VALVES
Valves are a mechanical device which are used to control the flow of liquids, solids and gases in industrial as well as domestic situations and are one of the major piping components.

The most common and familiar valves are the taps used in the home to control the flow of hot and cold water.

In the oil industry, valves are a major element in the control of operations.

About 8-10% of the total capital expenditure of the chemical industry is used for procurement of valves.
Valves are used for following main purposes:

- Controlling process and utility service
- Isolating equipment or instrument for maintenances
- Discharge gas, vapor or liquid
- Draining piping and equipment on shutdown
- Emergency shutdown
VALVES – Parts – Gate Valve

<table>
<thead>
<tr>
<th>IT.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HANDWHEEL</td>
</tr>
<tr>
<td>2</td>
<td>YOKE SLEEVE</td>
</tr>
<tr>
<td>3</td>
<td>GLAND FLANGE</td>
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<tr>
<td>4</td>
<td>GLAND EYE BOLT</td>
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<td>5</td>
<td>PACKING</td>
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<td>6</td>
<td>BONNET BOLT</td>
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<td>BODY</td>
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<td>8</td>
<td>BONNET</td>
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<tr>
<td>9</td>
<td>BACK SEAT</td>
</tr>
<tr>
<td>10</td>
<td>STEM</td>
</tr>
<tr>
<td>11</td>
<td>SEAT RING</td>
</tr>
<tr>
<td>12</td>
<td>WEDGE</td>
</tr>
</tbody>
</table>
VALVES – Parts – Globe Valve

Cross-sectional diagram of an open.
1. body
2. ports
3. seat
4. stem
5. disc when valve is open
6. handle or hand wheel when valve is open
7. bonnet
8. packing
9. gland nut
10. fluid flow when valve is open
11. position of disc if valve were shut
12. position of handle or hand wheel if valve were shut
VALVES - Parts – Body

<table>
<thead>
<tr>
<th>IT.</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>BONNET</td>
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<td>8</td>
<td>BACK SEAT</td>
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<tr>
<td>9</td>
<td>STEM</td>
</tr>
<tr>
<td>10</td>
<td>DISC</td>
</tr>
<tr>
<td>11</td>
<td>SEAT RING</td>
</tr>
</tbody>
</table>

Continued...
• The Valve body is the first boundary of a pressure Valve.
• It serves as the main element of a valve assembly because it is the framework that holds all the parts together.
• The valve-body ends are designed to connect the Valve to the piping or equipment nozzle by different types of end connections, such as butt or socket welded, threaded or flanged.
• Valve bodies are cast or forged in a variety of forms and each component have a specific function and constructed in a material suitable for that function.

Continued...
The cover for the opening in the body is the valve Bonnet, and is the second most important boundary of a pressure Valve.

- Cast or forged of the same material as the body.
- Commonly connected to the body by a threaded, bolted, or welded joint.
- During manufacture of the valve, the internal components, such as stem, disk and actuator, are put into the body and then the bonnet is attached to hold all parts together inside.
• Valve's trim is a collective name for the replaceable parts, in a valve.

• A typically valve design includes a disk, seat, stem, and sleeves needed to guide the stem.
The seat ensure the seating surface for the disk. For a good sealing, a fine surface finish from the seating area is necessary.

In some designs, the body is machined to serve as the seating surface, in other designs, forged seal rings are threaded or welded to the body.

To improve the wear resistance of the seat or seal rings, the surface is often hard faced.
A Valve may have one or more seats. In the case of a globe or a swing-check valve, there is usually one seat, which forms a seal with the disc to stop the flow.

In the case of a gate valve, there are two seats; one on the upstream side and the other on the downstream side.

A gate valve disc has two seating surfaces that come in contact with the valve seats to form a seal for stopping the flow.
VALVES – Parts – Stem

• The Valve stem provides the necessary movement to the disc, plug or the ball for opening or closing the valve, and is responsible for the proper positioning of the disk.

