

**SECTION 05100**

**STRUCTURAL METAL FRAMING**

**PART 1 GENERAL**

1.1 DESCRIPTION OF WORK

- A. This work includes furnishing all labor, materials and equipment necessary for installation of structural steel and aluminum support members and fasteners as specified herein and as shown on the Drawings.

1.2 REFERENCES

- A. This section references the latest edition of the following documents. They are a part of this section as specified and modified. In a case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
AISC	Steel Construction Manual, Allowable Stress Design
AISC	Code of Standard Practice for Steel Buildings and Bridges
ASTM A36	Specification for Structural Steel
ASTM A53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
ASTM A108	Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
ASTM A123	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153	Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A193	Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A449	Specification for Quenched and Tempered Steel Bolts and Studs
ASTM A500	Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes



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3. Indicate welded connections using standard AWS welding symbols. Indicate weld lengths. Include data for welding materials and methods to be used. Waterproof welds shall be tested to insure proper function for intended applications.

1.5 SURFACE TREATMENT, SHOP APPLIED

A. Steel

1. Galvanized Surfaces. Unless otherwise specified, all elements shall be hot-dip galvanized conforming to the applicable requirements of ASTM A123, A153, A385 and A525. Provide minimum of 2.3 oz./sq. ft. galvanizing on all surfaces. Touch-up Galvanized Metal Surfaces damaged in fabrication with "Galv-Weld", manufactured by Galv-Weld Products, Kenco Division, Southern Coatings and Chemical Co., Sumter, S.C. 29150, or approved equivalent.
2. Painted Surfaces (structural steel). Refer to SECTION 09900 for surface preparation and shop prime coats required.
3. No galvanized material is to be used on material that is in direct contact with fish rearing water.

B. Aluminum. Unless otherwise specified, aluminum shall have a smooth, polished finish and be clean 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.

C. Stainless Steel shall have the standard mill finish, be cleaned of all foreign matter before delivery to the job. Stainless steel shall have smooth polished surfaces and edges.

1.6 SURFACE TREATMENT, FIELD APPLIED

A. Steel

1. Galvanized Surfaces. Damaged shop galvanized surfaces and all field applied galvanizing shall be done with "Galv-Weld" or approved equivalent prior to installation.
2. Painted Surfaces. Damaged shop primed surfaces and all field priming shall be done as specified in SECTION 09900.

B. Aluminum. No field applied finish permitted. Do not use aluminum paint. Factory finished products with damaged surfaces will be replaced with no

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additional cost to the Owner. All aluminum surfaces shall be polished to a smooth uniform surface.

- C. Stainless Steel. No field applied finish required.

**PART 2 PRODUCTS**

2.1 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 lockwashers shall be of the same material as fasteners and connectors.
- D. Anchor bolts embedded in concrete and subjected to intermittent or continuous submergence during hatchery operations shall be stainless steel. Other anchor bolts shall be hot-dip galvanized unless otherwise noted.
- E. Hot Dip Galvanizing: Unless otherwise specified, galvanizing by the hot-dip process shall conform to the applicable requirements of ASTM A123 and A153.
- F. Field Galvanizing: If it is necessary that a previously galvanized or finished member be cut in the field, the exposed metal from the cutting, grinding, or welding shall be cleaned and painted with two coats of "Galv-Weld" as manufactured by Galv-Weld Products, Kenco Division, Southern Coatings & Chem. Co., Sumter So. Carolina, or approved equivalent.
- G. Welded Studs and Anchors: Provide anchor units or approved equivalent of diameter and length indicated on drawings. Install in accordance with manufacturer's recommendations and as shown on the plans.
- H. Headed Concrete Anchors: ASTM A108 or AISI Type 304

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2.2 STEEL

- A. Structural Steel Members and plate: ASTM A36
- B. Steel wedge and drop-in anchors: Stainless Steel HILTI or Engineer accepted equivalent.
- C. Steel Pipe: ASTM A53 Grade B
- D. Structural Tubing: ASTM A500, Grade B
- E. Anchor Bolts: ASTM A307, Grade A or ASTM A193 as noted on the Drawings.
- F. Welding Materials: Per AWS D1.1 - type required for materials being welded or E70XX electrodes.

2.3 ALUMINUM

- A. Structural aluminum members: 6061-T6 Alloy

2.4 STEEL FABRICATION

- A. Fabricate structural steel members in accordance with AISC Specification.
- B. All ferrous elements shall be hot-dipped galvanized after fabrication unless noted otherwise on the Drawings.

