

## **CAST IRON SLIDE GATES**

### **General**

The contractor shall furnish and install the following cast iron slide gate assemblies as listed on the "Gate Schedule" and detailed on the manufacturer's drawings. The cast iron slide gate assemblies shall include the gate, frame, wall thimble (if required), stem, stem guides, and lift. Cast iron slide gates and installation shall meet the requirements of AWWA C560 except as modified herein. The gate shall be manufactured by Hydro Gate or approved equal.

### **Materials of Construction**

Materials used in construction of gates shall be of the type best suited for the application and shall conform to the following ASTM specifications.

#### **MATERIAL COMBINATION NUMBER 1:**

Regular service, normal water, and wastewater.

Frame, Slide, Wall Thimble, Pedestal, Gear Housing, Wall Brackets, and Stem Guide Brackets

Cast iron, ASTM A126, Class B

Wedges and Wedge Blocks

Bronze, ASTM B584, Alloy C862

Lift Nut and Stem Block

Bronze, ASTM B584, Alloy C865

Seating Faces

Bronze, ASTM B21, Alloy C48200

Stems and Stem Couplings

Stainless steel, ASTM A276, Type 304

Fasteners

Stainless steel, ASTM F593/F594, Alloy Group 1

Flush-Bottom Seal

Neoprene, ASTM D2000

Flush-Bottom Retainer

Stainless Steel, ASTM A276, Type 304

### **Slide**

The gate slide shall be cast iron and shall be of one-piece construction. The slide shall be square or rectangular in shape with integrally cast vertical and horizontal reinforcing ribs. A heavy reinforcing rib along each side shall be provided to ensure rigidity between side wedges. The slide shall be designed to operate under maximum specified unbalanced head with the minimum safety factor of five. Guide tongues along each side of the slide shall be machined all over. A nut pocket shall be cast on the vertical centerline of the gate and shall be provided with a threaded block for attaching the stem to the slide. Pads for side wedges and top and bottom wedges, when required, shall be integrally cast on the slide and machined to receive the adjustable wedges.

### **Frame and Guides**

The gate frame and guides shall be cast iron and shall be a one-piece integral casting. Guide grooves shall be machined on all contact faces. Overall clearances with slide tongue shall be not more than 1/8 in. Faces for mounting of wedging devices shall be fully machined. Guide grooves shall be of such length as to support at least one-half of the slide when it is in the full open position. Frames shall be self-contained (S/C) or not self-contained (NS/C) as listed in the "Gate Schedule." Frames with a spigot-back arrangement are not allowed. Round opening gates shall have a circular flange cast as part of the frame for mounting to a wall or pipe flange. All wall thimble-mounted gates shall have a square or rectangular flanged-back frame. The frame shall be fully machined and drilled to match the wall thimble. Gates mounted on pipe flanges shall be furnished with partial drilling per manufacturer's recommendations.

### **Yokes**

Yokes of self-contained gates shall be cast iron or structural steel. They shall be designed to withstand the thrust of the manual lift when a 40 pound pull is placed on the handwheel or crank with a safety factor of 5 based on the ultimate strength of the material used. The yokes shall be bolted to machined pads on the gate frame.

### **Seating Faces**

Corrosion-resistant seating faces shall be mounted around the perimeter of the slide and frame. They shall be impacted into dovetail slots and held in position without use of screws or other fasteners. After mounting, they shall be machined to a plane with a 63 micro-inch finish or better. When the slide is in the fully closed position and wedged in position against the frame, maximum clearance between seating faces shall not exceed 0.004 in.

### **Wedges**

Each gate shall be provided with a sufficient number of wedges to provide a practical degree of water-tightness. Side wedging devices shall be designed to make full metal-to-metal contact with the overhung portion of the frame-mounted wedge block. Wedges shall be fully adjustable and keyed to prevent any lateral rotation. Side wedges shall be machined with angled faces and secured with a stud bolt to prevent any slippage during operation of the gate. Gate shall be designed with adjustable top and bottom wedges attached to the frame and slide. The top and bottom wedges shall be mounted in a machined slot and bolted to the slide to prevent lateral rotation. All contact faces of wedges and wedge blocks shall be precision-finished with 63 micro-inch finish or better.