• It is connected to the valve hand wheel, actuator, or the lever at one end and on the other side to the valve disc.

• In gate or globe valves, linear motion of the disc is needed to open or close the valve, while in plug, ball and butterfly valves, the disc is rotated to open or close the valve.

• Stems are usually forged, and connected to the disk by threaded or other techniques. To prevent leakage, in the area of the seal, a fine surface finish of the stem is necessary.

Continued...
A yoke connects the valve body or bonnet with the actuating mechanism. The top of the yoke holding a yoke nut, stem nut, or yoke bushing and the valve stem passes through it.

A yoke usually has openings to allow access to the stuffing box, actuator links, etc.. Structurally, a yoke must be strong enough to withstand forces, moments, and torque developed by the actuator.
Hand-operated valves are usually equipped with a hand wheel attached to the valve's stem or yoke nut which is rotated clockwise or counter clockwise to close or open a valve.

• Globe and gate valves are opened and closed in this way.

• Hand-operated, quarter turn valves, such as ball, plug or butterfly, has a lever for actuate the valve.
VALVES - Standards of Manufacture

- British Standards - BS
- German Standards - DIN;
- US Standards - ANSI (previously ASA);
- American Petroleum Institution - API. (flanges and other equipment are commonly used in the oil industry)
- Valves are rated according to the maximum pressure and temperature at which they can safely be used.
VALVES - Standards of Manufacture

Some BS standard are:

- BS 1414- Gate Valve For Petroleum Industry
- BS 1868- Steel Check Valve For Petroleum Industry
- BS 1673- Steel Globe Valve For Petroleum Industry
- BS 5155- Butterfly Valve
- BS 5351- Steel Ball Valve
- BS 5353- Carbon Steel And Alloy Steel Plug Valve
Some API standards are:

- API 6D - Pipe Line Valve
- API 600 – Steel Gate Valve
- API 602 - Carbon Steel Gate Valves
- API 609 - Butterfly Valves
VALVES - Stroke (Openness) Vs Flow

- Equal Percentage
- Linear
- Quick opening
VALVES - Stroke (Openness) Vs Flow

- Curve A = Quick Opening
- Curve B = Linear
- Curve C = Equal %
Equal Percentage:

• Most commonly used valve control
• Used in processes where large changes in pressure drop are expected
• Used in processes where a small percentage of the total pressure drop is permitted by the valve
• Used in temperature and pressure control loops
Linear

• Used in systems where the pressure drop across the valve is expected to remain fairly constant (i.e. steady state systems)
Quick Opening

- Used for frequent on-off service
- Used for processes where "instantly" large flow is needed (i.e. safety systems or cooling water systems)
VALVES - Classification (Function)

- ON/OFF
  - GATE
  - BALL
  - PLUG
  - PISTON
  - DIAPHRAGM
  - BUTTERFLY
  - PINCH VALVE

- REGULATION
  - GLOBE
  - NEEDLE
  - BUTTERFLY
  - DIAPHRAGM
  - PISTON
  - PINCH

- NON-RETURN
  - CHECK
VALVES - Classification (End Connections)

VALVES

- SCREWED ENDS
- SOCKET WELD ENDS
- FLANGED ENDS
- BUTT WELD ENDS
VALVES - Classification (Material)

- CAST IRON
- BRONZE
- GUN METAL
- CARBON STEEL
- ALLOY CARBON STEEL
- POLY PROPY-LENE
- SPECIAL ALLOY
- SS
Classify valves according to operating device (Actuators):

- Manual
- Hydraulic
- Pneumatic
- Motor (Electric and Air operated)
- Solenoid
VALVES - Gate Valve

Continued...
VALVES - Gate Valve

- Used when a tight shut-off is required & there must be straight-line flow of fluid
- Quick Opening valve
- Infrequent operation
- Gate usually wedge-shaped or a vertical disc as in the diagram
- Application: Oil, gas, air, slurries, heavy liquids, steam, no condensing gases, and corrosive liquids
VALVES - Gate Valve

