



Valves Specialist

Valve Training

IVM Welcomes Presentation Scope

This presentation covers the following subjects:

1- Introduction about the valve types & specifications .

2- API 602 & API 600 steel valve design and application.

The presentation is in 32 slides (approx 45 min)

Part 2



Valve Design and Application

Valve Design Selection

- 1- Valve type**
- 2- Body-bonnet**
- 3- Pressure classes**
- 4- End connections**
- 5- Nominal Size and port/bore options**
- 6- Body material**
- 7- Trim material**
- 8- Application**
- 9- Valve options (material)**
- 10- Valve options (tests)**

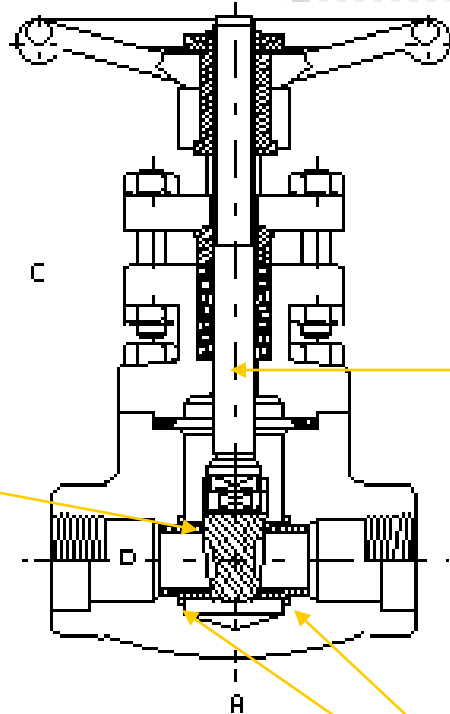
Valve Types

- 1- Gate**
- 2- Globe**
- 3- Check- Piston**
- 4- Check- Ball (T or Straight)**
- 5- Check- Swing**
- 6- Check - Ball Vertical Pattern**
- 7- Y Pattern Globe**
- 8- Y Pattern Check (Piston)**
- 9- Ball Floating**
- 10- Ball Trunnion**

Valve Type - GATE

Gate valves are defined by API 602 , API 600 and BS5352 standards

The closure member is called a **Wedge** and is tapered (the 2 sides are not parallel) with 2 flat faces in contact with the seats



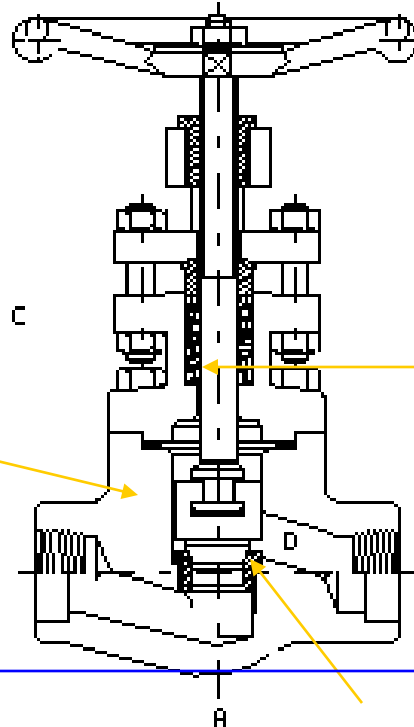
Stem is rising and non-rotating

The Wedge pressing on the Seats blocks the flow

Valve Type - GLOBE

Globe valves are defined by BS5352 only.
API 602 does not include Globe valves.

