

SECTION 15110

SLIDE GATES, FLAP GATES, AND STOP PLATES

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing slide gates, flap gates, stop plates and stop logs.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 15010 - General Process and On-Site Utility Piping Provisions
- C. Section 15100 - Valves

1.3 REFERENCE STANDARDS

- A. ASTM - American Society for Testing and Materials.
- B. AWWA - American Water Works Association.

1.4 SUBMITTALS

In accordance with Section 01300, submit materials list naming each product to be used identified by manufacturer and model number. Provide catalog cuts, shop drawings, or other information to fully describe and define the equipment being supplied including materials of construction. Submit Operations and Maintenance Manuals for approval for all gates. Provide operation and maintenance manuals in accordance with Specification Section 01680.

1.5 QUALITY ASSURANCE

All materials and equipment shall be the latest standard product of a manufacturer regularly engaged in the design and manufacturer for a period of at least five years. Gates shall be furnished with all necessary accessories for a complete installation, including hydraulic control systems. All gates shall be provided by one manufacturer.

PART 2 MATERIALS

2.1 GENERAL

- A. Anchor bolts for gates shall not conflict with the concrete reinforcing bars. Contractor shall not be allowed to drill through the reinforcing steel. The gate manufacturer shall modify the gate frame as required to prevent a conflict with the bolts and reinforcing steel. All gates are rising stem unless noted otherwise.

- B. All slide gates shall be of one manufacturer.
- C. All gates shall be opened by rotating the hand wheel in the counterclockwise direction.
- D. The naming of a manufacturer in this specification is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified

2.2 GATE SCHEDULE

Stainless Steel Slide Gate Schedule					
Gate #	Size	Rising/Non-Rising Stem	Operator	Duty	Seating/Unseating Head
101	36" x 36"	Non-Rising	Manual (2" Operating Nut)	Open/Close	20' / -
102	36" x 36"	Non-Rising	Manual (2" Operating Nut)	Open/Close	20' / -

Mechanical: Handwheel Automatic Motorized

2.3 CAST IRON SLIDE GATES

- A. General: Manufacturer shall provide or coordinate all accessory or appurtenant items associated with the slide gates. Leakage rate shall be less than 0.01 gpm/lineal foot of perimeter with water head at top of slide.
- B. Furnish and install complete with wall thimble or anchor bolts, operating stem, gate lift operator, and appurtenances. See drawings and schedule for:
 - 1. Number of gates
 - 2. Configuration
 - 3. Size
 - 4. Type of closure
 - 5. Operating system configuration
 - 6. Seating and unseating heads
 - 7. Wall thimbles
 - 8. Flat or flange back
- C. Gates shall be heavy duty, conforming to AWWA C560, latest revision, except as modified herein (meeting head requirements – see schedule).

- D. Wall Thimbles: One-piece cast iron, F-type (unless otherwise noted) shape, length as shown on the drawings. Thimble shall have integral cast water stop. Front flange shall be machined, drilled and tapped to match slide gate. Provide mastic seal between thimble and slide gate.
- E. Anchor Bolts, Nuts and Fasteners: 18-8 stainless steel; Bolts: ASTM A193, Grade B8; Nuts: ASTM A194, Grade 8.
- F. Frame, Slide, Guide Rails, Yoke, and Sill Plate (as applicable): Cast iron, ASTM A126, Class B.
- G. Seating Surfaces: Low-zinc bronze, ASTM B139 Alloy 510.
- H. Wedges and Stem Block: Low-zinc bronze, ASTM B584 Alloy 872.
- I. Stem and Couplings: Stainless steel, ASTM A582 Type 303 or 276 Type 304.
- J. Stem Guides: Cast iron (ASTM A126, Class B) with bronze (ASTM B584) bushings.
- K. Flushbottom Seal (as scheduled): Rubber, ASTM 2000, Grade R-62.
- L. Stem Guides:
 - 1. Fully adjustable in two directions.
 - 2. Wall bracket with four stainless steel anchor bolts.
 - 3. Cast iron construction.
 - 4. Bronze bushing.
 - 5. Center to center spacing limit L/r ratio of 200.
- M. Flush Bottom Closure:
 - 1. Removable neoprene seal mounted on a stainless-steel angle held in place with a stainless steel retainer bar.
 - 2. No projection into flow.
 - 3. Stainless steel fasteners.
- N. Operator Lifts:
 - 1. For bolting to frame of self-contained gate, wall bracket, or concrete floor.
 - 2. Bronze lift nuts with machined contact surfaces.
 - 3. Ball bearings above and below lift nut.
 - 4. Grease fittings.
 - 5. Transparent plastic cover on rising stem.
 - 6. Cast iron handwheel sized to 40-pound pull maximum.
 - 7. Position indicator.
 - 8. Ultraviolet resistant clear butyrate plastic with mylar strip for position indication.