Figure 11-5
CUTAWAY VIEW OF A GATE STOP VALVE (rising stem type)

continued...
VALVES - Gate Valve

**Advantage:**

- High capacity, No flow restrictions & low cost

**Disadvantage:**

- Poor throttling
- Gate valves should not be used where frequent operation is required
VALVES - Gate Valve

Operation:

- Operation of gate valve.
VALVES - Ball Valve

Continued...
VALVES - Ball Valve

• To provide a quick opening, simple shut-off
• For Fully open/closed, limited-throttling
• Higher temperature fluids
• Ball has opening through centre. when this opening is in line with the inlet & outlet ports, flow will be allowed. when ball is turned through 90 deg. No flow can takes place
• Application: Normally found in seawater, sanitary, drain, slurry and hydraulic systems
Advantage:

- Offer minimum resistance to flow
- Tight sealing with low torque
- Low leakage and maintenance
- Operation, reliability, durability, and capability of withstanding high pressures

VALVES - Ball Valve
Disadvantage:

- Not Suitable For Lines Subject to Pulsating Flow
- Poor throttling characteristics
- Expensive
VALVES - Plug Valve

Continued...
VALVES - Plug Valve

- To provide a quick, simple shut-off
- Not Common In Sizes Over 6 Inch
- Not Suitable For Lines Subject To Pulsating Flow
- Controls flow using a plug with a hole through it. Plugs can be made of rigid materials such as Teflon, making them ideal for high-purity
VALVES - Plug Valve

PLUG check valve

GLAND FLANGE
Sealant can be squeezed to the sealing surfaces between stem and body, minimizing the friction, handling easier.

SEALANT FITTING
Sealant can be injected to valve bottom and plug surface for emergency sealing.

WRENCH
It has a fixing unit for position limit through a set stud on gland flange.

SEALANT GROOVE
Up & down ring space on the plug enables four longitudinal ring grooves permit seal covered whole seating surfaces.

BODY

STEM

PLUG
It was sprayed a special wear-resisting material, which enabling very high precision surface finish and hardness, relatively low friction between the plug and the body.

NUT

BOLT

ADJUSTING COVER CAP SCREW
It can adjust PLUG'S position, up & down, with which the tightness adjusted and reliable.
VALVES - Plug Valve

**Advantage:**
- Good for high pressure applications
- Easy to operate
- Provide a tight shutoff

**Disadvantage:**
- Poor throttling characteristics
VALVES - Diaphragm Valve
VALVES - Diaphragm Valve

- For Low Pressure Corrosive Service As Shut-off Valves
- Diaphragm moves up and down to operate the valve
- Diaphragm materials available in Nitrile, Hypalon, Neoprene, PTFE, etc.
- Application: Slurry Services, Suspended Particles (Elastomeric Diaphragm only) & Severe Chemical
VALVES - Diaphragm Valve

Advantage:

- Can Be Used Where Leakage Cannot Be Tolerated

Disadvantage:

- Can Only Withstand A Maximum Operating Pressure 7 to 10 Kg/Cm² g
- Require frequent maintenance as damage to diaphragm occur
- Cannot Withstand Temperature Above 400 Deg F
VALVES - Diaphragm Valve

- Hand Wheel
- Position Indicator
- 'O' Ring Seal
- Bonnet
- Compressor
- End Connection
- Diaphragm
- Body
VALVES - Diaphragm Valve

(a) Weir type

(b) Straight-through type
VALVES - Globe Valve
 VALVES - Globe Valve 

- A Globe Valves is a linear motion Valve and are primarily designed to stop, start and regulate flow.
- Frequent operation
- Application: steam, air, water, oil lines, corrosive substances & slurries
- Disc attached to valve stem rests against seat to shut off flow of fluid