2.5 ALUMINUM FABRICATION

- A. Structural aluminum shapes and plates shall be fabricated from aluminum alloy 6061-T6 unless otherwise noted or accepted by Submittal. Protect all surfaces from damage by weld splatter and accidental scratching. Grind and polish (120 grit, A2O3 abrasive), all exposed weld surfaces to provide a smooth, uniform, polished surface. Welding shall conform to WA-20 Welding Aluminum by the Aluminum Association (AA). Provide full length or perimeter aluminum welding unless specifically directed not to in the plans. Protect items from heat warp and distortion. Maintain true and square mitered joints for all frames and similar items.
  - 1. All bolts, nuts, washers, screws used for assembly or mounting of aluminum fabricated items shall be stainless steel Type 304 or 316. Do not use plated or galvanized assembly hardware with aluminum fabricated items.

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2.6 Coat only portion of aluminum items to be embedded or in surface contact with concrete with coal tar epoxy paint system as identified in SECTION 09900. Do not paint the exposed portion of these aluminum items.

2.7 ANCHOR BOLTS & EXPANSION ANCHORS

A. Anchor bolts, nuts, expansion anchors, bolts and washers shall be zinc plated except where noted on the Drawings or when the application results in the bolts being continuously or intermittently submerged in water. In such cases, the anchor assembly shall be stainless steel.

2.8 BOLTS, NUTS, WASHERS AND SHEET METAL SCREWS

A. All bolts and nuts which will be continuously or intermittently in contact with water during hatchery operations shall be stainless steel conforming to ASTM A193 and ASTM A194 for the type approved. Type shall be 304 or 316. All other bolts, nuts and washers shall be hot-dip galvanized unless specifically identified as other materials with the exception that all assembly hardware for aluminum fabrication shall be stainless steel; no galvanized or plated or anodized materials shall be used with aluminum.

**PART 3 EXECUTION**

3.1 ERECTION

A. General Requirements

1. Metalwork shall be carefully installed as shown on the plans or as directed. Metalwork which is bent, broken, or otherwise damaged shall be repaired or replaced by the Contractor to the satisfaction of the Engineer or owner at no additional cost.
2. Metalwork to be embedded in concrete is to be placed accurately and held in the correct position while the concrete is placed, or if shown or accepted, recesses or blockouts shall be formed in the concrete and the metalwork shall be 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 and coated with a coal tar epoxy coat. All metalwork shall have proper fit-up and shall be job-measured where necessary.

B. Erect structural steel in accordance with AISC Specification and the AISC code of standard practice for steel buildings and bridges.

C. Do not field cut or alter structural members without acceptance by the Engineer.

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- D. For welding steel use electrodes compatible with galvanized steel.
  - 1. Minimum fillet weld size shall be 3/16 inch unless noted otherwise.
- E. After erection and welding of structural steel repair scratches, gouges, cut edges, welds, and other bare areas with zinc-rich paint according to ASTM A780. Paint thickness at repaired areas to be minimum of 10 mils. Paint for repair to result in dried film containing minimum of 94% zinc dust by weight.
- F. Provide temporary bracing or anchors in formwork for items which are to be built into concrete.
- G. All sharp edges, burrs, and protrusions shall be removed by the Contractor to the satisfaction of the owner. All edges and corners in potential contact with water during hatchery operation shall be radiussed and ground smooth to the satisfaction of the owner.
- H. Bearing plates, guides, and angles: units shall be set so that edges are flush and square with the floor and/or wall. Use extreme care to insure that embedded items are set at correct spacing and are perpendicular as shown. All metal shall be cut and/or ground to match chamfer of concrete.
- I. Anchor bolts: unless noted on the Drawings expansion anchors set in holes drilled in the concrete after the concrete is placed will not be permitted in substitution for anchor bolts except with the prior written acceptance of the Engineer.
- J. 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.

**END OF SECTION**

**SECTION 05300**

**METAL DECKING**

**PART 1 GENERAL**

1.1 DESCRIPTION OF WORK

- A. Work includes furnishing all labor, materials and equipment necessary for the design, manufacture and installation of formed metal deck as specified herein and as shown on the drawings.

