

**SECTION 05500**  
**MISCELLANEOUS METAL**

**PART 1 - GENERAL**

1.01 GENERAL

Under this heading shall be included the furnishing and installation of all miscellaneous steel and other metal work except as otherwise specified.

1.02 APPLICABLE STANDARDS

Where any material or operation is specified by reference to published specifications or standards or the specifications or standards of any other organizations, the referenced specification or standard shall be as much a part of this Section as if quoted in full herein.

1.03 SHOP DRAWINGS

Shop drawings and erection drawings shall be submitted for approval prior to equipment manufacture. Shop Drawings shall show complete details, including fastenings and connections. The Contractor shall be responsible for all dimensions and relation to other work.

**PART 2 – PRODUCTS**

2.01 MATERIALS

1. Steel  
Steel shall conform to ASTM A36 or similar suitable material subject to the Engineer's review and conforming to ASTM Specifications.
2. Cast Iron  
Cast Iron shall conform to ASTM A48.
3. Aluminum  
Aluminum shall be of the alloys as specified or if not specified, shall be suitable for the use required.
4. Other Metals  
Other metals shall be first quality, selected for the proper characteristics for the use intended and in conformance with ASTM Specifications.
5. Galvanizing  
Hot dipped galvanizing shall be in accordance with ASTM A123 as applicable. All galvanizing work shall be after complete fabrication of each item.

6. Quality  
Metals shall be free of defects impairing strength or durability and be of best commercial quality for use. For exposed work, where appearance is a factor, provide smooth unblemished metal, free of rust, scale, pitting, millmarks and similar markings.

## 2.02 PIPE RAILINGS AND HANDRAILS

Pipe railings and handrails shall be provided and installed to replace that currently existing on the Filter basins. Railings and handrails shall be aluminum construction as follows:

1. Pipe for railings and handrails shall be seamless extruded aluminum, welded or mechanically fastened. Rails shall be 6065-T6 alloy. Posts shall be 6061-T6 alloy. Slice and reinforcing sleeves, brackets, end caps, toeboards, etc, shall be aluminum alloy No. 6063-T6 or 6061-T6. Railing system fastening hardware shall be Type 304 stainless steel. After welding, aluminum shall be anodized. All aluminum post, railing, and toeboards shall be anodized.
2. Joints shall be welded, using either cast aluminum flush type fittings as made for pipe handrail or mitering the pipe, welding and grinding smooth. In either case, joints shall be rigid, completely welded all around and sightly. Rails and railings shall be shop fabricated in sections as long as is practicable. Provide field joints and expansion joints as required, using stainless steel and/or aluminum parts as suitable.
3. Provide chain closures as shown. Chain shall be welded steel. Chain shall be hot-dipped galvanized (not zinc plated) coil chain, 1/4 inch size. Chain shall have a rated working load of not less than 1,175 pounds and shall weigh not less than 7 6 pounds per 100 feet. Provide fasteners at each end of each chain using stainless steel shackles with captive pins, as made for yacht and/or marine usage, 3/4 inch x 1-1/2 inches inside dimensions (minimum) and with 7/3 2 inch (minimum) diameter pin. Provide stainless steel eyes fastened securely to the posts to attach the chain closures.
4. Provide gates and removable sections of railings, as shown, fabricated of aluminum pipe, same as railings. Fittings for hinges, latches, and lift-off sections shall be standard fittings made for chain link fence construction. Cyclone, Anchor, or equal, or custom fabricated fittings suitable for the use intended. Fittings shall be stainless steel or aluminum.
5. All aluminum work provided under this heading shall be mill finish, all welds shall be ground smooth, and all work shall be protected with suitable lacquer as specified hereinbefore.