The closure member - the Disc - has a conical seating face



The Stem is rising and rotating

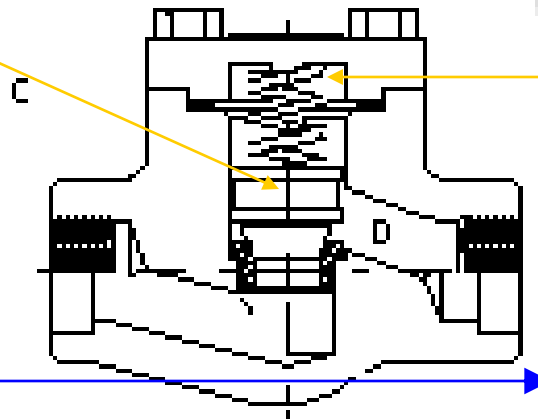
To shut : the Stem presses the Disc against the Seat .
The seat can be Renewable (screwed in) or Integral (directly machined from body material or from a layer of welded “hardfacing” on the body material).

Valve Type - HORIZONTAL LIFT PISTON and BALL TYPE CHECKS

Check valves only allow one-way flow

Check valves are defined by BS5352 only.
API 602 does not include Check valves.

The Disc (piston type) blocks the flow.

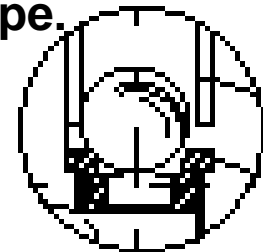


The optional Spring is necessary for vertical installation

Flow in only one direction

To shut: the Downstream pressure (plus gravity and spring) holds the Disc against the Seat . The seat is the same as the globe type.

Ball type discs are available, often used for dirty fluids or gas duty

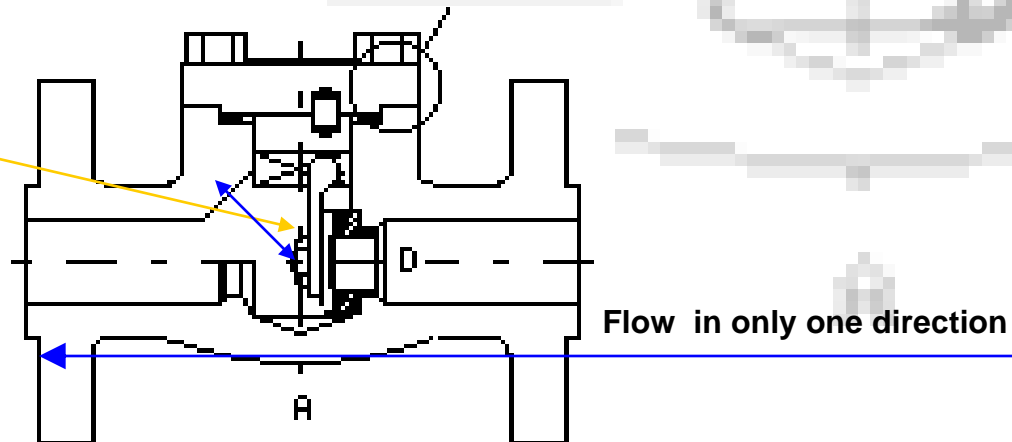


Valve Type – CHECK SWING

Check valves only allow one-way flow

Check valves are defined by BS5352 standards only. API 602 does not include Check valves.

The disc is free to swing up and down



To shut: the Downstream pressure (plus gravity) holds the Disc against the Seat . The seat is the same as the gate valve type.