Continued...
VALVES - Globe Valve

- 1. Body
- 2. Bonnet
- 3. Seat ring
- 4. Disk
- 5. Disk locknut
- 6. Disk washer
- 7. Stem
- 8. Back seat
- 9. Packing
- 10. Gland
- 11. Gland follower
- 12. Set screw
- 13. Stem nut
- 14. Handwheel

Rising stem "closed"

Rising stem "opened"
Advantage:

• Efficient throttling & Accurate flow control
• Available in multiple ports

Disadvantage:

• Flow resistance
• High pressure drop
• More expensive than other valves

Continued...
VALVES - Globe Valve
VALVES - Needle Valve
Needle valves generally are used for instrument, gauge, and meter line service.

Very accurate throttling is possible with needle valves and, therefore, they are extensively used in applications that involve high pressures and/or high temperatures.

In needle valves the end of the stem is needle point.
Advantage:

• Good for manual flow control.

Disadvantage:

• Positive shut-off not always possible or desirable.
• In some designs, seat is scored if shut down tightly
VALVES - Needle Valve
VALVES - Butterfly Valve
A Butterfly Valve is a quarter-turn rotational motion Valve,

Used to stop, regulate, and start flow.

Butterfly Valves are easy and fast to open.

A 90° rotation of the handle provides a complete closure or opening of the

Minimal fluid trapping in line

The disc seals against the opening to cut of flow & can be positioned at a point between fully closed and fully opens as required.

Application: Liquids, gases, slurries, liquids with suspended solids and ventilation systems
VALVES - Butterfly Valve

Figure 18-14
Butterfly valve

Continued...
Advantage:

- Small, light-weight, easy operation, low cost, minimum maintenance, drip tight shut–off, quick-acting & reliability
- High capacity, Low pressure drop & self-sealing so they don’t require an additonal flange gasket for installation
- Can be used for vacuum service
Disadvantage:

- High torque required for control
- Leaks early & only low-flow throttle
- The material used for seats restrict its use for high temperature application
A **pinch valve** is a full bore or fully ported type of control valve which uses a pinching effect to obstruct fluid flow.
VALVES - Pinch Valve

The most important benefits of using air operated Pinch Valves are their complete and true full bore, and the 100% tight shut off – even on solids such as granules, powders, pellets, chippings, fibres any kind of slurries and many more aggressive products.

Air operated Pinch Valves saves a lot down time, and guarantees a free flow through the valve, avoiding any blockages. Several rubber qualities such as natural rubber, EPDM, nitrile, viton, neoprene and butyl are used.
VALVES - Pinch Valve
VALVES - Relief Valve

• Special type of valve designed to operate automatically in a system overpressure condition (a protective feature in most systems)

• Most relief valves use an adjustable spring to determine lift pressure.

• System pressure opposes spring pressure, and when pressure is high enough, the valve will open against spring pressure and port the fluid to another location (typically, overboard for ‘safe’ fluids)
VALVES - Relief Valve

Type of relieve valve:

- Relief Valve - liquid systems
- Safety Valve - gas and vapour systems
- Safety Relief Valve - liquid and/or vapour systems
Safety valves

- Safety valves are generally used in gas or vapour service because their opening and reseating characteristics are commensurate with the properties and potential hazards of compressible fluids.
- The valves protect the system by releasing excess pressure. Under normal pressure, the valve disc is held against the valve seat by a preloaded spring. As the system pressure increases, the force exerted by the fluid on the disc approaches the spring force.
Safety valves

- As the forces equalize, fluid begins to flow past the seat. The valve disc is designed in such a way that the escaping fluid exerts a lifting pressure over an increased disc surface area, thereby overcoming the spring force and enabling the valve to rapidly attain near-full lift.

