and/or produces native material specifically for restoration or construction projects.

PART 3 - EXECUTION

3.1 PLANT PLACEMENT

Tree materials shall be placed by the Contractor in the appropriate planting zones and at densities as directed by the Engineer. Trees shall be installed within 7 days of achieving final grade in any area unless otherwise approved by the Engineer.

3.2 PLANT INSTALLATION

Tree plantings shall be installed by qualified professionals provided by the Contractor. All areas to be planted shall be free from weeds. Removal of weed growth shall be by approved methods which do not rut or scar the surface, or cause disruption of the slope line or grade.

3.3 PLANT SEASON

The calendar dates for installation of tree material shall be:

March 1 to June 15

August 15 to September 30

Plant installation at other times may be done only when approved by the Engineer.

3.4 PLANTING METHODS

Containerized plants shall be installed by the Contractor in the locations depicted in the Contract Drawings. Care shall be taken to avoid damage to stems, branches, bark, and root balls during installation. Any plant material damaged during installation shall be replaced at the Contractor’s expense.

Following the installation of containerized material, four inches of mulch shall be spread in the planted area. Care shall be taken to ensure that mulch is placed back a few inches from the base of the stems to discourage boring insects and fungi. The mulch application shall minimize watering requirements (by retarding evaporation and high soil temperatures) and will improve appearance.

Fertilizer shall be initially applied at a rate determined from analysis of the native soil.

3.5 ESTABLISHMENT, PROTECTION, AND MAINTENANCE

The Contractor shall be responsible for the establishment, protection, and maintenance of trees. Until complete site demobilization, the Contractor shall regularly water the trees and shrubs and protect the planted areas from damage due to foot traffic, vehicles, animals, or erosion (both wind and water). Silt fences shall be used to prevent mulch from washing downslope to the river in the event of flooding. Additional silt-fencing may need to be installed to protect planted areas from run-off originating from topographically higher areas. Until complete site demobilization, the Contractor shall also remove weeds and debris on a biweekly basis. The Contractor shall warranty installed trees for a period of one year beginning on the date of Final Acceptance of the project. All necessary replacements shall be the responsibility of the Contractor without additional cost to the Owner.

--End of Section--

SECTION 35 20 16
GATES AND OPERATORS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 148/A 148M	(2008) Standard Specification for Steel Castings, High Strength, for Structural Purposes
ASTM A 240/A 240M	(2009) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A 27/A 27M	(2008) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A 276	(2008a) Standard Specification for Stainless Steel Bars and Shapes
ASTM A 307	(2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 320/A 320M	(2008) Standard Specification for Alloy/Steel Bolting Materials for Low-Temperature Service
ASTM A 325	(2009) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 325M	(2009) Standard Specification for Structural Bolts, Steel, Heat Treated, 830 Mpa Minimum Tensile Strength (Metric)
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 490	(2008b) Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
ASTM A 490M	(2008) Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric)

ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 564/A 564M	(2004) Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
ASTM A 572/A 572M	(2007) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 588/A 588M	(2005) Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point, with Atmospheric Corrosion Resistance
ASTM D 2240	(2005) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D 395	(2003; R 2008) Standard Test Methods for Rubber Property - Compression Set
ASTM D 412	(2006ae1e2) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
ASTM D 413	(1998; R 2007) Rubber Property - Adhesion to Flexible Substrate
ASTM D 471	(2006; R 2008) Standard Test Method for Rubber Property - Effect of Liquids
ASTM D 572	(2004) Rubber Deterioration by Heat and Oxygen

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-W-410	(Rev E) Wire Rope and Strand

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

a. Shop Drawings

The Contractor shall submit Detail Drawings of the gates and operators to the Engineer for approval.

b. Product Data

Materials to be used in the fabrication of the gates shall be submitted to the engineer for approval. System of identification which shows the disposition of specific lots of approved materials and fabricated items in the work shall be submitted to the Engineer for the Project Record before completion of the contract.

c. Test Reports

Certified material test reports shall be submitted to the Engineer for the project record with all material delivered to the site.

Operation and test results shall be submitted to the Engineer for the project record before completion of the contract.

1.4 QUALIFICATION OF WELDERS AND WELDING OPERATORS

Qualification of welders and welding operators shall conform to the requirements of Section 05 50 14 – Structural Metal Fabrications.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 General

The Contractor shall deliver, handle, and store materials and fabricated items in accordance with the manufacturer's recommendations. The Contractor shall unload materials and equipment delivered to the site, verify the condition and quantity of the delivered items, and acknowledge receipt and condition thereof in writing to the Engineer. If delivered items are damaged or a shortage is determined, notify the manufacturer and the Engineer of such in writing within 24 hours after delivery.

1.5.2 Rubber Seals

Rubber seals shall be stored in a place which permits free circulation of air, maintains a temperature of 70 degrees F or less, and prevents the rubber from being exposed to the direct rays of the sun. Rubber seals shall be kept free of oils, grease, and other materials which would deteriorate the rubber. Rubber seals shall not be distorted during handling.

2.1 MATERIALS

2.1.1 Metals

Structural steel, monel, [babbit] steel forgings, steel castings, stainless steel, bronze, aluminum bronze, brass and other metal materials used for fabrication shall conform to the requirements as shown and as specified herein and in Section 05 60 00 - Structural Steel, Miscellaneous Steel, And Embedments.

2.1.1.1 Structural Steel

Structural steel shall conform to ASTM A 36/A 36M.

2.1.1.2 Structural Steel Plates

Structural steel plates shall conform to ASTM A 36/A 36M.

2.1.1.4 Stainless Steel Bars and Shapes

Stainless steel bars and shapes shall conform to ASTM A 276, UNS S 30400 Condition A, hot-finished or cold-finished, Class C.

2.1.1.5 Stainless Steel Plate, Sheet, and Strip

Stainless steel plate, sheet, and strip shall conform to ASTM A 240/A 240M, UNS S 30400. Plate finish shall be hot-rolled, annealed or heat-treated, and blast-cleaned or pickled. Sheet and strip finish shall be No. 1.

2.1.2 Rubber Seals

Rubber seals shall be compounded of natural rubber, synthetic polyisoprene, or a blend of both, and shall contain reinforcing carbon black, zinc oxide, accelerators, antioxidants, vulcanizing agents, and plasticizers.

Physical characteristics of the seals shall meet the following requirements:

PHYSICAL TEST	TEST VALUE	TEST METHOD SPECIFICATION
Tensile Strength	17.2 MPa2500 psi (min.)	ASTM D 412
Elongation at Break	450 percent (min.)	ASTM D 412
300 percent	6.2 MPa900 psi (min.)	ASTM D 412
Durometer Hardness (Shore Type A)	60 to 70	ASTM D 2240
*Water Absorption	5 percent by weight (max.)	ASTM D 471
Compression Set	30 percent (max.)	ASTM D 395
Tensile Strength (after aging 48 hrs)	80 percent of tensile strength (min.)	ASTM D 572

The "Water Absorption" test shall be performed with distilled water. The washed specimen shall be blotted dry with filter paper or other absorbent material and suspended by means of small glass rods in the oven at a temperature of 70 degrees C plus or minus 2 degrees for 22 hours plus or minus 1/4 hour. The

specimen shall be removed, allowed to cool to room temperature in air, and weighed. The weight shall be recorded to the nearest 1 mg as M subscript 1 (M subscript 1 is defined in ASTM D 471). The immersion temperature shall be 70 degrees C plus or minus 1 degree and the duration of immersion shall be 166 hours.

