



Ducks Unlimited, Inc.

TECHNICAL SPECIFICATIONS

RIGGS DAM AND FISH LADDER

DU PROJECT NO. OR-260-7

AUGUST 2026

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**SECTION 1000
SPECIAL PROVISIONS**

- 1. The CONTRACTOR shall be responsible for identification and protection of all utilities that may be affected by the Work. The CONTRACTOR shall not be entitled to additional compensation for protection or avoidance of utilities discovered in the course of the work unless substantial additional Work is required that could not have been reasonably identified.**
- 2. The OWNER may have an inspector monitoring the Work for the possible disturbance of archeological artifacts. Whether or not the inspector is onsite, the CONTRACTOR shall immediately cease all site work until instructed otherwise by the OWNER if any artifacts are discovered. Not used.**
- 3. The CONTRACTOR shall prioritize and order construction to meet the contract requirements. The window for construction is limited to 6 weeks.**
- 4. CONTRACTOR must notify ENGINEER immediately when adverse weather restricts access to the site. The ENGINEER must approve of all weather delays. The CONTRACTOR shall make attempts to protect site from adverse weather.**
- 5. Required Submittals: See sections for additional information.**
 - Rock imports including Sand, ¾”minus, 3”minus, Class 200 & Class 2000 riprap.**
 - Geotextile**
 - Concrete mix design including recent strength testing results.**
 - Concrete testing lab credentials.**
 - Miscellaneous Metal shop drawings.**
- 6. OWNER will provide FOB Burns OR site these items for CONTRACTOR installation:**
 - Aluminum Full Invert Box Culverts Unassembled.**
 - Miscellaneous metal including bridge, railings, guides, stoplogs, baffles.**
 - Canal gates**

***** END OF SPECIAL PROVISIONS *****

SECTION 2000
DESCRIPTION OF WORK

Part 1 - GENERAL

1.01 DESCRIPTION

- A. The work to be performed under this contract consists of furnishing all labor, equipment, materials, and supplies necessary for the excavation and demolition of existing water control structures on the Foley Creek and installation of a new water control structure including bank stabilization and stream bed reconstruction. Also included is all related work as shown on the drawings and specified in these contract documents.

1.02 PROJECT LOCATION & ACCESS

- B. The project is located east of Burns OR, Malheur County, Oregon. The project is on private property. See site vicinity map on plan set.

1.03 ELEMENTS/TASKS

There are four elements to the project, described below.

- A. Clear, grub, excavate, and demolish existing earthen dam and metal culvert structures. Dewater site during construction if water is present. Suitable excavated embankment shall be used as compacted fill or placed as spoil fill. All spoil material shall remain on site as directed by the ENGINEER.
- B. Installation of OWNER furnished metal box aluminum culvert, owner-furnished miscellaneous metals and owner-furnished canal gates.
- C. Excavate and backfill for new box culvert and concrete structures.
- D. Construct and install reinforced concrete structure and metal fabrications including slab/footings, cutoff walls, check dam walls, and all metal fabrications as shown on the plans.

1.04 PRIORITY OF WORK

- A. The CONTRACTOR shall prioritize and order construction to meet the contract requirements. The window for construction is limited to 6 weeks from the start date of October 12, 2026.

SECTION 2000
DESCRIPTION OF WORK

1.05 CONTRACTOR'S QUALITY CONTROL

- A. It is the intent of these specifications and the contract drawings that the work performed under the contract shall result in a complete operating system in satisfactory working condition with respect to the functional purpose of the installation, and no extra compensation will be allowed for anything omitted but fairly implied. The prices paid for various items in the proposal shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and doing all work necessary to complete the finished product as provided in the plans and specifications.
- B. The statement "or equal" in these specifications shall mean that the CONTRACTOR may substitute another manufacturer's product as a substitute for that specified. The CONTRACTOR will thereby warrant that the product will perform as good or better than that replaced. The statement "or approved equal" in these specifications shall mean that the CONTRACTOR must submit information and obtain prior approval from the ENGINEER before making a substitution. Acceptance as equal by the ENGINEER does not relieve the CONTRACTOR of responsibility for the performance of the substitute product.
- C. Where the contract requires that materials or equipment be provided or that construction work be performed, and detailed specifications of such materials, equipment, or construction are not set forth, the CONTRACTOR shall perform the work using materials and equipment of a quality comparable to the materials and workmanship specified for other parts of the work and at least equal to the general standard of quality found within existing work, from firms of established good reputations, and shall follow best practices in the performance of construction work. The work performed shall be in conformity and harmony with the intent to secure the best standard of construction and equipment of work as a whole or in part.

1.06 SUBMITTALS

- A. The CONTRACTOR shall be responsible for providing submittal information for approval as required in these specifications to the ENGINEER before purchasing the material or performing the work. The ENGINEER will review and approve or reject initial submittals in writing within 7 working days after receipt to the ENGINEER. Where the ENGINEER requests additional information or rejects an initial submittal, the ENGINEER shall use such time as is necessary to review the additional materials or new submittals.

SECTION 2000
DESCRIPTION OF WORK

1.07 CONSTRUCTION SCHEDULE

- A. Within 7 days after a contract is signed the CONTRACTOR shall submit an estimate of start and completion dates for each element of the work.

1.08 INSPECTION AND TESTING

- A. Inspection and testing will be performed on the project in accordance with these specifications. Where the CONTRACTOR has reached a point in construction where inspection is required to proceed, he will provide a minimum of 48 hours' notice to the ENGINEER before demobilizing equipment that may be necessary to adjust or modify the work in question. The ENGINEER will make every effort to provide inspection on shorter notices. The OWNER shall pay for inspection Services related to soil compaction and concrete testing.
- B. Portions of Inspection shall be performed by the ENGINEER. Concrete field testing and sampling shall be paid for and provided by CONTRACTOR.
- C. Items requiring special inspection and testing to be performed by the Project ENGINEER or certified testing lab include the following items.
 - 1. Cast in Place Concrete placement. ENGINEER Continuous. Testing lab sampling and testing as required in section 3000.
 - 2. Structural backfill. Periodic.
 - 3. Concrete Reinforcement. Periodic.

Continuous Inspection: Special inspection during and at all times.

Periodic Inspection: Special inspection to confirm conformance.

***** END OF SECTION *****

SECTION 2010
PROTECTION OF ENVIRONMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section covers, but is not limited to the following:
 - 1. Conforming to the requirements of permits furnished by the OWNER and obtaining other permits required to perform the Work.
 - 2. Handling and disposal of solid wastes.
 - 3. Handling, storage, spill prevention and clean up of oil and hazardous waste substances.
- B. The CONTRACTOR shall perform all work necessary to comply with the requirements of OWNER-furnished and CONTRACTOR-furnished permits governing this Work.
- C. Related Work Specified Elsewhere:
 - 1. Excavation and Fill - Section 02220
 - 2. Concrete - Section 03300

PART 2 - PRODUCTS

2.01 GENERAL

- A. The CONTRACTOR is responsible for the selection and adequacy of all materials and equipment used for diversion, dewatering and water quality control systems, except as specified otherwise.

SECTION 2010
PROTECTION OF ENVIRONMENT

PART 3 - EXECUTION

3.01 GENERAL

- A. CONTRACTOR shall prevent wastewater and waste concrete products from entering any active waterways.

3.02 SURFACE DRAINAGE

- A. To the maximum extent possible, intercept and divert all drainage away from work areas by the use of ditches, sumps or other approved means.

3.03 DRAINAGE OF EXCAVATED AREAS

- A. Provide and maintain ditches of adequate size to collect rainfall and groundwater seepage, which may enter the excavations. Divert the water into sumps, so that it can be drained or pumped out of the excavations, as approved.

3.04 CONTRACTOR'S WASTEWATER

- A. All water which has been polluted by materials such as sediment, oil, grease, cement and concrete, paints or chemicals used by the CONTRACTOR's operation shall be disposed of in an approved manner and in accordance with all applicable permits and local, state, and federal regulations.

3.05 WORK IN RIVER

- A. The CONTRACTOR shall comply with all permits pertaining to work in the river.