Valve Type – Y Globe

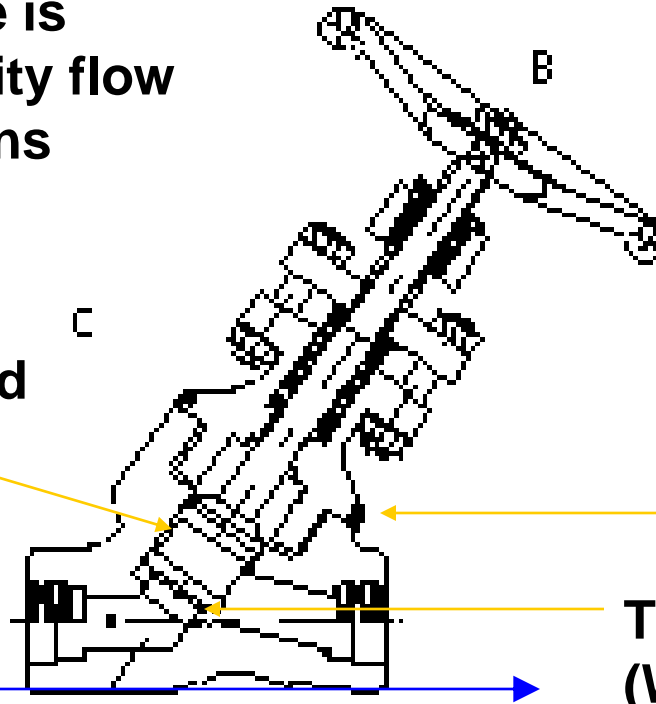
A “Y” Pattern Globe is used for high velocity flow in Steam applications

The “Disc” is guided by the Body

Bonnet is welded on the body

The Seat is integral (Weld deposit on the body)

Normal Flow direction



Y pattern valves have half the pressure loss of equivalent straight pattern globe valves.

Destructive erosion and noise can be minimised by reversing the flow direction in wet steam duties such as boiler blowdown.

Valve Type – Other designs

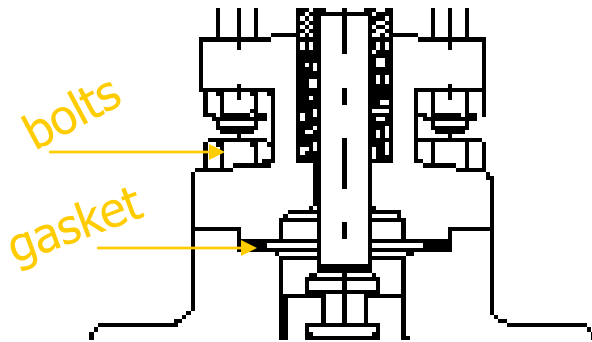
There are a series of unusual design available

Inside Screw Gate and Globe

Please refer to the catalogue for a complete list

Body-Bonnet Joint

1 - Bolted Bonnet + Gasket



Advantages :

- 0 ppm emission guaranteed for new valve
- Allows maintenance
- Fire resistant (IVM Std)

Disadvantages :

- Gasket may leak (eventually)
- Cost of maintenance will probably exceed price of new valve.

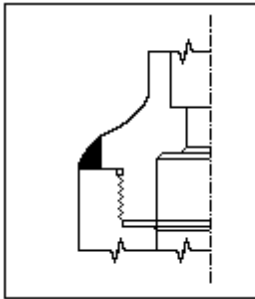
WHERE: STANDARD application – Approx 80-85% of valves.

Standard gasket is 316ss spiral wound graphite filled. This is suitable for nearly all applications and superior to most specified alternatives.

NOTE: Customers may require special gasket or bolting materials which may have a cost impact or reduce performance.

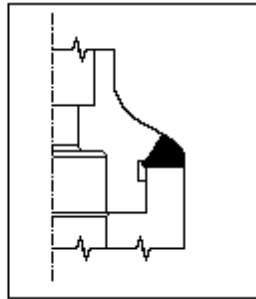
Connection Body-Bonnet

- 2 - Welded Bonnet :
- A) Threaded and seal- welded. (L)
 - B) Full penetration weld. (WPL)



"L" Version

A



"WPL" Version

B

Advantages:

- Eliminate any potential leak path in the Body-Bonnet connection.
- Prevents uneconomic maintenance of low value item.(eg. Shell/Exxon)

Disadvantage:

- Not maintainable in line.