2.2 FABRICATION

2.2.1 Detail Drawings

Detail drawings, including fabrication drawings, shop assembly drawings, delivery drawings, and field installation drawings, shall conform to the requirements specified and in Section 05 50 14 – Structural Metal Fabrications.

2.2.1.1 Fabrication Drawings

Fabrication drawings shall show complete details of materials, tolerances, connections, and proposed welding sequences which clearly differentiate shop welds and field welds.

2.2.1.2 Shop Assembly Drawings

Shop assembly drawings shall provide details for connecting the adjoining fabricated components in the shop to assure satisfactory field installation.

2.2.1.3 Delivery Drawings

Delivery drawings shall provide descriptions of methods of delivering components to the site, including details for supporting fabricated components during shipping to prevent distortion or other damages.

2.2.1.4 Field Installation Drawings

Field installation drawings shall provide a detailed description of the field installation procedures. The description shall include the location and method of support of installation and handling equipment; provisions to be taken to protect concrete and other work during installation; method of maintaining components in correct alignment; plan for prestressing gate leaf diagonals, which shall include descriptions of connections, riggings, anchorages, and measuring equipment; and methods for installing other appurtenant items.

2.2.2 Structural Fabrication

Structural fabrication shall conform to the requirements as shown on the drawings and specified herein. Dimensional tolerances shall be as specified and as shown. Bolt connections, lugs, clips, or other pick-up assembly devices shall be provided for components as shown and required for proper assembly and installation. Provisions shall be made for the installation of cathodic protection system devices and other appurtenances as recommended by the manufacturer.

Welding shall conform with the requirements specified and in Section 05 60 00 - Structural Steel, Miscellaneous Steel, and Embedments. Welds shall be of the type shown and approved shop drawings. Components shall be stress-relief heat treated after welding where shown. Stress-relieving of components shall be performed prior to the attachment of miscellaneous appurtenances.

2.2.3 Downstream Fish Bypass Sluice Gate

2.2.3.1 Slide Gate

The downstream fish bypass sluice gate shall be a multi-leaf slide gate with two-component structural fabrication. The slide gate shall be shop fabricated and shall be provided complete with gate stem, stem guides, seals, seal collars, manual operator, and other appurtenant items as required for installation. The bottom of the gate will be downward descending to the full open position and will have top level at El. 15.0 ft in the full closed position. The top half of the gate will seal on the bottom half of the gate and on the top of the sluice opening at El. 17.5 ft when in the full closed position. In the full open position, the top half of the gate will clear the top of the opening (El. 17.5 ft). Both leafs of the slide gate will be manually operated from the intake structure operating deck with separate operators.

Surfaces of gate framing elements to which skin plates are to be welded shall not vary from a true plane by more than 1/16 inch to provide uniform bearing. The outside surfaces of skin plates welded to framing elements shall not vary from a true plane by more than 1/16 inch. The overall width and height of the fabricated gate shall not vary from the respective dimensions shown on the drawings by more than 1/16 inch. The gate components shall be stress-relieved prior to the attachment of the seals. Surfaces where seals are attached shall be accurately machined to provide uniform bearing for the full contact dimensions. Bottom and side seals shall be firmly butted together at the corners. The ends of side bar seals shall be flush with the bottom seating surface of the gate. Final machining of seals shall be performed after they are attached to the gate. The bottom seat of the gate shall be machined for a tight fit with the gate frame sill.

2.2.3.2 Slide Gate Frame

The slide gate frame shall be shop fabricated. Guiding and seal surfaces of slide gate frame and bonnet shall be in a true vertical plane and shall be machined finished. Unmachined surfaces exposed to water flow shall match at joints between component parts, shall not depart from true planes shown by more than 1/16 inch and shall be free of offsets or irregularities greater than 1/16 inch. Allowable offsets or irregularities of less than 1/16 inch shall be ground to a bevel of not greater than one on twenty-four. The bottom seat of the gate shall be machined for a tight fit with the gate frame sill. Gate frame and bonnet shall be stress relieved prior to the attachment of seals. Surfaces where seals are attached shall be accurately machined to provide uniform bearing for the full contact dimensions. Top, side, and invert seals shall be firmly butted together at the corners. Final machining of seals shall be performed after they are attached to the gate frame.

2.2.3.3 Slide Gate Operator, Pedestal, and Base Plate

The flanges of the gate pedestal and base plate for the supporting the operator for the slide gate shall be accurately machined and drilled to match mating flanges and provide the required true alignment. Base plate dimensions may be altered to fit the operating machinery furnished, provided the basic configuration, plate thickness, and number and sizes of fasteners are equal to that shown and the altered dimensions are approved by the manufacturer.

2.2.4 Fishway Entrance Weir Gate

2.2.4 Weir Gate

The fishway entrance weir gate shall be a bottom hinged gate with side seals and an electric operator and shall be of single-component structural fabrication. The weir gate shall be shop fabricated in accordance with the Contract Drawings and shall be provided complete with two gate stems, stem guides, seals, seal collars, operator pedestals, electric operator, and other appurtenant items as required for installation.

Surfaces of gate framing elements to which skin plates are to be welded shall not vary from a true plane by more than 1/16 inch to provide uniform bearing. The outside surfaces of skin plates welded to framing elements shall not vary from a true plane by more than 1/16 inch. The overall width and height of the fabricated gate shall not vary from the respective dimensions shown on the drawings by more than 1/16 inch. The gate components shall be stress-relieved prior to the attachment of the seals. Surfaces where seals are attached shall be accurately machined to provide uniform bearing for the full contact dimensions. Bottom and side seals shall be firmly butted together at the corners. The ends of side seals shall be flush with the bottom seating surface of the gate. Final machining of seals shall be performed after they are attached to the gate. The bottom seat of the gate shall be machined for a tight fit with the gate frame sill.

2.2.4.2 Weir Gate Frame

The weir gate frame shall be shop fabricated and with both side seal components delivered to the site at the same time. Guiding and seal surfaces of weir gate frame shall be in a true vertical plane and shall be machined finished. Unmachined surfaces exposed to water flow shall match at joints between component parts, shall not depart from true planes shown by more than 1/16 inch and shall be free of offsets or irregularities greater than 1/16 inch. Allowable offsets or irregularities of less than 1/16 inch shall be ground to a bevel of not greater than one on twenty-four. The bottom seat of the gate shall be machined for a tight fit with the gate frame sill. Gate frames shall be stress relieved prior to the attachment of seals. Surfaces where seals are attached shall be accurately machined to provide uniform bearing for the full contact dimensions. Top, side, and invert seals shall be firmly butted together at the corners. Final machining of seals shall be performed after they are attached to the gate frame.