3.06 REMOVAL OF TEMPORARY FACILITIES

- A. Upon completion of all works, or when required, removes all temporary facilities constructed for dewatering and control of sediment and water.

***** END OF SECTION *****

SECTION 2050 MOBILIZATION

Part 1 - GENERAL

1.01 DESCRIPTION

- A. The work shall include the supply and transport of all labor, material and equipment to successfully complete that project as shown on the plans or described by the ENGINEER. Mobilization shall also include securing all permits for moving equipment on public roadways, construction permits, and other applicable permits.

Part 2 – MATERIALS (Not Used)

Part 3 - EXECUTION

3.01 GENERAL

- A. The CONTRACTOR shall conduct all mobilization operations in a timely orderly manner. Unless otherwise approved by the ENGINEER, mobilization operations shall commence no later than one week after the notice to proceed. De-mobilization shall be finished within two weeks after substantial project completion.
- B. Designated staging areas and haul roads will be determined in the field with the OWNER and the ENGINEER. The CONTRACTOR shall park all inactive equipment in only these designated locations. Refueling and servicing of equipment shall only be performed in these areas. All fuel and oil spills shall be cleaned up and disposed at the sole expense of the CONTRACTOR.
- C. During all operations, the CONTRACTOR is responsible for maintaining public and private property in original condition. Damage to existing roadways and roadway shoulders shall be repaired to the satisfaction of the ENGINEER at the CONTRACTORs expense.

Part 4 – MEASUREMENT AND PAYMENT

- A. Mobilization shall be measured and paid on a Lump Sum basis (L.S.) for the entire project. 50% of contract unit price shall be paid at the first billing. The remaining 50% of the contract unit price shall be paid at project completion.
- B. CONTRACTOR is eligible for a separate mobilization payment when the CONTRACTOR is required to discontinue work by the Engineer for reasons other than seasonal termination of work. The payment shall be payment in full for supply of all necessary labor, equipment, and materials to perform mobilization operations herein described and all work in this specification. The payment shall be commensurate to the amount of equipment and materials that are required to be removed from the project site and that payment shall not exceed the original unit price specified.

***** END OF SECTION *****

**SECTION 2100
SITE PREPARATION**

Part 1 - GENERAL

1.01 DESCRIPTION

- A. This specification shall cover the supply of all labor, materials, and equipment required for clearing, grubbing, stripping, demolition and dewatering the site.

1.02 SCOPE OF WORK

- A. Cofferdam installation and dewatering of work site.
- B. Clearing, grubbing, and stripping for water control structures and access road.
- C. Demolition of existing concrete check dam and metal culvert structure.
- D. Site access shall be provided by OWNER. Existing dirt/gravel road is primitive and shall be improved as needed by CONTRACTOR for delivery of all required materials.

Part 2 – MATERIALS (Not Used)

Part 3 - EXECUTION

3.01 DEMOLITION

- A. Demolition consists of the removal and disposal of an existing concrete headwall and CMP culverts for water control as shown on the plans.

3.02 CLEARING

- A. Clearing shall consist of the cutting, removing, and disposal of all brush, trees, logs, stumps, roots, heavy sod, vegetation, rocks, and stones larger than 6 in. in any dimension, and rubbish within designated work areas.

**SECTION 2100
SITE PREPARATION**

3.03 GRUBBING

- A. Grubbing shall consist of the complete removal of stumps including all roots 1.5 inches or greater in diameter, brush grass, or weeds. Stumps shall be grubbed to a depth of 3 ft below natural ground. Brush, grass, weeds, and similar materials shall be grubbed to a minimum depth of 12 inches below natural ground. Grubbed material shall be disposed off site.

3.04 STRIPPING

- A. Stripping shall consist of the complete removal of all earth materials contaminated by organics. The Contractor shall strip all such materials regardless of the depth of material encountered to the satisfaction of the Engineer.

3.05 DEMOLITION

- A. Demolition consists of the removal and disposal of existing CMP culverts for water control and concrete headwall structures as shown on the plans.

3.06 PROTECTION

- A. The CONTRACTOR shall provide protection devices including barricades, fencing, warning signs, and other devices necessary to ensure security and safety within the project site during all aspects of the work.

3.07 TEMPORARY ROADS

- A. Any temporary roads constructed for the use of the contractor shall be removed and left in a condition satisfactory to the Engineer upon completion of the project.

**SECTION 2100
SITE PREPARATION**

3.08 DEWATERING: CONTROL OF SURFACE/SUBSURFACE WATER

- A. The CONTRACTOR is responsible for control of surface water, subsurface water and drainage during the construction period. All temporary fills, crossings, or culverts necessary to promote drainage will be installed and removed at the CONTRACTOR's expense prior to acceptance of the work. Any claims arising from upstream or downstream damages as a result of the construction or failure of these temporary works will be the CONTRACTORs responsibility. No additional payment will be made to the CONTRACTOR for any work to be done as a result of adverse weather conditions or changing site conditions during the construction period.
- B. Temporary coffer dam shall be constructed with suitable material free of deleterious material. Construct coffer dam to elevation as shown on drawing
- C. The CONTRACTOR shall provide adequate dewatering pumps to meet a maximum flow capacity of 300 gallons per minute.

3.09 AIR POLLUTION CONTROL

- A. Burning of any kind on the project site is strictly prohibited. The CONTRACTOR shall take fire prevention measures to insure against the start or spread of fires as a result of the project work. The CONTRACTOR shall also comply with all regulatory requirements for dust control on the project site.

3.10 STORAGE OF FUEL AND LUBRICANTS

- A. All fuel and lubricants shall be stored in containers and areas that are in conformance with the Oregon State Department of Environmental Quality and local regulations. If a spill should occur, the spilled material shall be contained immediately, by using earthen berms, barricades, booms, or other suitable methods. All servicing of equipment shall be done in such a manner as to avoid spills.

**SECTION 2100
SITE PREPARATION**

Part 4 – MEASUREMENT AND PAYMENT

4.01 GENERAL

- A. Bid and payment quantities for Clear, Grub, Strip shall be paid per Lump Sum (LS).
- B. Bid and payment quantities for Demolition shall be paid per Lump Sum (LS).
- C. Bid and payment quantities for Dewatering shall be paid per Lump Sum (LS).

***** END OF SECTION *****

SECTION 2220
EXCAVATING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Unclassified excavation
- B. Structural filling, backfilling, and compacting
- C. Embankment filling, backfilling, and compaction
- D. Large Woody Material habitat structures

1.02 REFERENCES

- A. General: Publications listed below form a part of this Specification to the extent indicated by reference thereto:
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D 695 Test Methods for Moisture - Density Relations of Soils and Soils Aggregate Mixtures Using a 10-lb. (4.54-kg) Rammer and 18-in. (457-mm) Drop
- C. Uniform Building Code (UBC)
- D. Occupational Safety and Health Act (OSHA):
 - 1. Construction Industry Standards
 - 2. Occupational Safety and Health Standards

1.03 SUBMITTALS

- A. ¾" minus crushed rock fill.
- B. 3" minus crushed rock fill.
- C. CLASS 200 Riprap

1.04 PROTECTION

- A. All excavations shall be in accordance with applicable OSHA Construction Industry Standards. The CONTRACTOR shall provide shoring, signs, barricades, etc. Excavation slopes shown on the drawings are for illustrative purposes only. Actual slopes shall be determined by the CONTRACTOR and are the sole responsibility of the CONTRACTOR.
- B. The CONTRACTOR shall protect roadways and shall restore such damaged facilities to the pre-construction condition.

SECTION 2220
EXCAVATING, BACKFILLING AND COMPACTING

- C. The CONTRACTOR shall be responsible for dewatering work areas, and no extra payment will be made for water encountered in any excavation or other work area. Water removed from the excavations and other work areas shall be directed away from all construction activities.
- D. The CONTRACTOR shall take all necessary precautions to prevent silt-laden runoff from leaving the site and entering any active waterway. Silt fencing, ditch lining, straw bales, detention ponds, and other erosion control and reduction measures may be necessary to provide satisfactory erosion control. No additional payment will be made for erosion control measures not shown on the drawings.

