WACO Environmental Products

WACO 7600 & 7700 Series Fabricated Stainless Steel Slide & Weir Gates: Sample Specification

General

The fabricated stainless steel gates shall be Series 7600 type as manufactured by WACO Products, Inc., Baltimore, Maryland or equal. Gates shall be furnished with all necessary accessories and parts for a complete installation and shall be the latest standard product of a manufacturer regularly engaged in the production of equipment of this type. All gates shall be furnished by the same manufacturer. Upward opening gates shall be designated “slide gates” and downward opening gates shall be designated as “weir gates”.

Design

Gates shall be fabricated from 304 or 316 stainless steel alloys as required. All gates are to be designed and manufactured to meet or exceed all AWWA C561 “Standard for Fabricated Stainless Steel Slide Gates” most recent edition, specifications, including those defining allowable leakage, head and loading calculations, structural strength and deflection requirements, and material specifications and minimum dimensions.

Slide/Weir Plate

The slide/weir plate is fabricated from minimum 1/4” thickness stainless steel plate and reinforced as required. Deflection under full design head will be no more than 1/720 of the span width of the gate. Series 7700 shall be specified where ½” thick plate edge is required to resist head force on the slide plate.

Guide Frame & Bench

The guide frame is fabricated from minimum 1/4” thickness stainless steel structural members to resist loads imposed by the design head. Additionally, any self-contained frame will require no additional reinforcing where it extends above the operating floor to support the operator. The guide frame shall be a one-piece formed section without through-holes, reinforced with welded gussets as required to meet loading conditions. Guide frames with bolted or sandwich construction or otherwise requiring through-holes for frame assembly or seal attachment shall not be allowed. Guide frame shall be of the dual slot type to limit gate plate edge loading in the seated condition.

The frame is fabricated to accommodate a one-piece Ultra High Molecular Weight Polyethylene (UHMW) bearing bar/seal. This bearing bar/seal is supplied mounted in the frame to reduce friction and wear between the slide/weir plate and frame faces, as well as to form the side seal seats to prevent leakage.

On self-contained frames the bench (yoke) to support the operator is formed by two back to back structural shapes, angles or channels as loading requires, which are welded or bolted to the guide frame to provide a rigid complete frame assembly. The bench shall be capable of supporting all loads imparted by the operator or actuator, and shall have a deflection under full design head operation of

no more than 1/360 of the span width of the gate.
For non-self-contained frames, a fabricated pedestal of the same alloy as the frame shall be mounted on the operating floor or over-hung off of a wall at the operating level by means of a wall bracket. The pedestal and wall bracket where applicable shall be capable of supporting all loads imparted by the operator or actuator.

Invert

Slide gate: The frame bottom, or invert, is a flush-bottom design formed by a neoprene block held within a one-piece formed structural frame, or for embedded or surface anchor-mounted applications is sandwiched between two structural members with a welded bottom member to form a seating surface for the edge of the plate bottom and to retain the neoprene. The invert frame shall be welded to the guide frame to form a continuous frame and seal assembly. The flush-bottom design maximizes flow to that of the channel, port, or pipe opening and is required for all gates with the exception of surface anchor-mounted invert frames.

Weir gate: UHMW self-adjusting seals are attached to the invert frame which is welded to the guide frame sides across the bottom to form a continuous frame and seal assembly. The frame is mounted so that the gate invert is flush with the channel or port bottom.

Seals

All gate side frames, slide gate upper seals, and weir gate invert seals shall prevent leakage using a UHMW bearing bar/seal that requires no adjustment. Seal pressure shall be made constant automatically by means of an integrated round section nitrile member within a continuous extruded slot in the bearing bar/seal. The cord shall exert pressure on the UHMW away from the frame face and compressing the seal against the plate face. Seal systems that require pressure pads, p-seals, j-bulbs, or adjustable wedge systems to seal the gate shall not be permitted.

UHMW polymer shall be extruded from black virgin resins with an ultraviolet inhibiting formula and shall have integral flex reliefs. UHMW seals that are saw cut or otherwise machined to shape, or which do not have integral extruded reliefs to prevent flex fatigue shall not be allowed. The bearing bar/seal and cord can be replaced without dismantling or loosening any portion of the frame. Side guide bearing bar/seal shall be held in place by means of the frame construction and shall require no bolts or fastened retainers.

All WACO 7600 Series gates meet the referenced AWWA standards for allowable leakage. Additionally Series 7600 gates limit leakage to half of the AWWA standard with a design rating of 0.05 gpm/wfp in either the seated or unseated condition. Gate seals that de-rate performance as head increases shall not be allowed.

Manual Operators

The standard gate operator will be a BS-1015 horizontal handwheel type mounted on a pedestal or frame bench unless otherwise specified. The bronze operating nut of the operator will be accurately machined to match the thread of the rising stem. Non-rising stems shall be used where specified, where overhead space is limited, or where mounting the operator in a floor box is required. The operating nut shall be supported by regreasable ball or roller thrust bearings top and bottom, secured in an accurately machined cast aluminum or iron housing bolted to the bench or pedestal.