6. Railings shall be set in place in concrete using Hollaender Speed Rail Base Flanges or approved equal.

### 2.03 ALUMINUM GRATING

1. Aluminum gratings shall be provided and installed as shown. Aluminum gratings shall be Kerrigan Rectangular Bar Type, Borden Type B, Aluminum, or equal, I-Bar Type Gratings of equivalent load carrying capacity and equal workmanship and which conform to applicable requirements here will be accepted. Gratings shall have bearing bars of the size and spacing indicated; if not indicated on the Plans, bearing bars shall be spaced at 1-3/16 inches on centers and shall be of such size that deflections will be less than 1/4 inch at mid-span with a uniform load of 100 pounds per square foot. Aluminum gratings shall be made by punching the bearing bars to receive the cross bars, and the cross bars shall be secured by a swagging process which secures the bars together firmly and such that the cross bars will not turn or loosen. Special methods of fastening shall be provided at end bearing bars, such as welded on and/or loose anchors. Furnish gratings in sections as shown, or if not shown, in sections convenient to handle. End balding on aluminum gratings is not required, except where noted, but openings and the like shall be securely reinforced. Aluminum shall be Alloy 6063-T6 for bearing bars and 6063-T5 for cross bars, or other suitable alloy. All work shall be standard mill finish.
2. Frames shall be aluminum angles or zee sections rolled or extruded, anchored as shown and sized as required. Provide cutouts as necessary to fit pipes and equipment as necessary.

### 2.04 STEEL LADDERS

1. Provide and install ladders as shown. Ladder configuration shall conform to OSHA Minimum Standards. Ladder Stringers shall be punched and rungs inserted into the holes before being welded. All steel ladders shall be hot-dipped galvanized after fabrication. If not otherwise shown, stringers shall be 2-1/4" x 3/8" steel bars spaced- 16 inches apart, and rungs shall be spaced 12 inches on centers and shall be 3/4 inch diameter round steel bars. Stringers shall be punched and drilled, the rungs inserted in the holes and then welded in place. Ladders shall be secured to floor and walls and/or columns with suitable brackets not more than 6 feet apart and so that the centerline of the ladders will be 7 inches or slightly more from the wall, unless otherwise shown. Use suitable anchor bolts or suitable heavy duty anchor devices. Attach all work securely. Coordinate all dimensions and details.

### 2.05 ALUMINUM ACCESS COVER

1. The aluminum access cover must have a 300 lb. live load rating. The frame shall be an aluminum extrusion with a continuous door stop and grout lip integral to it. The size, as shown on plans, shall be the clear frame opening.
2. The hinged door shall be aluminum tread plate, a minimum 1/4" thick, with reinforcing aluminum flat bar to provide the 300 lb. per square foot live load rating. The door must have a positive open door latch to prevent accidental closing. The hinges shall be 316 stainless steel attached with stainless steel bolts, nuts and washers. The hinges must be tamper proof from the outside.
3. An exterior retractable door lifting handle shall be provided for opening and closing. Padlocking provisions must be provided to allow the access cover to be securely locked.
4. The access cover shall be fabricated using good assembly and welding techniques and be manufactured by Electric Specialty, Inc. or an approved equal.

## **PART 3 - EXECUTION**

### **3.01 WORKMANSHIP**

1. Steel and wrought iron shall be well-formed to shape and size, with sharp lines or angles. Shearing and punching shall leave clean, true lines and surfaces. Weld or rivet permanent connections. Where screws and bolts are used, heads shall be countersunk, screwed up tight and threads nicked to prevent loosening. Curved work shall be evenly sprung. All joints shall be accurately made and tightly fitted with adequate fastenings. Castings shall have exposed surfaces smooth finished and sharp with well-defined lines and arises. Machined joints, where required, shall be milled to a close fit. Provide necessary rabbets, lugs and brackets, so that work can be assembled in a neat and substantial manner. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to weather shall, be formed to exclude water. Provide holes and connections for work of other trades.

### **3.02 ERECTION**

1. All of this work shall be set accurately in place and permanently fastened in a neat and workmanlike manner. The work shall be plumb, level, or to the slopes shown, as the case may be. The contractor shall furnish all sleeves, bolts, screws, anchors, and expansion shield, etc., and shall do all drilling, tapping, cutting, etc., as necessary for the complete installation.