- An added benefit to the safety valve disc design is that the pressure at which the valve reseats is below the initial set pressure, thereby reducing the system pressure to a safe level prior to resealing.
Safety valves

- The ratio of the difference between the set pressure and the resealing pressure to the set pressure is referred to as the *blowdown*.
Pressure Relief valves

- Pressure-relief valves are used primarily in liquid service. These valves function in a way similar to safety-relief valves, except that as liquids do not expand, there is no additional lifting force on the disc.

- Therefore, the valve lift is proportional to the system pressure. Also, the valves reseat when the pressure is reduced below the set pressure.
Safety Relief valves

- A third type of pressure-relieving valve is a safety-relief valve, which can be used with both compressible and incompressible fluids. It combines the design features of a safety- and a relief-valve into one.

- Therefore, when it is used with compressible fluids, such as steam or a gas, it pops open to release the overpressure and when used with incompressible fluids, such as water or other liquids, it opens gradually, proportional to the increase in pressure over the set pressure, to safeguard the vessel, tank, heat exchanger, piping, or other equipment.
VALVES - Relief Valve

Figure 18-19.—Relief valve.
VALVES - Check Valve

• Allow flow in one direction only.
• Flow forces a ball or disk in one direction to open the valve; when flow stops, the ball or disk seats to close the valve.
• An important concept in check valves is the cracking pressure which is the minimum upstream pressure at which the valve will operate. Typically the check valve is designed and can therefore be specified for a specific cracking pressure.
VALVES - Check Valve

- One common application is in the discharge line of a centrifugal pump to prevent reverse suction

Advantage:
- Check valves are automatic in action
VALVES - Check Valve

CORRECT FLOW

REVERSE FLOW

Continued...
Classification:

- CHECK VALVE
  - SWING
    - WAFER
  - LIFT
    - PISTON LIFT
    - BALL LIFT
    - NON-SLAM

Continued...
VALVES - Check Valve (Swing)

- Controls direction of flow

- It has a hinged disk. When the water flow reverses, water pressure pushes the disk and closes the valve

- Application: Suspended Particles, high velocity
VALVES - Check Valve (Swing)

Figure 11-7
SWING-CHECK VALVE
VALVES - Check Valve (Swing)

- Swing Check Valve
- Vertical Style Lift Check Valve (helical spring loaded)
- Slanting/Tilting-Disk Check Valve
- Double Disk Swing Check Valve
- Swing Check Valve (Angle Seating)
VALVES - Check Valve (Swing)

Advantage:

• Minimum Pressure Drop is Required
• Best For Liquids And For Larger Line Sizes (Above 2”)

Disadvantage:

• Not Suitable In Line Subject To Pulsating Flow
• Some Styles Operates Only In A Horizontal Position
Wafer check valves are flangeless swing check valve covered under regulatory code API 594

Advantage:

• Less pressure drop across the valve in large sizes,

Disadvantage:

• Excessive wear under some operating conditions
VALVES - Check Valve (Wafer)

Part Names:
1. Body
2. Plates
3. Hinge Pin
4. Hinge Pin Retainers
5. Stop Pin
6. Stop Pin Retainers
7. Spring
8. Plate Lug Bearings

Direction of Flow
Closed
Partially Open
Section A-A
In a lift check valve, upward regular flow raises the piston and opens the valve, and reverse flow pushes the disk down to its seat and stops the backflow.

**Advantage:**
- Good for vapours, steam, and water.
- Suitable for pulsating flow.

**Disadvantage:**
- Many design but for horizontal service only.
- Not common in sizes over 6 inch.
- Not recommended for service which deposit solids.
VALVES - Check Valve (Piston Lift)
VALVES - Check Valve (Ball Lift)

- Controls direction of flow
- Ball is located at end of stem and lifts to allow flow
- Application: Space Limitation Problems, Minimum shut off is 5 psi

**Advantage:**
- Stop Flow Reversal More Rapidly Than Others
- Good For Viscous Fluids Which Deposit Solid Residues That Would Impair Operation Of Other type
- Vertical Or Horizontal Installation Is possible
Disadvantage:

- Not common in sizes over 6 inch.
- Not suitable for lines subject to pulsating flow
VALVES - Check Valve (Ball Lift)

Ball Check Valve
• The non-slam check valve is a spring-loaded lift check valve with a modified design of the body.