Where torque, operation (including dual stems) or space requirements dictate, BS-2000 type bevel gear boxes with either a handcrank or handwheel shall be supplied in lieu of the standard operator. Bevel gear boxes shall have stainless steel input

and/or output shafts, accurately machined gears supported by ball or roller bearings secured in an accurately machined cast aluminum or iron housing bolted to the bench or pedestal.

An AWWA square nut with or without a floor box will be supplied where t-wrench or portable actuator operation is required. The AWWA nut may be an input option for the standard manual operator in floor-box applications, or a permanent or removable part of a gear box assembly depending on the input torque required. The AWWA nut shall be stainless steel matching the gate alloy and shall be interchangeable with gear box operator cranks or handwheels as required.

Regardless of the manual operator used to meet the specification, the maximum effort on the handwheel, crank or T-wrench is to be limited to a 40 lb. pull or less. The lift mechanism will be capable of withstanding an effort of up to 200 lbs. or more without damage to the operator, stem or gate frame. Gates are to be supplied with adjustable stop collars as required to set the gate opening range and to prevent over-travel. Where the size of the gate requires powered lift assist but the frequency of operation does not indicate use of a permanent electric actuator, a portable electric or hydraulic operator with height adjustable floor stand or bench mount will be supplied as specified.

Electric Actuator Option

The slide gate or weir gate will be provided with an electric multi-turn actuator incorporating integral limit switches to stop the gate plate in the desired open and closed positions, or partial open positions when position modulation is required. The operator will also have a torque limit switches to prevent damage to an obstructed gate. Operators can be specified for position modulating function where required to maximize level or flow control. Electric actuators shall be in accordance with ANSI/AWWA C542 “Electric Actuators for Valves and Slide Gates” most recent edition.

Dual Stem Operator

When the gate plate width equals or exceeds 48 inches and has a width greater than twice the height, dual stems with interconnected operators are to be used. Operators for multiple stems will be linked with flexible couplings and stainless steel shafts. Dual stem gates can be manually or electrically powered. Dual stem gates wider than 10 feet shall have a center gearbox drive to eliminate differential backlash between the stem drives and weir plate height offset.

Offset or Extended Operator

When the height of the self-contained gate bench (yoke) is higher than 42” above the operating floor elevation, the operator or actuator system shall incorporate an offset operator system. Offset operator system shall be comprised of additional bevel gears and interconnecting shafting and couplings connected to the gate primary stem drive gearbox so that the centerline of the manual handwheel or crank of the operator or actuator is approximately 36” above the operating floor elevation. The offset system will locate the manual input on the front, rear, or either side of the gate frame as indicated in the project plans to make the manual drive input accessible and to give unobstructed access to electric actuator manual clutch lever and controls and indications when applicable. Interconnecting systems that do not place the electric actuator clutch lever at the required 36” elevation, and chain drives or chain wheels shall not be allowed. Electric actuator remote operating stations are not an acceptable substitute for offset operators as they do not give operating grade elevation access to the actuator indication lights or screen, or to the manual operator or engagement lever in the event of a power failure.

Where operators or actuators for any gate are not accessible due to distance from structure access points, extended shaft systems with interconnecting shafts and couplings and intermediate support bearings if required shall be incorporated in the gate design and supplied as an integral part of the gate system.

Offset and extended shaft options can be combined as required and are suitable for either manual or electric operation.

Stems

Stem shall be of minimum 1½" diameter stainless steel rod with accurately machined Acme full depth threads. Stem shall be designed for a safety factor of 2 based on a critical buckling compressive load calculated by the Euler Column formula where C=2 and assuming a 50 lb torque on the AWWA nut. A stem pocket shall be welded to the face of the stiffened side of the gate plate and to the uppermost stiffener. The stem shall fit within the gate plate stem pocket and be attached to the pocket by means of a stainless steel bolt(s) capable of withstanding the full force of the operator stem under full design head load.

Stem guides will be supplied to support the stem as required to meet the stem design criteria and shall be fabricated of the same alloy material as the gate and frame. Stem guides shall have bronze or UHMW bushings to reduce stem friction and wear as required by the installation. Stem guides shall be adjustable in multiple dimensions to allow for alignment with operator and gate stem nut. Guides will be mounted on the gate frame or installation wall as required to support and align the stem(s) properly.

Quality:

Welders shall be independently certified to AWS standards applicable to the alloys being welded and the gate manufacturer shall be ISO 9001:2015 certified. Proof of current certifications shall be available upon request of the Project Design Engineer or Owner.

Other Features:

All WACO Products gates are made to order from approved drawings and standard designs can be customized to fit virtually any specific head, mounting, or operating condition. Special operating systems such as water hydraulic, pneumatic, and fluid hydraulic cylinders, modulating duty electric actuators, or custom controls for timing and/or sequencing operation are also available.

Specifying Style:

To specify Series 7600 or 7700 models, use the specifying grid by selecting the opening type and mounting style required. Where the installation may require a combination of frame types (i.e. embedded side frame with channel mounted invert frame) please call WACO Products Engineering Department for recommendations and model designation.

WACO Products, Inc.

1330 Knecht Avenue
Baltimore, Maryland 21229-5511
410-242-1000 Fax: 410-247-4890
Sales@WACOProducts.com