2.2.4.3 Weir Gate Operator, Pedestals, and Base Plate

The flanges of the gate operator pedestals and base plates for the supporting the operator for the weir gate shall be accurately machined and drilled to match mating flanges on the gate frame and provide the required true alignment. Base plate dimensions may be altered to fit the operating machinery furnished, provided the basic configuration, plate thickness, and number and sizes of fasteners are equal to that shown and the altered dimensions are approved by the manufacturer.

2.2.4.4 Weir Gate Controls

The weir gate shall have an electric motor operator capable of raising or lowering the gate. The gate manufacturer will be responsible for designing the control logic system for the weir gate. The gate manufacturer will be providing a control box with a motor starter and control system for the gate. The gate control system will take the 4-20 mA signal from the water level transducer to set the gate at a prescribed set point. A power transformer will be located in control box to provide control power for the water level sensor. During the winter, the water level sensor will be removed and appropriately stored.

The weir gate actuator system will be designed open or close the gate to three (3) specific elevations:

Tide El. (ft)	Gate El.(Ft)
<0.0	-4.0
0.0<h<2.0	-2.0
2.0<h<4.0	0.0
>4.0	+2.0

The transducer will have set points at El. 0.0 ft, El. 2.0 ft, and El. 4.0 ft on the ascending and descending tides to set these gate positions

2.3 SHOP ASSEMBLY

Gate, frame, guides, and appurtenant items shall be assembled completely in the shop to assure satisfactory field installation. The match marking of unassembled components shall be carefully preserved until the components are assembled. Adequate support shall be provided during assembly to maintain components within 1/16 inch of actual installation planes. Mating surfaces and machined surfaces shall be coated with a rust preventive coating until assembled. Other connecting surfaces which are not required to be disassembled for shipment shall be thinly coated with an approved rust preventive coating before being joined. Adjoining components shall be fitted and bolted together to facilitate field connections. Shop assembled components shall be delivered assembled, if practically permitted by shipping and field installation conditions. Assembled components shall be shop welded in their final positions as much as delivery and field installation conditions allow. Shop assembly and disassembly work shall be performed in the presence of the Contracting Officer unless otherwise approved. The presence of the Contracting Officer will not relieve the Contractor of any responsibility under this contract.

2.3.1 Slide Gate

Shop assembly of the slide gate shall be in the vertical position. Shop assembly shall include the attachment of all accessories to the gate. If the gate leaf is out of plumb by more than 1/4 inch) in the total length in a vertical plane in the upstream-downstream direction, or by more than 1/16 inch in the total width in a vertical plane perpendicular to the vertical plane in the upstream-downstream direction, it shall be balanced by counterweighting or some other method.

2.3.2 Weir Gate

Shop assembly of the weir gate shall be in the horizontal position with the skin side of the gate leaf facing down. Shop assembly shall include the attachment of all accessories to the gate.

2.3.2 Seal Assemblies

Seal assemblies shall be attached to the gates during shop assembly and removed for shipment. The rubber seals of the assemblies shall be accurately fitted, drilled to match the seal retainers, match marked, and removed for shipment.

2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

Tests, inspections, and verifications for materials and fabricated items shall conform to the requirements specified and in Section 05 50 14 – Structural Metal Fabrications.

2.4.2 Inspection

Shop-assembled components shall be inspected for accurate fit and compliance with dimensional tolerances. Sealing, guiding, and connecting surfaces shall be inspected to determine if their planes are true, parallel, and in uniform contact with opposing surfaces. With the gate closed and uniformly blocked in the sealing position, rubber seals shall be inspected to determine if they are in continuous contact with the seal plates. Compression of rubber seals shall not vary by more than 1/32 inch.

2.4.3 Operational Tests

The operation of the shop-assembled gate assemblies shall be tested by opening and closing the gate several times by use of the operating machinery. The force used to operate the gate shall be the minimum required to open and close the gate. Since the sill of the unembedded gate frame is not fully supported during the operation tests, special precaution shall be taken to prevent the application of excessive force on the gate and frame when the gate is closed. Adjustments shall be made as required until operations are satisfactory.

The gate assembly shall be tested hydrostatically by applying a hydrostatic pressure of 2 psi, measured at the sill of the gate frame, to the upstream side of the gate leaf in the closed position. For conducting the hydrostatic testing, the gate frame shall be bulkheaded or restrained by some other method as approved. Under hydrostatic testing, the gate seals shall be sufficiently tight to prevent water leakage.

PART 3 - EXECUTION

3.1 INSTALLATION

Gate installation shall conform to all requirements specified by the manufacturer. Gate and appurtenant items shall be assembled for installation in strict accordance with the manufacturer's drawings, approved installation drawings, and shop match-markings. Components to be field welded shall be in correct alignment before welding is commenced.

3.1.1 Embedded Metals

Frames, bases, and other embedded metal items shall be accurately installed to the alignment and grade required to ensure accurate fitting and matching of components. Shims, jackbolts, or other supports required to align and hold components rigidly in place until embedment concrete has attained the specified strength shall be provided. Anchors shall be installed as shown. Embedded metals shall be given a primer coat of the required paint on all surfaces prior to installation in concrete forms. Items

requiring two concrete pours for installation shall be attached to the embedded anchors after the initial pour, adjusted to the proper alignment, and concreted in place with the second pour.

3.1.2 Gate Frame and Guides

Gate frames, guides, and seal plates shall be connected to embedded anchors, aligned, and rigidly blocked in place prior to the placement of concrete. The sealing surfaces of the gate frame seals shall serve as the reference plane for the installation alignment. Alignment shall be to two theoretical control planes described as control plane "A" and control plane "B". Control plane "A" is a vertical plane that is normal to the water passageway and is located at the sealing surface of the gate frame seal bars. Control plane "B" is a vertical plane that is parallel to the water passageway and is located at the centerline of the water passageway. The gate frame shall be aligned to within 0.015 inch of control planes "A" and "B". A taut piano wire and an electric micrometer or some other approved method shall be used to measure the vertical alignment tolerances. Gate frame and guides shall be tested for proper alignment and clearances prior to being embedded in concrete by lowering and raising the gate through the full operating range.

3.1.3 Gates

Gates shall be completely assembled, including the attachment of all components and accessories, prior to being placed in the gate frame. All necessary precautions shall be taken to avoid distortion of the gates and attached components during installation. Rubber seals shall be fastened securely to metal retainers. Before operating the gate, a suitable lubricant shall be applied to the rubber seal rubbing plates to protect the rubber.

3.1.4 Operating Machinery

Operating machinery for the gate assembly and supporting components, including pedestals and base plate, shall be positioned and aligned to the installed location of the gate frame and guides and anchored in place. The location of the slide gate stem shall be projected to and scribed on the sill of the installed gate frame to serve as a reference point for the alignment of operating machinery and supporting components. Operating machinery and components shall be aligned to within 0.030 inch of the reference point. Prior to being embedded in concrete, an alignment template shall be bolted to the forms.

