

Valve Philosophy

Valves

Uses

- Stopping or Starting Flow
- Regulating Flow
- Permitting flow in only one direction
- Switching flow
- Emergency Relief Flow

Valve Philosophy - LTD

- Introduction
- Specification H-221 (permitted Valve Types)
- Valve Accessories and Features
- Vents, Drains and Sample Outlets
- Pump and Compressor Valving
- Vessel and Exchanger Valving
- Valving in Steam and Condensate Systems
- Valving at Control Stations
- Miscellaneous Valve Applications

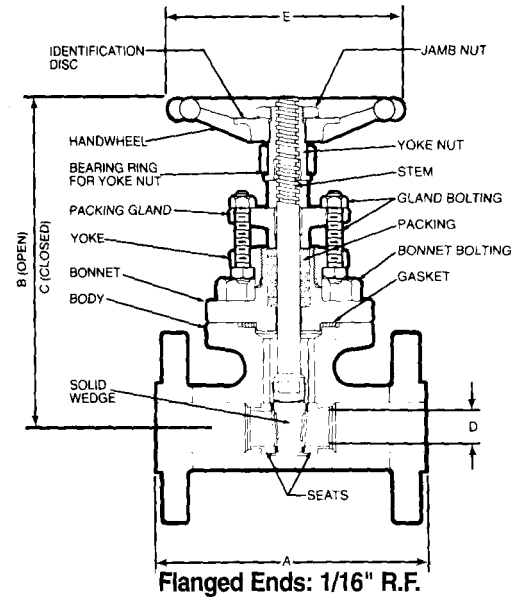
Valve Philosophy

Comparison of Basic Valve Types

Comparison of Basic Valve Types

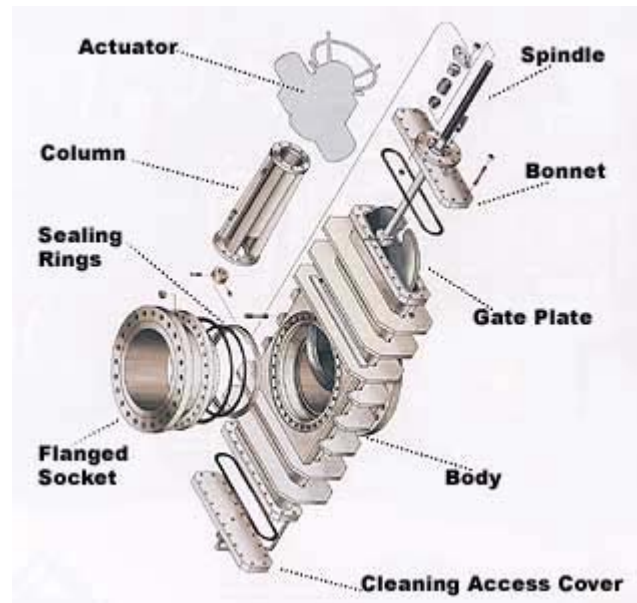
<u>Valve Type</u>	<u>Characteristic</u>	<u>Use</u>	<u>Limitations</u>
Gate	Gatelike disc actuated by a stem; screw and handwheel move at right angles to flow. The disc seats against two faces for shutoff.	On-off service requiring infrequent throttling.	Not good for throttling service. Throttling can cause wire drawing and erosion. Pocket at bottom of valve can fill with foreign material and prevent closing of valve. Purging should be considered for services which may contain solids.

