

SECTION 352226 - SLUICE GATES AND SLIDE GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. This section includes the furnishing and installation of wall thimbles, gate frames, sluice gates, slide gates, floor stands, extension stems, stem guides, operating devices, position indicators, wall brackets, floor boxes, anchors, and all appurtenances.
- B. Motors and electrical work incidental to installation and operation of sluice gates and slide gates shall be included herewith unless otherwise directed under other Contract Items.

1.3 QUALITY

- A. Sluice gates and their appurtenances shall conform to applicable portions of AWWA Standard for Sluice Gates, C501.

1.4 PROTECTION

- A. All gates shall be shipped, stored, and installed in such a way as to avoid warping the frame and to maintain tolerances between seating faces.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and application instructions.
- B. Sluice gates, slide gates, operators, and appurtenances shall be as shown on the Drawings, scheduled, as specified, or as ordered.

PART 2 - PRODUCTS

2.1 SLUICE GATES

- A. Sluice gates shall consist of an iron-bodied and bronze-mounted gate with bronze faced wedges and wedge blocks. Side wedges shall be adjustable. Top and bottom wedges shall withstand seating and unseating heads shown in the Schedule included in the Drawings.
- B. Frames shall be circular or rectangular flanged frames to connect with wall thimbles and provide for openings of the shape and dimensions specified unless otherwise indicated.

- C. Guides shall be of cast iron and of sufficient length so that at least one-half of the disc is within them at full opening.
- D. Operating stems and extensions shall be ASTM A 276 stainless steel with high finish corrosion-resistant restraint threads and shall operate without binding or jamming in the lift nut. Adjustable stem guides shall have bronze bushings.
- E. Wall thimbles shall be of cast iron and similar to Type "F" as manufactured by Rodney Hunt Mfg. Co., Hydro-Gate; or equal, unless otherwise noted.
- F. Each extension stem shall be the same material and the same size as the stem of the gate it operates. If the extension is more than 8 ft. long, intermediate stem guides shall be installed and supported from the wall by suitable brackets at 8-ft. intervals. Brackets and stem guides shall be made of cast iron and fully adjustable. The guide block shall be bushed where it contacts the extension stem.
- G. All gates which are to be operated by T-wrench shall have 2-in. square operating nut at the top of the extension stem. A T-wrench shall be supplied for each gate with operating nut.
- H. Sluice gates shall be manufactured by Rodney Hunt Mfg. Co., Hydro-Gate; or equal.

2.2 SLIDE GATES (ALUMINUM)

- A. The guides shall be of extruded aluminum incorporating a dual slot design. The primary slot shall accept the plate of the disc and the secondary slot shall be sufficiently wide to accept the reinforcing ribs of the disc. The guides shall be designed for maximum rigidity, shall have a weight of not less than 3 lbs. per foot and will be provided with keyways to lock it into the concrete. The invert of the frame shall be an angle welded to the lower ends of the guides to form a seating surface for the resilient seal mounted on the disc.
- B. Where the guides extend above the operating floor, they shall be sufficiently strong so that no further reinforcing will be required. The yoke to support the operating benchstand will be formed by two angles welded at the top of the guides to provide a one piece rigid frame. The arrangement of the yoke shall be such that the disc and stem can be removed without disconnecting the yoke.
- C. The disc or sliding member shall be of aluminum plate reinforced with "A" shaped aluminum extrusions welded to the plate not more than 16 inches apart. Reinforcing ribs shall extend into the guides so that they overlap the seating surface of the guide. A specially molded resilient seal shall be mounted on both vertical sides and the bottom of the disc to provide flush bottom closure or as noted on the slide gate schedule. The shape of the seal shall produce a seating surface having a minimum width of 3/4" and the seal shall extend into the secondary slot of the guide. The vertical face of the seal shall be in contact with the seating surface of the guide to provide a proper seal at the corners.
- D. All parts of the gate shall have a minimum thickness of 1/4".