• The valve is designed in such way that same can be sandwiched between the two flanges. Here the disc is held in position by a spring which is housed in a housing cap or yoke.
# VALVES

<table>
<thead>
<tr>
<th>OPERATED VALVES</th>
<th>SELF-OPERATED VALVES</th>
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</thead>
<tbody>
<tr>
<td><strong>GATE</strong></td>
<td><strong>CHECK</strong></td>
</tr>
<tr>
<td><strong>GLOBE</strong></td>
<td><strong>REGULATING</strong></td>
</tr>
<tr>
<td><strong>ROTARY</strong></td>
<td></td>
</tr>
<tr>
<td><strong>DIAPHRAGM</strong></td>
<td></td>
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<tr>
<td>SOLID WEDGE GATE</td>
<td>SWING CHECK</td>
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<tr>
<td>GLOBE</td>
<td>PRESSURE REGULATOR</td>
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<tr>
<td>ROTARY BALL</td>
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<tr>
<td>DIAPHRAGM (BUNNELL TYPE)</td>
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<tr>
<td>SPIT-WEDGE GATE</td>
<td>BALL CHECK</td>
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<td>ANGLE GLOBE</td>
<td>PITCH CHECK</td>
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<td>BUTTERFLY</td>
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<td>PINCH</td>
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<tr>
<td>SINGLE DISC</td>
<td>FILLING DISC CHECK</td>
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<td>SINGLE SEAT GATE</td>
<td>STOP CHECK</td>
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<td>NEEDLE</td>
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<td>PLUG or COCK</td>
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<tr>
<td>PRESSURIZING FLOW</td>
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</tr>
<tr>
<td>*Control seat is optional</td>
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</table>

**SQUEEZE**
## VALVES - Types Vs Motion

<table>
<thead>
<tr>
<th>Valve Types</th>
<th>Linear Motion</th>
<th>Rotary Motion</th>
<th>Quarter Turn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate</td>
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<td>NO</td>
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</tr>
<tr>
<td>Globe</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Plug</td>
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</tr>
<tr>
<td>Ball</td>
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<tr>
<td>Butterfly</td>
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<tr>
<td>Swing Check</td>
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<td>Safety</td>
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<td>NO</td>
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<tr>
<td>Relief</td>
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<td>NO</td>
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<tr>
<td>Valve Types</td>
<td>Linear Motion</td>
<td>Rotary Motion</td>
<td>Quarter Turn</td>
</tr>
</tbody>
</table>

- Linear Motion: YES or NO
- Rotary Motion: YES or NO
- Quarter Turn: YES or NO
VALVES - Selection Criteria

- Size limitations
- Cost
- Operating Conditions: Temperature, Pressure and Flow Rate
- Service
- Maintenance requirements
General procedure for valve selection.

• Identify design information including pressure and temperature, valve function, material, etc.
• Identify potentially appropriate valve types and components based on application and function (i.e., block, throttle, or reverse flow prevention).
General procedure for valve selection.

• Determine valve application requirements (i.e., design or service limitations).

• Finalize valve selection. Check factors to consider if two or more valves are suitable.

• Provide full technical description specifying type, material, flange rating, etc.
• Valve size is denoted by the nominal pipe size (NPS), which is equal to the size of valve-connecting ends or the flange-end size.

• In the metric system, valve size is designated by the nominal diameter (DN) of connecting pipe or the connecting flange ends.

• When a valve is installed with reducers on each end, the size of the valve will be equal to the size of the reducer-connecting ends attached to the valve.