Comparison of Basic Valve Types



Flanged Gate Valve

Comparison of Basic Valve Types

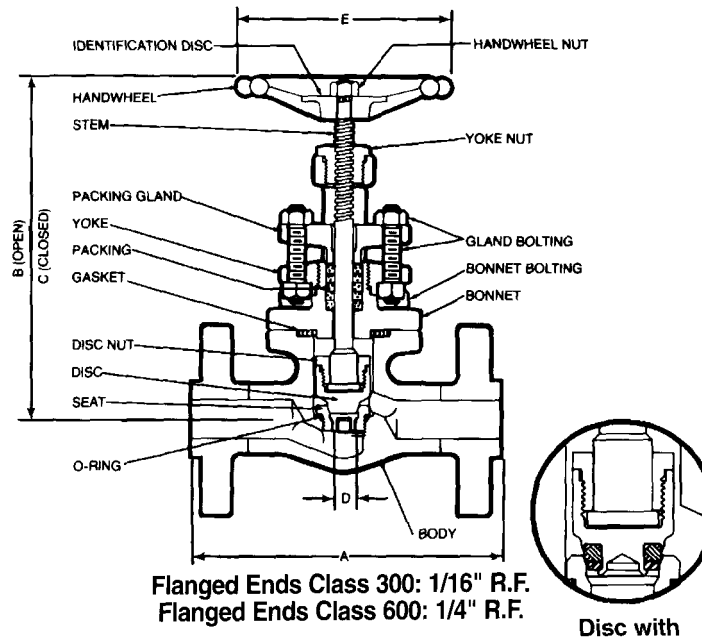


Rhefla® Flat Plate Type Gate Valve

Comparison of Basic Valve Types

<u>Valve Type</u>	<u>Characteristic</u>	<u>Uses</u>	<u>Limitations</u>
Globe		GENERAL: Preferred for throttling services.	Not recommended for on-off service.
A) Standard	Disc attached to stem seats on circular opening. Fluid changes direction in passing through valve.	Most throttling services where corrosion or erosion are not a problem.	Cost and throttling efficiency above 6" become unfavorable. Not recommended where solids or corrosives are present.

Comparison of Basic Valve Types

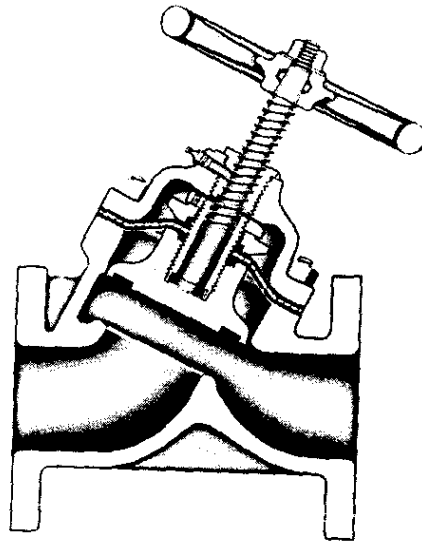


Flanged Globe Valve

Comparison of Basic Valve Types

<u>Valve Type</u>	<u>Characteristic</u>	<u>Use</u>	<u>Limitations</u>
Globe	Similar to conventional globe valve; handwheel normally opposed to flow direction.	Y" - valve produces lower pressure drop and turbulence than standard globe and is preferred for high pressure/temperature service as well as corrosive or erosive service.	Not recommended for on-off service. Cost and throttling efficiency above 6" become unfavorable. Not recommended where solids or corrosives are present.
B) "Y" Pattern			

Comparison of Basic Valve Types



“Y” Pattern Globe Valve

Comparison of Basic Valve Types

<u>Valve Type</u>	<u>Characteristic</u>	<u>Use</u>	<u>Limitations</u>
Butterfly Valve	Circular disc is pivoted at center and opened by a 1/4 turn of external handle. Gear operators are available for larger sizes.	Where minimum pressure drop and face to face dimension is required, low cost is a factor as is quick opening feature. May be used for throttling.	Positive shut-off is not always possible except when discs or seats are coated with a suitable elastomer, which may limit the maximum allowable temperature.

Comparison of Basic Valve Types

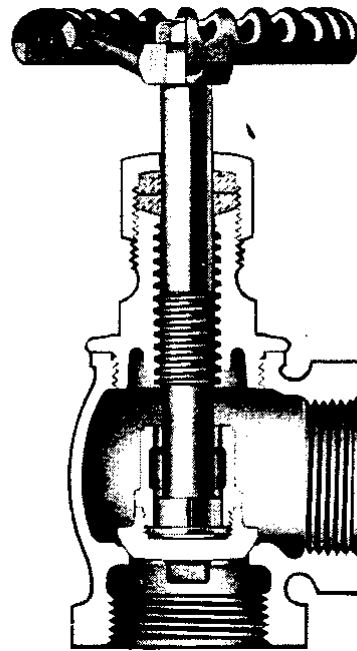


Butterfly type (control) valve

Comparison of Basic Valve Types

<u>Valve Type</u>	<u>Characteristic</u>	<u>Use</u>	<u>Limitations</u>
Angle (90°)	Similar to globe valve except inlet and outlet make 90° angle.	Same as globe. Used for high pressure-drop service where little temperature change is anticipated in piping	Bends in piping systems are subject to strains that should not be placed on valves.

