**SECTION 11950**

ADD-2

**SLUICE AND SLIDE GATES**

1. GENERAL
	1. SCOPE
2. Work Included:
3. 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, stop plates, stop plate grooves and all appurtenances.
4. 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 Sections.
5. Related work:
6. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
7. Division 3: Concrete
8. Dimensions:
9. Sluice gates, slide gates, operators and appurtenances shall be shown on the Drawings schedules as specified or as ordered.
	1. QUALITY ASSURANCE
10. Qualifications of Manufacturers: Company specializing in manufacturing the Products specified in this section with minimum of 100 installations of water control gates. The Project Manager assigned to this project shall have a minimum five years documented experience designing and manufacturing similar water control gates.
11. Equipment Rating: Certification requirements.
12. Sluice gates and their appurtenances shall conform to latest revisions and applicable portions of:
13. ASTM ‑ American Society for Testing and Materials.
14. AWWA C542-16 – Electric Motor Actuators for Valves and Slide Gates.
15. AWWA C561-14 – Fabricated Stainless Steel Slide Gates.
16. American National Standards Institute (ANSI)
17. The gate manufacturer shall be ISO 9001:2008 certified.
18. Qualification of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.
	1. SUBMITTALS AND SUBSTITUTIONS
19. Comply with pertinent provisions of Section 01300.
20. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01310 of these Specifications:
21. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
22. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
23. Test data required elsewhere in this Section.
24. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Engineer three copies of an operation and maintenance manual compiled in accordance with the provisions of Section 01730 of these Specifications.
	1. PRODUCT HANDLING
25. Comply with pertinent provisions of Section 01600.
26. 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.
27. PRODUCTS
	1. MANUFACTURERS
28. Sluice and Slide gates shall be manufactured by:
29. Hydro Gate
30. Waterman Industries, Inc. P.O. Box 458, Grater, CA 93222
31. Or equal.
	1. SLUICE GATES (STAINLESS STEEL)
32. The Slide and Sluice Gates shall be manufactured in accordance with the latest version of AWWA C561 and shall be constructed of stainless steel ASTM 304L.
33. Materials of construction shall conform to the following ASTM Standards:

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| Frame, Slide and Reinforcing | ASTM A240/A240M, Type 304L |
| Stems and retainer bars | ASTM A276, Type 304L |
| Fasteners | ASTM F593/D594, Alloy Group 1 or 2 |
| Invert seals and compression load pad | Neoprene or EPDM, ASTM D2000 60 Durometer |
| Side Seal | Ultra High Molecular Weight (UHMW) Polymer, ASTM D4020 |
| Top Wedges | ASTM A351-CF8N, Type 304 or 316 |
| Pedestals, Wall Brackets and Stem Guide Brackets | Cast Iron, ASTM 126, Class B. |
| Stem Guide Bushings | Silicon Bronze, ASTM B584, Alloy 873 or UHMW Polymer, ASTM D4020 |
| Anchors | ASTM F593/D594, Alloy Group 1 or 2 |

NOTE: EPDM or Neoprene to be used only as a flush bottom seal on upward-opening gates.

