

## 1. GENERAL DESCRIPTION

Bonneted gate valves are designed and manufactured in accordance with "Bureau of Reclamation" standards, always with a rectangular geometry, which is generally located on bottom or mid-bottom water outlet conduits, embedded in concrete with the exception of the actuator (fig.1). Its normal configuration includes a service gate (downstream) and a safety gate (upstream) for maintenance purposes.

It is an fabricated and specially robust construction, the flush bottom design of which avoids the accumulation of solids, and the absence of rubber seals avoids potential leakage over the long term due to the rapid deterioration of this kind of material.

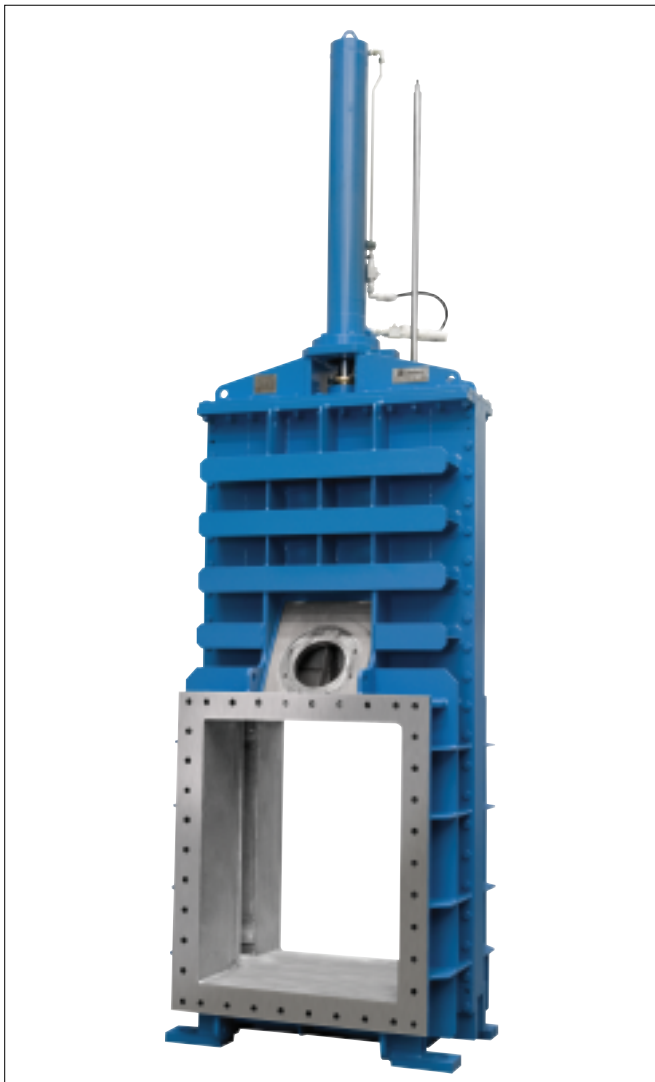


Fig. 1

## 2. DESIGN CHARACTERISTICS

All ORBINOX bonneted gate valves are designed for the specific service conditions of each particular case.

The structural evaluation is performed using the finite elements method and CAD modelling systems.

The standards used in the evaluations are:

- DIN 19704: "Hydraulic Steel Structures. Criteria for Design and Calculation".
- DIN 19705: "Hydraulic Steel Structures. Recommendation for Design, Construction and Erection".
- Standards and design criteria of the Bureau of Reclamation (USBR) for sliding gates.

The body of the gate is designed as a self-resistant recipient which resistant to the design pressure without the assistance of the concrete.

The recess along which the gate moves is designed so that no downstream depression zones are created. The upper and side body faces downstream are appropriately bevelled for this purpose (fig.2).

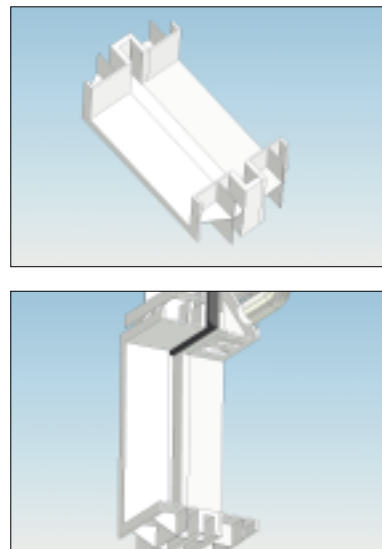


Fig. 2

The gates are normally raised to a height where, in the maximum open position, the lower edge of the gate is slightly above the upper body face (fig.3) so that in cases of small leaks in hydraulic circuit, the position indicators together with the hydraulic units have sufficient margin to carry out a hydraulic reset to return the gate to its maximum opening position.