- E. Operation of the gate shall be by means of a handwheel or crank operated benchstand mounted on the yoke of the gate. The benchstand will be fully enclosed, equipped with roller bearings above and below the operating nut and with a mechanical seal around the operating nut. On a crank operated benchstand, the pinion shaft will be cadmium plated and supported on roller bearings. A mechanical seal will be provided around the pinion shaft where it extends from the hoist enclosure. The operating stem shall be of Type 304 stainless steel designed to have an L/r of less than 200, to withstand at least twice the rated output of the benchstand and to have a minimum diameter of 1-1/2". The stem shall be connected to the disc by means of a cast aluminum stem connector threaded and bolted to the stem and welded to the disc.
- F. All necessary attaching bolts and anchor bolts shall be stainless steel and will be furnished by the slide gate manufacturer.
- G. Slide gates shall be manufactured by Rodney Hunt Mfg., Hydro-Gate; or equal.

2.3 SLIDE GATES (STEEL)

- A. Gate seat and angle frame shall be an integral unit of steel structural shapes, assembled by welding or bolting, to form the waterway opening. Side angles, filler bars, and cover bars shall form guides for the slide and holes shall be provided for mounting on anchor bolts.
- B. Slide gate shall be fabricated from plate having 1/4- in. minimum thickness and shall be reinforced with structural shapes sized to withstand the specified seating and unseating heads with a maximum deflection of 1/360 of the gate span. The slide shall be provided with a pocket for attaching the stem. This pocket shall be attached to the slide by welding and shall be capable of taking the full thrust developed during normal gate operation.
- C. Gates so designated in the Gate Schedule shall be provided with a flush bottom seal. All parts shall be as specified above except a solid rubber seal shall be securely fastened to the bottom cross member of the frame with a retainer and threaded fasteners. The top surface of the seal shall be flush with the invert of the gate opening. The seal shall be replaceable without disassembly of the gate.
- D. The gates, frames, stems and extensions shall be fabricated entirely of ASTM A 36 steel.
- E. Slide gates shall be manufactured by Rodney Hunt Mfg., Hydro-Gate; or equal.

2.4 SLIDE GATES (STAINLESS STEEL)

- A. Slide gates shall conform in all respects to the latest version of AWWA C561. Materials used in construction of slide gates shall be suitable for the application and conform to the following specifications:
 - 1. Frame, Slide, Reinforcing Members and Self-Contained Yoke (if required): Stainless Steel ASTM A240/A240M, Type 304L.
 - 2. Stems and retainer bars: Stainless Steel, ASTM A276, Type 304.
 - 3. Fasteners: Stainless Steel, ASTM F593/F594, Alloy Group 1 or 2 (Type 304).
 - 4. Invert seals and compression load pad: Neoprene or EPDM, ASTM D2000, 60 Durometer.

5. Side Seal: Ultra High Molecular Weight *UHMW) Polymer, ASRM D4020.
 6. Top Wedges: Stainless Steel, ASTM A351-CF8M, Type 304.
 7. Pedestals, Wall Brackets, and Stem Guide Brackets: Stainless Steel, ASTM A276, Type 304.
 8. Stem Guide Bushings: Silicon Bronze, ASTM B584, Alloy 873 or Ultra High Molecular Weight (UHMW) Polymer, ASTM D4020.
- B. Gate slide deflection under full head shall be limited to 1/720 of the span. Stem connector clips or stem block pocket shall be welded to the slide. Gates over 24-inches wide shall have adjustable top wedges to prevent defection in the slide resulting from over closure.
 - C. Yoke: Self-contained gates shall be provided with a yoke designed to withstand the thrust of the operator. Yoke deflection shall not exceed 1/360 of the gate width or a maximum of 1/4" whichever is less at maximum operating load. The yoke head channels shall be welded to the gate frame. The channels shall be sufficiently spaced to allow removal of the gate slide.
 - D. The operating stem shall be of a size to safely withstand, without buckling or permanent distortion, the stresses induced by normal operating forces.
 - E. All parts of the gate shall have a minimum thickness of 1/4".
 - F. Manually operated lifts shall be handwheel or geared crank type as shown. 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-inches 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 or ductile iron housings and cast or fabricated pedestals. All lifts shall be rising stem type if possible.
 - G. All necessary attaching bolts and anchor bolts shall be stainless steel and will be furnished by the slide gate manufacturer.
 - H. Slide gates shall be manufactured by Rodney Hunt Mfg., Hydro-Gate; Whipps; or equal.