### **Flush-Bottom Seal**

Flush-bottom gates shall be provided with a frame-mounted flush-bottom seal. The solid bulb resilient rubber seal shall be firmly held in place using stainless steel retainers and corrosion-resistant fasteners. The full length of the bottom edge of the slide shall be machined for making uniform contact with the seal when it is mounted on the frame. The differential pressure on the rubber seal shall be variable by adjustment of wedges on the gate.

### **Wall Thimble**

Wall thimble shall be a heavy, one-piece iron casting of an E, F or mechanical joint type configuration. A center ring or water stop shall be cast around the periphery of the thimble. The front face of the thimble shall be machined and holes drilled and tapped for attaching the gate with corrosion-resistant metal studs. The vertical

centerline shall be clearly marked at top and bottom to permit alignment of the front face in the vertical plane. Wall thimbles shall be internally braced during concrete placement to prevent warping. Square thimbles shall be provided with holes in the invert to allow satisfactory concrete placement beneath the thimble. Holes shall be on centers of 24 inches or less. A rubber gasket of uniform thickness or a mastic shall be used to form a seal between the front face of the thimble and the back of the gate frame. E-type or mechanical joint wall thimbles shall have the back flange drilled and machined as shown in the plans or specified in the "Gate Schedule."

### **Stem and Stem Splices**

Stems shall be manufactured from stainless steel sized to withstand the axial compressive and tensile forces created during gate operation under the specified unbalanced heads and to transmit in compression at least two times the rated output of the lift with a 40-lb effort on the crank or handwheel, or 1.25 times the stall thrust of the electric actuator. Threading on stems shall be rolled with double-lead threads of the Acme type. Cut threads will not be allowed. The contact surfaces of the threads shall have a maximum 16 micro-inch finish. Stem couplings shall have internal threads for transmitting the full thrust of the stem and shall be held in place on the stem with a key, simultaneously engaging the coupling and both stems.

### **Stem Guides**

Stem guides shall be fully adjustable, heavy duty castings, with 2 piece cast bronze removable collars. The stem guides shall be properly spaced to support the stem as a long column, with maximum spacing not to exceed an  $l/r$  of 200.

### **Lifts**

Manual Lifts – The lifts shall be of the handwheel or enclosed gear type. Gears shall be steel with machine-cut teeth designed for smooth operation. The gearing and lift nut shall be mounted in a cast iron housing which, in turn, shall be supported by a cast iron or structural steel pedestal to place the input shaft approximately 36 in. above the floor. Lubrication fittings shall be provided in the gear housing to permit lubrication of all gears and bearings. A maximum effort of 40 lbs shall be required to operate the gate after it is unseated from its wedging devices. All rising stem gates shall be supplied with a clear plastic stem cover. Geared lifts shall be suitable for manual and portable motor operation. Lift nuts shall be high-strength bronze. Oil bath lubrication shall not be allowed.

Stem Covers – Rising stem gates shall be provided with clear plastic stem covers that will not discolor, crack or become opaque for at least 5 years after installation. The covers shall be capped, vented, and long enough to allow full travel of the gate.

Electric Powered Lifts – Motor operator shall be a 460-V, 3-phase, 60-Hz motor with precision reduction gearing enclosed in a weatherproof housing. The operator shall be designed to raise the gate at a rate of approximately 12 in./min. Integral controls shall include a control power transformer, reversing controller, torque and limit switches required for controls and remote indication, space heater to prevent condensation, open-stop-close push-buttons, and gate position indicator. Where applicable, the controls shall also include a local-off-remote selector switch. Motor reduction helical gear and pinion shall be of heat-treated alloy steel. Final reduction worm shall be of alloy steel and worm gear of machined high-tensile-strength bronze. All gearing shall be proportioned for 100% overload condition. Operator shall have a declutch lever and handwheel for manual operation.