PART 2 - PRODUCTS

2.01 COMPACTED EMBANKMENT FILLS

- A. Material shall be obtained from required excavations or other borrow sites as approved by the ENGINEER prior to placement. All material shall be free of organic materials and debris from excavation. Embankment fill shall be a mixture of clay, silt, sand, and gravel with a maximum particle size of four (4) inches and shall be free of peat and other organic materials, debris, and trash. Imported rock material is not classified as embankment fill.

2.02 RIPRAP

- A. Material shall be angular in shape. Thickness of a single rock shall not be less than one-third its length. Rounded rock will not be accepted unless authorized by the ENGINEER. Shall meet the gradation requirement for the class specified.
- B. Material shall be free from overburden, spoil, shale and organic material. Non-durable rock, shale, or rock with shale seams is not acceptable. Riprap shall meet the following quality requirements:

Specific gravity:	2.55 minimum
Los Angeles Abrasion: (Percent loss at 500 rev.)	50% maximum
Sodium Sulfate Soundness: (Percent loss at 5 cycles)	15% maximum

SECTION 2220
EXCAVATING, BACKFILLING AND COMPACTING

- C. Gradation Requirements - Grade loose riprap by class and size of rock according to the following:

<u>Class 200</u>	<u>Percent By Weight</u>
200-140 LBS	20.0
140-80 LBS	30.0
80-8 LBS	40.0
8-0 LBS	10.0

2.03 CRUSHED AGGREGATE 3/4" MINUS

- A. Aggregate shall conform to AASHTO 27-84

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing by Weight</u>
3/4 inch	60-100
No. 4	30-55
No. 30	11-27
No. 200	15-20

- B. All crushed rock shall have a minimum durability value of not less than 35 as determined by AASHTO T 210-84

2.04 CRUSHED AGGREGATE 3" MINUS

- A. Aggregate shall conform to AASHTO 27-84

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing by Weight</u>
3 inch	100
2 inch	65-95
3/4 inch	40-74
No. 4	0-10
No.200	0

- B. All crushed rock shall have a minimum durability value of not less than 35 as determined by AASHTO T 210-84

SECTION 2220
EXCAVATING, BACKFILLING AND COMPACTING

2.05 GEOTEXTILES

- A. Geotextile fabric shall be Mirafi 500X, or ENGINEER approved equivalent. See section 2300 for additional information.

2.06 LARGE WOODY MATERIAL

- A. Large woody material (LWM) shall be Juniper trees or approved equal. LWM tree shall be a minimum of 15 feet long (roots to top) with roots intact, 3-foot diameter root wad, free of branches, with a 9-inch minimum log diameter at the top end.

PART 3 - EXECUTION

3.01 GENERAL

- A. Following completion of site grading and backfilling operations all disturbed areas shall be shaped and graded to pre-construction conditions, free of sudden dips or rises and depressions. All completed grading shall be to the satisfaction of the ENGINEER.
- B. All disturbed areas shall be seeded and mulched.

3.02 UNCLASSIFIED EXCAVATION

- A. Unclassified excavation includes excavations required for cofferdam installation, concrete placement, site grading, and all other excavation.
- B. The CONTRACTOR shall remove all material to the elevations shown on the drawings or as required for removal of unsuitable material as directed by the ENGINEER. Excavated material meeting the requirements of Part 2 of this Section may be used as embankment fill material. The CONTRACTOR as directed by the ENGINEER shall place unsuitable material as spoil fill.

3.03 SPOIL MATERIAL DISPOSAL

- A. All surplus excavated material will be placed on site as directed by ENGINEER. No compaction required.

3.04 PLACING COMPACTED EMBANKMENT FILL

- A. Place Embankment fill in layers with a maximum loose lift thickness of eight (8) inches before compaction. Compact to at least 90 percent of maximum dry density as determined by ASTM Standard D-698, Procedure A.

- B. Place Embankment fill at moisture content near optimum moisture, as determined by the ENGINEER.
- C. Spread Embankment fill such that it is free from lenses, pockets, streaks, lumps, or layers of material differing substantially in texture, gradation, or moisture content from the surrounding material so as to form as homogeneous layer of material as practical.
- D. Do not place Embankment fill when the fill or the foundation on which it would be placed is frozen. Stop fill placement temporarily during unsuitable weather conditions, as directed by the ENGINEER.
- E. The CONTRACTOR shall not be entitled to additional compensation above the prices bid in the schedule for Placing Embankment Fill for reworking, removal, rehandling, reconditioning, rerolling, or combinations of these procedures to the Embankment fill as required to meet compaction requirements.
- F. All embankment backfills within a horizontal distance of 5-feet from concrete structures such as walls, footings, catch basins, manholes, etc. is defined as structural fill.
- G. Pipe backfill shall be deposited in horizontal, uniform layer not exceeding six (6) inches in thickness before compaction, and each layer shall be compacted to ensure thorough tamping of backfill under the haunches and around the pipe. This is to be achieved by hand compaction for a distance of two (2) feet from the pipe circumference. Hand compaction of fill material shall be accomplished by the application of motor driven hand tampers.
- H. Where backfill is to be placed against both sides of concrete walls, the backfill shall be brought up evenly on both sides of the wall.
- I. Backfill shall not be placed against just one side of concrete walls (including grade beams) until the concrete has developed sufficient strength to resist the load imposed by the backfill. Any abutting concrete walls or beams shall also have attained sufficient strength. In any case, the backfill placement shall not begin prior to 72 hours after concrete placing and shall not exceed the following schedule:

<u>Age of Concrete</u>	<u>Backfill Height</u>
72 Hours	1/2 Wall Height
7 Days	2/3 Wall Height
28 Days	Full Wall Height

SECTION 2220
EXCAVATING, BACKFILLING AND COMPACTING

3.05 COMPACTION METHOD EMBANKMENT FILL

- A. Compaction to the density as required by Section 3.04 above, shall be by means of an appropriately sized static, vibratory or impact type compactor suited to the soil and physical restrictions of the area to be compacted. Although the CONTRACTOR is responsible for the selection of the method of compaction, selection of an inappropriate method shall not relieve the CONTRACTOR of the responsibility to achieve the specified result.

3.07 PLACING CRUSHED ROCK FILL

- A. Place crushed rock fill to the lines, grades, and locations shown on the Drawings. Crushed rock shall be placed in 12" maximum lifts.
- B. Compaction shall be required for 3/4" minus material with vibratory plate compactor. 3" minus base rock shall be placed in 12" maximum lifts and lightly compacted with hydraulic equipment to avoid pumping of water.

3.08 PLACING RIPRAP

- A. Place riprap to the lines, grades, and locations shown on the Drawings. Riprap shall be placed to the full surface course thickness in one operation.
- B. All riprap shall be placed in such a manner as to produce a mass of unsegregated stone with maximum interlocking and stone to stone contact and a minimum of voids. The finished mass shall be free from pockets of small stones, clusters of larger stones, and excessive voids. Placing riprap by dumping into chutes or by similar methods likely to cause segregation shall not be permitted. Distribution of various sizes of stones shall be obtained during final placing. Rearranging of individual riprap stones by mechanical equipment or by hand may be required to obtain a reasonably well-graded distribution of stone sizes.
- C. Riprap shall be placed starting at the toe of the slope, progressing up the slope. Placement of riprap from the top of the slope, proceeding down the slope shall not be allowed.
- D. Riprap shall be placed with smaller rock fragments used to fill in the voids between larger rock fragments in such a manner as to form a smooth, uniform, well graded layer of rock that is stable and not susceptible to sliding. Riprap shall also be placed to form smooth transitions to embankment slopes, channel slopes, and channel side slopes. No distinct horizontal, vertical or angular joints shall be allowed in the riprap that would reduce interlocking capability.

SECTION 2220
EXCAVATING, BACKFILLING AND COMPACTING

3.08 PLACING LARGE WOODY DEBRIS

- A. Place centerline of logs at elevations as shown on the plans. Place riprap and 3" of rock bedding material to required elevation to ensure that centerline of trunk is as shown on the plan set.

