

UNDERSTANDING API 6A GATE VALVES

GATE VALVE BASICS

Gate valves are linear motion valves in which a flat closure element slides into the flow stream to provide shut-off. They are one of the most common valves used in many industrial applications including the oil and gas industry, pharmaceuticals, manufacturing, automotive, and marine.

ADVANTAGES

- Good shut off features
- Gate valves are bidirectional and therefore they can be used in two directions
- Pressure loss through the valve is minimal

DISADVANTAGES

- They can not be opened or closed quickly
- Not suitable to regulate or throttle flow
- Sensitive to vibration in the open state

Source: http://www.wermac.org/valves/valves_gate.html



WHAT IS API 6A?

API is the American Petroleum Institute and spec 6A is the International Standard that specifies requirements and gives recommendations specifically for wellhead and Christmas tree equipment, used in the petroleum and natural gas industries.

WHAT MAKES API 6A VALVES DIFFERENT?



API 6A valves are designed for the demanding environments of onshore and offshore drilling and production, pressure and temperature extremes and heavy oil, sour, and subsea applications.

They are rated for much greater pressures than the more common API 6D valves, with some being designed to withstand pressures up to 20,000 psi.

API 6A COVERS THE FOLLOWING:

- PERFORMANCE
- DIMENSIONAL & FUNCTIONAL INTERCHANGEABILITY
- DESIGN
- MATERIALS
- TESTING
- INSPECTION
- WELDING
- MARKING
- HANDLING
- STORING
- SHIPMENT
- PURCHASING
- REPAIR
- REMANUFACTURE

MAIN SECTIONS OF A GATE VALVE

Bonnet

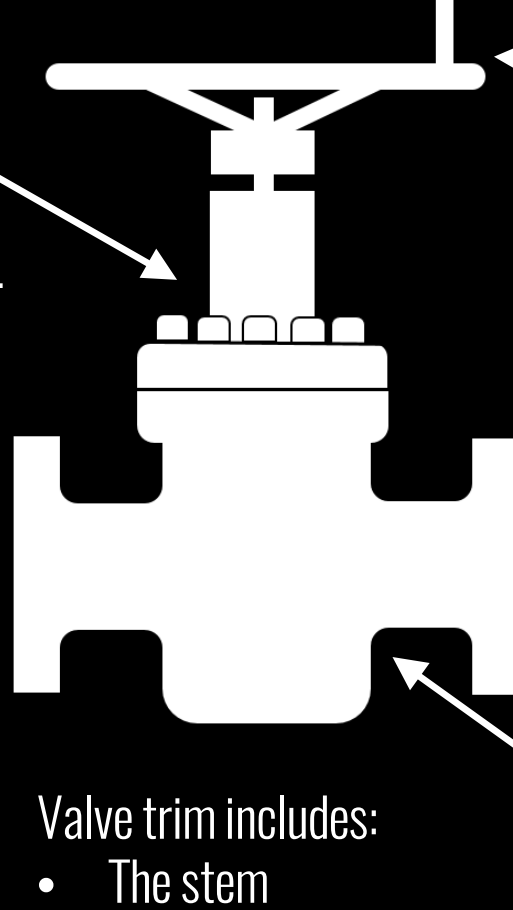
The top part of a valve, attached to the body, which guides the stem and adapts to extensions or operators. The bonnet can be removed from the body to allow for maintenance and replacing of parts.

Valve Trim

The operating parts inside the valve which are normally exposed to the process fluid are referred to as 'valve trim'. These parts are subject to wear and degradation and are replaceable.

Valve trim includes:

- The stem
- The gate
- The disc (or wedge)
- The seat rings



Actuation

Commonly 'Operator' activated using a handwheel, or 'Geared' (used where space is limited).

Body

This holds all of the operational parts of the valve.

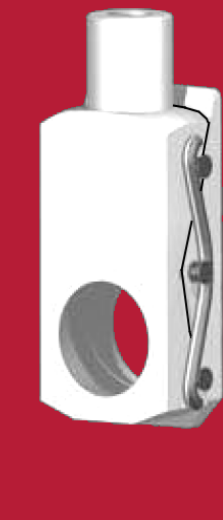
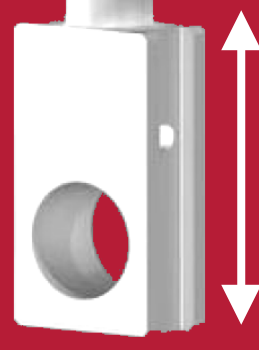
The body can be manufactured as a **casting**, or as a **forged body**.