3.1.5 Concrete and Concrete Grout Placement

The embedment of the gate frame and other components in concrete shall be performed in an approved manner to fill all voids, secure anchorage, prevent seepage, and provide uniform finish surfaces. After embedment concrete has cured for at least 7 days, any voids around embedded components shall be filled by pumping concrete grout around the components. After the pumped grout has cured for at least 7 days, hammer blows to the components shall be used to detect any remaining voids. Where remaining voids are located, 1 inch diameter grout holes shall be drilled in the components and the voids shall be filled by pressure grouting through the grout holes. Grout holes in the components shall be plugged by welding and shall be ground flush.

3.2 OPERATING MACHINERY

Gate operators shall be installed in accordance with the manufacturer’s instruction.

3.3 ACCEPTANCE TRIAL OPERATION AND TEST

After the gate assembly has been installed, including operating machinery, the Engineer will examine the complete system for final acceptance. Operation and test results conducted by the Contractor shall be furnished to the Engineer. The assembly will be examined first to determine whether or not the workmanship conforms to the specification requirements. The Contractor shall operate the gate throughout its full operating range a sufficient number of times to demonstrate proper operation to the Engineer. The initial operation of the gate assembly shall be conducted in the dry prior to removal of the cofferdam. The second trial operation and testing of the gate assembly shall be conducted with the reservoir normal operating pool hydrostatic pressure. The workmanship in the fabrication and installation of the gate assembly shall be such that the gate shall form a watertight barrier when lowered to the seated position. Adjustments shall be made to the operation and control apparatus until all components function as required. Required repairs or replacements to correct defects, as determined by the Engineer, shall be made at no additional cost to the Owner. The trial operation and testing shall be repeated after defects are corrected.

3.4 PROTECTION OF FINISHED WORK

The Contractor shall protect all finished gate installation work through the entire construction period and the facilities have been accepted.

-End of Section--

SECTION 41 22 23
MONORAIL HOISTS
(06/12)

PART 1 - GENERAL

1.1 SCOPE

Provide a monorail system with electric powered hoist and electric powered trolley complete, tested and ready for operation. Monorail, hoist, trolley, equipment, materials, installation, examination, inspection, and workmanship shall conform to the applicable requirements of NFPA 70, ASME B30.11, ASME B30.16, ASME HST-1, and MHI MH27.2 as modified and supplemented by this specification. Reference in these publications to the "authority having jurisdiction" means the Engineer.

1.1.1 Design Data

The Contractor shall submit structural design calculations verifying the size of structural members, structural supports (fittings, rods, brackets, and components), and lifting beams for the track beam system, including stress and loading diagrams. Monorail calculations shall be submitted with monorail drawings. Additional product data for commercially procured items, including as a minimum, the festoon system and end stops.

1.1.2 Design Requirements

The Contractor shall submit shop drawings showing crane capacity, hook envelope, and the general arrangement of the track beam system, including curves and switches, clearances, principal dimensions, details of structural connections, and all component details. Include complete schematic wiring diagram with description of operation. Manufacturer's catalog data will suffice for items of standard manufacturer.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 348	(2000) Structural Joints Using ASTM A325 or A490 Bolts

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2008; Errata 2009) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B30.11	(2004) Monorails and Underhung Cranes - Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings

ASME B30.16	(2007) Overhead Hoists (Underhung) Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings
ASME HST-1	(1999; R 2004) Performance Standard for Electric Chain Hoists

AMERCIAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 275/A 275M	(2008) Standard Test Method for Magnetic Particle Examination of Steel Forgings
ASTM A 325	(2009) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 325M	(2009) Standard Specification for Structural Bolts, Steel, Heat Treated, 830 Mpa Minimum Tensile Strength (Metric)
ASTM A 563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A 563M	(2007) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM E 543	(2008a) Standard Practice for Agencies Performing Non-Destructive Testing
ASTM E 709	(2008) Standard Guide for Magnetic Particle Examination
ASTM F 436	(2009) Hardened Steel Washers
ASTM F 959	(2007a) Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners
ASTM F 959M	(2007) Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners (Metric)

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 74	(2004) Top Running and Under Running Single Girder Electric Overhead Cranes Utilizing Under Running Trolley Hoist, No. 74

MATERIAL HANDLING INDUSTRY OF AMERICA, INC (MHIA)

MHI MH27.1	(2003) Specifications for Underhung Cranes and Monorail Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ESPG	(2004) Electrical Standards and Product Guide

NEMA ICS 8	(2000; R 2005) Industrial Control and Systems Crane and Hoist Controllers
NEMA MG 1	(2007; Errata 2008) Standard for Motors and Generators
NEMA MG 2	(2001; Rev 1 2007) Safety Standard for Construction and Guide for Selection, Installation, and Use of Electric Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.179 Overhead and Gantry Cranes

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 – Submittal Procedures:

a. Shop Drawings

Shop drawings shall be submitted to the Engineer for approval, including:

- Monorail system, including attachments to existing building structure roof beams
- Complete schematic wiring diagram with description of operation

b. Product Data

The following product data shall be submitted to the Engineer for the project record:

- Electric Chain Hoist Trolley
- Pendant Pushbutton Station
- Hook Proof Test
- Festoon System
- End Stops

Product data shall include manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions, and parts list.

c. Test Reports

The following test reports shall be submitted to the Engineer for the project record:

- 125% Rated Load Test
- No-Load Test

- Post-Erection Inspection
- Operational Tests
- Rated Load Speed Test
- Load Chain Proof Test
- Hook NDT Report

d. Certificates

- Compliance with all listed Standards
- Semi-Annual Overload/Safe for Testing
- Loss of Power Test
- Hook Proof Test

e. Operation and Maintenance Data

Monorail with hoist system, all components, Operation and Maintenance Manual

1.4 QUALITY ASSURANCE

1.4.1 Certificates

The following certifications shall be submitted to the Engineer for the project files:

a. Certification of minimum Load Chain Proof Test, clearly indicating load chain breaking strength for each hoist, and clearly identified for traceability and factory certification of load chain rated capacity.

b. Certification that the hoist, hook, and trolley system contains no hazardous material, asbestos, cadmium, lead, elemental mercury, or PCBs.

c. Semi-Annual Overload/Safe for Testing certification that the hoist, hook, and trolley system is safe to test on a semi-annual overload basis with a test load of 131.25% of rated capacity with no detrimental effects.

d. Certification that testing may be performed in which hoist, hook, and trolley system is subjected to a Loss of Power Test during operation with no detrimental effects.

e. Certification that the hoist, hook, and trolley system design and fabrication is in compliance with all listed standards.

f. Hook Proof Test certification that the hoist hook was subjected to a minimum static load of 200% of rated capacity for at least 10 minutes without deformation.

g. Runway Straightness/Levelness certification that the straightness, levelness, and elevation of the monorail system meet MH27.1 requirements.

h. Certification of brake settings, including the allowable range of adjustment for hoist and trolley brakes and the initial setting of each.