3.09 TOLERANCES

- A. All earthwork, except riprap and quarry spalls, shall be finished to within an allowable tolerance of plus or minus 0.10 foot from the grades shown on the drawings.
- B. Riprap shall be placed to within an allowable tolerance of six (6) inches above and three (3) inches below the neat lines shown on the Drawings.

PART 4 - MEASUREMENT AND PAYMENT:

4.01 MEASUREMENT and PAYMENT

- A. The unit contract price shall be full pay for all work described by Section 2220 for each of the following bid items included in the bid proposal:
 - I. Embankment fill used to backfill structures and construct embankments, Cubic Yard (CY), is in place compacted, PLAN QUANTITY including haul. Fill material shall be taken from required excavations or designated borrow areas and will have no separate measurement for excavation.
 - II. Riprap, Cubic Yard (CY), is in place, PLAN QUANTITY, including haul. Riprap shall be taken from approved offsite source.
 - III. 3" minus Crushed Foundation Rock, Cubic Yard (CY), is in place, PLAN QUANTITY, including haul. Crushed Rock shall be taken from approved offsite source.
 - IV. ¾" minus Crushed Rock, Cubic Yard (CY), is in place, PLAN QUANTITY, including haul. Crushed Rock shall be taken from approved offsite source.
 - V. Large Woody Material, each log (EA) is in place, PLAN QUANTITY, including delivery and placement.

***** END OF SECTION *****

**SECTION 2300
GEOTEXTILE FABRIC**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work of this section shall include the furnishing and installation of geotextile fabric.

1.02 SCOPE OF WORK

- A. Provide geotextile filter fabric under Rip Rap and Base Rock where indicated in the plans and specifications.

1.03 SUBMITTALS

- A. The CONTRACTOR shall submit source and composition details for fabrics and geotextiles specifications that he intends to use at the project site which are different than as specified in these technical specifications.

1.04 INSPECTION

- A. The CONTRACTOR shall call for inspection after base preparation and prior to placement of all geotextiles.

PART 2 - MATERIALS

2.01 GEOTEXTILES UNDER RIPRAP AND BASE ROCK

- A. Geotextile fabric shall be Mirafi 500X, or ENGINEER approved equivalent.

PART 3 - INSTALLATION

3.01 INSTALLATION OF GEOTEXTILE FABRIC

- A. The final grading of the earthwork shall be completed before installation. The site shall be free from depressions, ridges, rocks greater than 1-inch, sharp objects, and foreign material such as wood, wire and metal before the geotextile fabric is installed.

**SECTION 2300
GEOTEXTILE FABRIC**

- B. In channels, the fabric shall be installed in the direction of flow. On slopes, the fabric may be installed across the slope or perpendicular to the slope. The ends and edges shall be overlapped or shingled a minimum of 3-feet in the direction of flow and anchored as shown on the plans. Where specified, continuous lengths of geotextile fabric shall be placed in unbroken widths of at least 12 feet and in accordance with manufacturer installation instructions. Where it is required for two pieces of fabric to join a 3-foot overlap shall be provided as a minimum. The fabric shall be covered as shown on the drawings.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

The unit contract price shall be full pay for all work described by Section 2300- Geotextile Fabric for each of the following bid items included in the bid proposal:

- A. Geotextile Fabric, per Square Yard (SY). The quantity has been increased to compensate for overlapping of the geotextile fabric. Fabric shall be measured and paid as per PLAN QUANTITY.

***** END OF SECTION *****

SECTION 2600
WATER CONTROL STRUCTURES AND CULVERTS

PART 1 – GENERAL

1.01 DESCRIPTION

The Work of this section shall include the supply of all labor, materials, and equipment required to complete the manufacture and installation of the water control structures as called for on the drawings and/or specified herein, including excavation, bedding, and backfill.

1.02 SCOPE OF WORK

- A. Excavation of native material for water control structures and pipe.
- B. Construction of rock foundations with leveling gravel for the water control structures.
- C. Installation of the OWNER-furnished Aluminum Box Culvert and metal arch culvert.
- D. Backfill of excavated area.

1.03 INSPECTION

The CONTRACTOR shall stop work and request inspection at the following points of construction:

- A. Prior to the installation of water control structure or pipe to allow inspection of excavation, rock foundation, and initial backfill.
- B. During the installation of water control structures and culverts.

PART 2 – MATERIALS

2.01 APPURTENANCES

The CONTRACTOR shall supply all tools, and all accessories recommended by the material manufacturer or necessary for a complete installation. All metal pipe and materials shall be new. Materials supplied may be subject to inspection and tests by the ENGINEER.

2.02 ALUMINUM FULL INVERT BOX CULVERT

Aluminum Box Culvert parts will be furnished by the OWNER and installed by Contractor. CONTRACTOR shall be required to offload FOB New State Duck Club or retrieve material from New State stockpile. Culvert parts shall be assembled and placed by CONTRACTOR.

2.03 LEVELING AND ROAD SURFACE GRAVEL

Gravel for leveling material for the water control structure base, and as a top lift for the water control structure backfill shall be in accordance with Section 2200 – Excavation, Backfilling, and Compacting.

SECTION 2600
WATER CONTROL STRUCTURES AND CULVERTS

PART 3 - EXECUTION

3.01 HANDLING AND STORAGE OF MATERIALS

All materials shall be handled and stored in careful and workmanlike manner to the satisfaction of the ENGINEER. Any cracks or other damage from storage or handling during transportation or installation shall not be allowed. The CONTRACTOR shall be responsible for replacement and reinstallation of any damaged material at his/her own expense. Welding, drilling, bolting, or otherwise attaching devices (temporary or permanent) to the structure to assist in structure installation is prohibited. The CONTRACTOR shall be responsible for loading and hauling the water control structures and culverts from the place of storage onsite to their final destination.

3.02 UNSUITABLE MATERIAL

If in the opinion of the ENGINEER, the site excavated material is unsuitable for backfill, the CONTRACTOR shall supply, from an assigned borrow area, suitable impervious backfill material. The unsuitable material (spoil) shall be placed in an area specified by the ENGINEER and spread out and blended into the natural ground to the best of the CONTRACTOR's ability.

3.03 EXCAVATION

Base excavation shall extend as shown on plan beyond the ends and 3 foot beyond the sides of the pipe, or pipes, and the excavation shall be transitioned to meet the existing stream grades. If necessary, the excavation shall be dewatered in order to prevent disturbing the natural soil conditions at the base of the excavation and to allow the placing and compacting of the backfill material in the dry.

The CONTRACTOR shall not over excavate below specified lines and grades. If, in the opinion of the ENGINEER, the CONTRACTOR over excavates material in an area, CONTRACTOR shall replace at CONTRACTOR'S expense the over excavated material with suitable site material and compact that material to a density equal to the surrounding in situ material, or to 90 percent of Standard Proctor whichever is greater.

3.04 ASSEMBLY OF ALUMINUM BOX CULVERT PIPE

Structures shall not be placed on the base until the elevation and compaction of the base are approved by the ENGINEER. All final structure and pipe elevations shall be within +/- 0.1 foot of elevations shown on the plans.

The CONTRACTOR, after preparation of the bed, shall assemble the box culvert in strict accordance with the manufacturer's instructions. All culverts supplied to site shall be inspected prior to assembly for chipping or damage in handling and shall be repaired as directed by the ENGINEER. All materials damaged, distorted by more than 5 percent of nominal dimensions, lost, broken or deemed unsuitable due to the CONTRACTOR's method of installation, handling, or from neglect shall be replaced by the CONTRACTOR at his/her expense.

SECTION 2600
WATER CONTROL STRUCTURES AND CULVERTS

3.05 PLACEMENT OF LEVELING GRAVEL

A minimum of 12 inches of compacted leveling gravel shall be placed under water control structures. The bedding shall extend beyond all edges of the water control structure base. The leveling gravel shall be worked and leveled to minimize voids and ensure consolidation and done with care to minimize disturbance of in-situ subgrade. In the event the subgrade is too soft for efficient compaction, the bedding is to be compacted as directed by the ENGINEER.

