SECTION 11294

slide gates

# general

## work of this section

### The WORK of this Section includes providing slide gates, bulk heads, stop plates and stop logs in the sizes and locations indicated with manual or electric operators, bracing, frame, and mountings.

### Unit Responsibility: The Work requires that slide/stop and logs gate, complete with all accessories and appurtenances including, but not necessarily limited to, be the end product of one responsible equipment manufacturer, who shall provide all components of the system to enhance compatibility, ease of construction and efficient operation and maintenance and as necessary to place the equipment in operation to perform its intended functions without altering or modifying the Contractor’s responsibilities under the Contract Documents including selection and performance of all equipment systems as indicated.

## reference codes and standards

### The Work of this Section shall comply with the codes and standards indicated in Section 11000, and shall include the following:

#### ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes

#### ASTM B584 – Standard Specification for Copper Alloy Sand Castings for General Applications

#### ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications

#### ASTM D4020 – Standard Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials

#### AWWA C560 – Cast-Iron Slide Gates

#### AWWA C561 – Fabricated Stainless Steel Slide Gates

## related work specified elsewhere

### Section 01300 – Shop Drawings and Submittals

### Section 11000 – Equipment General Provisions

## submittals

### Provide submittals in accordance with Sections 01300 and 11000, including the following specific information:

#### Shop drawings of gates, frames, slides, seals and operators.

#### Design load calculations for deflection at maximum design head.

#### Calculations indicating lifting force required to lift the gate based on 40 pounds on the crank.

#### Details, calculations and drawings indicating method of fabrication of stop gates and stop logs and confirming that platen will withstand design forces without buckling or other damage.

## factory testing

### Factory testing shall be in accordance with section 11000.

## project conditions

### The project site is in a semi-arid area where the climatic conditions are typical of the Central Valley of California, conditions listed below.

|  |  |
| --- | --- |
| **Site Condition** | |
| Elevation (ft) |  |
| Record Low and High Ambient Temperature (°F) |  |
| Average Low and High Ambient Temperature (°F) |  |
| Ambient Humidity (%) |  |

## Definitions

### **Slenderness ratio (L/R):** The largest ratio obtained by dividing the unsupported length of the stem by the radius of gyration of the stem cross section.

### **Design head:** Depth from surface of water to centerline of gate. Use value specified in the gate schedule.

### **Seating head:** Pressure applied to gate slide from weight of water column above gate centerline that forces gate slide into seat.

### **Unseating head:** Pressure applied to gate slide from weight of water column above gate centerline that forces gate slide away from seat.

### **Substantially similar:**

#### Similar in size, design head, and service.

#### Utilizes the proposed design for critical components including guides and seals.

# products

## stainless steel slide gates

### **General:**

#### Slide gates shall be self-contained units fabricated in compliance with applicable requirements of AWWA C561.

#### Leakage shall not exceed 0.02 gpm/ft of wetted seal perimeter in seating and unseating head conditions.

#### The gate frame shall be fabricated for mounting on concrete walls, on wall thimbles, or embedded concrete channels as shown. Non-shrink grout, polysulfide elastomeric sealant or EPDM gaskets shall be provided at the back of the gate frame and the concrete wall.

### **Materials of Construction:**

|  |  |
| --- | --- |
| **Item** | **Material** |
| Wall thimble, gate frame, yoke, slide, side guides, and reinforcing members | Stainless steel ASTM A276 Type 316L |
| Stem | Stainless steel ASTM A276 Type 316 |
| Fasteners | Stainless steel ASTM A276 Type 316 |
| Stem guides liner | Ultra-high molecular weight polyethylene (UHMWPE) ASTM D4020 |
| Side and top seals | Ultra-high molecular weight polyethylene (UHMWPE) ASTM D4020, or UHMWPE  seats incorporating a neoprene seal |
| Bottom seal | Neoprene ASTM D2000 Grade 2 BC 510 |
| Lift nut | Manganese bronze ASTM B584 Alloy 432 |

### **Wall Thimble:**

#### Provide flanged wall pipes or F-pattern wall thimbles to match the thickness of the walls in which they are installed only where indicated on the Drawings. Wall pipes shall be provided with pipe joint to match connecting pipe as indicated on the Drawings. Thimbles shall be supplied by the gate manufacturer, and shall fit the bolt dimensions of the gates. Thimbles shall be internally braced during concrete placement. A center ring shall be welded around the thimble perimeter. Large rectangular wall thimbles shall be provided with holes in the invert to allow satisfactory concrete placement beneath the thimble. Hole spacing shall be such that the unvented invert length does not exceed 24 inches.