**Fasteners**

All anchor bolts, studs, assembly bolts, cap screws, nuts, and adjusting screws shall be of ample section size to withstand the force created by operation of the gate under full heads of water specified and shall be stainless steel.

**Installation**

All parts shall be installed and adjusted by the contractor in a workmanlike manner. The manufacturer shall furnish necessary drawings and detailed installation, operation and maintenance instructions for all components. It shall be the contractor's responsibility to handle, store, and install all parts and adjust switches and controls in accordance with the manufacturer's detailed written recommendations. Stem threads shall be lubricated prior to operation of the gate.

**Cleaning and Coating**

Cleaning and coating shall be performed at the manufacturer's plant. Rust, mill scale, dirt and grease shall be removed by commercial blast cleaning (SSPC SP-10) method. Paint shall be manufacturer's standard or in accordance with paint specifications in the paint section.

**Leakage**

After installation and before the gates are put into operation, a leakage test shall be performed on all slide gates in accordance with AWWA C560. Excess leakage shall be reduced to this maximum by adjusting the gate and its wedges.

## **HEAVY DUTY SLIDE GATE**

### **General**

Fabricated stainless steel heavy duty service gates shall be fabricated from formed stainless steel plate and structural shapes. The size, quantity, gate configuration and operating conditions shall be as listed on the gate schedule. Design stress shall be the lesser of 1/5 of ultimate tensile and shear or  $\frac{3}{4}$  of tensile yield strength. Maximum allowable deflection under rated load or head is 1/720th of span.

Manufacturer shall have proof of design test records in accordance with AWWA on file available for submittal. The gates shall be as manufactured by Hydro Gate Corp. or approved equal.

Manufacturer shall be experienced and in regular production of gates and water control equipment. Welders and procedures shall be certified according to AWS D1.6 or ASME Section IX.

The gate shall be fully shop assembled, adjusted, inspected and tested for operation and leakage before shipment.

The gate shall be cleaned with water blast or glass bead blast to remove weld splatter and discoloration and produce even texture. All edges and corners shall be free of sharp burrs.

### **Materials**

Materials used in construction of gates shall be of type best suited for the application and shall conform to the following ASTM specifications:

#### **Body**

Stainless Steel, ASTM A276, Type 304 or 316 – specify on gate schedule.

#### **Fasteners and Anchor Bolts**

Stainless Steel, ASTM F593/F594 alloy group 1 (304)

Stainless Steel, ASTM F594/F594 alloy group 2 (316) – specify on gate schedule

#### **Guides, Liner and Seals**

UHMW PE (Ultra high molecular weight polymer)

#### **Flush Bottom Seal/Loading Pads**

Neoprene Rubber, ASTM D2000 grade 1BE625

### **Gate Construction**

#### **Slide**

The slide shall be a weldment of plate with integrally formed reinforcements at top and bottom with welded-on interior reinforcements. The slide shall have at least one vertical reinforcement on or adjacent to the vertical center line. All edges and corners shall be radiused and polished for smooth operation within the guide seal assembly.

Provision shall be provided for attaching stems to the gate with a clevis-type connection. Alternatively: stem block connection shall be used when precise adjustment of hydraulic cylinders is required.

### **Frame**

The frame shall be of flange type design for mounting on anchor bolts and grout pad. Size and spacing of anchor bolt holes shall be suitable for the operating conditions of the gate. Spacing shall not exceed 12".

The frame shall be of self-contained or not self-contained design as listed in the gate schedule. The frame shall be sufficiently rigid to transfer hydrostatic loads to the gate anchorage.

The frame shall positively retain the polymer guide/seal strip and the neoprene loading pad on studs welded to it. Non-loosening (prevailing torque) fasteners shall be used on the gate guide assembly. The guide seal assembly shall be field adjustable and replaceable. The length (vertical height) of the guide shall retain at least 2/3 of the slide height in the full open position.

### **Guide/Seal Assembly**

Guide seal shall be special milled or molded polymer to positively retain the slide and form a tight seal on face plate edge. Sealing shall be accomplished by pinching action of the polymer guide/seal the elastomer loading pad and the fastener cover bar system. Engagement of slide into guide groove shall be 7/8" nominal.