1.2 RELATED REQUIREMENTS

- A. SECTION 01340 - Submittals
- B. SECTION 03300 - Cast-in-Place Concrete

1.3 REFERENCES

- A. This section references the latest edition of the following documents. They are a part of this section as specified and modified. In a case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
AISI	Specifications for the Design of Cold-Formed Steel Structural Members
ASTM A446	Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A525	Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
ASTM A611	Specification for Steel, Sheet, Carbon, Cold-Rolled
AWS D1.3	Specification for Welding Sheet Steel in Structures
Factory Mutual Listing	Factory Mutual System Approval Guide
ICBO	Evaluation Report No. 2078
SDI	Steel Deck Institute Design Manual



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1.4 SUBMITTALS

- A. Submit shop drawings for steel deck in accordance with SECTION 01340.
  - 1. Indicate profiles, panel sizes, and connection attachments.
  - 2. Drawings shall indicate panel span vertical load ratings and shear resistance values.

1.5 PERFORMANCE REQUIREMENTS

- A. Diaphragm Shear Capacity: The gage and attachment of the deck is designed to provide a diaphragm shear capacity in accordance with Evaluation Report No. 2078 of the International Conference of Building Officials. Other ICBO approved methods of attachment and gage will be acceptable as an equal if they meet the diaphragm shear capacity shown on the structural drawings.
  - 1. Factory Mutual Listing: Provide HSB Roof Deck units which have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire rated construction.
  - 2. Deck manufacturer shall be a member of SDI.
  - 3. Deck Units: Composite deck shall have deformations and indentations to provide a mechanical bond with the concrete.

**PART 2 PRODUCTS**

2.1 MATERIALS

- A. Galvanized Steel: ASTM A446, Grade A..
  - 1. Zinc-Coated per ASTM A525, Grade 60.
  - 2. Factory Prime Painting Gray or Double White.

2.2 FABRICATION

- A. General: Form deck units in lengths to single span with button of nested 2" end laps and interlocking side laps formed with standing seam allowing button punch connection.

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- B. Roof Deck Units: Provide deck configurations equal to the selections shown on the drawings, and as per SDI Design Manual.

**PART 3 EXECUTION**

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Steel Deck
  - 1. Do not bend or mar decking.
  - 2. Store off ground with one end elevated for drainage.
  - 3. Cover deck with waterproof material, ventilated to avoid condensation.

3.2 INSPECTION

- A. Check supporting members for correct layout and alignment.
- B. Verify that the surfaces to receive roof deck are free of debris.
- C. Do not proceed with installation until defects are corrected.

3.3 INSTALLATION

- A. General: Install deck units and accessories in accordance with manufacturer's recommendations, shop drawings, and SDI Design Manual installation procedures.
- B. Placing Deck Units
  - 1. Position on support system framework and adjust to final position with ends bearing minimum 2 in. on supporting members.
  - 2. Place units end to end before being permanently fastened.
  - 3. Align ribs over entire length of run.
  - 4. Provide deck opening and additional reinforcing steel as shown on the drawings.
- C. Fastening Deck Units
  - 1. Use temporary shoring to hold deck in place.

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2. Bend reinforcement bars extending up out of CMU wall down to center of concrete covers.
3. Attach closure plates , end forms and side lapping.
4. Place concrete to depth indicated on drawings.

3.4 PROTECTION

- A. Do not use deck units for storage or working platforms until secured in position.
- B. Construction loads must not exceed carrying capacity of deck.

**END OF SECTION**

**SECTION 05920**

**FISH SCREENS**

**PART 1 GENERAL**

1.1 DESCRIPTION OF WORK

- A. The work includes furnishing all labor, equipment and materials to design and install a complete and functional design fish screen system as shown on the Drawings and as specified herein.
- B. The work includes:
  - 1. Intake Screens (including screen design)
  - 2. Air Manifold/Screen Support
  - 3. Screen Seats and Manifold Supports

1.2 SUBMITTALS

- A. Submit the following in accordance with SECTION 01340:
  - 1. Certificates of Compliance. Submit Certificates of Compliance, or Mill Test Reports, for all members, shapes, and plates.
  - 2. Welder Qualifications. Submit documentation of welder qualifications, in accordance with 1.3.C.2.
  - 3. Fabrication Shop Qualifications. Submit fabrication shop qualifications as required by 1.3.B.
  - 4. Product Data. Submit manufacturer's descriptive literature and installation instructions for the following:
    - a. Fasteners
    - b. Headed Concrete Anchors
    - c. Galvanizing Repair Paint
    - d. Grout