9. For manual operators, pull shall be less than 40 pounds on handwheels. The minimum gear operator size shall be a Waterman 3ESL with a 2:1 gear ratio. Contractor shall provide detailed calculations (utilizing seating and unseating heads scheduled) for sizing stem diameter and operator. Breakaway force shall be a minimum 1.5 times the lifting forces.
- O. Enclosed Gear Lift:
1. Pedestal type for mounting to concrete floor or wall bracket.
 2. Input shaft approximately 36 inches above bottom of its base, unless a short-based pedestal is called for on Drawings.
 3. Steel or ductile iron bevel and pinion gears with cut teeth.
 4. Ball bearings above and below bronze lift nuts.
 5. Grease fittings at all bearing points, over gears and at stem.
 6. Cast iron or fabricated steel pedestal, Waterman Type 1 Lift or equal suitable for motorized operator.
 7. Cast iron removable crank.
 8. Manual Operators: For manual operators, pull shall be less than 40 pounds on handwheels. The minimum gear operator size shall be a Waterman 3ESL with a 2:1 gear ratio. Contractor shall provide detailed calculations (utilizing seating and unseating heads scheduled) for sizing stem diameter and operator. Breakaway force shall be a minimum 1.5 times the lifting forces.
 9. Stem cover/indicator: Ultraviolet resistant clear butyrate plastic with Mylar strip.
 10. Capable of being operated by portable motorized wrench.
 11. Enclosed machined or bearing surfaces shall be coated with water resistant grease.
- P. Coating: In accordance with Section 09900.
- Q. Coordination: Gate manufacturer shall be responsible for the entire gate assembly including actuators and control systems for a complete, operating system.
- R. Manufacturers:
1. Waterman Industries, Exeter, California.
 2. Rodney Hunt Company, Orange, Massachusetts.
 3. Hydro Gate Corporation, Longmont, Colorado.
 4. Whipps Inc., Athol, Massachusetts
 5. Or equal.

2.4 STAINLESS STEEL SLIDE GATES

- A. General: Gates shall be fabricated from stainless steel per gate schedule requirements. Gate leakage requirements shall be less than AWWA C513 or C561A. Leakage rate shall be less than 0.01 gpm/lineal foot of perimeter with water head at top of slide.

B. Design Requirements

1. Slide: Maximum deflection under design seating and unseating head shall equal $1/320$ of span or $1/16"$, whichever is smaller.
2. Yoke: Maximum deflection under design seating and unseating and at full operating load shall equal $1/360$ of plan or $1/16"$, whichever is smaller.
3. Stem: Maximum slenderness ratio shall equal 200.

C. Furnish and install complete with all necessary or appurtenant items associated with slide gate. See drawings and schedule for:

1. Number of gates
2. Configuration
3. Size
4. Type of closure
5. Operating system configuration
6. Seating and unseating heads
7. Wall thimbles
8. Embedded or face-mounted frame
9. Gate material

D. Gate Slide: Fabricate using Type 304 stainless steel plate with welded structural shapes reinforcement, as shown on the drawings. The slide and reinforcing stiffeners shall have a minimum thickness of $1/4$ -inch, per AWWA C561.

E. Frames: Guides, invert members and yokes welded to form one-piece:

1. Material
 - a. Type 2205 stainless steel plate is required.
 - b. Capable of providing true dimensions within tolerances and preventing binding and excessive wear of sliding parts.
2. Mounting: All gates shall be face mounted.
3. Guide Length: Sufficient to retain at least $2/3$ of gate slide when gate is in fully open position.
4. Additional Supports: Not required in members above operating floor.
5. Yoke to Support Bench Stand Operator: Form by 2 angles welded to gate frame.
6. Yoke Arrangement: Capable of allowing removal of slide.
7. All structural components of the frame shall have a minimum thickness of $1/4$ -inch, per AWWA C561.