### **Top Seal and Bottom Seal (if standard bottom)**

The top and bottom (if used) seal shall be specially milled or molded shape securely attached to the frame. It shall have an elastomer loading pad to ensure contact with the slide plate. Corners or intersections of seals and loading pads shall be interlocked and sealed for leak-proof joint.

### **Flush Bottom Closure**

Rectangular solid bulb section neoprene seal shall be attached to frame horizontal member. Sealing action shall be against lower edge of slide plate. The sealing face of neoprene seal shall form a chased invert.

### **Standard Bottom Closure**

When specified by gate schedule, the gate shall be furnished with the special shaped polymer seal and loading pad on the gate frame lower member. The bottom edge of slide shall have integrally formed reinforcement and have gently ramped lead in surface to prevent damage to the seal.

### **Wedges**

Gates 24" wide and wider shall have adjustable wedges across top of opening and across bottom of opening on standard bottom gate. Wedges may be fabricated or cast and shall be held onto slide reinforcing member with two inline welded studs with backing plate.

### **Yoke**

The yoke or head frame may be welded or bolted to frame extensions. The slide shall be removable thru the yoke opening or by disassembly/removal of the yoke. Yoke shall be sufficiently strong to prevent deflection greater than 1/4" under load.

### **Stems**

Gate stem diameter shall be adequate to withstand twice the force created by a 40 lb. pull on the handwheel or crank. Stems shall have rolled threads with a maximum roughness of 16 micro inches. Cut threads are not acceptable. The stem shall be supported by angle guides or fabricated stainless steel, bronze bushed stem

guides, spaced to provide an 1/r ratio of 200 or less. Stems shall withstand 1.25 times the stalled motor thrust of the actuator.

### **Wall Thimbles**

When thimbles are used, they shall be fabricated stainless steel with minimum thickness of 1/4". The flange shall be flat and plane within 3/16" without machining. Welded studs or threaded holes for screwed in studs shall be provided to match the gate layout. The top of the thimble flange shall be permanently marked top. The thimble shall be set plumb and flat within 1/8" of true plane and plumb. The gate shall be mounted with hard setting mastic or polyurethane closed cell foam gasket of no more than 1/2" uncompressed thickness. Refer to the gate schedule for type and application of wall thimbles.

### **Manual Lifts**

Gate lifts shall be handwheel or geared crank type as shown in the gate schedule. Lifts shall operate the gate with a maximum pull of 40 lb. on the handwheel or crank. Handwheel or crank shall be located approximately 36" above grating or walkway. All lifts shall have thrust bearings, bronze lift nuts and a bronze stop nut to limit the downward travel of the stem and slide. All geared lifts shall have cast iron or steel housing and pedestals. Aluminum housing and pedestals shall not be acceptable. All lifts shall be rising stem type. Stem covers made of clear butyrate shall be furnished for all lifts. Lifts shall be grease lubricated and regreaseable through grease zerks. Oil bath lifts are not acceptable.

### **Motor Operated Lifts**

Motor operator shall be a 460-V, 3 phase, 60-H motor with precision reduction gearing enclosed in weather-proof housing. The operator shall be designed to raise the gate at a rate of approximately 12 in/min. Integral controls shall include a control power transformer, reversing controller, torque switches, space heater to prevent condensation, open-stop-closed push buttons.

### **Installation**

The gate and accessories shall be installed according to manufacturer's recommendation. The gate shall be clean and free of construction debris and stem threads shall be lubricated prior to operation of the gate. If electric motor operator is used, limit switches shall be adjusted according to manufacturer's instructions. If hydraulic cylinder is used, the rod or stem connection shall be adjusted for correct stroking and closing action. The gate shall be cycled minimum of 1-1/2 cycles (open-close-open or vise versa) to ensure smooth operation. The gates may be field leak tested by the contractor. Leakage shall not exceed .05 gpm per foot of perimeter at the rated head, seating or unseating. Consult installation drawing for pressure rating of the specific gate.

Approved manufacturer shall be Hydro Gate or pre-approved equal.