• The valve size is not necessarily equal to the inside diameter of the valve.

Continued...
It is a normal industry practice to categorize valves, based upon size, in two classification: small and large.

Small Valves. NPS 2 (DN 50) and smaller valves are called small valves. At times NPS 21⁄₂ (DN 65) and smaller valves are referred to as small valves. As such, the size classification can vary and, therefore, it should not be considered a uniform industry practice.

Large Valves. NPS 21⁄₂ (DN 65) and larger valves are classified as large valves.
Class Ratings.
Pressure-temperature ratings of valves are designated by class numbers. Based on the material(s) of construction, the pressure-temperature ratings for each class are tabulated to provide the maximum allowable working pressures, expressed as gauge pressures at the given temperature.

ASME B16.34 for Valves Flanged, Threaded, and Welding End is one of the most widely used Valve standards. It defines three types of classes: standard, special, and limited. ASME B16.34 covers Class 150, 300, 400, 600, 900, 1500, 2500, and 4500 Valves.
Inspection plan to be submitted to Purchaser by supplier during order.

FOR FORGED VALVES/CAST STEEL VALVES

- Visual and dimensional inspection.
- Review of material test certificates.
- Any mandatory of supplementary test.
- Hydrostatic test of all valves.
- Review of radiographs/radiographic reports and reports of any other NDT tests, for cast steel valve only.
IBR VALVES:

- Valves described as “IBR Valves” shall be in accordance with the latest IBR (Indian Boiler Regulations) as well as the other requirements specified in the specification.
- For all “IBR Valves” test certificate in form III-C shall be furnished, duly signed by IBR inspection authority or an IBR approved representative.
- All valves shall be painted red.
For SW/ BW end carbon steel valves under “IBR”, the body material chemical composition shall conform to the following:

- Carbon (Max.) : 0.25%
- Others (S, P, Mn) : As per IBR
Pressure–temperature ratings:

Pressure–temperature rating is the maximum allowable sustained non shock pressure at the corresponding tabulated temperature. These are listed in ASME B16.34

Class:

The valve is specified by the pressure rating of the body of the valves. American Standard specified the following classes (i.e. 150#, 300#, 400#, 600#, 900#, 1500# & 2500 #)

Continued...
Trim:

- The trim is comprised of stem, seat surfaces, back seat bushing and other small internal parts that normally contact the surface fluid.
- API 600 specifies trim number in table 3 of the standard, it specifies the types of material which can be used for the parts with its typical specification and grade.
Trim parts of common valves

<table>
<thead>
<tr>
<th>GATE</th>
<th>GLOBE</th>
<th>SWING</th>
<th>LIFT CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem</td>
<td>Stem</td>
<td>Seat Ring</td>
<td>Disc Guide</td>
</tr>
<tr>
<td>Seat Ring</td>
<td>Seat Ring</td>
<td>Disc Holder</td>
<td>Seat Ring</td>
</tr>
<tr>
<td>Wedge Ring</td>
<td>Disc Nut</td>
<td>Side Plug</td>
<td></td>
</tr>
<tr>
<td>Bushing</td>
<td>Bushing</td>
<td>Holder Pin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disc Nut Pin</td>
<td></td>
</tr>
</tbody>
</table>
Wetted parts:

All parts which come in contact with the service fluid are called the wetted parts.

Wire drawing:

- This term is used to indicate the premature erosion of the valve seat caused by excessive velocity between seat and seat disc

Straight-through flow:

This refer to the valve in the closing element is retracted entirely so that there is no restriction of flow
Quarter–turn valve:

• This refers to the valve where the entire operation of valve is achieved by 90 deg. Turn of the closing element

Upstream pressure:

Pressure of the fluid entering the valve, sometimes refers to as inlet or supply pressure.

Downstream pressure:

Pressure of the fluid discharged from the valve, sometimes refers to as outlet or reduced pressure.