WHERE: Usually requested in Steam and Thermal Fluid applications on Bellows seal valves, on Cryogenic Valves
Approx 10-15% of the valves

Pressure Classes (ASME)

ASME B16.34	Cold Working Pressures For Carbon Steel (A105,WCB,LF2)		
CLASS	psig(lbf/in ²)	bar	Mpa
150#	285	19.7	1.97
300#	740	51.0	5.10
600#	1480	102.1	10.21
800#	1975	136.2	13.62
900#	2220	153.1	15.31
1500#	3705	255.5	25.55
2500#	6170	425.5	42.55
4500#	11110	766.2	76.62

Notes: Class **900** does not exist as a valve design in API 602 or BS5352 so Class 1500 is always used (0.5"-2") when class 900 is specified. Similarly ASME B16.5 only includes class 900 flanges from 3" size, so class 1500 is used.

Class 900 valves = Class 1500 valves up to 2"

The pressure rating of a valve is the lower of the ratings for the body and the end connection.

Eg. an 800 class body and class 3000 socket weld ends results in a class 800 valve (NOT 3000).

A class 800 body with a class 150 flange gives a class 150 valve.

Pressure



Ends : **Socket Weld**

SW

Standard: ASME B16.11

Classes : 800 –1500 –2500 4500

where classes 150,300,600 are specified use class 800.

Use: 50% of forged valves – standard applications

Modifications: Threaded ends can be converted to SW, not vice-versa.



Ends : Threaded

NPT

Standard: ASME B1.20.1

Female taper thread, seal is made on the threads.

Classes : 800 –1500 –2500 4500

where classes 150,300,600 are specified use class 800.

Use: 45% of forged valves – standard applications

Modifications: A Threaded end can be converted to SW, not vice-versa. There is a common version with one connection SW and other NPT (OMB calls this: SWxNPT)



Ends : **Butt Weld**

Standard: ASME B16.25 (end profile)

Classes : 150 – 300 – 600 – 1500 - 2500

API 602 and BS 5352 specify that class 150, 300, 600, 1500 valves shall be to ASME B16.10 and BS 2080) end to end dimensions.

Use: Critical applications - high pressures and temperatures, heat transfer systems, toxic fluids.

Forged steel material usually requires only crack detection on weld bevels - magnetic particle or liquid penetrant.

Cost: To achieve the ASME B16.10 end to end dimensions, flanged forgings are used to make BW end valves. The flanges are machined off so the costs are higher than for flanged valves.



Ends : Flanged Raised Face

Customer designations 150RF etc.

Standard: ASME B16.5 (BS 1560)

Face to face dimension to ASME B16.10 (BS 2080)

Classes : 150 – 300 – 600 - 1500 - 2500

Use: standard applications for flanged valves
(approx 10% of total)

Options: SF - “Smooth” Finish - ASME B16.5 standard RA 3.2- 6.3 μ m
RF - “Serrated” RA 6.3-12.5 μ m



Ends : Flanged - Ring Joint Faced

Standard: ASME B16.5

Face to face dimension: ASME B16.10

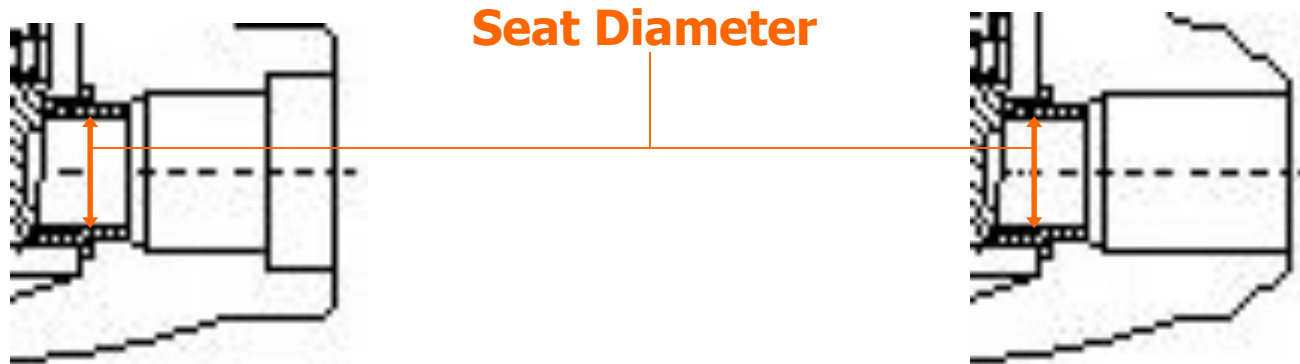
NB: F-F different from RF valves.