A **forged body** is stronger and more commonly used for high pressure applications.

TYPES OF API 6A GATE VALVES

Slab Gate

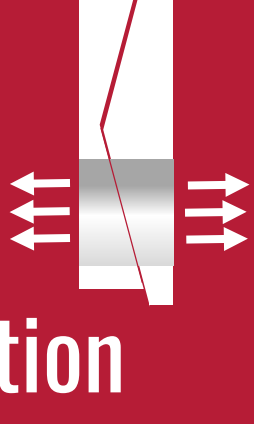
- Slab gate designs work by moving one piece solid gates to create a metal to metal seal on the flow stream of the valve.
- The simple design makes it suitable for low and high pressure sealing situations where contaminants could create sedimentary problems with other valve types.
- They can withstand high working pressures, typically from 2000 up to 20000psi.



Expanding Gate

- These are commonly used in manual valves to simultaneously produce a tight seal against both the upstream and downstream sealing faces.
- Unlike the single slab design, the expanding gate comprises of 2 wedge sections which move apart when force is exerted. The seal is unaffected by line pressure fluctuations
- They are capable of working pressures typically from 2000 to 5000psi

When the valve handwheel is in the fully open position, this exerts force from beneath, causing the wedge configuration to increase in width in the lower open section.



Open Position

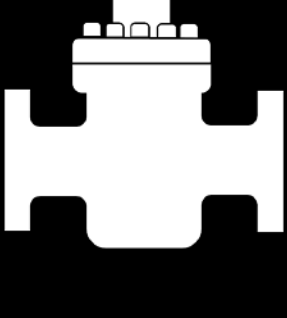
When the valve handwheel is in the fully closed position, this exerts force from above, causing the wedge configuration to increase in width in the lower closed section.



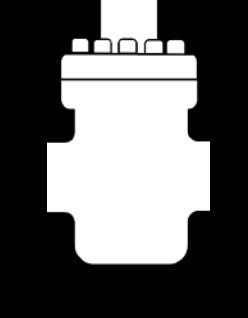
Closed Position

COMMONEST CONNECTION TYPES

Flanged End



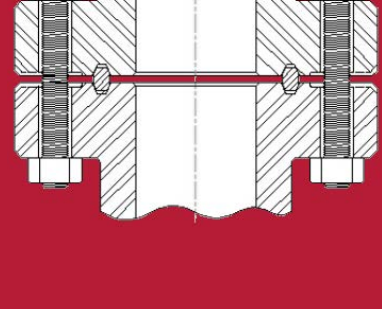
Threaded End



API 6A FLANGE TYPES

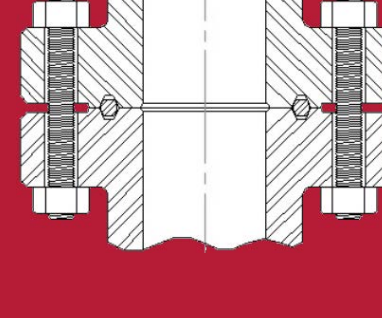
Type 6B Flanges

Type 6B flanges are of the ring joint type and are not designed for face-to-face make-up. The connection make-up bolting force reacts on the metallic ring gasket. The type 6B flange should be of the through-bolted or studded design.



Type 6BX Flanges

Type 6BX flanges are of the ring joint type and are designed with a raised face. Depending on tolerances, the connection make-up bolting force may react on the raised face of the flange when the gasket has been properly seated. This support prevents damage to the flange or gasket from excessive bolt torque. Therefore one of the flanges in a 6BX connection should have a raised face. The type 6BX flange should be of the through-bolted or studded design.



NOTE Face-to-face contact is not necessary for the proper functioning of type 6BX flanges.

Sources: Specification for Wellhead and Christmas Tree Equipment ANSI/API Specification 6A, Nineteenth Edition, July 2004.