Comparison of Basic Valve Types

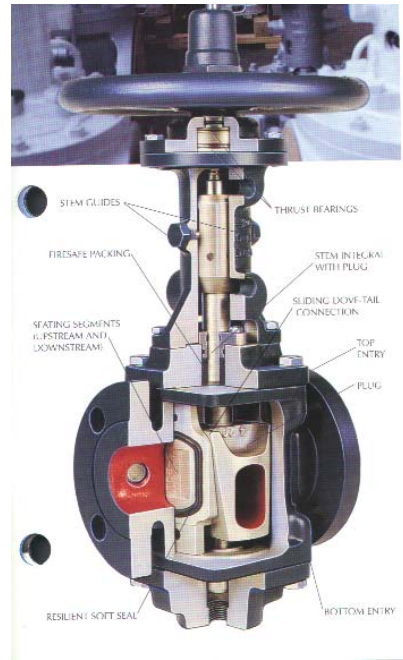


Angle Valve

Comparison of Basic Valve Types

<u>Valve Type</u>	<u>Characteristic</u>	<u>Use</u>	<u>Limitations</u>
Plug	Tapered plug with hole same shape as interior of valve body, opens or closes valve body, opens or closes valve with minimum travel. 1/4 turn required to fully open or close.	General: On-off service. More positive shut-off than gate valve. Also can be used for throttling but characteristics not as satisfactory as globe for such service. For low pressure drop service. Unexposed seats eliminate corrosion and erosion. Less stem leakage which may be of concern when pipe is carrying toxic or hazardous material.	May be difficult to operate