* 1. COMPONENTS
1. Operators shall be of the type indicated in the Sluice and Slide Gate Schedule or on the Contract Drawings.
2. Slide Gate shall have square or rectangular openings as specified in the Schedule provided on the Contract Drawings.
	1. FRAMES
3. Furnish flange back frames for all wall mounted gates. Gate seats, seals and frame shall be an integral unit. Frames shall be provided with lifting lugs.
4. The frame shall be an integral unit of structural shapes, rigidly assembled to form the waterway opening. The frame members shall form guides for the slide, and holes shall be provided for mounting on anchor bolts. The head channels shall be welded to the gate frame. The head channels are to be sufficiently spaced to allow removal of the gate slide. The primary slot of the frame shall contain polymer guide bars to prevent metal-to-metal contact between slide and frame.
	1. YOKES
5. Furnish a yoke on self-contained gates that consists of two C-channels of sufficient dimensions to withstand loads developed during gate operation. Channels shall have a minimum depth of four (4) inches. Provide a stainless steel adaptor plate with a minimum thickness of 1/2-inch for mounting the operating mechanism.
	1. SLIDE
6. Fabricate gate slide shall be in no case less than 1/4- inch thick plate, reinforced with structural shapes to limit deflection under full head to less than 1/360 of span or 1/16-inch, whichever is less. The slide shall engage the frame a minimum of 1-inch on each side. Weld stem pocket or stem connectors to the slide and make capable of withstanding full thrust developed during gate operation. The connection between the slide and stem shall be made by a minimum of two bolts.
	1. FLASH BOTTOM SEAL
7. 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.
8. Provide upward opening gates so designated with a solid EPDM or neoprene seal attached to the bottom cross member of the frame, flush with the invert. Attach seal with stainless steel attachment bolts and/or a stainless steel retainer, seal replaceable without disassembly of the gate.
	1. SEALS
9. UHMW sandwich style seals shall be provided on the sides of the opening utilizing a rubber compression pad or cord to allow for self-adjusting once installed. UHMW sealing surfaces to be extruded, not saw cut, to ensure smooth surface finish. Top member seal will be sufficiently flexible to self-adjust, using compression cord or pad, with deflection in the slide plate under unseating loads.
10. All seats and seals shall be mechanically fastened with 316 stainless steel attachment bolts and shall be field replaceable without the need to remove the frame from the wall or without the need to remove grout or concrete.
	1. STEMS
11. Gate stem diameter shall be adequate to withstand twice the force created by a 40-lb pull on the hand-wheel 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 integral stem guide angles or wall mounted brackets with bronze split type stem collars, spaced to provide an l/r ration of 200 or less. Stems shall withstand 1.25 times the stalled motor thrust of the actuator.
	1. ACCESSORIES
12. Anchors:
13. Anchors shall be furnished by the gate manufacturer. Furnish one piece anchor of ASTM A276, 316 stainless steel. Anchors shall have a minimum diameter of 1/2-inch.
14. Fabricate stems from round stainless steel bars. Threaded portion of stem shall have machine rolled, full depth Acme threads polished to a 16 micro-inch finish or better. Stem shall be threaded and pinned to a bronze nut in the slide pocket or bolted to the stem connector.
15. Supply fully adjustable stem guides, UHMWPE or bronze bushed, fabricated stainless steel stem guides, spaced as recommended by the gate manufacturer, to hold stem in alignment, but allow easy operation. However, length to radius of gyration shall not exceed 200. Stem guides for self-contained gates shall, if required, be structural angles welded or bolted to the frame to accommodate the stem.
16. Fabricate all fasteners including anchor bolts of 316 stainless steel. Provide anchor bolts with washers and two nuts each. Design lift mechanisms to operate with no more than a 40 pound pull on the handwheel or crank at design head. The maximum radius of the handwheel shall be 24 inches or 15 inches for hand cranks. Self-contained gates with manual operators shall have ductile iron lift housing mounted on the yoke. A bronze lift nut, supported by ball thrust or roller bearings, flanged to maintain position in the housing shall accommodate the maximum thrust developed during opening and closing. Lift shall include an internally threaded bronze or aluminum stop nut above the lift nut to prevent over closing of the gate. Provide lifts for non‑self contained gates with a fabricated stainless steel pedestal, ductile iron gear housing and internally threaded bronze stop nut. Flanged lift nut shall be bronze, provided with ball thrust or roller bearings above and below the flange. Gears shall be machined with cut teeth and bronze sleeve bearings.
	1. LIFT ASSEMBLIES: SLUICE GATES
