



## *WACO Environmental Products*

# **WACO Series 3000 Flap Gates and Frames- Sample Specification**

### **General**

The fabricated 6061-T6 aluminum or 300 series alloy stainless steel flap gates and frames shall be Series 3000 type as manufactured by WACO Products, Inc., Baltimore, Maryland or equal. Flap gates with rubber flap plates reinforced with stiffeners of the same alloy as the frame are also available. Flap gates and frames 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 flap gates and frames shall be furnished by the same manufacturer.

### **Design**

WACO Series 3000 flap gates are designed to prevent backflows into pipes and square or rectangular wall openings. The flap gates require minimal water pressure in the unseating direction to allow flow through the gate and out of the pipe, channel or basin. Under a backflow condition, a seating head is exerted upon the gate plate, closing it against the frame seals and effectively preventing backflow into the controlled opening. Double pin hinges shall maintain proper seating position between the gate plate and frame seals and do not require field adjustments. The gate may be manually opened for pipe/opening maintenance and inspection by using the gate's lifting eye(s).

All aluminum or stainless steel flap gates and frames will be designed and manufactured to have a minimum design safety factor of 4 with regard to ultimate tensile,

compressive, and shear strength and a minimum safety factor of 2 with regard to tensile, compressive, and shear yield strength. The flap gate and frame design shall be sufficient to withstand all loads imposed on the system by the design head indicated by the flap gate schedule or as shown on the plans.

### **Flap Gate Plates**

The aluminum and stainless steel flap gate plates are to be fabricated from minimum 1/4" thickness plate, reinforced with stiffeners made from structural shapes of the same alloy as the plate. Stiffener size and spacing shall be as required to meet the engineer's specified design head. All stiffeners shall be welded to the flap gate plate; bolted, screwed or riveted attachment shall not be allowed. Construction shall minimize deflection of the plate in order to optimize seating against the frame seal. Deflection of the flap plate under full design seating head will be no more than 1/360 of the span width of the gate.

The rubber flap plates shall be made from single piece reinforced rubber elastomer suitable for the intended water service. The rubber shall be reinforced with 2 or more plies of non-absorbent woven fabric continuously vulcanized within the elastomer. Non-reinforced rubber materials shall not be allowed. The rubber shall be reinforced with stiffeners of the same material as the frame alloy, suitably sized and spaced to resist the design head. The stiffeners shall be bolted to the rubber plate by means of special wide head toothed bolts of the same alloy as the stiffeners and requiring

no sealants, so that the rubber maintains a flat seating edge around its perimeter in order to optimize fit with the frame seal. Attaching stiffeners using bearing bars with through bolts and sealants shall not be acceptable. Stiffener deflection under full design seating head will be no more than 1/360 of the span width of the gate.

All flap gate plates equal to or under 3 feet in width shall have a single lifting eye; plates over 3 feet in width shall have two lifting eyes.

### **Flap Gate Frames**

The gate frame is to be fabricated from minimum 1/4" thickness materials of the same alloy as the metal flap gate plate or the rubber flap gate stiffeners. The frame structure shall be designed to resist all loads imposed by the design head upon the flap plate and transferred into the frame and loads directly on the frame itself. The frame shall have fully welded hinge support plates and lifting padeyes as required for rigging and installation. The frame shall be designed for mounting directly to a wall or pipe flange, unless optional wall thimbles are indicated elsewhere in the specifications. Optional WACO Products wall thimbles shall be manufactured from the same alloy as the flap gate frame.

End-of-wall mount and pipe mount frames shall be designed to allow for a flush bottom installation. Pipe mounted frames shall be gasketed and will have mounting bolt and gasket holes spaced in accordance with the pipe flange. Gaskets shall be high density closed cell neoprene with a self-adhesive backing for mounting to the pipe flange prior to flap gate installation. Field applied mastics or sealants shall not be acceptable.

End-of-wall mounted frames shall have mounting bolt holes suitably spaced for the loads and bolt sizes, and with edge clearance as required to maximize the bolt strength in the wall. Flap gate manufacturer shall supply 300 series alloy stainless

steel mounting anchors sized in accordance with loading at full design head. If mounting on a wall with an integral precast pipe or port, the Contractor shall verify the outer precast diameter so that bolt spacing can be arranged to prevent interference with flap gate frame mounting bolts. End-of-wall mounted frames shall be designed for grouted or gasketed installation as indicated. Gasket-type frames require that Installer/Contractor field verify channel dimensions, wall alignment and wall surface conditions for suitability with gasket use prior to start of submittal drawings.

### **Flap Gate Hinges**

Flap gate plates shall be attached to the frame by means of a double pin hinge mechanism that will assure flat and even seating around the frame seal when the gate is closed. Single pin hinges, multiple single pin hinges or other hinges requiring field adjustment shall not be acceptable. Hinge pins shall be stainless steel with high density nylon or UHMW bushings to reduce friction and to prevent metal to metal contact and corrosion. Note: rubber flap plates can also be supplied with an optional clamp hinge in lieu of double pin type.

### **P-Seals**

Flap gate p-seals (j-bulbs) shall be minimum 1/4" thick neoprene hollow bulb extrusion fastened to the flap gate frame by means of a bolted retainer of the same alloy as the frame. The p-seal and retainer shall have slotted mounting holes to allow for adjustment of the p-seal against the flap plate. The retainer and p-seal shall not intrude upon the clear opening of the pipe or port opening. Seals shall be adjustable and replaceable without special tools and without removing the frame from its installed position.

### **Using this Specification and Other Design Features:**

All WACO Products' gates are made to order from approved drawings and our standard designs can be

customized to fit virtually any specific head, mounting, or operating condition. Other materials of construction for demanding applications can also be provided. Please call WACO Products for design assistance.

**Specifying Style:**

Use the following guide to indicate the WACO Products' Series 3000 flap gate for your requirements as:

**series/alloy-flap material-opening**

**3000 Series/Alloy types:**

**3060; 6061-T6 aluminum**

**3034; 304L stainless steel**

**3036; 316L stainless steel**

**Flap Materials:**

**M; metal**

**R; rubber**

**Opening:**

**XXRO; round dimension in inches**

**XXYY; width x height in inches**

**Examples:**

- 1) A 48" pipe mounted flap gate in 304 stainless steel would be a 3034-M-48RO.
- 2) A 60" wide by 36" high clear rectangular opening flap gate in 3061-T6 aluminum would be a 3060-M-6036.
- 3) A 24" square clear opening flap gate with a 316 stainless steel frame and a rubber flap plate with stainless steel stiffeners would be a 3036-R-2424.

***WACO Products, Inc.***

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