F. Stem

1. Material: Type 304 stainless steel.

2. Diameter: Capable of withstanding anticipated opening and closing thrusts under head scheduled on Drawings and 1.5-inches minimum.
 3. Length: Capable of permitting easily installation and removal.
 4. SST Stop Nuts: Provide one or two as scheduled or required.
- G. Frame Seals
1. Self-adjusting ultra-high molecular weight polyethylene.
 2. Hold seals in place by Type 316L stainless steel bar and fasteners.
 3. Set seals to be slightly compressed with slide in closed position.
 4. Seals shall be fully field adjustable and replaceable.
 5. Provide invert seal for all downward (weir) gates.
 6. Provide top seal for all standard upward opening gates.
- H. Bottom Seal: Resilient neoprene or Buna N seal compressed by closing action of gate slide against stop plate for all standard upward opening gates.
- I. Fasteners: Type 316 stainless steel.
- J. Operators: See Gate Schedule
1. Manual Operators: For manual operators, pull shall be less than 40 pounds on handwheels. The minimum gear operator size shall be a Waterman 3ESL with a 2:1 gear ratio. Contractor shall provide detailed calculations (utilizing seating and unseating heads scheduled) for sizing stem diameter and operator. Breakaway force shall be a minimum 1.5 times the lifting forces.
 2. Electric Operators: As specified in accordance with Section 15135.
- K. Anchor Bolts: Type 316 stainless steel, hooked end type, adhesive type anchor bolts, or sufficient quantity and length to anchor the gate.
- L. Wall Thimbles (stainless steel slide gates):
1. 316L Stainless steel F-type shape. Width of Mounting Flange of Wall Thimble shall be ½-inch wider than mounting flange of gate, F-section of a depth equal to the thickness of the structure wall upon which the gate is mounted or as shown on the drawings. Modify F-sections where required for F-section and pipe bell ring connections in a wall.
 - a. Provide flange-by-mechanical joint wall thimble where ductile iron piping connects to the wall thimble.
 - b. Provide flange-by-bell joint where spigot connects to the wall thimble.
 - c. Provide flange-by-bell ring wall thimble insert where reinforced concrete piping connects to the wall thimble.
 - d. Thimble flange and gate frame flange shall be planar within 1/16-inch, if not fully machine flange to a plane. Drill and tap to match the drilling on the flange back gate seat.

- e. Clearly mark top center of each thimble for installation.
 - f. Provide stainless steel studs for attaching the gate frame.
 - g. Seal joint between thimble and gate watertight, in accordance with AWWA C501/C561.
 - h. To permit entrapped air to escape as the thimble is being cast in concrete, drill holes in each entrapment zone formed by ribs, flanges, and water stops.
- M. Manufacturers: Waterman Industries, Model R, Whipps, Inc., Rodney Hunt Company, Series 700, Fontaine Ltd, Golden Harvest, or equal.

2.5 STOP PLATES

- A. Plates: Stop plates shall be manufactured with 316 stainless steel or ¼” thick 316 SST and shall be provided with a ½-inch diameter lifting handle(s). Unless otherwise noted, for all plates larger than 24-inches wide or weighing more than 50 pounds, provide two lifting handles.
- B. Guides: Gate guides shall be manufactured of stainless steel shaped to receive the stop plate. Guide frames shall be of welded one piece construction.
- C. Seals and Guides: The frames shall be provided with UHMWPE bearing strips to reduce friction and leakage. Flush bottom closure shall be provided to reduce leakage.
- D. Manufacturers:
 - 1. Waterman, Inc.
 - 2. Fontaine, Ltd.
 - 3. Whipps, Inc., Model 451
 - 4. Golden Harvest, Inc.
 - 5. Or equal.

2.6 FLAP GATES

- A. General: All flap gates and appurtenant items shall be provided by one manufacturer.
- B. Material:
 - 1. Body Frame and Cover: 316 Stainless Steel.
 - 2. Seats: Neoprene with machined iron face.
 - 3. Hinge Pins and Arms: 316 Stainless Steel.
- C. Flap gates shall be flat back designed to install with F thimble unless otherwise shown on the drawings.
- D. Manufacturers: Waterman, SSF-41, Golden Harvest GH39, Rodney Hunt, Fontaine, or equal. For pump discharge flap gates, provide appropriate model.