2.5 LIFT ASSEMBLIES

- A. Floor stands shall be of the enclosed gear pedestal lift type with single or double gears as required, and with thrust bearings above and below the flange on the bronze lifting nut. Bevel and pinion gears shall be steel with cut teeth, and spur gear shall be cast iron with cut teeth. Bearings for the gear and pinion shaft shall be bronze bushed. The lift shall operate on a 25-lb. pull on the crank. A clear butyrate plastic pipe stem cover shall be provided with Mylar open and close indication.
- B. The guides on self-contained gates shall extend above the operating floor. They shall be sufficiently strong so that additional reinforcing is not necessary. The yoke to support the operating benchstand will be formed by welding two angles across the top of the guides.
- C. Where the head frame extends higher than 4 ft. above the operating floor, the gate operator shall include a bevel gear assembly.

D. Electric Gate Operator (Open-Close)

1. The operator shall be the helical and worm gear type driven by electric motor. All power gearing shall be grease lubricated. The valve manufacturer shall furnish the value of the maximum operating torque required to operate the valve as defined in the Appendix to AWWA C501. The operator manufacturer shall furnish evidence that the operator is designed to equal or exceed the torque requirements.
2. Unless otherwise noted, the operator shall be geared to operate the gate at a rate of approximately 12 in. in 60 seconds under the full specified operating head. It shall be possible to change this cycle time by substituting suitable gear trains. The operator shall be equipped with a declutchable handwheel for manual operation. The operator shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering.
3. Suitable reduction gearing shall be provided off the main shaft of the gearing, turning approximately 270 degrees while the valve performs full travel. The reduction gearing shall be equipped with a mechanical position indicator dial. Other indicating devices shall be provided as indicated.
4. Each operator shall be equipped with adjustable torque switches for overload protection in both opening and closing directions with torque switch bypass for unseating.
5. Each operator shall be equipped with four adjustable train gear limit switches. Each limit switch shall include a switch and counter gear. The setting accuracy shall be less than 1/10 turn of the operator output shaft. Two (2) gear limit switches are for switching off when reaching end positions.
6. Each motor shall be 480 volts, 60 Hz, three phase, squirrel cage, totally enclosed type suitable for modulating service. The motor shall be capable of starting and stopping with a frequency of 10 cycles per minute and of reversing service after a minimum delay of 50 msec.
7. Three (3) thermostats in series placed in the winding shall provide the motor with thermal protection. They shall interrupt the control circuit as soon as the temperature goes beyond the permissible winding temperature.
8. Each operator shall be equipped with a reversing magnetic starter. The starter shall be capable of receiving contact closures from remote sources to actuate the operator in either direction. Control voltage shall be 120 volts supplied by a transformer included in the control enclosure. Each operator shall include a local OPEN-STOP- CLOSE control switch and a pad lockable LOCAL-OFF- REMOTE selector switch.
9. All electrical components shall be integral with the operator, housed in a watertight NEMA 4X enclosure and completely wired.
10. A circuit-breaker disconnect shall be provided with the operator.
11. Easily identifiable terminal blocks shall be provided for all external power, control, and signal connections.
12. Operator, located outdoors, shall include thermostats and space heaters in the motor and control compartments and heavy duty PVC stern covers.
13. The operator shall be as manufactured by Limatorque; EIM; or equal.

2.6 PAINTING AND FINISHING

- A. All unmachined surfaces of the cast iron sluice gates and slide gates shall be shop cleaned by shot or sandblasting and painted with one coat of a polyester resin primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be as shown on the Drawings and in conformance with AWWA Standard C501 for sluice gates.

3.2 TESTING

- A. After installation the Contractor shall test each gate for satisfactory operation and watertightness against maximum operating pressure insofar as practicable.
- B. Leakage limits shall be as follows:
 - 1. Without resilient seal
 - a. Seating head up to 20 ft. - 0.3 gpm/lin. ft. of perimeter
 - b. Unseating head up to 20 ft. - 0.6 gpm/lin. ft. of perimeter
 - 2. With resilient seal
 - a. Seating head up to 20 ft. - 0.2 gpm/lin. ft. of perimeter
 - b. Unseating head up to 20 ft. - 0.4 gpm/lin. ft. of perimeter

3.3 OPERATION AND MAINTENANCE MANUALS

- A. Prior to or with the delivery of equipment, the manufacturer shall provide copies of an operation and maintenance manual including storage, installation, start-up, operating and maintenance instructions and a complete parts list and recommended spare parts list. The O & M manuals shall be in compliance with the General Requirements.

END OF SECTION 352226