3.06 INITIAL BACKFILL

Initial backfill shall consist of pipe bedding material, deposited in horizontal, uniform layers not exceeding 6 inches in thickness before compaction, and each layer shall be compacted throughout to ensure thorough tamping of backfill under the haunches and around the pipe. This is to be achieved by hand and mechanical compaction, to a density of at least 90 percent of Standard D-698. Compacted backfill shall be placed in this manner and shall extend to a depth of 1 foot above the top of the pipe for the entire width of the trench. Vehicles shall not be permitted to cross the pipe until initial backfill is completed.

3.07 FINAL BACKFILL

After initial backfilling has been completed, the remaining backfill, consisting of suitable site material, shall be placed in layers not exceeding 8 inches before compaction. Each layer shall be compacted by mechanical means to a density equivalent to that of the surrounding unexcavated material.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

The unit contract price shall be full pay for all work described by Section 2600 Water Control Structures for each of the following bid items included in the bid proposal:

- A. Box Culvert installations shall be measured and paid on a lump sum basis, per Lump Sum (LS). Aluminum and Concrete Box Culvert structures to be furnished by the OWNER and installed by the CONTRACTOR. All appurtenances, excavation, base preparation, unloading, transporting, erection, and placement shall be considered incidental to the Culvert installation. Base rock, Compacted Backfill pay quantities shall be as specified in section 2200.

***** END OF SECTION *****

SECTION 3300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concrete Formwork
- B. Concrete Reinforcement
- C. Cast-in-Place Concrete
- D. Grout
- E. Epoxy bonding agent

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Inserts, sleeves, bolts and similar embedded items.

1.03 REFERENCES

Publications listed below form a part of this Specification to the extent indicated by references thereto.

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - 2. ASTM C33 Specification for Concrete Aggregate
 - 3. ASTM C94 Specification for Ready-Mixed Concrete
 - 4. ASTM C150 Specification for Portland Cement
 - 5. ASTM C156 Test Method for Water Retention by Concrete Curing Materials.
 - 6. ASTM C171 Specification for Sheet Material for Curing
 - 7. ASTM C172 Standard Practice for Sampling Freshly Mixed
 - 8. ASTM C173 Standard Test Method for Air Content
 - 9. ASTM C260 Standard Specification for Air-Entraining Admixture for Concrete

SECTION 3300
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- 10. ASTM C309 Specification for Liquid Membrane-Forming
 Compounds for Curing Concrete
- 11. ASTM C494 Specification for Chemical Admixtures for Concrete
- 12. ASTM C618 Specification for Fly Ash or Pozzolan for Concrete
- 13. ASTM C873 Standard Test Method for Compressive Strength of
 concrete Cylinders from molds
- 14. ASTM D1751 Specification for Preformed Expansion Joint Fillers

B. American Concrete Institute (ACI)

- 1. ACI 301 Specification for Structural Concrete
- 2. ACI 304R Guide for Measuring, Mixing, Transporting, and
 Placing Concrete
- 3. ACI 305.1 Specification for Hot Weather Concreting
- 4. ACI 305R Guide to Hot weather Concreting
- 5. ACI 306.1 Specification for Cold Weather Concreting
- 6. ACI 306R Guide to Cold Weather Concreting
- 7. ACI 308.1 Standard Practice for Curing Concrete

1.04 SUBMITTALS

- A. Design Data: Submit documentation as per ACI 301 for proposed design mix to ENGINEER for approval in sufficient time to allow review without delay in the work. Include a complete list of materials including type/brand and quantity in weight of cement and supplementary cement modifier (SCM fly ash), aggregates and admixtures. Provide aggregate gradation test results. Also include certified compression test results for this mix design performed within the last 24 months.

SECTION 3300
CAST-IN-PLACE CONCRETE

PART 2 - PRODUCTS

2.01 MATERIALS

A. Forms

1. Forms shall be wood or metal. Metal forms shall have all bolt and rivet heads countersunk so that a plane, smooth surface of the desired contour is obtained.
2. Wood forms shall be sheathed or lined with plywood or tempered masonite so as to form even and uniform surfaces. Plywood forms shall not be used with the second ply exposed. Plywood panels shall be as large as possible.

B. Reinforcing

1. Bars shall be of the sizes and shapes shown and shall conform to ASTM A615, Grade 60. Bars shall be free of mill, rust, or other coatings.

C. Cast-in-Place Concrete

Concrete shall be ready mixed concrete conforming to ASTM C94 and the following:

1. Standard Mix: Max Water/Cement Ratio (.48)
 - a. 7-day compressive strength: 2,000 psi minimum
 - b. 28-day compressive strength: 4,000 psi minimum
 - c. Slump: Three (3) inches, plus or minus one (1) inch. Slump may be increased to five (5) inches, plus or minus one (1) inch, by the addition of a water-reducing admixture.
 - d. Aggregate: Per ASTM C33. Specific gravity of 2.60 minimum required. Coarse aggregate size: 1.5-inch maximum.
 - e. Cement: Cement shall conform to ASTM C150, type II or type IIA. Fly Ash used as a partial substitution of Portland cement shall conform to the requirements of ASTM C 618.
 - f. Air entrainment: Six (6) percent, plus or minus one (1) percent
 - g. Chemical admixture
 - (1) Chemical admixtures shall conform to ASTM C494
 - (2) Type A Water Reducing Admixture

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CAST-IN-PLACE CONCRETE

- D. Non-shrink Grout
 - 1. For setting dowels and other reinforcing bars; Submit to ENGINEER for approval before use.
 - 2. For grouting of base plates. Submit to ENGINEER for approval before use.
- E. Curing Materials
 - 1. Curing materials and methods shall conform to ACI 308.
 - 2. Curing and Sealing Compound: ASTM C309. Compound must be compatible with all applied finishes designated for use. Materials shall provide water retention not exceeding loss of .055 kg per square meter of surface in 72 hours when used at a coverage of 200 square feet per gallon and tested in accordance with ASTM C156.
 - 3. Non-staining Waterproof Paper Covering: ASTM C171.
 - 4. Polyethylene Film: Permeance not to exceed 0.20 perms when tested according to ASTM E96, Procedure B.
- F. Bonding Agent
 - 1. Bonding agent shall be a two-component epoxy suitable for bonding new concrete to existing. Submit to ENGINEER for approval before use.
- G. Compressive Strength Testing
 - 1. Provide certified field sampling of compression samples per ASTM C39. Samples shall be taken at first cubic yard and at 32 cubic yard increments after for each design element (footing, walls, beams, slabs).

SECTION 3300
CAST-IN-PLACE CONCRETE

PART 3 - EXECUTION

3.01 FORMWORK

- A. Forms shall be used to confine the concrete to the shape, line and dimensions of the members, and shall be substantial and sufficiently tight to prevent leakage of mortar. Forms shall be adequate in strength, securely anchored and properly braced and/or tied together to maintain position, shape and alignment within the specified tolerances during all concrete placement and consolidation operations.
- B. The inside of forms shall be clean, free of encrusted grout and coated with a form release compound appropriate for the form surface and concrete finish required. Forms shall be thoroughly wetted before placing concrete. Under no circumstances shall form release compound be allowed to contact reinforcing steel or construction joint surfaces.
- C. Exterior corners of walls shall have a 3/4-inch chamfer.

3.02 REINFORCING

- A. Fabrication and placement of all reinforcing steel shall comply with requirements of the ACI 318. All bends shall be cold bent and formed to templates meeting radius requirements of the ACI 318.
- B. Before any concrete is placed, all reinforcing steel in the section or area to be placed shall be securely tied in place (alternate bar intersections minimum), and permission given by the ENGINEER. All concrete placed without permission to proceed shall be subject to removal and replacement at no additional cost to the OWNER.