Classes : 150 – 300 – 600- 1500 - 2500

Use: Limited application,
mainly in 1500 and 2500 classes.

Sizes : Reduced & Full Bore

Forged steel valves have 2 options with regards to the size of the flow passage



BS5352 **Reduced** bore: means that the internal **diameter of the seat** is one size smaller than the nominal valve bore.
Also: API 602 Standard, **Regular** port.

BS5352 **Standard** bore: means that the internal **diameter of the seat** is the same size as the nominal bore of connecting pipe.
Also: **Full** bore, full port

...this means that a Reduced port will have the same seat passage of a Full port of 1 size larger



Size : **Reduced Port**

Advantages:

- Standard option for all forged steel valves
- Cheaper version
- Smaller, lighter
- Adequate for low and non-flow applications

Disadvantages

- High pressure loss particularly globe and lift checks
- Not suitable for where high flow or low pressure loss required.

Use: 90% of the uses – standard applications

Definitions: STANDARD = API 602, BS5352 Reduced bore.



Size : Full Port

Limited application on request.
More expensive version - specified when necessary.

Use: 10% limited use . Always in Flanged/BW classes 1500, 2500, mainly for powerplant, and liquid process lines.

Definitions: STANDARD =BS5352 Standard Bore, ASME B16.34

Body Material

ASTM Standard definition

forged steel valves

Material definition used is for FORGED STEEL equivalent

<i>Carbon Steel</i>	<i>Alloy Steel</i>	<i>Stainless Steel</i>
A105	F5	F304
A105N	F9	F304L
LF2	F11	F304H
LF1	F22	F316
	F91	F316L
	F1	F316Ti
	F12	F321
		F321 H
		F347
		F347 H

Material

Body Material

ASTM Standard definition

IVM manufacture Valves in SPECIAL MATERIALS

<i>DUPLEX</i>	<i>Exotic</i>	<i>Exotic</i>
F51	Incoloy 800H	Titanium
F44	Incoloy 825	Monel
F55	Inconel 600	Monel K500
F53	Inconel 625	K60 (AISI 4130)
	Hastelloy C276	SAF 2507
	F6NM	Ferralium
	F317L	Alloy 20
		Alloy 28

(Each name is trademark of its respective owner)

Materials

API Trim Materials

API TRIM	Nominal Trim DISC+SEATS(STEM)	OMB Description	SPEC BASE MAT'L + HARDFACING
1	F6	F6	A276-410
2	304	304	A276-304
5	Hardfaced (410)	F6-HF	A276-410 + AWS R-CoCrA
8	F6 and Hardfaced	F6-HFS	A276-410
9	Monel	Monel	UNS N04400
10	316	316	A276-316
11	Monel and Hardfaced	Monel-HFS	UNS N04400 + AWS R-CoCrA
12	316 and Hardfaced	316-HFS	A276-316 + AWS R-CoCrA
13	Alloy 20	Alloy 20	UNS N08020
14	Alloy 20 and	Alloy 20-HFS	UNS N08020+AWS R-CoCrA
15	Hardfaced (304)	304-HF	A276-304+AWS R-CoCrA
16	Hardfaced (316)	316-HF	A276-316+AWS R-CoCrA
17	Hardfaced (347)	347-HF	A276-347+AWS R-CoCrA
18	Hardfaced (Alloy 20)	Alloy 20-HF	UNS N08020+AWS R-CoCrA