Comparison of Basic Valve Types

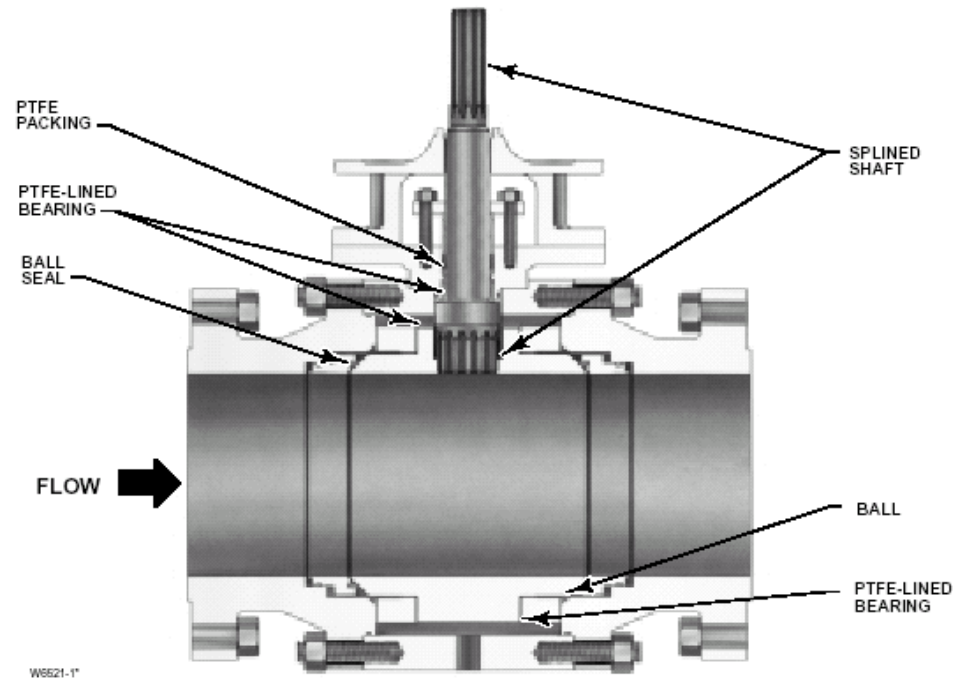


“Orbit”® type Plug Valve

Comparison of Basic Valve Types

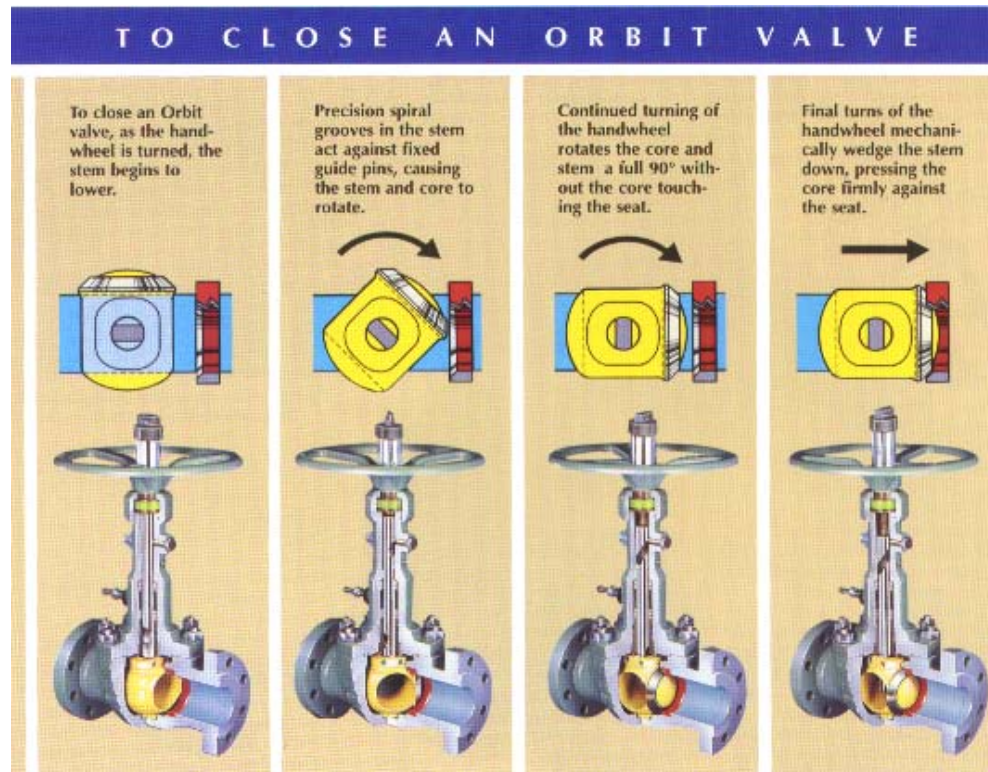
<u>Valve Type</u>	<u>Characteristic</u>	<u>Use</u>	<u>Limitations</u>
Ball Valves	Related to plug valves except that movable element is a ball. Resilient seats used. One quarter turn from full open to full closed.	Similar to plug valves - low Pressure drop across valve. Full port valve reduces holdup of solids.	Usually limited temperature range because of elastomer seats. Gives tighter shutoff than plug as pressure forces ball onto seat

Comparison of Basic Valve Types



Conventional Ball (control) Valve

Comparison of Basic Valve Types

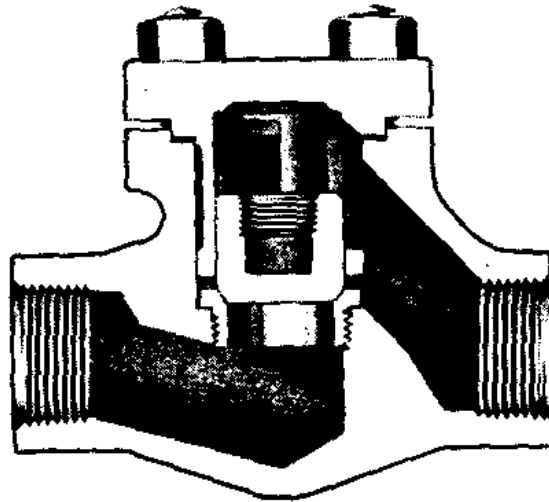


“Orbit®” type Ball Valve

Comparison of Basic Valve Types

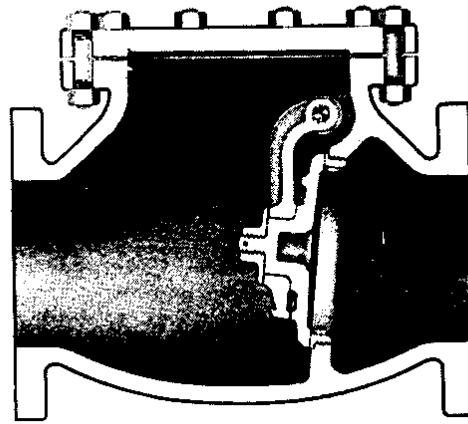
<u>Valve Type</u>	<u>Characteristic</u>	<u>Use</u>	<u>Limitations</u>
Check Valves	Flow keeps swing gate open, while gravity and flow reversal close it. Outside levers and weights are used on large swing checks when greater sensitivity for changes in flow is required.	General: Prevent back-flow in lines. Best for liquids and less affected by solids in fluid	Not suitable in line subject to pulsating flow. Some styles operate only in a horizontal position