### **3.03 WELDING**

1. General  
Conform to AWS D1.1, latest edition as applicable, using skilled welders. For structural type welds, use care to provide welds which will develop proper stresses in welds, using licensed welders, inspected by qualified

welding inspectors. Conform to other requirements specified elsewhere herein.

2. Exposed Work

Use plug-welding including field joints, where required or where welds will provide best possible joints. Provide other exposed welding by cutting and grinding a suitable "vee" to receive weld and insure rigid connection flush with original surface. Provide full length welds, generally. Grind and finish as previously specified.

3. Field Welding

Welds made in the field are subject to the same requirements. Provide field welds where indicated on Plans or as required to provide positive connections, weather-tight joints, and to provide neat joint connections.

### 3.04 PAINTING

1. All steel work, except galvanized items, shall be cleaned and painted one coat in the shop. The cleaning shall be in accordance with SSPC-PC-6 Commercial Blast Cleaning and shall remove all loose mill scale and loose rust and shall also remove any grease, oil and other foreign materials which may be on the surface to be painted. Surfaces to be embedded in concrete shall not be painted but shall be cleaned. Also omit paint within 2 inches of required field welding. Primer shall be Red Lead, Iron Oxide, Raw Linseed Oil, Alkyd Primer, Glidden Y-4570, or approved equal. The Contractor shall be responsible for the compatibility of the primer and the finish paints. The paint shall be carefully strained before using and shall be applied in a workmanlike manner by skilled painters. The work shall be carefully protected to prevent dust and other particles settling on the paint before it is dry.
2. Wire brush clean and touch-up field welded areas with same paint as was used for the shop coat. Finished erected painted work shall show no bare metal or scratched paint.

### 3.05 PROTECTIVE COATINGS FOR ALUMINUM

1. Before shipment, aluminum work which is not anodized shall be given a coating on all surfaces which will protect the metal against stain, discoloration and other surface injuries. Anodized aluminum shall not be coated but shall be handled with care to prevent damage.
2. Aluminum surfaces to be placed in contact with concrete, mortar or masonry construction or dissimilar metals or plaster shall be given a heavy coat of suitable zinc chromate paint or bituminous paint.

3. Protective coatings on exposed surfaces shall be removed just prior to the final acceptance of the building, unless such coatings are transparent and colorless and not visible.
4. Clear water-white methacrylate type lacquer may be used for protective coating on exposed surfaces and, if so used, need not be removed.

### 3.06 DELIVERY

1. Deliver items to be installed by other trades in a timely manner so not to delay progress of the work. Coordinate all delivery schedules with Contractor and insure that materials delivered are adequately protected until installation.

**END OF SECTION**

## **SECTION 11280**

### **SLIDE GATES**

#### **PART 1 - GENERAL**

##### **1.01 SCOPE OF WORK**

- A. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the specifications, engineering data, instructions, and recommendations of the equipment manufacturer.
- B. Gates and operators shall be supplied with all the necessary parts and accessories specified or otherwise required for a complete and properly operating installation, and shall be a standard product of a manufacturer regularly engaged in the production of fabricated water control gates.
- C. Unit Responsibility: To insure compatibility of all components directly related to the slide gates, unit responsibility for the slide gates, frames, actuators and accessories as described in this section shall be the responsibility of the slide gate manufacturer.

##### **1.02 SUBMITTALS**

- A. Shop Drawings: Shop drawings shall be approved by the engineer or contractor prior to the purchase of the gates. Sufficient data shall be included to show that the product conforms to Specification requirements.
- B. Manufacturer's warranty
- C. Manufacturer's installation instructions
- D. Manufacturer's operation and maintenance manuals and information.

##### **1.03 QUALITY ASSURANCE**

- A. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 10-years of experience designing and manufacturing slide gates. The manufacturer shall have manufactured stainless steel slide gates of the type described herein for a minimum of 10 similar projects.
- B. The sealing system shall be certified and tested for operation and performance to leakage specifications compliant with AWWA C-561 for a minimum of 100,000 cycles.