SECTION 3300
CAST-IN-PLACE CONCRETE

3.03 CONCRETE

A. Placing Concrete

1. No concrete shall be placed except in the presence of the ENGINEER. Notify ENGINEER of intent to place concrete a minimum of 24 hours before placement is to start.
2. The temperature of the concrete at time of placement shall not be over 90 degrees Fahrenheit. Add cold water or ice to mix. Cover all exposed surfaces and provide shade from direct sunlight. Apply sealer to exposed surfaces. Cover to remain in place for 48 hours.
3. Concrete shall not be placed without adequate cover during expected cold periods below 40 degrees Fahrenheit. Concrete temperature shall maintain a minimum of 50 degrees Fahrenheit for a minimum of 24 hours. Cover all exposed concrete surfaces and form material with insulated blankets or provide shelter. Cover to remain in place for 7 days or until the concrete has set sufficiently to resist any damage to the strength of concrete from cold temperatures.
4. Where new concrete is placed against existing concrete (older than 14 days) or rock, the existing surface shall be thoroughly cleaned and roughened by sand blasting, high-pressure water washing or other approved method. Immediately prior to concrete placement the surface shall be coated with an epoxy-bonding agent.
5. Concrete shall be deposited in all cases as near as practicable directly in its final position and shall not be caused to flow in the mass in a manner to permit or cause segregation. Dropping concrete, a distance of more than 8 feet vertically without proper confinement or depositing a large quantity at any point and running or working it along the forms will not be permitted.
6. Concrete shall be consolidated with the aid of mechanical vibrating equipment supplemented by hand spading and tamping. Vibrating equipment shall be of the internal type and shall at all times be adequate to properly consolidate all concrete.

SECTION 3300
CAST-IN-PLACE CONCRETE

B. Placing Concrete in Water

1. In no case shall concrete be placed in running water. Whenever permission is given to place concrete under water, it shall be so placed within the confines of a watertight compartment, such as a cofferdam, tube, or caisson.
2. Concrete placed under water shall include a water-reducing admixture within the manufacturer's recommended dose range as approved by the ENGINEER. Concrete placed in still water inside an open crib or cofferdam shall be placed by means of a tremie. The width of section of footing being poured shall not exceed 18 feet for each tremie or bucket used.
3. When specifically authorized by the ENGINEER, concrete may be placed by use of a tremie. Tremie placement shall comply with the following requirements:
 - a. All tremies shall consist of a tube having a diameter not less than 6 inches and a hopper adequate to perform the work, or a method using a straight tremie tube on the end of a concrete pumper hose may be developed provided prior approval of the proposed method and procedure is obtained from the ENGINEER.
 - b. A satisfactory method of expelling the water and first filling the tremie with concrete shall be used.
 - c. The end of the tremie tube shall be kept deep enough into the seal concrete, and the concrete maintained in the tube at the elevation required to prevent water from entering the tremie tube at any time during the concrete placement. In placing concrete through a tremie, 2 distinct handling devices shall be used, one to rise, lower, and place the tremie and the other to deliver concrete to the tremie. When a batch is dumped into the hopper at the top, the tremie shall be raised slightly (but not out of the concrete at the bottom) until the batch discharges to the bottom of the hopper or the top of the tremie tube. The flow shall then be stopped by lowering the tremie.
 - d. The seal shall be completed by placing full thickness as the seal advances from one end of the cofferdam to the other, keeping the finished surface of the concrete as level as possible.
 - e. The concrete shall be placed continuously until the required seal is placed. If, for any unavoidable reason, it becomes necessary to discontinue the placing before the required seal is completed, the CONTRACTOR may be required to remove all concrete placed in the seal at no cost to the OWNER.

SECTION 3300
CAST-IN-PLACE CONCRETE

C. Concrete Finishing

1. Spreading dry cement for finishing is not permitted.
2. Finishing operations of all formed surfaces shall begin immediately upon removal of the forms and shall be completed within 8 hours following form removal. Immediately after form removal, all fins, unsightly ridges and projections, and exposed lips and edges shall be removed with a sharp tool or stone to make smooth and flush with adjoining surfaces. All tie rod holes shall be mortar packed. Honeycomb areas shall be patched or cutout and replaced as directed by the ENGINEER.
3. Float Finish: All concrete slabs, walkways and wall tops shall be float finished. Floating may be performed by use of hand or power-driven equipment. Floating shall be started as soon as the screeded surface has stiffened sufficiently to produce a uniform surface free from screed marks.
4. Trowelled Finish: Structural slabs and walkway surfaces shall be steel trowelled after float finishing as specified above and when concrete is sufficiently hard to prevent excessive amount of fines and water from working to the surface sufficient pressure shall be applied to the trowel to flatten and smooth the concrete and produce a dense, uniform surface free of blemishes, ripples and trowel marks. The top exposed edge shall be tooled with a 1/2-inch radius tool.
5. Broom Finish: Exterior slabs, ramp tops, and tops of walls shall be floated as specified above and then broomed immediately following. The broom shall be of an approved type that will produce regular corrugations not over 1/8-inch deep. Strokes of the broom shall be to the edge of the slab. The finished surface shall be free of porous spots, irregularities, depressions and pockets.
6. Smooth Finish: Faces of concrete walls shall have the joint marks and fins ground or stoned off to leave the surfaces smooth, dense, and free of honeycombing. Fill honeycombs, tie-rod holes and minor surface defects with mortar. Patches and tie-rod holes shall be finished smooth to match adjoining work.

SECTION 3300
CAST-IN-PLACE CONCRETE

D. Curing Concrete

1. Protect concrete from premature drying. Provide temporary housing, covering, heating, cooling, or other protection as needed. Follow finishing operations with curing measures within 2 hours.
2. Keep concrete continuously moist for 7 days. Prevent rapid drying at the end of the curing period. Accomplish cure by one of the following methods:
 - a. Ponding or continuous sprinkling.
 - b. Absorbent mats or fabrics kept continuously wet.
 - c. Use curing compounds as specified. Remove compound film from all exposed surfaces at the end of curing period. Obtain ENGINEER's approval for all curing compounds used on vertical surfaces.
 - d. Non-staining waterproof paper as specified. Keep all joints airtight and weighted in place.
 - e. Non-staining polyethylene film as specified. Keep all joints weighted to prevent wind penetration.
3. If high early strength cement is used, curing period may be reduced to 3 days.

E. Concrete Tolerances

1. Irregularities of exposed surfaces shall not exceed 1/8-inch in elevation and 1/4-inch horizontally. Maximum variations of anchor bolt centerlines shall be 1/8-inch.

F. Rejected Concrete

1. Concrete not conforming with any portion of the specifications or concrete damaged from any cause and any concrete which shall be found defective by reason of the CONTRACTOR's operation at any time before the completion and acceptance of the work shall be removed and replaced by the CONTRACTOR with acceptable concrete. All costs resulting from the removal and replacement shall be borne by the CONTRACTOR.

**SECTION 3300
CAST-IN-PLACE CONCRETE**

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

The unit contract price shall be full pay for all work described by Section 3300- Concrete for each of the following bid items included in the bid proposal:

- A. Concrete Structure, per Lump Sum (LS). Formwork, embeds, and reinforcing steel bars shall be incidental to Concrete Structure bid item. Steel beams, support bracing, stop log guides, grating, and Aluminum stop logs are not included in this bid item.

Unless otherwise specified, the unit contract price shall include the costs of materials, labor, tools, equipment, and incidentals necessary to conduct the work described.

***** END OF SECTION *****

SECTION 5500
METAL FABRICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Structural steel
- B. Guides and other embedded steel items
- C. Guardrails, handrails, posts and related materials
- D. Miscellaneous fabricated metal items
- E. Aluminum items fabricated from shapes, plates, and sheets
- F. Anchor bolts, epoxy anchors and expansion anchors

1.02 RELATED SECTIONS

- A. Section 03300 – Cast-in-Place Concrete

1.03 SUBMITTALS

- A. Product Data: CONTRACTOR shall submit manufacturer's descriptive literature and installation instructions.
- B. Shop drawings:
 - 1. CONTRACTOR shall submit Shop drawings that verify field dimensions for all metal fabrications of all fabricated items prior to shop fabrication.
 - 2. CONTRACTOR shall indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, welded connections (using standard AWS welding symbols), and weld lengths and shall include erection drawings, elevations, details and data for welding materials and methods to be used.
 - 3. Modifications of connections or details to accommodate shop practice will be considered if called to the ENGINEER's attention and approved prior to fabrication.