17. Floor stands shall be of the enclosed gear pedestal or yoke mounted lift type with single or double gears as required, and with thrust bearings above and below the flange on the bronze-lifting nut. Floorstands and wall brackets fabricated of 316 stainless steel. 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 bronzed bushed. The lift shall operate on a 40-lb. pull on the handwheel or crank at design head. A clear butyrate plastic pipe stem cover shall be provided with Mylar open and close indication.
18. 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 bench shall be formed by welding two angles across the top of the guides.
19. Where the head frame extends higher than 4 ft. above the operating floor, the gate operator shall include a bevel gear assembly to lower the operator centerline to approximately 36-inches above the operating floor.
	1. Operators
20. Manual Lifts
21. Operation of the gate shall be by means of a manual handwheel operated gearbox or crank operated gearbox, or electric motor operator mounted on the yoke of the gate as shown on the Drawings, Gate Schedule. Manual operators shall be provided with an input shaft that is suitable for operation with a portable operator.
22. The manual benchstand shall be fully enclosed, equipped with ball thrust or roller bearings above and below the bronze operating nut and with a mechanical seal around the operating nut. On a handwheel and crank operated benchstand, the pinion shaft shall be stainless steel and supported on ball thrust or roller bearings.
23. A mechanical seal shall be provided around the pinion shaft where it extends from the hoist enclosure.
24. The operating stem shall be of Type 316 stainless steel designed to have a slenderness ration (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".
25. Motor-Operated Lift
26. Motor actuator shall be a 460-V, 3-phase, 60-Hz motor with precision reduction gearing enclosed in weatherproof housing.
27. The actuator shall be designed to raise the gate at a rate of approximately 12 in./min.
28. Integral controls shall include a control power transformer, reversing controller, torque switches, limit switches, open-stop-closed pushbuttons and gate position indicator. The controls shall include a local-off-remote selector switch.
29. 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.
30. Actuator shall have a declutch lever and hand-wheel for manual operation.
	1. PAINTING AND FINISHING
31. Stainless steel gates and accessories shall not be painted
32. All weld burn and spatter on stainless steel components shall be passivated by the manufacturer in accordance with ASTM A380. If bead blasting or sand blasting is used for passivation, the entire slide and frame shall be blasted to a uniform finish.
33. EXECUTION
	1. SURFACE CONDITIONS
		1. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
	2. IDENTIFICATION OF GATES
		1. Each valve installed in exposed process piping systems shall be provided with a 1-1/2" minimum diameter heavy brass tag. Each tag shall bear the identifying number of the valve and an identifying letter symbol of the service line as provided by the Engineer.
		2. The tags shall be attached to the valve by split-key rings soldered so that ring and tag cannot be removed. The numbers and letters shall be of block type, with 1/2" high numbers and 1/4" high letters stamped thereon and filled with black enamel.
	3. COORDINATION
		1. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
	4. INSTALLATION
		1. Install the work of this Section in strict accordance with the manufacturer's recommendations and shop drawings as approved by the Engineer.
		2. All aluminum construction in contact with steel or concrete shall be given a protective insulating bituminous coating prior to installation.
		3. Installation shall be as shown on the Drawings and in conformance with AWWA Standard C-501, Section 27, for sluice gates.
		4. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.
	5. TESTING
		1. After installation the Contractor shall test each gate for satisfactory operation and water tightness against maximum operating pressure insofar as practicable.
		2. Leakage: Allowable Leakage under the design head, seating or unseating head, as specified, shall not exceed 0.1 gpm/ft of sealing perimeter.
	6. SERVICE
		1. Demonstrate to the Owner's operation and maintenance personnel the proper methods for operating and maintaining the equipment, and the contents of the operation and maintenance manual required to be submitted under Article 1.03 in this Section.
		2. The Contractor shall furnish to the Owner, through the Engineer, a written report prepared by the equipment manufacturer's field service technician certifying that the equipment:
			1. Has been properly installed and lubricated.
			2. Is in accurate alignment.
			3. Is free from any undue stress imposed by connecting piping or anchor bolts.
			4. Has been operated under full load and that it operates satisfactorily and in compliance with the requirements of this Section.

 END OF SECTION