## PART 2 – PRODUCTS

### 2.01 GENERAL

- A. The gate frame, slide, and stem shall be stainless steel, ASTM A276, Type 304 or 316. The gate, frame and yoke design shall be compliant with the latest version of AWWA C561. The frame members shall form guides for the slide, and holes shall be provided for mounting on anchor bolts. The primary slot of the frame shall contain polymer guides to prevent metal-to-metal contact between slide and frame.
- B. The gates shall be self-contained with yoke and hand wheel operators with rising stems.
- C. Specific configurations shall be provided to match existing gates in the field. The contractor will be responsible for verifying existing conditions.

### 2.02 FRAME AND GUIDE RAILS

- A. The gate frame shall be composed of stainless steel guide rails with UHMW seat/seals upstream and downstream. The seat/seals shall form a tight seal between the frame and the slide (disc). The guides will be of sufficient length to support ½ the height of the slide when in the full open position.
- B. Yoke shall not deflect more than 1/360<sup>th</sup> of the span under full head break load.

### 2.03 STEM AND STEM GUIDE

- A. Material
  - 1. The stem shall be constructed of stainless steel round bar meeting the requirements of ASTM A 276, type 304.
- B. Design
  - 1. Gate stem diameter shall be adequate to withstand twice the force created by a 40-lb pull on a hand-wheel or crank operator.
  - 2. Guides shall be adjustable with split stem sleeves. Guides shall be spaced per the manufacturer's recommendations. The stem L/r ratio shall not exceed 200.
  - 3. Stem threads shall be machine-cut or rolled threads.
  - 4. Nominal diameter of the stem shall not be less than the crest of the threaded portion.

### 2.04 SEALS

- A. Slide gates shall incorporate a flush-bottom seal that is attached to the bottom frame invert member. Seals attached to the slide are not acceptable.

- B. Seals shall be securely fastened to the frame and shall be replaceable and adjustable without removing the frame from the installed position. In the case of embedded gates, they shall be constructed in a manner that allows replacement of the seals without removal of the gate frame from the embedment.

## 2.05 SLIDE

- A. The slide shall be stainless steel plate, no less than 1/4" thick, reinforced with structural shapes welded to the plate.
  - 1. The slide cover shall not deflect more than 1/720th of the span, or 1/16" at the seated sealing surface of the gate under maximum specified head.
  - 2. The stem to gate connection shall be either the clevis type, with structural members welded to the slide and a bolt or bolts to act as a securing method, or a threaded and bolted (or keyed) thrust nut supported in a welded nut pocket.
  - 3. The clevis, or pocket and yoke, of the gate shall be capable of taking, without damage, at least twice the rated thrust output of the operator at 40 pounds of pull on a hand wheel or hand crank, and at locked-rotor stall of a motor operator.
  - 4. The slide shall be constructed with vertical and horizontal reinforcement ribs.
  - 5. All welds shall be performed by an AWS-certified welding technician.

## 2.06 ANCHOR BOLTS

- A. Anchor hardware shall be stainless steel, ASTM F593/F594.
  - 1. The size, quantity, and location of the anchor hardware shall be engineered by the slide gate manufacturer. Upon client request manufacturer shall provide calculations for anchor bolt sizing and quantity.
  - 2. Anchor hardware consisting of studs, nuts and washers shall be provided by the manufacturer.

## 2.07 LIFT

- A. Gate lifts shall be hand-wheel type and shall operate the gate with a maximum pull of 40 lbs. Hand wheel shall be located approximately 36" above the grating or walkway. All lifts shall be of the rising stem type.
- B. Stem covers made of clear butyrate shall be furnished for all lifts.
- C. Lifts shall be grease lubricated and regreasable through grease zerks.

## 2.08 MANUFACTURER

- A. The slide gate shall be manufactured by Hydro-Gate, Waco, Waterman or approved equal.