Comparison of Basic Valve Types



Globe type Lift Check Valve

Comparison of Basic Valve Types

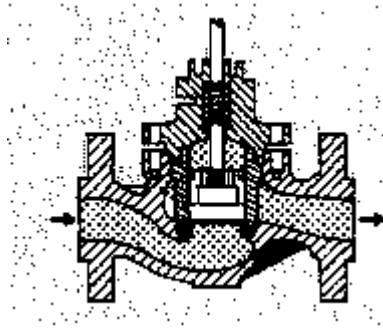


Swing Check Valve

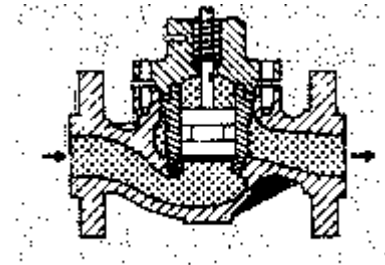
Comparison of Basic Valve Types

<u>Valve Type</u>	<u>Characteristic</u>	<u>Use</u>	<u>Limitations</u>
Automatic Control	Similar in principle to globe valve but precision-built for accurate automatic control. Air pressure actuates the diaphragm causing the stem to move, opening or closing valve orifice. Air pressure is controlled by the primary measuring instrument. The valve plug is tapered (parabolic or has V-ports) to give the desired throttling characteristics. Double-port valves give better control range and require only small force to move stem.	Automatic control of fluids to effect control of flow or pressure which in turn may affect changes in other process variables such as level or temperature	Double Port valves are not very good for tight shut-off. Control valves which normally throttle are subject to wear and are normally not preferred for emergency shut-off purposes. Control valves often have bypasses or hand wheels which can defeat safety isolation requirements. Control valves requiring tight shut-off (TSO) or bubble tight shut off (BTSO) must be indicated on P&I diagrams and control valve summary sheets.