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5. Shop Drawings. Submit shop drawings for all metal fabrication items providing the following information:
  - a. Indicate profiles, sizes, connection attachments, tolerances, reinforcing, anchorage, size, and type of fasteners.
  - b. Include erection drawings, elevations, and details. Contractor shall verify field dimensions for all metal fabrications and provide shop drawings for all fabricated items prior to shop fabrication.
  - c. Indicate welded connections, in accordance with AWS A2.4. Indicate weld lengths. Include data for welding materials and methods to be used. Piping welds shall be tested to insure proper function for intended applications.
6. Calculations. Submit calculations for screen panel design, in accordance with paragraph 2.6.

1.3 QUALITY ASSURANCE

- A. Steel. Visually inspect steel plates and shapes for defects, such as laminations and non-metallic inclusions prior to use.
- B. Fabrication Shop Approval. Fabricator's shop shall comply with UBC, 1701.7. In lieu of the above, Contractor may employ a special inspector to perform required inspections.
- C. Welding.
  1. Welding Requirements. Comply with AWS. D1.1.
  2. Qualification. Comply with AWS D1.1 for welder qualification. Welders or welding operators shall have qualified within the last twelve (12) months, or shall be pre-qualified for each process used. Welders qualified in accordance with ASME, Section IX need not be re-qualified to AWS D1.1.
  3. Stud Welding. All stud welding shall be pre-production tested, in accordance with AWS D1.1, paragraph 7.7.1.
  4. Inspection. Unless all welding is performed by an approved fabricator, in accordance with paragraph 1.3.B, all shop welds shall be inspected by a special inspector, employed by the Contractor, in compliance with the UBC Chapter 17. Field welding will be subject to review and acceptance by the Engineer.

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- a. Fitup. Unless waived by the Engineer, the fitup of all full and partial penetration welds shall be subject to review and acceptance by the Engineer.
- b. Visual Inspection. All shop welds shall be visually inspected prior to shipping. Shop welding will also be reviewed for acceptance by the Engineer upon delivery to the site, and prior to installation. All field welds shall be subject to review and acceptance by the Engineer. Notify the Engineer a minimum of two (2) working days prior to required inspections.

1.4 PRODUCT HANDLING

- A. General. Store and handle in such a manner which will insure final installation in an undamaged condition. Perform lifting using only designated pick points, or as required, to prevent distortion of the item. Use particular care in handling screen panels, embeds, and other items which require special fitup requirements.

**PART 2 PRODUCTS**

2.1 MATERIALS

- A. Comply with the following:
  - 1. Carbon Steel Bars, Plates, and Shapes: ASTM A36
  - 2. Stainless Steel Plates: ASTM A167 or A240, Type 304
  - 3. Stainless Steel Bars and Shapes: ASTM A276, Type 304
  - 4. Bolts: ASTM A193, B8
  - 5. Nuts: ASTM A194
  - 6. Stainless Steel Pipe: ASTM A376, Type 304
  - 7. Structural Tubing: ASTM A500, Grade B
  - 8. Welding Electrodes: E70XX or Type 308-15, as required for base metal
  - 9. Screening Materials: Type 304 Stainless Steel
- B. Bolting materials, air piping and intake screen assembly shall be stainless steel. Unless otherwise specified, all other materials shall be carbon steel.

2.2 CONNECTION

- A. Furnish all connectors, fasteners, welded metal, and miscellaneous items required to complete and construct the items shown on the Drawings.
- B. Furnish washers and lock washers, of the same materials as fasteners and connections, for all bolted connections, unless otherwise specified.

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2.3 FABRICATION

- A. Comply with AISC Specification for all steel fabrication.
- B. Verify all measurements and take all necessary field measurements prior to fabrication. Provide materials and parts necessary to complete the installation of each item, even if such details are not shown. Drilling and punching shall produce clean true lines and surfaces.
- C. In addition to the welded connection shown, all welded connections shall be seal welded around the entire faying surfacing (matching edges of the pieces being joined), to seal this surface. Grind seal welds flush, as required for assembly.

2.4 WELDING

- A. Comply with AWS D1.1, or ASME Section IX, for all shop welding.

2.5 FINISH

- A. Stainless steel shall be provided to a standard mill finish, which has been cleaned of all foreign matter, and with all rough edges ground to a smooth finish.