1.4.2 Pre-Erection Inspection

Before erection, the Contractors and the manufacturer's representative shall jointly inspect the monorail and hoist systems and components at the job site to determine compliance with specifications and manufacturer's data and shop drawings as approved. The contractor shall notify the Engineer 7 days before the inspection.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

The Contractor shall inspect materials delivered to site for damage; unload and store with minimum handling. Materials shall be stored onsite in enclosures or under protective coverings. Materials not suitable for outdoor storage shall be protected to prevent damage or corrosion during periods of inclement weather, including subfreezing temperatures, precipitation, and high winds. Materials susceptible to deterioration by direct sunlight shall be stored under cover and avoid damage due to high temperatures. Do not store materials directly on ground. When special precautions are required, prominently and legibly stencil instructions for such precautions on outside of equipment or its crating.

1.5.2 Handling

Materials shall be handled in such a manner as to ensure delivery to final location in undamaged condition. Make repairs to damaged materials at no cost to owner.

1.6 MAINTENANCE

The contractor shall submit a maintenance manual prepared by the manufacturer for the entire monorail system in accordance with Section 01 78 23 – Operation and Maintenance Data.

PART 2 - PRODUCTS

2.1 IDENTIFICATION PLATES

Manufacturer-installed identification plates of non-corrosive metal showing shall be provided in clearly legible permanent lettering, the manufacturer's name, model number, capacity rating in pounds, and other essential information. Monorail track beam identification plates showing the capacity of the system, in pounds, legible from the floor and from either side of the monorail track beam shall be provided.

2.2 OVERHEAD MONORAIL SYSTEM

The contractor shall provide an overhead monorail system conforming to MHI MH27.1, Duty Class C, Frequent Usage (Heavy Service), for outdoor service, with an electrical chain hoist mounted on a movable motor operated trolley. The hoist and trolley shall meet the design requirements specified in ASME HST-1, Duty Class.

2.2.1 Capacity and Speed

The monorail system shall have a minimum rated capacity of 2 tons. The hook lift capacity and speed shall be the manufacturer's standard within the limits specified above. The hook lift maximum height limit is 15 feet above the finished floor and, at its lowest point, 5 feet below the finished floor.

2.2.2 Material and Design Requirements

The monorail hoist system shall include the following design requirements:

a. Powered hoists shall include a brake and a controlled braking means, and an overload limiting device.

b. Directional contactors shall include electrical and mechanical interlocks. Design the mainline contactor, along with the power-off/power-on circuitry to remove power from the drive motors, brakes and control circuit. The control circuit shall not operate unless a power-on button is depressed.

c. Overcurrent protection for the control circuit and control circuit transformer; fuse or circuit breaker protection for branch circuit short circuit and ground fault protection; and overload protection for each motor, motor controller, and branch circuit conductor shall all conform to the NFPA 70.

d. Provide safety (drop) lugs or a functional equivalent on the trolley frame to prevent derailment in the event of wheel failure.

e. The hoist and trolley shall be capable of general service protected indoor working conditions.

f. The monorail hoist system shall operate on a 480-volt power supply.

2.2.3 Safety

The monorail system shall comply with the mandatory and advisory safety requirements of ASME B30.11, ASME B30.16, and 29 CFR 1910.179. The Contractor is responsible for checking the proper operation and condition of safety devices, electrical components, mechanical equipment, and structural assemblies prior to installation. Immediately report any observed defective components and replace. The contractor shall submit structural and load capacity calculations verifying a design safety factor of 5 to 1 to ultimate strength of weakest material (steel) used for any track suspension device or support which is not a standard cataloged product of the manufacturer.

2.3 MONORAIL TRACK SYSTEM

The track system shall conform to MHI MH27.1, except as modified and supplemented in this section, for powered hoists. Provide patented track beam sections fabricated by a manufacturer regularly engaged in production of this type of beam. The maximum allowable vertical and lateral deflection shall conform to

CMAA 74, with the hoist at rated load(s) and at any location(s). Rail separation at joints shall not exceed 1/16 in.

2.3.1 Quick Shutoff

Electrical disconnect and/or quick shutoff type air supply valve, readily accessible from the floor, and located within proximity to the monorail system shall be provided.

2.3.2 Track Beam System

Track beam system shall have trolley stops at all open end locations. The stops shall retain the hoist on the track. Stops shall contact the wrap-around type trolley frame.

2.3.3 Track Suspension System

Rigid type monorail suspension shall be provided. Design and installation of the monorail track beam suspension system is the responsibility of the Contractor. The monorail track system shall be supported using only the structural members indicated on the drawings.

The monorail track beam shall be suspended with the beam manufacturer's standard cataloged suspension products. Submit manufacturer's published tables verifying the sizing of any track beam and suspension system shall be submitted.

Bolted connections to supporting structure, excluding hanger rods, shall be with ASTM A 325 bolts, ASTM A 563 nuts, and ASTM F 436 hardened washers. ASTM A 325 bolts shall be fully pre-tensioned in accordance with AISC 348.

2.4 ELECTRIC CHAIN HOIST

Electric chain hoist shall conform to ASME HST-1, Class H3 and NEMA ICS 8, NEMA MG 2, and NEMA ESPG except as modified herein. Load chain proof test results shall be provided.

Chain hoists with 10-ft lift or more shall have a load chain bucket.

2.5 TROLLEY

The trolley drive shall be designed to operate from the track beam section furnished under this contract.

2.6 MOTORS

Motors shall conform to NEMA MG 1. All motors shall be minimum 60-minute duty rating. Motor insulation shall be Class H with a Class B temperature rise. All motors shall be equipped with thermal trip type over-temperature protection. Single-speed magnetic control shall be provided for the hoist and trolley.

2.6.1 Trolley Motors

The trolley drive motor shall be AC totally enclosed non-ventilated (TENV), squirrel cage induction type. The trolley motor shall have reduced voltage starting, acceleration and deceleration for the trolley drive.

2.6.2 Hoist Motors

Hoist motors shall be totally enclosed non-ventilated (TENV), squirrel cage induction type hoist motors.

2.6.3 Adjustable Frequency Drive Controls

2.6.3.1 Trolley Electric Drive

Static reversing, adjustable frequency controllers shall be provided.

2.6.3.2 Hoist Electric Drive

The hoist electric drive shall have a static reversing, adjustable frequency, speed regulated, closed loop flux vector controller with encoder feedback. The hoist drive shall ensure that adequate motor torque is available to suspend the load before the brakes are released. For a hoist with one brake, two independent drive outputs energizing separate brake contactors, whose contacts are in series with the brake coil, are required to release the brake; or an additional separate brake contactor independent of the drive whose contact is in series with the drive controlled brake contactor. For hoists with two brakes, connect the secondary brake to a different output from the primary brake.

2.6.3.3 Electric Drive Speed Control

Each electric drive shall be infinitely variable. Speed control shall be of the three step infinitely variable type for the hoist function, and two-step infinitely variable type for the trolley function, controlled via pendant pushbuttons.