1.04 QUALITY ASSURANCE

- A. All welders shall be qualified in accordance with AWS 83.0-41 within the past 12 months. Written certifications for welders performing work shall be furnished to the ENGINEER.

SECTION 5500
METAL FABRICATIONS

- B. Mill-spot markings of alloy and temper shall be placed on aluminum products. If such markings are obliterated or eliminated in fabrication, the fabricator shall furnish a certificate verifying the information.
- C. Waterproof welds shall be tested to ensure proper function for intended applications.

1.05 REFERENCE STANDARDS

Publications listed below form a part of this Specification to the extent indicated by referenced thereto:

- A. American Institute of Steel Construction (AISC):
 - 1. AISC Specifications and Code of Standard Practice
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36 Specification for Carbon Structural Steel
 - 2. ASTM A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
 - 3. ASTM A108 Specification for Steel Bars, Carbon, Cold Finished, Standard Quality
 - 4. ASTM A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 5. ASTM A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 6. ASTM A167 Specification for Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip
 - 7. ASTM A193 Specification for Alloy Steel and Stainless-Steel Bolting Materials for High Temperature Service
 - 8. ASTM A194 Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High Temperature-Service
 - 9. ASTM A240 Specification for Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
 - 10. ASTM A276 Specification for Stainless Steel Bars and Shapes
 - 11. ASTM A307 Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

SECTION 5500
METAL FABRICATIONS

12. ASTM A385 Practice for Providing High Quality Zinc Coatings (Hot-Dip)
13. ASTM A500 Specification for Cold-Formed Welded and Seamless
 Carbon Steel Structural Tubing in Rounds and Shapes
14. ASTM A525 Specification for General Requirements for Steel Sheet,
 Zinc-Coated (Galvanized) by the Hot-dip Process
15. ASTM A780 Practice for Repair of Damaged and Uncoated Areas of Hot
 Dip Galvanized Coatings
16. ASTM B209 Aluminum and Aluminum-Alloy Sheet and Plate
17. ASTM B221 Specification for Aluminum and Aluminum-Alloy Extruded
 Bar, Rods, Wire, Shapes and Tubes
18. ASTM B308 Specification for Aluminum-Alloy 6061-T6 Standard
 Structural Shapes, Rolled or Extruded
19. ASTM B429 Specification for Aluminum-Alloy Extruded Structural Pipe
 and Tube

D. American Welding Society (AWS):

1. AWS A5.4 Corrosion Resisting Chromium and Chromium Nickel
 Covered Welding Electrodes
2. AWS A5.17 Specification for Carbon Steel Electrodes and Fluxes or
 Submerged Arc Welding
3. AWS D1.1 Structural Welding Code – Steel

E. Aluminum Association:

1. WA-20 Welding Aluminum Specifications for Aluminum Structures
 (Section 1 of Aluminum Construction Manual)

**SECTION 5500
METAL FABRICATIONS**

1.06 DELIVERY, HANDLING, AND STORAGE

- A. Handle all metal fabrications with care to avoid bending, twisting, or other damage.
- B. Store in manner to allow drainage of water from all parts.
- C. Place blocking to keep metal fabrications off ground.
- D. Repair or replace damaged items as directed by ENGINEER.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Furnish all connectors, fasteners, welded metal and miscellaneous items required to complete and construct the items shown on the drawings.
- B. Unless otherwise shown, the fasteners and connectors shall be of same material as the attached metal, except for aluminum where fasteners and connectors shall be stainless steel. All fasteners used for submerged or "wet locations" shall be stainless steel.
- C. Furnish washers and lock washers for all bolted connections unless otherwise noted. Washers and lock washers shall be of the same material as fasteners and connectors.
- D. Anchor bolts embedded in concrete and subjected to intermittent or continuous submergence shall be stainless steel. Other anchor bolts shall be hot dip galvanized unless otherwise noted.
- E. Hot-Dip Galvanizing: Unless otherwise specified, shall be after fabrication.
- F. Welded Studs and Anchors: Provide anchor units or approved equivalent of diameter and length indicated on the drawings. Install in accordance with manufacturer's recommendations and as shown on the drawings.

SECTION 5500
METAL FABRICATIONS

2.02 MATERIALS

- A. Structural Steel Shapes, Plates, and Bars:
 - 1. Conform to ASTM A 36 and ASTM A 108.
 - 2. Clean free from mill scale, rust, pitting, and warps.
- B. Tubular Steel Products - Hot formed structural quality, welded or seamless:
 - 1. Square, rectangular and special shapes: ASTM A 500, Grade B, yield stress 46 ksi minimum.
 - 2. Pipe: ASTM A 53, Grade B Type S Schedule 40.
- C. Aluminum Shapes, Plates, and Bars:
 - 1. Aluminum shapes shall conform to ASTM B308 and may be either American Standard or Aluminum Association section. All shapes shall be of the same section configuration.
 - 2. Aluminum plates shall conform to ASTM B209, alloy 5052.
 - 3. Aluminum tubes shall conform to ASTM B429 or Military Specification QQA 200/9. Alloy shall be 6063-T52

2.03 ANCHOR BOLTS, EPOXY ANCHORS AND EXPANSION ANCHORS

- A. Anchor bolts, nuts, and washers shall conform to ASTM A307 and shall be hot dip galvanized in accordance with ASTM A153 except where noted on the drawings or when the application results in the bolts being continuously or intermittently submerged in water or in contact with fabricated aluminum items. In such cases, the anchor assembly shall be stainless steel conforming to ASTM A193 and A194.
- B. Epoxy anchors shall be sized as shown on the drawings. Minimum embedment shall be 3 3/8-inches for 3/8-inch anchors, 4 1/2-inches for 1/2-inch anchors and 5 5/8-inches for 5/8-inch anchors. Epoxy anchor rod, nuts and washers shall be type 304 stainless steel. Epoxy anchors shall be Simpson Set-XP or approved equal. Adhesive anchor bolts shall be installed per the manufacturer's recommendation
- B. Expansion anchors shall be sized as shown on the drawings. Minimum embedment shall be 2 1/2-inches for 3/8-inch anchors, 3 1/2-inches for 1/2-inch anchors and 4-inches for 5/8-inch anchors. Expansion anchors, including nuts and washers shall be zinc plated carbon steel. Expansion anchors shall be Hilti Kwik Bolt II or approved equal. Expansion anchors shall be installed per the manufacturer's recommendations.

**SECTION 5500
METAL FABRICATIONS**

2.04 BOLTS, NUTS, AND WASHERS

- A. All bolts and nuts that will be continuously or intermittently in contact with water during normal operations shall be stainless steel conforming to ASTM A193 and ASTM A194. Type shall be 304 or 316.
- B. All other bolts, nuts and washers shall conform to ASTM A307 and shall be hot dip galvanized.
- C. All assembly hardware for aluminum and stainless-steel fabrication shall be stainless steel.

2.05 MISCELLANEOUS

- A. Mild Steel Covered Welding Electrodes: Conform to the requirements of the American Welding Society, series E-60 or E-70 as required.
- B. Bare Electrodes and Flux for Submerged Arc Welding: Conform to the requirements of the American Welding Society. Flux shall be series F-60 or F-70 as required with appropriate electrode per AWS A5.17.
- C. Field applied, galvanizing repair shall be performed in accordance with ASTM A 780 with "Galv-Weld" as manufactured by Kenco Division, Southern Coatings and Chemical Company, or approved equal.

PART 3 - EXECUTION

3.01 FABRICATION

- A. General
 - 1. Conform to "Standard Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", AISC, and AWS D1.1 - Structural Steel Welding Code, AWS 5.4 for stainless steel and WA-20 for aluminum.
 - 2. All shop connections shall be welded, unless otherwise detailed.