2.6 INTAKE SCREENS

- A. Screen assemblies shall be constructed of Type 304 Stainless Steel.
- B. Screening materials shall be welded wedge wire, with continuous 1.75 mm slots, and a minimum effective open area of forty percent (40%).
- C. Configuration of screen panel assembly shall be determined by the supplier to conform to the sizes shown on the drawing. Configuration shall leave no gaps which create a path through the assembly, other than through the screen slots. Screen slots shall be oriented perpendicular to flow direction. Assembly shall be designed by the supplier for the following loading conditions:
  - 1. A uniform hydrostatic loading to be used for the design of each screen is called out in the Drawings. This loading is to be uniformly applied across the entire screen area with all screen elements remaining within allowable stress in accordance with AISC Specifications.
- D. Screen manufacturer shall also provide a calculation for maximum headloss through the screens with an approach velocity of 0.4 fps.
- E. Screen material shall be continuously welded to framing around the entire perimeter and to intermediate frame members.

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- F. Contractor shall design and fabricate a strongback device for each site, for lifting/placing each screen assembly into position, with the strongbacks becoming the property of Owner. The device shall be designed to place the assembly in and out of position using pick points on the top edge of the screens.

2.7 AIR MANIFOLD/SCREEN SUPPORT

- A. Provide assemblies constructed of stainless steel and in configuration, dimensions, and quantities, as shown on Drawings.
- B. Protect all surfaces from weld splatter and accidental scratching. Protect items from heat warp or distortion. Maintain true and square mitered joints.
- C. Assemblies shall be fastened in place with stainless steel bolts, lock washers, and double nuts.
- D. Upper surface air holes shall be drilled prior to fabrication. Lower surface air holes shall be drilled after attaching piping to angle frame.
- E. Piping interior shall be cleaned to remove any metal from drilling air discharge holes.
- F. All holes shall be clean, true, and free of any debris, paint or irregular blockage prior to review and acceptance by the Engineer for final assembly in place.

2.8 SCREEN SEATS AND MANIFOLD SUPPORTS

- A. Provide assemblies in configuration, dimensions, and quantities, as shown on Drawings.
- B. Protect all surfaces from weld splatter and accidental scratching. Protect items from heat warp or distortion. Maintain true and square mitered joints.
- C. Apply heat evenly while welding to prevent warping or distortion. Seat plates shall be true and square to allow for proper seating of screen and air manifold/screen support. Prior to shipment, pre-assemble seat frame for each bay, and utilizing a template verify that seats are flush with template around entire perimeter and square with template mating surface.
- D. Seats may be machined to remove a maximum of 1/16-inch thickness, if required to achieve required flatness. Top of embeds and all other dimensions shall be modified accordingly.
- E. Provide erection holes for bolting embeds to formwork during placement. No erection holes shall be put in screen seats. Position of erection holes shall be



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shown on shop drawings and is subject to the review and acceptance by the Engineer.

- F. Provide stainless steel bolting materials with double nuts or lockwashers. Lockwashers shall be in addition to standard flat washers.

2.9 GROUT

- A. Furnish and install "Master Builders, Masterflow 713" nonshrink, natural aggregate grout or approved equivalent in accordance with manufacturer's recommendations.

**PART 3 EXECUTION**

3.1 GENERAL REQUIREMENTS

- A. Work shall be accurately set to establish lines and grades and securely fastened in place. Use particular care during installation of screen seats, manifold supports, air manifold/screen support, screen panels, and other items requiring special fitup requirement. Repair all damage, or replace items at no additional cost to Owner prior to installation.

3.2 INSTALLATION

- A. Installation shall comply with the Drawings, manufacturer's installation instructions, and the AISC Specifications, subject to modifications of the Engineer.

3.3 SCREEN SEATS AND MANIFOLD SUPPORTS

- A. Place all metalwork to be embedded in concrete accurately and hold securely in place during concrete placement. Surface of embedments shall be set so that edges are flush and square with the floor and/or wall. Thoroughly clean all rust, dirt grease, loose scale, grout, and other foreign matter, from surfaces which will be in contact with concrete and coat with coal tar epoxy.
- B. Position screen seat embedments using a template to assure that seats of the entire frame are in one plane and square. Seats shall be positioned to provide for full bearing of screen panels and air manifold/screen support. Securely hold embeds in the final position during concrete placement. Protect all surfaces from weld splatter and accidental scratching.