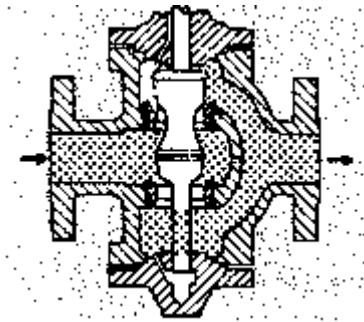
Comparison of Basic Valve Types



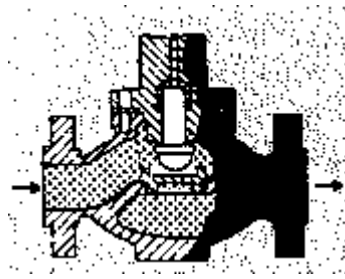
Balanced Cage Type



Unbalanced Cage Type

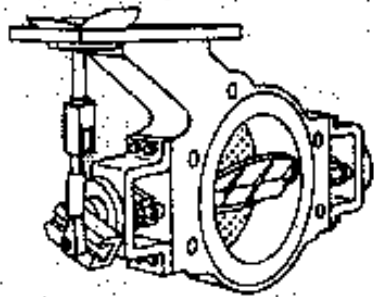


Double Ported Type

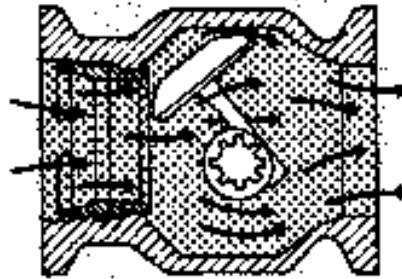


Single Ported Type

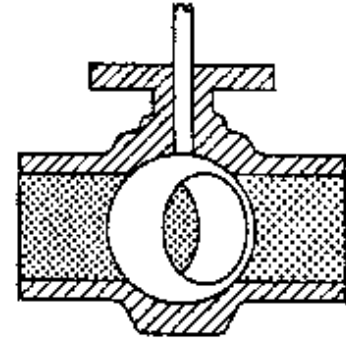
Comparison of Basic Valve Types



Butterfly Type

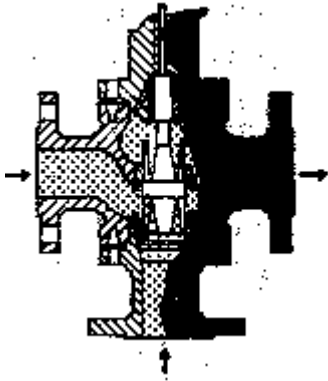


Camflex Type

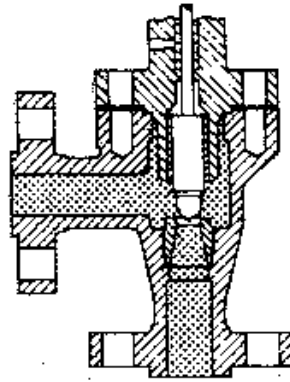


Ball Type

Comparison of Basic Valve Types

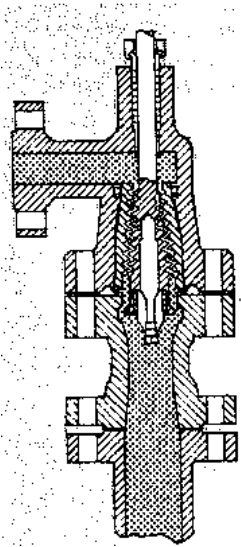


Three Way Type

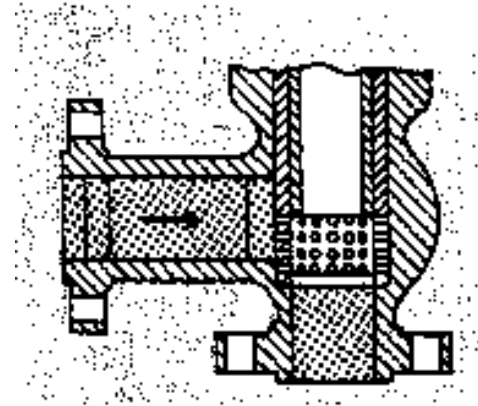


Angle Type

Comparison of Basic Valve Types



Lo-dB Type



Velocity control trim

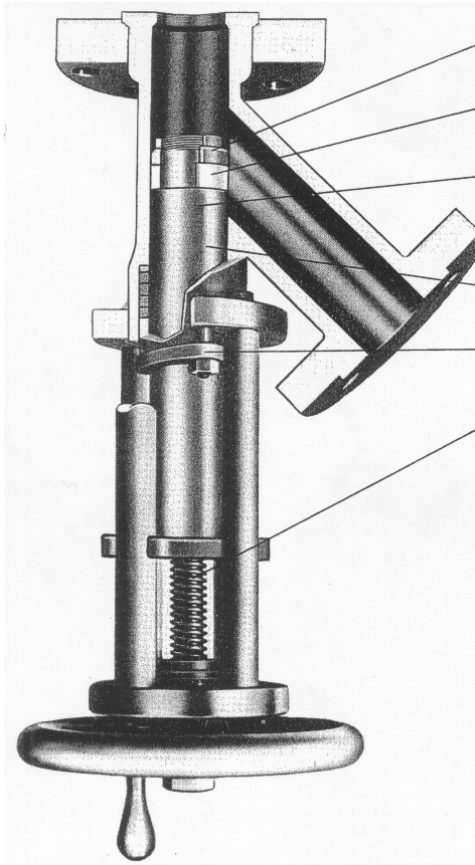
Comparison of Basic Valve Types

Valve Sizing

A *sizing coefficient* (C_v) of 1 is defined as the coefficient of a valve that will pass 1 gpm of water with a pressure drop of 1 psi

