



HEAVY DUTY CAST SLUICE / SLIDE GATES

SUGGESTED SPECIFICATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the engineer.
- Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified or otherwise required for a complete and properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of cast water control gates.
- B. Unit Responsibility: To insure compatibility of all components directly related to the sluice gates, unit responsibility for the sluice gates, actuators, and accessories as described in this section shall be the responsibility of the sluice gate manufacturer unless specified otherwise.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Sections _____ and as specified herein.
- Submittals shall include as a minimum:
1. Shop Drawings
 2. Manufacturer's operation and maintenance manuals and information.
 3. Manufacturer's installation certificate.
 4. Manufacturer's equipment warranty.
 5. Manufacturer's performance affidavit in accordance with Section _____.
 6. Design calculations demonstrating lift loads and deflection in conformance to the application requirements.
- Design calculations shall be approved by a licensed engineer (PE) and shall be available upon request.

1.03 QUALITY ASSURANCE

- A. Qualifications
1. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20-years of experience designing and manufacturing cast iron sluice gates. The manufacturer shall have manufactured cast sluice gates of the type described herein for a minimum of 20 similar projects.
 2. The project design is based on the Waterman Heavy Duty Series Cast Sluice Gate as manufactured by McWane Plant & Industrial. Proposed alternates must be pre-approved, per addendum, at least 14-days prior to close of bid. Requests for alternates must be supplemented with detailed drawings, specifications, and references. Any/all additional costs for engineering structure modifications or other changes associated with utilizing a brand other than Waterman are to be borne by the contractor.
 3. When domestic content is required, all machining/assembling and testing of domestically sourced castings shall be performed in a US facility owned and operated by the manufacturer..

PART 2 EQUIPMENT

2.01 GENERAL

- A. The gates shall be either self-contained with yoke and benchstand operators, or non-self-contained with stem guides and operator, in accordance with the requirements of this specification.
- B. The gates shall be compliant with the latest version of AWWA C560, as described below.
- C. Specific configurations shall be as noted on the gate schedule or as shown on the plans.
- D. Materials: see material selection chart page 3.

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COMPONENTS	MATERIALS (select from the choices listed below in each section)
Frame, Cover Slide, Wall Thimbles	Standard: Ductile Cast Iron ASTM A536
Yokes	Standard (Fabricated): Steel ASTM A36 Optional: Stainless Steel ASTM A240/A276 AISI Type 304L Stainless Steel ASTM A240/A276 AISI Type 316L
Seats	Standard: Low-Zinc Bronze ASTM B98 C65100 Optional: Naval Bronze ASTM B21 Alloy 48200
Flush Bottom Seals	Neoprene ASTM D2000 BC 615/625 Grade BE 625
Wedges and Stem Blocks	Standard: Low-Zinc Bronze ASTM B98 C65100 Optional: Manganese Bronze ASTM B584 Alloy 86500
Stems	Standard: Stainless Steel ASTM A276 AISI Type 304 Optional: Stainless Steel ASTM A276 AISI Type 316
Stem Cover	Standard: Clear Butyrate with Mylar Strip Optional: Galvanized A53 Steel Aluminum ASTM B210
Stem Guides	Standard: Cast Iron ASTM 126 Class B Bronze Bushed Optional (Fabricated): Stainless Steel ASTM A240/A276 AISI Type 304 UHMW Bushed Stainless Steel ASTM A240/A276 AISI Type 316L UHMW Bushed
Wall Brackets	Standard: Cast Iron ASTM 126 Class B Optional (Fabricated): Steel ASTM A36 Stainless Steel ASTM A240 AISI Type 304L Stainless Steel ASTM A240 AISI Type 316L
Pedestals	Standard: Cast Iron ASTM 126 Class B Optional (Fabricated): Steel ASTM A36/A53 Stainless Steel ASTM A240/A276 AISI Type 304L Stainless Steel ASTM A240/A276 AISI Type 316L
Fasteners and Anchor Bolts	Standard: Stainless Steel ASTM F593 / F594 Type 304 CW Optional: Stainless Steel ASTM F593 / F594 Type 316 CW
Finish	Standard: Polyamide Epoxy NSF/ANSI 61 Compliant Optional: Coal Tar Epoxy or other custom finish as specified by customer

*Other material options may be available upon request

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E. GATE SCHEDULE

EQUIPMENT NUMBER	GATE SIZE, INCH ¹	GATE TYPE + MOUNTING ²	OPENING DIRECTION ³	BOTTOM SEATING ⁴	DESIGN HEAD, FEET		OPERATOR TYPE
					SEATING	UNSEATING	