2.6.3.4 Dynamic Braking

Dynamic braking shall be provided for both hoist and trolley electric drives. The hoist and trolley brakes shall set after the associated controller decelerates motor to a controlled stop. Size the hoist and trolley controllers to provide sufficient starting torque to initiate motion of that drive mechanism from standstill with 0 to 131.25 percent of rated load on the hook and not produce any rollback. The hoist controller shall enable the drive motor to develop full torque continuously at zero speed. Drive motors shall run smoothly, without torque pulsations at the lowest speed and be energized at a frequency not exceeding 60 HZ for the trolley, and 120 HZ for the hoist drive, with less than full capacity on the hook.

2.7 CONTROLS

Control of the electric hoist and trolley shall be from a pendant pushbutton station. Arrange pushbuttons in accordance with ASME B30.11 recommendations. If provided, locate pushbutton station 4 ft above the finished floor. Control pendant shall extend below the underside of the track beam.

2.8 LIMIT SWITCHES

The hoist shall be equipped with adjustable upper and lower limit stops for chain to prevent over-travel in both the raising and lowering directions. Use a three-position spring return bypass key switch. In one direction the bypass key switch shall allow resetting of the secondary upper limit switch prior to resuming operation. During resetting of the secondary limit, the hoist shall operate in the lowering direction only. In the other direction, the keyed bypass switch shall allow bypassing of the primary upper limit switch to allow the secondary limit switch to be tested on a periodic basis.

2.9 BRAKES

2.9.1 Hoist Load Brake

A hoist load brake that is capable of stopping and holding a 131.25% test load shall be provided. If dynamic braking is not included, provide a hoist mechanical load brake that is capable of stopping and holding a 131.25% test load. If the hoist has more than one brake, each brake shall independently stop and hold 131.25% of rated capacity.

2.9.2 Trolley Brake

The trolley shall have either a non-coasting worm drive or with an electro mechanical brake that is spring applied, electrically released trolley brake shall have a torque rating equal to or greater than 50% of the drive motor rated torque and be adjustable from 85% to 100% of its torque rating. The trolley brake shall be equipped with a manual release and shall be designed to permit easy access for wear, inspection and setting.

2.10 LOAD BLOCK AND HOOK

The hoist shall have a safety hook fitted with self-closing, spring loaded steel safety latch, and with hook nuts keyed to hook shanks by means of a setscrew installed in a plane parallel to the longitudinal axis of the hook shank, or by any other similar easily removable securing device. Unpainted hook and hook nut, permanently marked with an identification number shall be provided. The hook and hook nut shall be clearly marked with a unique identification number corresponding to the number used in non-destructive test (NDT) reports.

2.10.1 Non-Destructive Testing

The following requirements apply:

a. The Hook NDT Report supplier shall provide a letter certifying that the requirements of ASTM E 543 are met.

b. The NDT supplier shall develop, and submit for review, procedures, including technique sheets specific to the types, shapes, and sizes of the parts being examined (e.g., shank hook, eye hook, duplex hook, eye bar nut). For the magnetic particle method, the procedures shall adequately describe the orientation of the hook or nut, or pin with the magnetizing equipment.

c. These procedures shall be reviewed by a Level III examiner who is independent of the NDT supplier and is certified in the applicable NDT method.

2.10.2 Hook and Hook Nut Magnetic Particle Inspections

The hook and hook nut shall be magnetic-particle inspected in compliance with ASTM E 709 over the entire area in accordance with ASTM A 275/A 275M, with the following restrictions: Do not use DC yokes (including switchable AC/DC yokes used in the DC mode) and permanent magnet yokes. Do not use automatic powder blowers or any other form of forced air other than from a hand-held bulb for the application or removal of dry magnetic particles. Remove arc strikes. Equipment ammeters shall have an accuracy of +/- 5 percent of full scale (equipment ammeter accuracy other than that stated is acceptable provided the MT procedure states that a magnetic field indicator is used to establish and verify adequate

field strength for the aspects of the inspection). The acceptance standard is no linear indications greater than 1/16 in.

2.11 BEARINGS

All bearings except those subject to a small rocker motion shall be anti-friction type. Provide a means for lubrication for bearings not considered to be lifetime lubricated by the manufacturer.

2.12 ELECTRIFICATION

Runway electrification shall be the flat festooned type. Electrical work for the monorail system shall be in accordance with NFPA 70 and Section 26 20 00 – Interior Distribution System.

2.13 PAINTING SYSTEM

Manufacturer's standard painting of components shall be provided including a primer and a finish coat. All components shall be blast cleaned prior to painting. Primer shall be inorganic zinc type. Paint coats shall be smooth and even, free of runs, sags, orange peel, or other defects.

PART 3 - EXECUTION

3.1 ERECTION AND INSTALLATION

The monorail system shall be installed complete in accordance with the approved submittals and in condition to perform the operational and acceptance tests.

3.2 ERECTION SERVICES

Supervisory erection services from the monorail system manufacturer shall be provided.

3.3 FIELD QUALITY CONTROL

3.3.1 Post-Erection Inspection

After erection, the Contractor, the Engineer, and a representative of the Owner shall jointly inspect the monorail and hoist systems and components to determine compliance with specifications and approved submittals. Notify the Engineer 7 days before the inspection. A list of deficient items, including a determination of criticality will be provided to the Contractor for corrective action. Outstanding items shall be noted for correction during the inspection. Items considered critical (load bearing, load controlling, or operational safety devices) shall be corrected prior to further testing. Upon correction, provide a report of the inspection indicating the monorail system is considered ready for operational tests.

3.3.2 Operational Tests

After erection and inspection, test the monorail system, hoist, and trolley as specified herein. The systems in service shall be tested to determine that each component of the system operates as specified, is properly installed and adjusted, and is free from defects in material, manufacturing, installation, and workmanship. All deficiencies disclosed by testing shall be rectified and retested of system or component to prove the monorail system is operational.

The contractor shall furnish loads for testing, operating personnel, instruments, and all other necessary apparatus.

The contractor shall furnish test loads, operating personnel, instruments, and other apparatus as necessary to conduct field tests on hoist and monorail. The contractor shall perform test and final adjustments of the equipment under the supervision of the Contracting Officer, and a representative of the activity crane maintaining organization.

3.3.3 Test Data

The contractor shall record test data on appropriate test record forms suitable for retention for the life of the monorail system. Operating and startup current measurements for electrical equipment (motors and coils) shall be recorded using appropriate instrumentation (i.e., clamp-on ammeters). Recorded values shall be compared to design specifications or manufacturer's recommended values. Abnormal differences (i.e., greater than 10 percent from manufacturer's or design values) shall be justified or appropriate adjustments performed. In addition, note any high temperatures or abnormal operation of any equipment or machinery, investigate and correct. Hoist and trolley speeds shall be recorded during each test cycle.

3.3.4 Hook Tram Measurement

The hook shall be measured for hook throat spread before and after load test. A throat dimension base measurement shall be established by installing two tram points and measuring the distance between these tram points (plus or minus 1/64 in.) as the base dimension. The distance between tram points shall be measured before and after load test. An increase in the throat opening from the base measurement is cause for rejection.