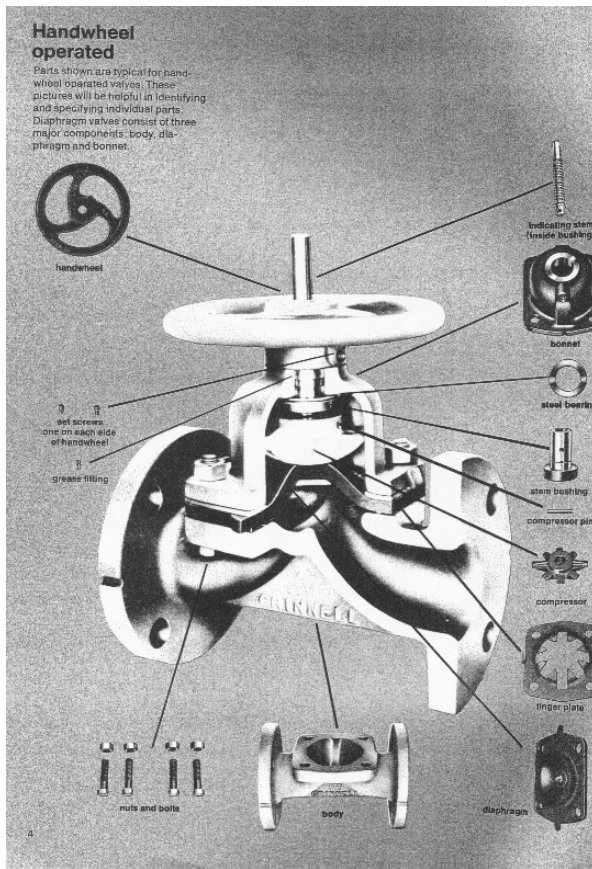
$$C_v = q \sqrt{SG/\Delta P}$$

Comparison of Basic Valve Types



- Ram type valve for use in solids or slurry service
- Valve flush with vessel bottom when closed
- Plug out of flow path when open

Comparison of Basic Valve Types

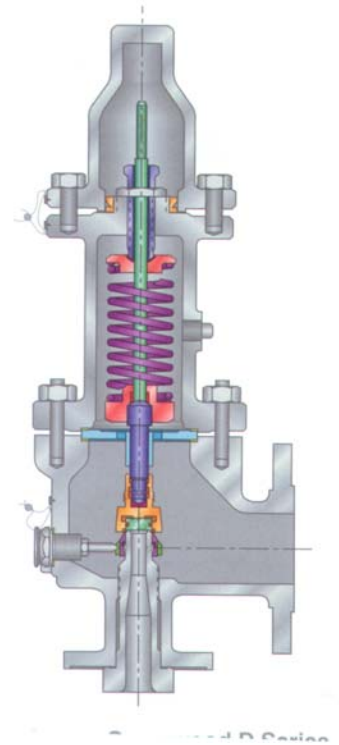


- Weir type valve used in corrosive service.
- Not to be used in vacuum service.
- Lower cost alternative to alloy valve.
- Liner is replaceable.

Comparison of Basic Valve Types

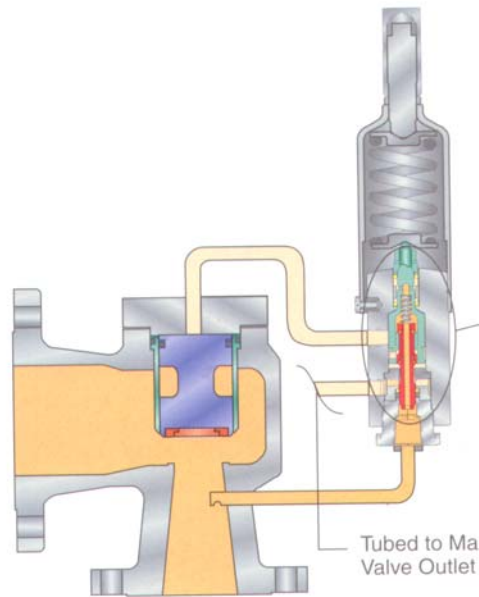
<u>Valve Type</u>	<u>Characteristic</u>	<u>Use</u>	<u>Limitations</u>
Relief Valve	Valve opens automatically when force on seat exceeds that of spring. Returns to closed position when pressure drops below set pressure.	For protecting equipment and vessels from excessive pressures	Require periodic inspection to insure operability. (In some jurisdictions, this is a legal requirement)