#### Wall thimbles shall be constructed of 1/4 inch minimum thickness material and the front face shall have a minimum thickness of 3/8 inch. Width and height of the gate-mounting flange shall be 1/2” greater than the mounting flange of the gate.

#### The fabrication process shall ensure that the wall thimble is square and plumb, and the front face is sufficiently flat to result in zero leakage between thimble and frame, and to prevent distortion of the frame.

#### The face of the wall thimble shall only be machined if recommended by the gate manufacturer. If the wall thimble is to be machined, the front face shall have a minimum thickness of 3/8-inch after machining.

#### The front flange shall be drilled and tapped to match the gate seat flange drilling. A suitable gasket shall be provided between the thimble flange and gate seat.

### **Frame:**

#### Gate frame shall be constructed of structural members, minimum 1/4 inch thick, of formed plate welded to form a rigid one-piece frame.

#### Frame shall be of the flange back design with anchorage system independent from sealing system and allow mounting without a box-out into the concrete opening. Guide seal (or seat) shall engage the slide plate a minimum of one inch.

#### The use of adjustable pressure pads is not acceptable.

#### Gate frame shall be furnished with the self-adjusting sealing type. Either A continuous compression cord or neoprene seal shall keep a constant pressure on the perimeter of the gate.

#### Frame configuration shall allow replacement of top and side seals without removing the gate frame from concrete or wall thimble.

### **Slide:**

#### The slide shall be a flat plate of not less than 1/4 inch thick, reinforced with formed plates or structural members to prevent warpage and bending under the intended use. Deflection of the slide under the design heads shall not exceed 1/720 of the gate span.

### **Guides and Seals:**

#### Guides shall be of such length as to retain and support at least two thirds (2/3) of the vertical height of the slide in the full open position.

#### Side and top seals shall be of the self-adjusting type, or have provisions for adjustment, or incorporate UHMWPE side seats and a neoprene seal to maintain water tightness between the slide and the frame throughout the life of the gate. Sealing systems shall be integrated in the guides and shall not interfere with water flow.

#### Seals shall maintain the specified leakage rate in both seating and unseating conditions.

#### The bottom seal shall be attached to the bottom member of the frame, or the bottom of the slide and shall form a flush bottom.

### **Yoke:**

#### Self-contained gates shall be provided with a yoke made of structural members or formed plates. Construction shall be such as to limit deflection to 1/360 of the span of the gate. The yoke arrangement shall allow the removal of the slide without the removal of the yoke, or yoke arrangement shall be easily removable.

### **Stem and Couplings:**

#### Operating stem shall be such designed to transmit in compression at least 2 times the rated output of the operating manual mechanism with a 40 pound effort on the crank and shall have a slenderness ratio (L/R) less than 200.

#### The threaded portion of the stem shall have machined cut or rolled threads of the Acme type and shall have a surface finish of 32 microns or less.

#### When hydraulic, pneumatic, or electric operators are used, stem design force shall not be less than 1.25 time the output thrust of the hydraulic or pneumatic cylinder with a pressure equal to the maximum working pressure of the supply, or 1.25 times the output thrust of the electric motor in the stalled condition.

#### Sections of stem assemblies of diameter 1-1/2 inches and larger shall be joined together with solid couplings.

#### The couplings shall be grooved and keyed and shall be of greater strength than the stem. All similar parts shall be interchangeable.

#### The rising stem shall be provided with a clear polycarbonate or PVC stem cover complete with a cap and condensation vents as well as a clear mylar position indicating tape.

#### Gates having widths equal to or greater than 2 times the height shall be provided with 2 lifting mechanisms connected by a tandem shaft.