Images: Slideshare, Wellhead Basics at <http://www.slideshare.net/frakov/wellhead-basics>

EXAMPLE API 6A SLAB GATE VALVE SIZES

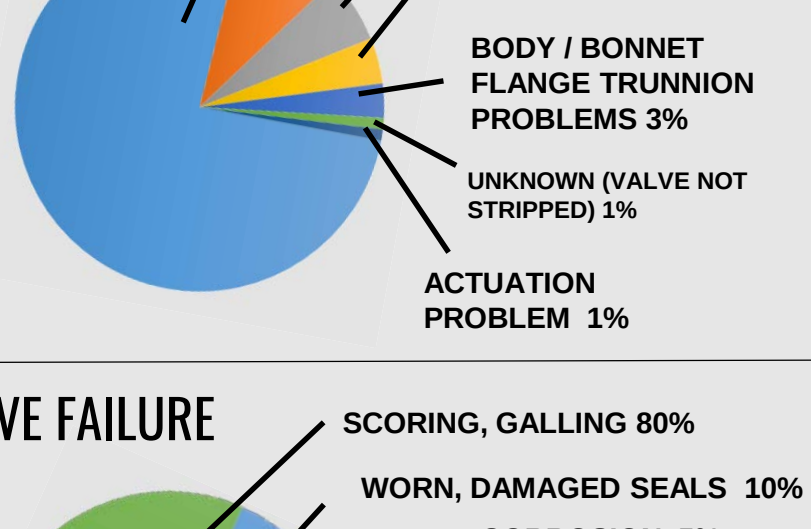
Working Pressure	Available Sizes
API 2000	2 – 1/16"
	2 – 9/16"
	3 – 1/8"
	4 – 1/16"
	5 – 1/8"
API 3000	7 – 1/16"
	2 – 1/16"
	2 – 9/16"
	3 – 1/8"
	4 – 1/16"
API 5000	5 – 1/8"
	7 – 1/16"
	2 – 1/16"
	2 – 9/16"
	3 – 1/8"
API 10000	4 – 1/16"
	5 – 1/8"
	7 – 1/16"
	1 – 13/16"
	2 – 1/16"
API 15000	2 – 9/16"
	3 – 1/16"
	4 – 1/16"
	5 – 1/8"
	4 – 1/16"

WHY DO VALVES FAIL?

PRIMARY REASONS FOR VALVE FAILURE

In a study of 1764 valve failures in the offshore oil & gas sector carried out for the HSE in 2003, the following primary reasons for valve failure were reported.

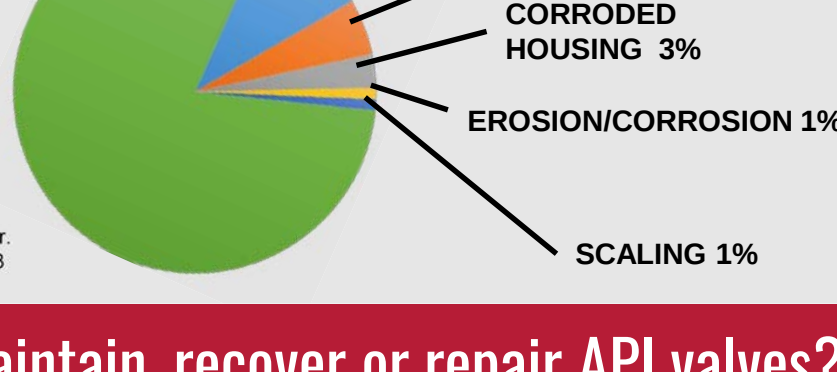
Although the study included various valve types and was not just limited to API 6A valves, 85% of these were block valves and these findings give an insight into the demands API 6A valves are exposed to.



SECONDARY REASONS FOR VALVE FAILURE

The above primary reasons were investigated, with 1600 of these valves being subjected to a strip-down examination.

Most of the valves had several secondary reasons / underlying causes for failing which are shown on the right.



Source: Assessment of valve failures in the offshore oil & gas sector. Prepared by TUV NEL Ltd for the Health and Safety Executive 2003



Do you need to maintain, recover or repair API valves?

Mirage Machines has a range of on-site machines available covering the full range of sizes and working pressures.

For details of on-site portable machines contact Mirage Machines.

www.miragemachines.com