3.4 WELDING

- A. Comply with AWS D1.1, or ASME Section IX for all field welding.

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3.5 BOLTING

- A. Make all steel member bolted connection snug tight with double nuts or lockwashers.

3.6 SCREEN PANEL ASSEMBLY

- A. Upon final assembly, and without any external force applied, the screen panels shall rest upon the supports and seats with no gaps in excess of 1/16 inch.

**END OF SECTION**

**SECTION 05990**

**MISCELLANEOUS METALS**

**PART 1 GENERAL**

1.1 DESCRIPTION OF WORK

- A. Work consists of furnishing all labor, materials and equipment for the fabrication and erection of all metal fabrications as specified herein and shown on the drawings and which are not part of structural steel, structural aluminum or other metal systems specified elsewhere.
- B. Work includes, but is not limited to, embedded and non-embedded metal work and fabrication of the following:
  - 1. Headboxes
  - 2. Incubation Headers
  - 3. Incubation Racks
  - 4. Guardrail/Handrail
  - 5. Bollards
  - 6. Stairways
  - 7. Support Assemblies
  - 8. Screens
  - 9. Grates
  - 10. Grating - Aluminum and Galvanized Steel
  - 11. Angles, Brackets, Hangers, Frames , Supports, Channels and Embeds
  - 12. Anchor Bolts and Expansion Anchors
  - 13. Bolts, Nuts & Washers, Headed Concrete Anchors
  - 14. Ladders & Steps (Rungs)
  - 15. Aluminum Fabrications
  - 16. Rubber Gasketing for Fish Screens, Measuring Weirs and Attachment
  - 17. Fish crowders
  - 18. Fish ladder and adult holding pond diffuser panels and bar racks
  - 19. Fish lock Brail floor, lifting beams and gates
  - 20. Spawning building dewatering screens, shock tanks, live tanks, sorting table, carcass racks, and work stations
  - 21. Sorting tube supports
  - 22. Spawning building work platform and stairs

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23. Degassing towers and support grating

1.2 SUBMITTALS

- A. Product data. Submit manufacturer's descriptive literature and installation instructions for the following:
1. Fasteners
  2. Grout
  3. Galvanizing repair paint
  4. Gratings
- B. Shop drawings. Submit shop drawings for all metal fabrications items for review and acceptance in accordance with SECTION 01340.
1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners.
  2. Include drawings, elevations and details. Contractor shall field verify all dimensions required for proper fitting of metal fabrications and provide shop drawings for all fabricated items prior to shop fabrication.
  3. Indicate welded connections using standard AWS D1.1 welding symbols. Indicate weld lengths. Include data for welding materials and methods to be used. Waterproof welds shall be tested to insure proper function for intended applications.

1.3 QUALITY ASSURANCE

- A. All welders shall be qualified in accordance with AWS D1.1 within the past twelve months. Written certifications for welders performing work shall be furnished to the Engineer.
- 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.

1.4 REFERENCE STANDARDS

- A. This section references the latest edition of the following documents. They are a part of this section as specified and modified. In a case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

ASTM  
A36                      Structural steel.

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A53	Steel pipe, Grade B .
A123	Zinc (hot-dip galvanized) coatings on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strip.
A167	Stainless steel plate, sheet and strip, Type 302, 304 and 316.
A193	Stainless steel bolts.
A194	Stainless steel nuts.
A276	Stainless steel bars and shapes, Types 302, 304 and 316.
A307	Carbon steel externally threaded standard fasteners.
A386	Zinc coating (hot dip) on assembled steel products.
A526	Steel sheet, zinc-coated (galvanized) by the hot-dip process, commercial quality.
B308	Aluminum-alloy 6061-T6 standard structural shapes, rolled or extruded.
F468	Nonferrous bolts, hexcap screws and studs for general use.

American Welding Society (AWS)

AWS	D1.1-2000	Structural Welding Code - Steel
AWS	D1.2-97	Structural Welding Code - Aluminum
AWS	D1.6-99	Structural Welding Code - Stainless Steel

Aluminum Association (AA)

Aluminum Design Manual, 2000 Edition

National Association of Architectural Metal Manufacturers (NAAMM)

ANSI/NAAMM MBG 53193 Metal Bar Grating Manual

1.5 SURFACE TREATMENT, SHOP APPLIED

A. Steel

1. Galvanized Surfaces. Unless otherwise specified, all elements shall be hot-dip galvanized conforming to the applicable requirements of ASTM A123, A153, A385 and A525. Provide minimum of 2.3 oz./sq. ft. galvanizing on all surfaces.
2. Painted Surfaces (structural steel). Refer to Section 09900 for surface preparation and shop prime coats required.
3. No galvanized material is to be used on material that is in direct contact with fish rearing water.