2.7 SHEAR GATES

- A. General: Gates shall be designed to control flows under low seating head conditions, as detailed in the gate schedule in the contract specifications.
- B. Material:
 - 1. Frame shall be of cast iron with pads to receive the bolt on wedges and shall be flanged type drilled for mounting to an ANSI 125# flange or mounting to a wall.
 - 2. Seating surface shall be bronze machined to a smooth surface.
 - 3. The wedges shall be cast bronze and securely attached to the frame utilizing two 316 stainless steel bolts per wedge and shall be adjustable to ensure proper closure.
 - 4. The cover shall be cast iron with machined bronze seat attached (sizes 4" and 6" shall be cast bronze with machined seating surface) and incorporate cast wedge pads for mating with the wedges. The cover shall be mounted to the frame utilizing a 304 stainless steel hinge bolt.
 - 5. A cast iron lifting lug shall be bolted to the cover in such a manner as to allow a swiveling action. The lug shall be made so that it accepts a pipe type lifting rod which is to be filed cut to the desired length.
- C. Manufacturer: Shear gates shall be Waterman Industries, Model C-16, or equal.

2.8 PORTABLE MECHANICAL GATE OPERATOR

- A. Provide one portable electric operator of the electric drill type, Milwaukee Super Hole Shooter or equal, with reversing switch and safety hold down On-Off switch incorporated into the handle. Capable of handling maximum torque of all gates specified above.
- B. The portable electric operator shall incorporate an overload release clutch of the positive, spring-loaded hand type that releases at a preset torque. Provide an adaptor to fit the pinion shafts on gearboxes. Mount the unit on a lightweight, adjustable tripod. Provide 100-foot extension cord with ground.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install as indicated on the Drawings and in strict conformance with the manufacturer's installation instructions, shop drawings, and recommendations.
- B. Mount thimbles and gates plumb in both vertical planes and level in horizontal plane.
- C. Coat seating surfaces between frame and wall thimble with a waterproof plastic compound prior to tightening of frame studs.
- D. Adjust wedges or other parts of the gate to the point where it will not be possible to insert a 0.004-inch feeler gauge between the gate slide and the gate frame at any point. Securely lock wedges into position after adjustment.

- E. Adjust limit switches in electric and hydraulic operators in accordance with manufacturer's instructions.
- F. Face Mounted Gates: Where wall thimbles are not provided, mount gate to wall with anchor bolts and a 1-inch grout pad in accordance with manufacturer's recommendations.
- G. Embedded Gates
 - 1. Provide blockouts in side walls and channel bottom for installation of gates.
 - 2. After gate placement, adjustment, and alignment in accordance with manufacturer's recommendations, grout fill with non-shrink grout.

3.2 FIELD QUALITY CONTROL

- A. Testing, Training, and Start-Up: As specified herein.
- B. Testing
 - 1. Leakage Tests: Conduct in accordance with respective AWWA Standard (C560, C561, or C562). Comply with allowable leakage limits as specified.
 - 2. After the gate installation and checking, run gates through at least 2 full cycles from the closed position to full open position and back to the closed position. Also operate gates with intermediate stops.
 - 3. Verify functionality of all controls and limit switches.
 - 4. Provide certificate of proper installation.
- C. Manufacturer's Field Services
 - 1. Coordinate field service work with the manufacturer's representative, Owner, and Engineer prior to initiating such work.
 - 2. Manufacturer's Representative: Furnish services of a representative experienced in installation and operation of the gates.
 - 3. Manufacturer's representative shall perform the following services in three separate trips (minimum) as described below:
 - a. Installation assistance and inspection: One man-day.
 - 1) Advise/observe the Contractor on the installation of the gates.
 - 2) Check and verify the installation of the gates is in accordance with the Drawings and manufacturer's installation instructions.
 - b. Certification of installation, field testing, and start-up assistance: One man-day.
 - c. Operator Training: One man-day.
 - d. Each man-day consists of 8 working hours.
 - e. The specified durations are the minimum required time on the job site and do not include travel time.

END OF SECTION