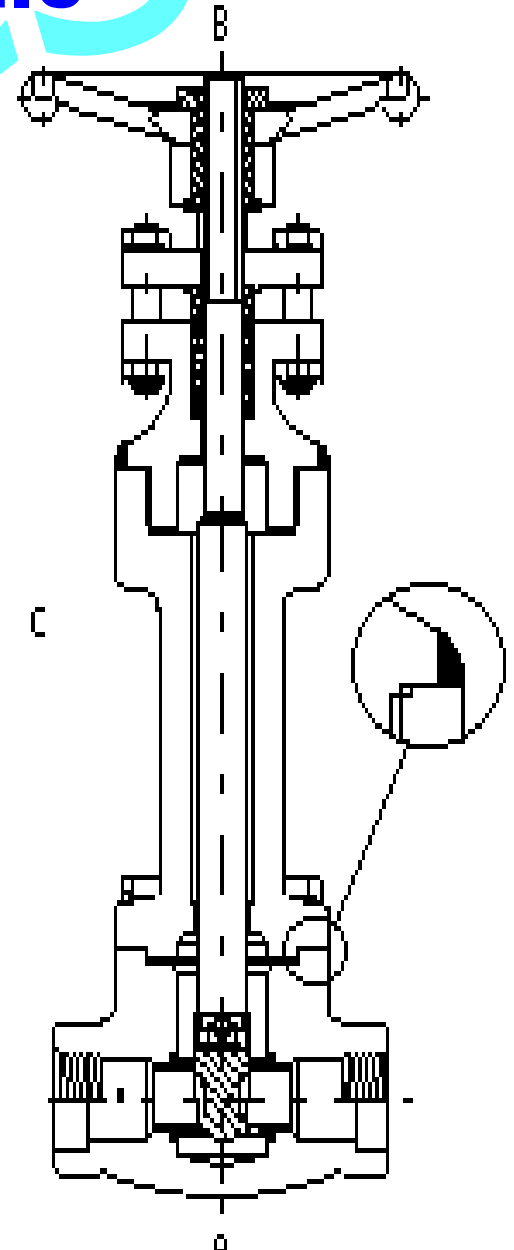
Other Special Trim on request

Valve services – CRYOGENIC

Gate and Globe valve operating in Cryogenic service are fitted with and extended bonnet connection

Wedge can be required with cavity relief hole

TEST : IVM can provide cryogenic performance tests at temperatures -50C to -200C



Valve **OPTIONS** - Components

Valve can be fitted with a number of options:

- Actuators: -Electric or Pneumatic
- Locking devices
- Grease injectors and lantern rings
- Position Indicators
- Various flow setting globe disc types: Parabolic, Needle, V type.
- PTFE packing and inserts on wedge
- Welded Nipples of various length and schedule
- Special flange finish: Flat, large groove, RTJ

Options

Valve OPTIONS – Paint and Marking

Forged Steel valves are usually supplied with a rust resistant zinc and iron phosphate coating. The valves are said to be “Phosphated” or Parkerised.



Nameplate: carries the valve description

Add tag: used to include PO information

Forging: carries heat number for material tracking and material type

Part 3

A thick, horizontal yellow brushstroke with a textured, painterly appearance, extending across the width of the slide.

Price Factors

Other pricing considerations

The unit price is affected by the following factors

1. **Number of valves** : the higher the qty the lower the
2. **Painting** : Price depends on painting specifications and APCS system .
3. **Delivery** : del shorter than 16 weeks requires a premium over normal prices
4. **Min order value** : lower value orders necessitate a handling charge to cover administrative costs
5. **Inspection and documentation** : the cost of these activities is not usually included in the unit prices apart simple API598 test and 3,1B certificate
6. **Payment terms and currency** : the commercial conditions can add up to an additional 7% to the prices.

End of presentation



For any information please refer to:

IVM