### **PART 3 - EXECUTION**

#### **3.01 DELIVERY, STORAGE, AND HANDLING**

- A. Gates shall be handled and stored in accordance with the manufacturer's recommendations.
- B. Upon arrival at the destination, inspect the gate(s) and accessories for damage in transit. If damage has occurred, manufacturer shall be notified immediately.

#### **3.02 INSTALLATION**

- A. Operate gate before installation. Check that the seat is free of defects.
- B. Install the gates in strict accordance with manufacturer's instructions. Gate frames shall be installed in a true vertical plane, square and plumb, with no twist or divergence between the vertical legs of the frame.
- C. The contractor shall fill any void between the guide frames and the structure with non-shrink grout as shown on the installation drawing and in accordance with the grout manufacturer's recommendations.
- D. The frame cross rail shall be adjusted as required to maintain consistent seal compression across the full width of the gate.

#### **3.03 FIELD TESTING**

Allowable leakage under the design head, seating or unseating, shall be limited to 0.1 gpm/ft of seating perimeter.

**END OF SECTION**

## **SECTION 11355**

### **WEIRS**

#### **PART 1 - GENERAL**

##### **1.01 SCOPE OF WORK**

- A. The CONTRACTOR shall provide material for replacement of current effluent weirs at the filter discharge and overflow weirs along the center by-pass channel. The effluent weirs shall be constructed of stainless steel, while the overflow weir may be fiberglass reinforced plastic. The contractor will be responsible for installation and leveling of the weirs per this specification to provide a complete and operational filter.
- B. Unit Responsibility: The CONTRACTOR shall be responsible for furnishing the weirs and all fastening hardware as a complete package.

##### **1.03 SUBMITTALS**

- A. Shop Drawings: Shop drawings shall depict materials of construction, critical dimensions, jointing and connecting, fasteners and anchors, and locations of structural components. All dimensional layouts shall be based on field measurements by the contractor to ensure proper installation.
- B. Manufacturer's warranty
- C. Manufacturer's installation instructions

#### **PART 2 – FRP PRODUCTS**

##### **2.01 FIBERGLASS REINFORCED PLASTIC (FRP) WEIR PLATES**

- A. Weir Plates, weir washers, and splice plates shall be constructed from fiberglass reinforced isophthalic polyester or vinyl ester resin. All material shall be produced with a resin rich surface, free of voids and porosity, without dry spots, crazes, or unreinforced areas. A synthetic veil and UV inhibitors shall be used to enhance the surface and aid in the resistance to ultraviolet degradation. The color shall be olive green throughout.
- B. Weir plates shall not exceed 12' in length. Cut edges of non-standard lengths shall be sealed with a compatible resin per the manufacturer's recommendations.
- C. All fastening and connecting hardware shall be stainless steel, type 304 or 316.
- D. Weir plates, washers, and splice plates shall have a thickness of 1/4" plus/minus 10%.
- E. Physical Properties of the RFP Weirs shall be as follows:
  - 1. Tensile Strength (ASTM D-638): 14,000 psi

2. Flexural Strength (ASTM D-790): 25,000 psi
  3. Flexural Modulus (ASTM D-790): 1,000,000 psi
  4. Barcol Hardness (resin-rich surface, ASTM D-2583): 40
  5. Izod, Notched (ASTM D-256): 15.5 ft-lb/in
  6. Water absorption (ASTM D-570): 0.2% maximum at 24 hrs.
- F. Weir plates shall have slotted mounting holes shall allow for a minimum of 2° of vertical and horizontal adjustment.
- G. Mounting to concrete wall shall be completed with ½" diameter stainless steel bolt, nut and two(2) washers including a 5" diameter fiberglass washer.
- H. Where overall length requires more than one plate, ends shall be secured with a ¼" thick, 6" long FRP splice plate to allow for horizontal expansion.
- I. Weirs shall be manufactured by MFG, NEFCO, Bedford, or approved equal.
- J. The manufacturer shall warrant the weirs to be free of defects in materials and workmanship for a period of one year after the date of Substantial Completion.