### **Stem Guides:**

#### Guides shall be adjustable in two directions and shall be spaced in accordance with manufacturer's recommendation.

#### Stem guides shall not be located on the threaded portion of the stem.

### Thrust Nut. For rising stem arrangement, the thrust nut shall be located at the operator level.

### Gate (and wall thimble, as applicable) shall be sandblasted after fabrication to remove weld splatter and to polish scratches. Blasting shall clean the entire surface and produce an even color and sheen.

## Stop plates/bulk head gates

### **General:**

#### Gates shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings.

#### Leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter in seating head and unseating head conditions.

#### The gate shall utilize self-adjusting or resilient seals.

#### All structural components of the frame and slide shall be fabricated of shaped structure having a minimum thickness of 1/4 inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.

#### All welds shall be performed by welders with AWS certification.

#### Materials of Construction:

|  |  |
| --- | --- |
| **Item** | **Material** |
| Frame Guides and Invert | Stainless Steel ASTM A276, Type 316 |
| Slide and Stiffeners | Stainless Steel ASTM A240/A276, Type 316 |
| Invert Seal | EPDM |
| Seat/Seal and Facing | EPDM or UHMWPE ASTM D4020 |
| Fasteners | 316L Stainless Steel |

### **Frame:** Frame design shall allow for embedded mounting or mounting directly to a wall. All wall mounted gates shall have a flange frame. Flat frame gates are not acceptable. A rigid invert member shall be provided across the bottom of the guides. The invert member shall be of the flush bottom type. Gussets shall be provided as necessary to support the guide members in an unseating head condition. The gussets shall extend to support the outer portion of the guide assembly and shall be positioned to ensure that the load is transferred to the anchor bolts. The frame shall extend to accommodate the entire height of the slide when the slide is in the fully opened position.

### **Slide:** The slide and reinforcing stiffeners shall be constructed of plate with a minimum thickness of 1/4 inch. The slide shall not deflect more than 1/360 of the span or 1/16 inch, whichever is smaller, under the maximum design head. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. Vertical stiffeners shall be welded on the outside of the horizontal stiffeners for additional reinforcement. A lifting handle or lifting lugs shall be welded to the top of the slide. Stop/bulkhead gates with widths in excess of 36 inches shall be provided with dual lifting handles or lugs.

### **Seat/Seals:** Gates shall be provided with resilient self-adjusting seal system to restrict leakage and to prevent metal to metal contacts between the frame and slide. The seal shall be attached to the invert member of the frame or the bottom of the slide and shall be bolted to the frame. Alternatively, the side and top seals may be of the J type and the bottom seal of the flush bottom type. J-seal corners shall be formed by continuous molded corners. Joints between the molded corners and top and side sales shall be a square butt type located a minimum of ½” form the corner. The molded corner shall be bonded to the top and side seal and assembled to the gate disc in the manufacturer’s shop. Mitered joints are not acceptable. The seals shall be mounted so as not to obstruct the water way opening.

## stop logs

### **General:**

#### Stop log assemblies shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings.

#### Leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter.

#### The stop logs shall be provided with a continuous resilient seal along the bottom and both sides. The guide frames shall not incorporate seals.

#### Stop logs shall be designed to function properly when stacked in any order.

#### All structural components of the stop logs shall be fabricated of aluminum and shall have adequate strength to prevent distortion during normal handling, installation and in service.

#### All welds shall be performed by welders with AWS certification.

#### Finish: Mill finish on aluminum and stainless steel. All aluminum in contact with concrete shall be shop coated with a heavy coat of coal tar paint. Welds on aluminum shall be cleaned to provide a uniform finish.

### Materials of Construction:

|  |  |
| --- | --- |
| **Item** | **Material** |
| Frame Guides and Invert | 316 Stainless steel ASTM A276 |
| Stop Logs | 6061 T6 |
| Lip Seal and J seal | Urethane, Neoprene ASTM D2000 or EPDM |
| Fasteners | 316L Stainless Steel |

### **Frame Guides:** Frame shall be constructed of extruded aluminum with a minimum thickness of 1/4 inch. Frame design shall allow for mounting directly to a wall. An invert member shall be provided across the bottom of the guides. The invert member shall be of the flush bottom type.

### **Stop Logs:** The stop logs shall be constructed of extruded aluminum with a minimum thickness of 5/16 inch. Each stop log shall be 18 inches tall unless otherwise indicated on the Contract Drawings. Maximum bending stress shall not exceed 7600 psi at the maximum operating head. Two slots shall be provided in the top of each stop log for removal and installation via the stop log lifter.