Notes: 1. Clear opening width by height. 2. W = wall mounted, T= Thimble (specify type E, F, or MJ, see page 6) Y = self-contained, F = flatback, SC=square/circular 3. U = upward, D = downward 4. FB = flush bottom

2.02 FRAME AND GUIDES

- The frame and guides shall be cast one-piece construction or may have guides dowelled and bolted to the frame.
- Frames shall be of the standard flangeback or extended flange type with round or rectangular opening as indicated on the plans and in the sluice gate schedule.
- A machined dovetail groove for the mounting of the seat facings shall be provided on the front face of the frame for all dovetail embedded seats.
- The frame shall be provided with cast-on pads which shall be machined, drilled, and tapped for the mounting of the wedge device.
- The back of the frame flange shall be machined to a plane and drilled to match the wall thimble, pipe flange, or anchor bolt pattern.
- Guide rails shall be of such length as to retain at least one-half of the vertical height of the slide when it is in the fully opened position.
- A groove running the full length of the guide shall be accurately machined to receive the slide tongue, with a nominal clearance of 1/16-inch.

2.03 STEM AND STEM GUIDE(S)

- The stem shall be solid stainless steel of the specified grade.
- Stem threads shall be machine cut 29 degree full Acme or stub Acme type.
- Nominal diameter of the stem shall not be less than the crest of the threaded portion.
- Stem guides and brackets shall be cast iron or fabricated stainless steel, with bronze or UHMW bushings.
- Two-piece guides shall be adjustable in two directions and shall be so constructed that, when properly spaced, they will hold the stem in alignment and still allow enough play to permit operation per AWWA C560.
- Stem guide spacing shall be as recommended by the gate manufacturer for the specific stem size, but in no case shall the unsupported stem length/radius of gyration (l/r) exceed 200.
- Stem guide brackets shall be secured to the wall by anchor bolts of sufficient strength and arrangement to prevent unacceptable stem guide deflection due to either axial and/or radial stem loading caused by gate operation forces during manual operation, or caused by motor-operator locked rotor stall conditions.

2.04 COVER (SLIDE)

- The cover shall be designed for the design head indicated with a minimum safety factor of 5 with regard to ultimate tensile, compressive and shear strength.
- The cover shall be of one piece cast construction with vertical and horizontal ribs, a reinforced pocket to receive the thrust nut, pads to receive the wedges, and a reinforced periphery around the back side of the cover for machining of the dovetail grooves in which the seating faces shall be mounted.
- All wedge pads shall be machined, drilled and tapped to receive the wedge devices.
- The cover shall have fully machined tongues running the full length of each side to properly engage the guide grooves.
- A thrust nut shall be provided to attach the slide to the stem. The nut shall be threaded and, in the case of rising stems, provided with keys and/or two set screws locked into indents in the stem to prevent rotation of the stem.
- For non-rising stems, the stem shall turn freely in the thrust nut, to open and close the slides as the stem is rotated, the nut pocket shall be cast on top of the slide so that the stem does not project into the waterway when the gate is fully opened.

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2.05 SEATING FACES

- A. All seating faces for both covers and frames shall be malleable corrosion resistant material (see materials section) of a shape that will permanently lock in the slide and the frame. No other means of attachment will be allowed.
- B. The seats shall be machined to a 63 micro-inch finish, or better.

2.06 WEDGES

- A. All wedges and wedge blocks shall be of solid corrosion resistant material and shall be of sufficient number to provide a practical degree of water tightness per AWWA C560.
- B. All wedge bearing surfaces and contact faces shall be machined to give maximum contact and wedging action.
- C. Wedges shall be fully adjustable, but once set shall not rotate or move from the set position.
- D. All wedge fasteners and adjustment screws shall be corrosion resistant.

2.07 SELF-CONTAINED GATES WITH RISING AND NON-RISING STEMS

- A. When a self-contained gate is specified, a yoke shall be mounted on the machined pads provided on the upper ends of the guides.
- B. The yoke shall allow a mounting surface for the lift, pedestal, or pedestal mounting plate.
- C. The thrust generated by gate operation shall be contained within the gate assembly.
- D. The yoke shall be designed for the thrust produced at actuator rated torque with a safety factor of 5, based on the ultimate strength of the yoke material used.