## 2.02 STAINLESS STEEL WEIR PLATES

- A. Weir Plates shall be constructed from stainless steel, type 316, meeting the requirements of ASTM A240. Provide materials with a smooth, flat surface free of seam marks, roller marks, trade names, or blemishes. Edges shall be smooth and without burrs.
- B. Each effluent weir shall be provided as one continuous piece without splices.
- C. All fastening and connecting hardware shall be stainless steel, type 304 or 316.
- D. SS Weirs shall have a minimum nominal thickness of 1/4".
- E. Weir plates shall have slotted mounting holes to allow for a minimum of 2° of vertical and horizontal adjustment.

## PART 3 - EXECUTION

### 3.01 DELIVERY, STORAGE, AND HANDLING

- A. Manufacturer shall provide the product banded on skids or other suitable packaging for ease of handling and to minimize damage during shipping. At the site, store the product out of the way of construction activities and, for RFP weirs, in an area protected from sun exposure.

### 3.02 INSTALLATION

- A. Prior to installation, verify that dimensions are correct and project conditions are suitable for installation.

- B. Install the weirs in strict accordance with manufacturer's instructions. Ensure that products are installed plumb and true, free of warp or twist.
- C. Weir plates shall be adjusted to be level and at the proper elevation plus or minus 1/8 inch; set with surveyor's level, keep records and submit records to the Engineer. Weir plates shall be set so that the maximum plus and minus tolerances do not occur at ends of the same plate and also so that the average deviation from design elevation does not exceed 1/16 inch.
- D. The contractor shall apply a suitable sealant between the weir and the wall to prevent the flow of liquid between the weir and the tank wall.

**END OF SECTION**

## **SECTION 15100**

### **MUD VALVES**

#### **PART 1 - GENERAL**

##### 1.01 SCOPE OF WORK

- A. The CONTRACTOR shall provide mud valves for replacement of existing units in the filter basin.
- B. Unit Responsibility: The CONTRACTOR shall be responsible for furnishing the valves, extension stems, stem guides, and operators as a complete package.

##### 1.02 SUBMITTALS

- A. Shop Drawings: Shop drawings shall be approved by the engineer or contractor prior to the purchase of the mud valve. Sufficient data shall be included to show that the product conforms to Specification requirements.
- B. Manufacturer's warranty
- C. Manufacturer's installation instructions

#### **PART 2 – PRODUCTS**

##### 2.01 GENERAL

- A. The mud valve shall be of the heavy duty flanged type designed to provide a positive seal under both seating and unseating head conditions. The valve shall be rising stem style.
- B. The frame, yoke and gate shall be sturdily proportioned for strength and rigidity and be of cast iron conforming to ASTM specifications A126 Class B.
- C. The seat ring shall be bronze with a tapered, accurately machined seating face. The plug seat shall be a seamless molded ring of BUNA-N tapered to accurately mate with the seat ring to form a positive seal.
- D. The valve shall be equipped with stainless steel extension stems, stem guides and mounting hardware.
- E. The valves shall be supplied with a hand wheel operator and pedestal.

##### 2.02 MANUFACTURER

- A. Valves shall be manufactured by M&H, Clow, or approved equal.

## **PART 3 - EXECUTION**

### **3.01 DELIVERY, STORAGE, AND HANDLING**

- A. Valves shall be handled and stored in accordance with the manufacturer's recommendations.
- B. Upon arrival at the destination, inspect the valve(s) and accessories for damage in transit. If damage has occurred, manufacturer shall be notified immediately.

### **3.02 INSTALLATION**

- A. Operate valve before installation. Check that the seat is free of defects.
- B. Install the valves in strict accordance with manufacturer's instructions

### **3.03 FIELD TESTING**

- A. All valves shall be confirmed operational prior to filling of the basins. Insure no binding or warping of the seat due to uneven torque on mounting bolts.
- B. After filling of the basins, check the drain lines for evidence of excessive leakage through the valves.

**END OF SECTION**