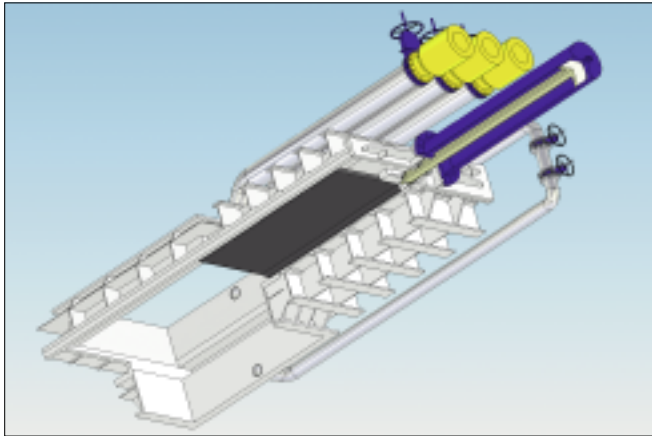


Fig. 3

The gate can be raised above the open position to the upper packing change position when required (fig.4). The sealing system in this position guarantees the water tightness of the shaft and allows the packing to be changed whilst the valve is loaded.

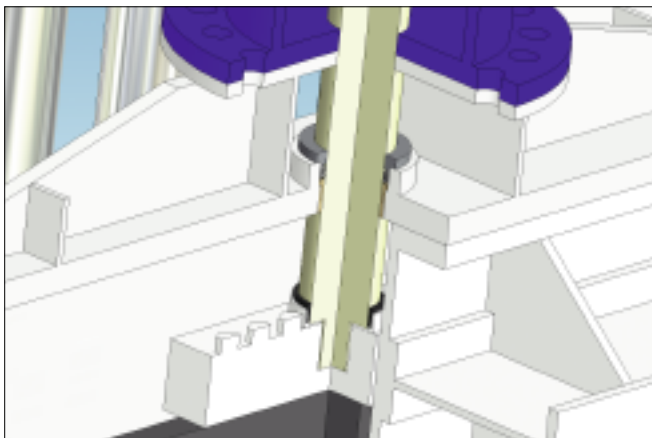


Fig. 4

Maximum admissible leakage for this type of gate is 0.08 litres per second and linear meter of joint.

The aeration conduits are dimensioned in such a way that maximum depression does not exceed 2 mwc, for which air speed is limited (max. 90 m/s) with the aim of avoiding excessive load losses and air swirls in the conduits which could cause vibrations in the valve.

### 3. MANUFACTURING CHARACTERISTICS

A gate valve has the following elements:

- Gate
- Body and bonnet
- Actuation cylinder
- By-pass device
- Air aduction device

#### Gate:

The gate is a robust part, made from either thick steel plate sheets or from an fabricated structure, with a skin plate located on the upstream position.

The gate has seats on the sides, upper and lower faces. All of said seals are bronze, with the exception of the bottom one which is made of stainless steel. Bronze sliders are located on the front face of the gate which fit with the counter guides. Similarly, sliders are located for guiding the gate at the side. Four wedges are also arranged on the front face in order to guarantee closure with little water pressure.

The gate has a 45° bevel and has the side and top horizontal seat facing in bronze, which are correctly adjusted and machined in order to achieve the required tightness required. The lower edge of the panel is machined austenitic stainless steel and sits upon a piece of the same material located on the bottom of the gate.

#### Body and bonnet:

The body of the valve is designed as two fabricated sub units and are joined together along its vertical length using flat screwed flanges.

The front body is formed by a short armoured section joined to the upstream part of the valve recess and its corresponding bonnet section (or housing chamber). It includes the stainless steel counter guides and has a series of horizontal stiffeners. The fixture of this body to the conduit armouring is done using a flat flange.

The rear body includes the downstream part of the valve recess and bonnet and includes the sill, side and lintel seals along with the side guides, all of which are stainless steel, it also includes the venting inlet. Stiffening and joining to the rear armour of the conduit is done using a flat flange.

The side seat facings, counter guides on the upstream faces and side guides at the bottom of the recess are made of stainless steel and designed to go along the height of the body and bonnet.

On the upper area, the bodies end in a robust flat flange for connection with the bonnet cover.