2.08 FLUSH BOTTOM SLUICE GATES

- A. When a flush bottom closure is specified, a resilient seal shall be attached to the frame so that it is flush with the gate invert.
- B. The flush bottom seal shall be supported by a ductile iron or stainless steel bracket which shall be bolted to machined pads provided on the frame.
- C. The seal shall be held in place by a bronze or stainless steel bar which shall be bolted through the seal to the bracket with bronze retainer bar.

2.09 WALL THIMBLES AND ANCHOR BOLTS

- A. Wall thimbles shall be provided with all gates except those to be mounted on pipe flanges or those gates to be attached to concrete headwalls with anchor bolts, as shown on the plans.
- B. Each thimble shall be of one-piece cast iron or one-piece fabricated stainless steel construction and of the section and depth as specified in the plans and gate schedule.
- C. There shall be an integrally cast, or watertight, water stop around the periphery of the thimble.
- D. The front flange of the thimble shall be machined, drilled and tapped to receive the sluice gate attaching studs. Bolt pattern shall match gate bolt pattern.
- E. After machining, the front flange shall be marked with vertical centerline and the word "top" for correct alignment.
- F. Thimbles shall be provided with grout holes as needed in the invert to permit entrapped air to escape. The holes shall be 1-1/2" in diameter, no more than two feet apart and shall be upstream and downstream of the water stop.
- G. A mastic type gasket shall be provided between the sluice gate and the wall thimble.
- H. Gate anchor bolts shall be corrosion resistant.
- I. Gates mounted directly upon the headwall shall be sealed between the gate back and wall with a non-shrink grout. See manufacturers detailed installation instruction.
- J. Wall thimbles to include "E", "F", Mechanical Joint, and/or Bell configurations, or as specified in the plans.

2.10 MANUALLY-OPERATED LIFTS

- A. Sluice gates shall be operated manually by handwheel or crank-operated pedestal floorstands or benchstands as required.
- B. Each lift shall be provided with a threaded cast bronze lift nut to engage the threaded portion of the stem. The lift nut shall have a machined surface, fitted above and below with thrust ball or rolling bearings.
- C. Handwheel lifts shall be without gear reduction while crank-operated lifts shall have either a single or double reduction. A maximum effort of 40 lbs. pull on handwheel or crank shall operate the gates under the specified operating head.
- D. The gears, when required, shall be steel with machine-cut teeth. Pinion gears shall be supported by bronze bushings or rolling element bearings.

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- E. The lift mechanism shall be totally enclosed within a cast iron housing.
- F. The pedestal shall be structural steel, stainless steel, or cast iron.
- G. The hand crank shall be of aluminum and shall be removable. The hand crank shall be a maximum of 15" long.
- H. All lifts for rising stems shall be provided with a galvanized steel stem cover, a tubular aluminum stem cover, or a transparent plastic stem cover with mylar strip position indicator. A dial-type position indicator shall be optional.
- I. Non-rising stem gates can be provided, valve boxes, or T-handle wrenches make an indicator impractical.
- J. Handwheels and crank input shafts shall be approximately 36" from the operating floor unless otherwise shown or specified.
- K. The word "open" shall be cast onto the handcrank or handwheel indicating direction of rotation to open the gate.

2.11 PAINTING

- A. All cast parts of the sluice gate (not bearing or sliding contact) and stem guides shall be painted in accordance with the section on painting found elsewhere in these specifications. That portion of the wall thimbles which will be in contact with concrete shall not be painted.

2.12 SHOP TESTING

- A. The completely assembled gate and hoist shall be separately shop-operated to insure proper assembly and operation.
- B. The gate shall be adjusted so that a .004" thick gauge (required by AWWA standards) will not be admitted at any point between frame and cover seating surfaces.
- C. All gates and equipment shall be inspected and approved by a qualified shop inspector prior to shipment.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation of the gates shall be performed in accordance with standard industry practices. It shall be the responsibility of the CONTRACTOR to handle, store, and install the equipment specified in this Section in strict accordance with the Manufacturer's recommendations.
- B. The CONTRACTOR shall review the installation drawings and installation instructions prior to installing the gates.
- C. The gate frames shall be installed in a true vertical plane, square and plumb, with no twist, convergence, or divergence between the vertical legs of the guide frame.
- D. The CONTRACTOR shall fill any void between the guide frames and the structure with non-shrink grout as shown on the installation drawing and in accordance with the grout manufacturer's recommendations.

3.02 FIELD TESTING

- A. After installation, all gates will be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate assembly shall be water tested by the CONTRACTOR at the discretion of the ENGINEER and OWNER, to confirm that leakage does not exceed the specified allowed leakage per AWWA C560.