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- B. Aluminum. Unless otherwise specified, aluminum shall have a smooth, polished finish and be clean 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.
- C. Stainless Steel shall have the standard mill finish, be cleaned of all foreign matter before delivery to the job. Stainless steel shall have smooth polished surfaces and edges.
- D. Touch-up Galvanized Metal Surfaces damaged in fabrication with "Galv-Weld", manufactured by Galv-Weld Products, Kenco Division, Southern Coatings and Chemical Co., Sumter, S.C. 29150, or approved equivalent.

1.6 SURFACE TREATMENT, FIELD APPLIED

- A. Steel
  - 1. Galvanized Surfaces. Damaged shop galvanized surfaces and all field applied galvanizing shall be done with "Galv-Weld" or approved equivalent prior to installation.
  - 2. Painted Surfaces. Damaged shop primed surfaces and all field priming shall be done as specified in SECTION 09900.
- B. Aluminum. No field applied finish permitted. Do not use aluminum paint. Factory finished products with damaged surfaces will be replaced with no additional cost to the Owner. All aluminum surfaces shall be polished to a smooth uniform surface.
- C. Stainless Steel. No field applied finish required.

**PART 2 PRODUCTS**

2.1 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.

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- C. Furnish washers and lock washers for all bolted connections unless otherwise noted. Washers and lockwashers shall be of the same material as fasteners and connectors.
- D. Anchor bolts embedded in concrete and subjected to intermittent or continuous submergence during hatchery operations shall be stainless steel. Other anchor bolts shall be hot-dip galvanized unless otherwise noted.
- E. Hot Dip Galvanizing: Unless otherwise specified, galvanizing by the hot-dip process shall conform to the applicable requirements of ASTM A123 and A153.
- F. Field Galvanizing: If it is necessary that a previously galvanized or finished member be cut in the field, the exposed metal from the cutting, grinding, or welding shall be cleaned and painted with two coats of "Galv-Weld" as manufactured by Galv-Weld Products, Kenco Division, Southern Coatings & Chem. Co., Sumter So. Carolina, or approved equivalent.
- G. Welded Studs and Anchors: Provide anchor units or approved equivalent of diameter and length indicated on drawings. Install in accordance with manufacturer's recommendations and as shown on the plans.
- H. Headed Concrete Anchors: ASTM A108 or AISI Type 304

2.2 GRATING

- A. Aluminum Bar Grating
  - 1. Grating edges and openings shall be trim banded on all sides flush with top of the grating bars, and attached to every fifth bearing bar and each cross bar. Bars shall be the same thickness as bearing bars. A serrated walking surface shall be provided, except where the grating is in contact with rearing water.
  - 2. Bearing bars and cross-bars shall be of a size and spacing as indicated on plans. All grating shall be fabricated from 6061-T6 aluminum alloy. All grating shall be fastened to support frames with aluminum saddle-clips and stainless steel U-bolts with nut and lockwasher.
- B. Galvanized Steel Grating
  - 1. Steel grating shall be of the size and types as shown on the drawings. Materials shall be hot-dip, mill-galvanized mild carbon steel. The galvanized finish shall comply with ASTM A525.

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2. The walking surface shall be a serrated or reticulated pattern. If a reticulated pattern is chosen, the pattern will consist of teeth that are approximately 5/16 inches high, and contain a minimum of 500 teeth per square foot.
3. The anchor and clamp assembly will consist of nuts, washers, and J-bolts, sufficient to lock down the grating. The anchorage shall be spaced no more than 30 inches apart, with a minimum of 4 locations per panel.
4. All gratings shall be furnished to cover the required areas with no more than 1/4-inch between grating pieces or more than 1/2-inch less than required overall dimension.
5. All bar gratings shall be banded at ends of bearing bars and around all notches or openings with material of the same thickness and 1/4-inch less depth than the bearing bars. Banding shall be flush with the top of the bearing bars.