3.3.5 No-Load Test

a. Hoist: Raise the load hook the full operating lift distance and verify satisfactory operation of hoist, upper limit switches, lower limit switch, and the hoisting and lowering speeds.

b. Trolley: Operate trolley assembly the full length of the monorail in both directions. Operate trolley at low and high speed in each direction. Verify satisfactory operation and verify trolley speed.

3.3.6 Rated Capacity Load Test

The following hoist system tests shall be conducted at 100 percent of rated capacity:

a. Hoist Static Test: Raise test load approximately 1 ft above the floor and hold for 10 minutes. Observe load lowering that may occur which indicates malfunction of hoisting component or brake. Lower the test load to the floor until the hoist line is slack.

b. Hoist Dynamic Test: Raise the test load to approximately 5 ft above the floor, using both speed points in the process. Lower the load back to the floor using both speed points. Stop the test load at least once while lowering at high speed and observe proper brake operation. Wait 5 minutes and then repeat the above cycle.

c. Load Brake Test: Raise test load approximately 5 ft. With the hoist controller in the neutral position, release the holding brake. The load brake must hold the test load. Again with the holding brake in the released position, start the test load down and return the controller to off position as the test load lowers. The load brake must stop and hold the test load.

d. Loss of Power Test: Raise the test load approximately 3 ft and while lowering test load, cut main power to hoist. The load must stop.

e. Trolley Test: With test load hoisted to a height of 1 ft above the floor, operate trolley the full distance of the monorail in both directions, using both speed points in the process. Observe for any malfunctioning of the trolley assembly and monorail system.

3.3.7 Rated Load Speed Test

With the hoist loaded to rated capacity, raise and lower the load verifying that the hoisting and lowering speeds are provided as specified. With the hoist loaded to rated capacity, operate trolley along the monorail beam verifying that the trolley speed is provided as specified. Further, verify that the trolley stops in each direction within a distance in feet equal to 10 percent of rated capacity high speed in feet per minute when initially traveling at high speed and carrying the rated capacity load. Record voltage, amperage, hoisting and lowering speeds, trolley travel speed, and motor speed for each motor.

3.4 MONORAIL FIELD TEST PROCEDURES

3.4.1 General Instructions

The crane and supporting structure shall be tested in accordance with the applicable paragraphs of this guide. The contractor shall assure that all components and features that affect load bearing, load controlling, or operational safety devices of the cranes are properly tested. The contractor shall perform all the tests described below along with any other tests required to verify that the crane meets the contract requirements including any contract modifications. The sequence of testing is at the option of the contractor's test director except that the no-load test shall be performed first. The contractor shall develop data sheets for tests that require data recording and shall include in the data sheets the expected results along with the allowable tolerance in accordance with the requirements of the specification. The contractor shall determine the tools, meters, measuring devices, etc. that are required to perform the test and have them available at the site. When measuring currents less than 5 amps, a 10-amp series type amp meter is recommended instead of an amp probe or use of the drive monitoring display. All equipment shall be calibrated.

3.4.2 Equipment Monitoring

During the load test, check for the proper operation and condition of safety devices, electrical components, mechanical equipment, and structural assemblies. Immediately report any observed defects critical to continuing testing to the contractor's test director, who shall suspend the testing until the deficiency is corrected.

3.4.3 Hooks

The hook serial number shall be recorded. The hook shall be measured for hook throat spread before load testing. Two tram points shall be installed on hook throat and the distance between these tram points (+/-

1/64 in.) shall be measured and recorded. Record this base dimension. Operation of safety latches shall be checked.

Load Hook Unique Identification Number _____
Load Hook Nut Unique Identification Number _____
Load Hook Throat Measurement - Before Load Testing _____
Load Hook Safety Latches SAT_____ UNSAT_____ NA_____

3.4.4 Preparing For Load Testing

a. The contractor shall select a safe test area and all traffic, unauthorized personnel, and equipment shall be cleared from test area. This test area shall be roped off or otherwise secured to prevent entry of unauthorized personnel and equipment.

b. All rigging used in crane load testing shall conform to applicable OSHA regulations and ASME standards for inspection and testing. Note that test loads shall include the weight of rigging used to connect them to the load block.

3.4.5 Precautions during Load Testing

a. Extreme caution shall be observed at all times.

b. Personnel shall remain clear of suspended loads and areas where they could be struck in the event of component failure.

c. Test loads only shall be raised to a height sufficient to perform the test.

3.4.6 Testing

Inspection Codes for testing are: SAT = Satisfactory, UNSAT = Unsatisfactory, NA=Not applicable

3.4.6.1 No Load Test

<u>Pendant Control</u>

From the pendant station energize the main line contactor by activating the START button.

a. Power On SAT_____ UNSAT_____ NA_____

De-energize the crane by activating the E-STOP button.

b. E-Stop SAT_____ UNSAT_____ NA_____
c. Power Off SAT_____ UNSAT_____ NA_____

From the pendant controller check all the function of the crane. Verify that the motions match the button labels and the directions of operation are correct.

d. Main Hoist Up SAT_____ UNSAT_____ NA_____
e. Main Hoist Down SAT_____ UNSAT_____ NA_____
f. Trolley North/West SAT_____ UNSAT_____ NA_____
g. Trolley South/East SAT_____ UNSAT_____ NA_____
h. Indicator Lights SAT_____ UNSAT_____ NA_____
(Power On, Power Available, etc.)

Motor Controls

Hoist controls shall be tested to verify that sequencing and timing are in accordance with the requirements of the specification.

Record the following: Nameplate Actual

a. Disconnect Switch Voltage _____Volts _____Volts

b. Current (High Speed) Up _____Amps _____Amps

c. Voltage (High Speed) Up _____Volts _____Volts

Note: The current and voltage will be measured at the disconnect switch.

d. Current (High Speed) Down _____Amps _____Amps

e. Voltage (High Speed) Down _____Volts _____Volts

Note: The current and voltage will be measured at the floor disconnect switch.

Hoist Speeds: Measure hoist speed in FPM at fast speed in each direction.

Actual Required

a. Up (High Speed, No Load) _____ FPM _____ (FPM)

b. Down (High Speed, No Load) _____ FPM _____ (FPM)

Measure hoist speed in FPM at slow speed in each direction.

c. Up (Slow Speed) _____ (FPM) _____ (FPM)

d. Down (Slow Speed) _____ (FPM) _____ (FPM)

Note: Full speed tolerance is 10%. Rated high speed is 2.1 7 FPM with fast speed switch in the OFF position.

Test Trolley Controls to verify that sequencing and timing are in accordance with the requirements of the specification.

Record the following: Nameplate Actual

a. Disconnect Switch Voltage _____Volts _____Volts

b. Current (High Speed) North/East _____Amps _____Amps

c. Voltage (High Speed) North/East _____Volts _____Volts

d. Current (High Speed) South/West _____Amps _____Amps

e. Voltage (High Speed) South/West _____Volts _____Volts

Note: The current and voltage will be measured at the floor disconnect switch.

Measure trolley speed in FPM high speed in each direction.