### **Seals:** Stop log shall be furnished with a continuous resilient lip seal along the bottom and both sides to restrict leakage, and shall be mechanically retained to the stop log. Alternatively, side seals may be J-type seals and shall be attached to the guides.

## gate operating mechanism

### Gate operators shall be provided as listed on the gate schedule in the Drawings and specified herein. The operators shall be mounted to top frame on self-contained gates and to floor stand pedestal on non-self-contained gates.

### Manual operators shall be the cranking mechanism designed to operate the gate under the seating and unseating heads with a maximum effort of 40 pounds on the crank. All bearings and gears shall be totally enclosed in a weather tight housing. The pinion shaft of the cranking mechanism shall be stainless steel and shall be supported by roller or needle bearings. The crank shall be removable, so that the gate can be operated with 2-inch square nut and portable electric operator, and shall be fitted with a handwheel.

### Motor operators shall be as specified in Section 15101.

## tagging requirements

### Each gate operator shall be provided with a 1-1/2-inch minimum diameter heavy 316 stainless steel tag. Each tag shall bear the gate tag number and tag barcode shown in the attached as shown on the Drawings. The barcode format shall be provided by the DISTRICT.

### The tags shall be attached to the operator by soldered split key rings so that ring and tag cannot be removed. The numbers and letters shall be of block type, with 1/4-inch-high numbers and letters stamped thereon and filled with block enamel.

## spare parts and spare tools

### The following spare parts and special tools shall be furnished. All parts and tools shall be suitably marked and packed in a single, hinged-cover box.

|  |  |
| --- | --- |
| **Item** | **Quantity** |
| Stop collars for all gate stems, closing and opening | 1 set of each different size positions |
| Bronze lift nuts for gates in OPEN/CLOSED service | 1 of each different size |
| Nylon lift nuts for modulating gates | 1 of each different size |
| Special tools | 1 set |

### In addition to the spare parts listed above, the Contractor shall furnish the DISTRICT with a portable electric operator capable of operating all of the manually operated slide gates provided under this Section. The unit shall be driven by a 110-volt, 60 Hertz, single phase, reversible motor for open and close actuation. The motor shall be rated for 15 minutes of continuous duty under full load. The portable operator shall be complete with a set of adapters for square, half-round and splined input shafts, tripod adjustable from 32 to 44 inches, and a 7.5-foot-long grounding type power cord.

## gate schedule

### See contract drawings for gate schedule.

## manufacturers

### Fontaine Company

### Hydro-Gate

### Golden Harvest

### Mechanical Associates

### Waterman Industries

### Whipps Inc.

# execution

## Installation

### Installation of slide gates shall comply with the Manufacturer's written instructions and section 11000 of these specifications.

### Prior to setting each gate, if polysulfide elastomeric sealant will be use, the elastomeric sealant shall be applied to the back of the gate frame. After setting the gate, the nuts shall be run down on the anchor bolts far enough to make them snug and to cause the rubber sealant to begin to ooze out but without stress on to the frame. Excess sealant at the edges shall be removed. The sealant shall be allowed to cure for at least 7 days, after which the anchor bolt nuts shall be tightened to their final positions. If gaskets are being used, they shall be installed over the studs in one piece, or dovetailed and cemented with a liquid-type gasket material.

## field testing

### Sluice gates shall be tested for leakage in accordance with the provisions of ANSI/AWWA C561. Leakage allowance for gates shall not exceed 0.05 gpm/ft of seating perimeter under seating head specified in the Slide Gate Schedule, and

### 0.05 gpm/ft under unseating head specified in the Slide Gate Schedule.

### If leakage exceeds the indicated criteria, modifications and corrections shall be made under the supervision of manufacturer's representative at no additional cost to the DISTRICT.

### Power operated gates shall be tested over their full range of travel to verify proper operation and compliance with the functional requirements specified herein. End position limit switches shall be adjusted and set in accordance with manufacturer's recommendations.

### Provide manufacturer's certification of installation indicating that frames and slides have been installed as per manufacturer's instructions and have been tested and withstand the maximum heads indicated.

end of section