On each valve there is a position indicator by means of a stainless steel rod and an indication needle which signals the opening position of the panel on an indication strip fixed to the cylinder.

The bonnet cover closes both bodies and supports the cylinder. It is designed as a robust fabricated structure, formed by a thick plate with external ribs which support the coupling flange with the cylinder support flange. The necessary parts for the compression gland of the cylinder shaft and the gate position indicator are located on it, along with a threaded outlet for the purge tap.

#### Actuation cylinder:

The actuation electro of the sliding valves is a dual action cylinder. It incorporates a position indicator which consists of a frame with an aluminium graduated strip and an indication needle moved by a stainless steel shaft, fixed to the panel and which moves vertically along the outside through the bonnet cover by means of a compression gland. There are position indications on the indicator (open and closed).

#### By-pass device:

The by-pass device is comprised with a pipe with two gate valves, one security pipe and one service pipe.

#### Venting system:

Venting system is comprised of a collector which distributes the air uniformly through the upper area immediately behind the gate. The collector may be connected to pipes on the outside or to air relief valves protected by their respective gate valves. The air relief valves used for the venting system are double action.

## 4. ACTUATORS

This gate is normally actuated with a hydraulic actuator due to the high stresses required.

The hydraulic unit will normally be equipped with a double motor pump and an emergency manual pump. There is the option of using accumulator batteries for performing emergency operations.

The electrical cabinet has a PLC for programming the opening, closing and packing change manoeuvres along with further manoeuvres specific to each case.

Speak with our technicians for alternative actuators.

## 5. SERVICE AND LOAD CONDITIONS

The "Bureau" type sliding gate valve is designed to support water loads of up to 150 mwc and speeds in excess of 25m/s.

The nominal forces for opening and closing the valve at the specified speed will be determined as the algebraic sum of the components of the forces applied, corrected by the applicable rates in each case.

## 6. ANTI-CORROSION PROTECTION SYSTEM

Steel structures permanently immersed in water:

- Shot blasting SA 2 1/2
- 50 microns polyamide cured epoxy primer
- 300 microns glassflake reinforced polyamine adduct tar free epoxy coating

Steel structures in open air:

- Shot blasting SA 2 1/2
- 50 microns polyamide cured epoxy primer
- 100 microns aliphatic acrylic polyurethane finish blue RAL 5015

Steel structures, embedded in concrete:

- Shot blasting SA 2 1/2
- 50 microns polyamide cured epoxy primer

## 7. MATERIALS AND STANDARDS

Structural Parts: Carbon steel:

EN 10025	DIN	ASTM
S275JR	1.0044	A570 Gr40

Moving Parts: Stainless Steels

EN 10088	DIN	AISI
X2CrNi18-9	1.4307	304L
X2CrNiMo17	1.4404	316L

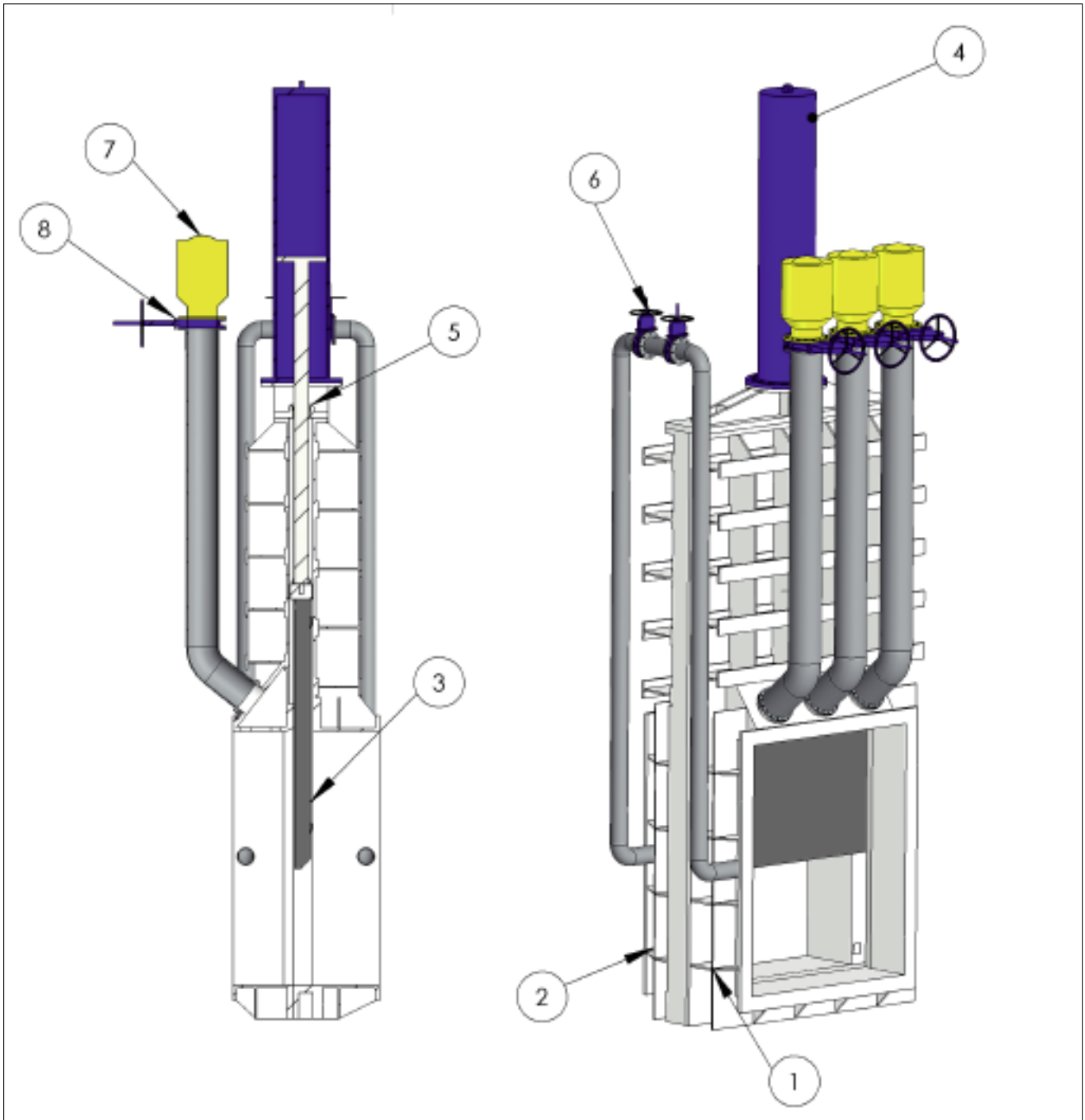
Bronze rims:

CDA	ASTM
C86500	B584-96

## 8. TESTS

Hydraulic Tests

- Body at 1.5 x Design Pressure
- Valve closing at 1.1 x Design Pressure.



**POSSIBLE MATERIAL COMBINATIONS**

1. Body part 1:	Carbon Steel C S275JR + AISI 304	6. By-pass device:	see BU-5 specifications file
2. Body part 2:	Carbon Steel C S275JR + AISI 304	7. Venting system:	see BU-5 specifications file
3. Panel:	Carbon Steel S275JR + Bronze	8. Air relief safety valve:	see BU-5 specifications file
4. Hydraulic Cylinder:	Shaft in AISI 304		
5. Packing Gland:	Impregnated synthetic fibre		

**SPECIFICATIONS OF THE "BUREAU" TYPE SLIDING GATE VALVE**

**OPERATING CONDITIONS**

Valve application: \_\_\_\_\_  
 Maximum operating pressure: \_\_\_\_\_ mwc  
 Design Pressure: \_\_\_\_\_ mwc  
 Maximum Flow: \_\_\_\_\_ m<sup>3</sup>/s  
 BU valve configuration: Only valve   
 Tandem (Safety + Service)

**CHARACTERISTICS**

Conduit dimensions: \_\_\_\_\_ mm x \_\_\_\_\_ mm  
 Bypass: DN \_\_\_\_\_ mm  
 2 Manual gate valves (with outer spindle in AISI 304)   
 1 manual gate valve (with outer spindle in AISI 304) and 1 motorised gate valve   
 Other: \_\_\_\_\_

Aeration: \_\_\_\_\_ x DN \_\_\_\_\_ mm  
 Dual function   
 Triple function   
 Air relief safety valve:  
 Manual gate valve (with outer spindle in AISI 304); one per relief valve.   
 Other: \_\_\_\_\_

Actuator: Hydraulic   
 Hydraulic Unit   
 Electrical Cabinet ( V/ \_\_\_\_\_ Hz)   
 Electric (DIN; V/ \_\_\_\_\_ Hz)   
 Manual   
 Observations: \_\_\_\_\_

**TESTS**

NDT \_\_\_\_\_  
 Welding approval: ASME IX   
 Other: \_\_\_\_\_

**OBSERVATIONS**

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