Actual Required

a. North/East (High Speed) _____ FPM _____ FPM

b. South/West (High Speed) _____ FPM _____ FPM

Measure trolley speed in FPM slow speed in each direction.

c. North/East (Slow Speed) _____ FPM _____ FPM

d. South/West (Slow Speed) _____ FPM _____ FPM

Note: Full Speed tolerance is 10%.

Bumper Stops: At slow speed, contact the trolley bumpers with the bumper stops. Verify satisfactory performance of the bumpers, and the alignment of the bumpers with stops.

SAT_____ UNSAT_____ NA_____

Limit Switches

Test all limit switches to determine that they function and that all associated functions occur in accordance with specifications.

Hoist Upper Geared Limit Switch (Primary)

Raise the hoist. Slowly raise the hoist into the upper-geared limit switch and verify that the hoist stops after the limit switch is tripped and the hook is only capable of lowering. Ensure that the runout distance at full speed is greater than the distance to the weighted upper limit by gradually increasing hoist control lever travel to achieve full hoist speed and verify that the weighted limit is not tripped when the geared limit is engaged at this "full speed." If the hoist is equipped with a slow down function, verify that the hoist speed decreases to 25% (+/- 10%) of the full rated speed before entering the primary limit switch.

a. Hoist in slow speed approaching Upper-Geared Limit Switch SAT_____ UNSAT_____ NA_____

b. Hoist Upper Geared Limit Switch SAT_____ UNSAT_____ NA_____

c. Hoist can lower only SAT_____ UNSAT_____ NA_____

d. Hoist slows before primary limit (if slow down enabled) SAT_____ UNSAT_____ NA_____

Hoist Upper Limit Switch (Secondary)

Using the geared limit switch bypass key switch, bypass the hoist upper-geared limit switch and continue slowly raising the hoist. Once the switch is tripped, verify that the hoist motion stops and hoist drive is inoperable.

a. Hoist in slow speed approaching upper limit switch SAT_____ UNSAT_____ NA_____

b. Hoist upper limit switch SAT_____ UNSAT_____ NA_____

c. Hoist drive inoperable SAT_____ UNSAT_____ NA_____

Using the hoist reset key switch, reset the hoist drive and verify that the hoist is only operable in down direction until the upper limit switch is deactivated.

d. Hoist up inoperable SAT_____ UNSAT_____ NA_____

e. Hoist can lower only SAT_____ UNSAT_____ NA_____

Hoist Lower Geared Limit Switch

Lower the hoist. Slowly lower the hook into geared lower limit switch. When the limit switch is tripped, verify that the hoist motion stops. Verify hoisting up capability for lower limit switch.

a. Hoist in slow speed approaching lower geared limit switch SAT_____ UNSAT_____ NA_____

b. Hoist lower geared limit switch SAT_____ UNSAT_____ NA_____

c. Hoist up capability SAT_____ UNSAT_____ NA_____

Warning Devices and Lights

Crane Status Lights

Verify that white status light illuminates when power is available to crane.

White Status Light SAT_____ UNSAT_____ NA_____

Verify that Blue status light illuminates when power to crane is on (main contactor energized).

Blue Status Light SAT_____ UNSAT_____ NA_____

3.4.6.2 Hoist Load Testing

The hoist shall be tested at 100 Percent of Rated Capacity (+0%, -5%) Load Test.

Dynamic Load Test

The actual weight of the certified weight, including rigging gear that will be used shall be recorded.

Trolley loss of power test

Raise the test load approximately midway between the trolley and any permanent obstructions on the operating floor. Starting at a safe distance from walls or other obstructions, attain a slow speed of trolley

travel. While maintaining a safe distance from obstructions, disconnect the main power source to simulate a power failure. Restart trolley travel and allow the drive to reach an intermediate speed. Repeat the simulated power failure. Restart trolley travel and allow the drive to reach maximum operating speed. Repeat the simulated power failure. Verify that the trolley stops and that the brake sets properly at all speeds.

SAT_____ UNSAT_____ NA_____

Hoist loss of power test at rated load

Raise the test load a minimal distance. Lower the test load at slow speed. Disconnect the main power source and return the controller to the neutral position to simulate a power failure. Restart hoist in a downward direction and allow the drive to reach an intermediate speed. Repeat the simulated power failure. Restart hoist in a downward direction and allow the drive to reach maximum operating speed. Repeat the simulated power failure. Verify that the hoist stops and that the brake sets properly to bring the test load to a stop at all speeds.

SAT_____ UNSAT_____ NA_____

Hoist Maximum Speed Test at rated load

Measure and record the motor current, voltage, and hook speed in FPM at maximum speed in both directions. Stop the load during hoisting and lowering to verify that brake stops and holds the load.

Record the following:	Nameplate	Actual
a. Current (High Speed) Up	_____Amps	_____Amps
b. Voltage (High Speed) Up	_____Volts	_____Volts
c. Current (High Speed) Down	_____Amps	_____Amps
d. Voltage (High Speed) Down	_____Volts	_____Volts

Note: The current and voltage will be measured at the floor disconnect switch.

Measure hoist speed in FPM at fast speed in each direction.

Hoist	Actual	Required
a. Up (High Speed)	_____ FPM	_____ FPM
b. Down (High Speed)	_____ FPM	_____ FPM

Measure hoist speed in FPM at slow speed in each direction.

c. Up (Slow Speed) _____ FPM _____ FPM

d. Down (Slow Speed) _____ FPM _____ FPM

Note: Speed tolerance is 10%
Maximum Runway Deflection

Measure the maximum runway deflection with the trolley centered between vertical supports and 100% (+5%, -0%) of rated load on the hook. Repeat the measurement for each segment of runway and record the maximum value. The vertical and lateral deflection must not be greater than the values stated in CMAA 74.

_____Max deflection _____Unsupported Distance at Max deflection

_____Allowable Deflection (1/450 of unsupported distance)

SAT_____ UNSAT_____ NA_____

Rollback Check

Check rollback. With the load approximately 2 ft above the ground, engage the hoist up controller to the slowest hoist position. Verify that the motor turns in raise direction only.

SAT_____ UNSAT_____ NA_____

Trolley Functionality Test

1. Operate the trolley the full distance of the runway in both directions. Verify that the brake operates properly. Measure and record the distance required to come to a full stop from rated speed.

   _____Stopping distance

2. Measure and record the motor current, voltage, and hook speed in FPM at maximum speed in both directions.

   Record the following: Nameplate Actual

   a. Current (High Speed) North/East _____Amps _____Amps

   b. Voltage (High Speed) North/East _____Volts _____Volts

c. Current (High Speed) South/West _____Amps _____Amps

d. Voltage (High Speed) South/West _____Volts _____Volts

Note: The current and voltage will be measured at the floor disconnect switch.

Measure Trolley speed in FPM high speed in each direction.

a. North/East (High Speed) _____ FPM _____ FPM

b. South/West (High Speed _____ FPM _____ FPM

Measure trolley speed in FPM at slow speed in each direction.

c. North/East (Slow Speed) _____ FPM _____ FPM

d. South/West (Slow Speed) _____ FPM _____ FPM

Note: Speed tolerance is 10%.

-- End of Section --