C. Plank Grating

1. Grating shall be of the size and types shown on the Drawings.
2. Anchor assemblies shall be stainless steel.
3. Cut plank ends shall be ground smooth.
4. Coat ends of cut galvanized steel planks with a cold galvanized compound.

2.3 ANGLES, BRACKETS, FRAMES, EMBEDS, ALUMINUM FRAMING, AND RELATED MISCELLANEOUS ALUMINUM FABRICATED ITEMS

- A. General. Work consists of providing all aluminum fabricated items shown on the plans in the numbers, sizes, dimensions and configuration as indicated on the Drawings.
- B. Aluminum shapes and plates shall be fabricated from aluminum alloy 6061-T6 unless otherwise noted or if accepted by the Engineer. Protect all surfaces from damage by weld splatter and accidental scratching. Grind and polish (120 grit, A2O3 abrasive), all exposed weld surfaces to provide a smooth, uniform, polished surface. Welding shall conform to WA-20 Welding Aluminum by the Aluminum Association (AA). Provide full length or perimeter aluminum welding unless specifically directed not to in the plans. 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.



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- C. Screen guides fabricated from bent plates shall have all edges broken and rounded. All guides shall be trimmed and ground to match raceway wall bevel.
- D. Coat only aluminum items to be embedded or in surface contact with concrete with coal tar epoxy paint system as identified in SECTION 09900. Do not paint the exposed portion of these aluminum items.
- E. All bolts, nuts, washers, screws used for assembly or mounting of aluminum fabricated items shall be stainless steel Type 304 or 316. Do not use plated or galvanized assembly hardware with aluminum fabricated items.

2.4 ANCHOR BOLTS & EXPANSION ANCHORS

- A. Anchor bolts, nuts, expansion anchors, bolts and washers shall be hot-dip galvanized coated except where noted on the Drawings or when the application results in the bolts being continuously or intermittently submerged in water. In such cases, the anchor assembly shall be stainless steel.

2.5 BOLTS, NUTS, WASHERS AND SHEET METAL SCREWS

- A. All bolts and nuts which will be continuously or intermittently in contact with water during hatchery operations shall be stainless steel conforming to ASTM A193 and ASTM A194 for the type approved. Type shall be 304 or 316. All other bolts, nuts and washers shall be hot-dip galvanized unless specifically identified as other materials with the exception that all assembly hardware for aluminum fabrication shall be stainless steel; no galvanized or plated or anodized materials shall be used with aluminum as specified in Paragraph 2.3 E.

2.6 LADDERS AND STEPS

- A. Ladders and steps may be fabricated from properly designed structural pieces to the dimensions and elevations shown on the drawings or they may be furnished by an industrial ladder/step manufacturer. Ladders and steps shall be designed and installed to meet or exceed all applicable OSHA and/or ANSI standards for industrial ladders. Ladders and steps shall be fabricated from 6061-T6 aluminum alloy.

- B. Steps shall be of a quality equivalent to that furnished by:

Alco-Lite Industrial Ladders

P.O. Box 5329

Florence, S.C. 29502

Phone 803-662-2595

Model No. D-M-03-WT-AL, Modified for anchor to floor and grating support system.

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**PART 3 EXECUTION**

3.1 CONSTRUCTION

A. General Requirements

1. Metalwork shall be carefully installed as shown on the plans or as directed. Metalwork which is bent, broken, or otherwise damaged shall be repaired or replaced by the Contractor to the satisfaction of the Engineer at no additional cost to the Owner.
2. Metalwork to be embedded in concrete is to be placed accurately and held in the correct position while the concrete is placed, or if shown or accepted, recesses or blockouts shall be formed in the concrete and the metalwork shall be 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 and coated with a coal tar epoxy coat. All metalwork shall have proper fit-up and shall be job-measured where necessary.

3.2 INSTALLATION

- A. Bearing plates, guides, and angles: units shall be set so that edges are flush and square with the floor and/or wall. Use extreme care to insure that embedded items are set at correct spacing and are perpendicular as shown. All metal shall be cut and/or ground to match chamfer of concrete.
- B. Anchor bolts: unless noted on the Drawings expansion anchors set in holes drilled in the concrete after the concrete is placed will not be permitted in substitution for anchor bolts except with the prior written acceptance of the Engineer.
- C. 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.
- D. After fabrication, each screen, baffle and other miscellaneous metals items that are to be removable shall be tested in their intended location. Operation shall be verified fit by approval of the Engineer.

**END OF SECTION**