SECTION 5500
METAL FABRICATIONS

3. Connections not otherwise detailed shall support full load capacity of members joined.
 4. Do all intermittent and continuous welding and straightening of built-up sections in a manner to minimize internal stress.
 5. Exposed members shall be free from bend, warp or other defects.
 6. Modifications of fabrication details for economy or feasibility may be made on written approval of ENGINEER.
 7. Clean all exposed items of rust, scale, grease, weld spatter and slag prior to finishing.
 8. All joints shall be tightly fitted. Where exposed welding is required, weld neatly and grind smooth without pits or blemishes.
 9. Provide holes at spacing indicated for all items detailed on the drawings to be anchored with screws or bolts. Bolt hole diameter shall be equal to the nominal diameter of the bolt plus 1/16-inch, unless otherwise indicated.
 10. Fit all work together at shop as far as possible and deliver complete and ready for erection. Properly mark and match-mark for field assembly.
 11. Provide all required bolts, anchors, clips, and other anchorages required for structural steel built into or anchored to concrete structures.
- B. Welding:
1. Comply with AWS Code for procedures, appearance, and quality of welds and methods used in correcting welding work.
 2. Remove all welding slag, weld spatter, rust, and burnt paint with slag hammer and metal scraper. Wire brush until completely cleaned. Remove all temporary erection bracing, clips, and similar items. Grind any burrs left after their removal flush with parent metal. Fill all undercuts and pulled places in parent metal on exposed members by welding and grinding flush.
 3. Remove any welder found to be producing unsatisfactory work as determined by the ENGINEER even though that welding operator may have passed the qualifications tests. Remove unsatisfactory welding by chipping or the arc air method.
 4. Fillet welds, connecting plates and shapes shall be a minimum of ¼-inch, except where thickness of metal requires use of 3/16-inch weld. Fillet welds connecting sheet material shall be a minimum thickness of the sheet material.
 5. Exercise care in welding of all sections to avoid heat distortion of joined sections.
- C. Guardrails and Lock Rods:
1. Guardrails and Lock Rods shall be fabricated as shown on the drawings. Guardrails shall be welded construction with all welds shall be ground smooth after completion.
 2. Bends and caps shall be made with standard pipefittings. Intersections between posts and rails shall be made by cutting and fitting the rails to the posts. All posts shall be continuous from floor to top rail.
 3. All guardrails shall be hot dipped galvanized.

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- D. Aluminum Fabrications
1. Protect all surfaces from damage by weld splatter and accidental scratching. Grind and polish (120 grit, A_2O_3 abrasive) all exposed weld surfaces to provide a smooth, uniform, polished surface. Welding shall conform to WA-20. Provide full length or perimeter aluminum welding unless specifically directed not to in the drawings. Protect items from heat warp and distortion. Maintain true and square mitered joints for all frames and similar items. Test all waterproof welds and repair or replace any that leak.
 2. Coat aluminum items to be embedded or in surface contact with concrete with coal tar epoxy paint. Do not paint the exposed portion of these aluminum items.

3.02 SURFACE TREATMENT, SHOP APPLIED

- A. Steel:
Galvanized Surfaces: Unless otherwise specified, all ferrous metal shall be hot dip galvanized conforming to the applicable requirements of ASTM A123, A153, A385 and A525. Provide a minimum of 2.3 ounces per square foot galvanizing on all surfaces.
- B. Aluminum:
Unless otherwise specified, aluminum shall have a smooth, polished finish and be cleaned of oils, chemical or other foreign matter using acid wash after fabrication. No rough grinding marks or welding splatters shall be permitted on aluminum items. In all cases, edges shall be radiused to remove sharp edges.

3.03 SURFACE TREATMENT, FIELD APPLIED

- A. Steel:
1. Damaged or modified galvanized and painted surfaces shall either be returned for shop repair or field repaired at the discretion of the ENGINEER.
 2. Field applied surface treatment for damaged galvanized surfaces shall be molten "Galv-Weld" or approved equal. Apply treatment before final installation in accordance with ASTM A 780.
 3. Painted Surfaces: Repair of damaged shop-primed surfaces and all field priming shall be performed as specified in Section 09900.
- B. Aluminum:
1. No field-applied finish permitted. Do not use aluminum paint. Factory finished products with damaged surfaces shall be replaced with no additional cost to the OWNER. All aluminum surfaces shall be polished to a smooth uniform surface.

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3.04 ERECTION

- A. General
 - 1. Erect all structural steel and related work in accordance with AISC Specifications and Code of Standard Practice.
 - 2. Maintain all work in stable and safe condition at all times during erection.
 - 3. Draw bolts up tight with lock washer so nut cannot come loose.
 - 4. Set steel accurately to line and level, securely brace in position until permanent connections are made and all construction operations, which could load structure, are complete. Provide temporary shoring and bracing of all members as required.
 - 5. Only light drifting will be permitted to draw parts together. Drifting to match unfair holes is not permitted. Enlargement of holes necessary to make connections shall be done by reaming and twist drills and by use of the proper size bolts.
 - 6. Cutting of steel shapes in the field is not permitted without approval of the ENGINEER.
 - 7. CONTRACTOR shall be responsible for the costs of returning substandard or damaged items to the fabricator for fabrication and/or galvanizing corrections. The ENGINEER shall have the authority of acceptance or rejection.
- B. Embedded Items
 - 1. Metalwork to be embedded in concrete shall be placed accurately and held in the correct position while the concrete is placed, or if shown or accepted, recesses or blockouts may be formed in the concrete and the metalwork grouted in place. The surfaces of all metalwork in contact with or embedded in concrete shall be thoroughly cleaned of all rust, dirt, grease, loose scale, grout, mortar and other foreign matter. All metalworks shall have proper fit-up and shall be job-measured where necessary.
 - 2. Metalwork shall be set so that edges are flush and square with the floor and/or wall. Use extreme care to ensure that embedded items are set at correct spacing and are perpendicular as shown. All metal shall be fabricated to match the chamfer of concrete.
 - 3. After anchor bolts have been embedded, their threads shall be protected by having the nuts screwed on or by other accepted means until the time of installation of the equipment or metal work.
- C. Guardrails shall be erected with the posts plumb and the rails straight and in alignment with adjoining sections. Use steel shims under base plates to plumb posts.
- D. After fabrication and installation, each screen, baffle and other miscellaneous metal item that is removable shall be tested in its intended location. Identical units shall be interchangeable.

**SECTION 5500
METAL FABRICATIONS**

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

The unit contract price shall be full pay for all work described by Section 5500- Structural Steel Metal fabrication for each of the following bid items included in the bid proposal:

- A. Structural Steel, per Lump Sum (LS). Includes beams, supports, stop log guides, grating, railings and aluminum stoplogs, pullers.

Unless otherwise specified, the unit contract price shall include the costs of materials, labor, tools, equipment, and incidentals necessary to conduct the work described.

***** END OF SECTION *****

APPENDIX A: BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) are designed to reduce adverse impacts to fish, wildlife, and plant species and their critical habitats. CONTRACTOR shall execute appropriate BMPs. BMPs are listed by main project categories, but in practice overlaps do exist among the categories. Individual BMPs are subject to becoming more stringent or additional BMPs instituted if restoration activities are changed.

General BMPs for all Project Categories:

Follow all terms and conditions in regulatory permits and other official project authorizations to eliminate or reduce adverse impacts to any endangered, threatened, or sensitive species or their critical habitats.

Complete restoration activities at individual project sites in a timely manner. This will reduce disturbance and/or displacement of fish and wildlife species in the immediate project area.

Significant modifications to an approved work plan must be reviewed and approved by appropriate agency personnel and the OWNER(s) before the work can be carried out or continued.

Use existing roadways or travel paths for access to project sites.

Streams, riparian zones, and wetlands must not be used as staging or refueling areas. Equipment must be stored, serviced, and fueled away from aquatic habitats or other sensitive areas.

Boulder and rock material used for restoration projects must come from non-streambed and non-wetland sources.

Sedimentation and erosion controls must be implemented at all locations as shown in the plans and as described in the specifications.

Staging and stockpile areas must be located on or immediately beside the project area whenever possible.