Comparison of Basic Valve Types



Conventional Safety Valve

Comparison of Basic Valve Types

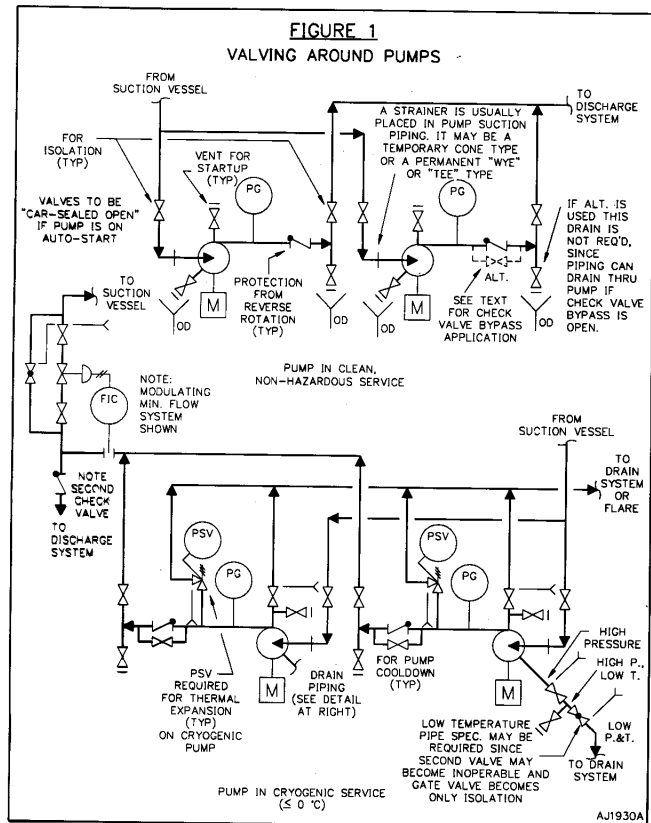


Pilot Operated Safety Valve

Valve Philosophy

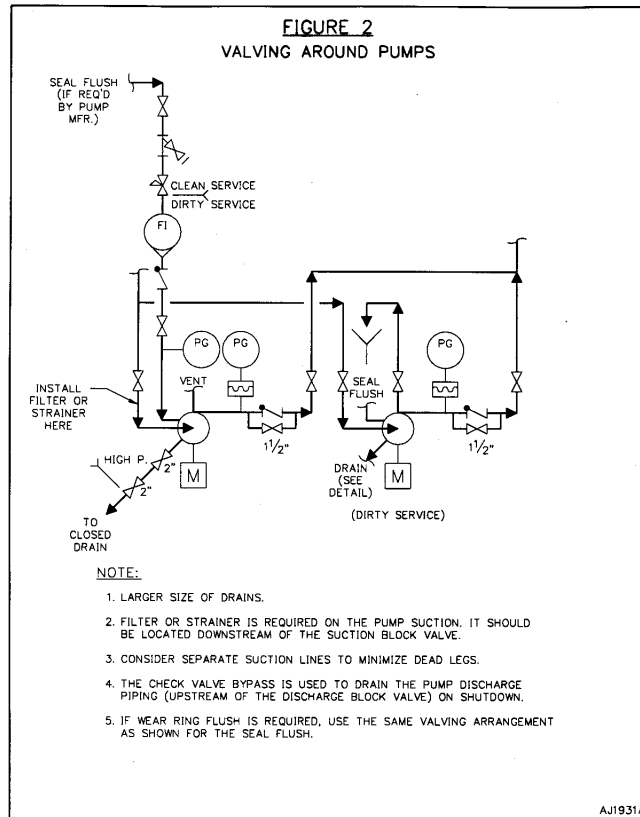
Examples of Valving Arrangements

Valve Philosophy



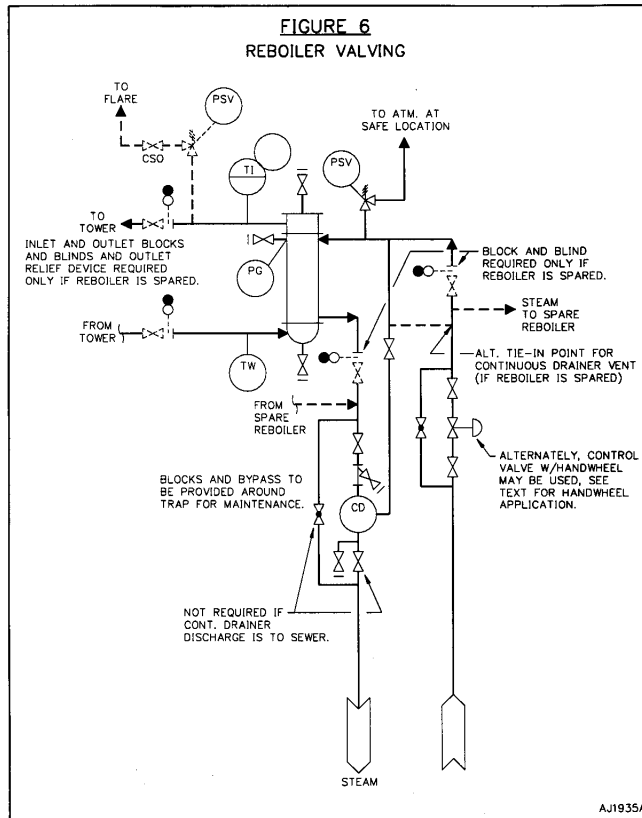
- Gate valves (usually) on suction and discharge for isolation
- Check valve on discharge to prevent backward rotation of pump impeller
- Common pump min flow

Valve Philosophy



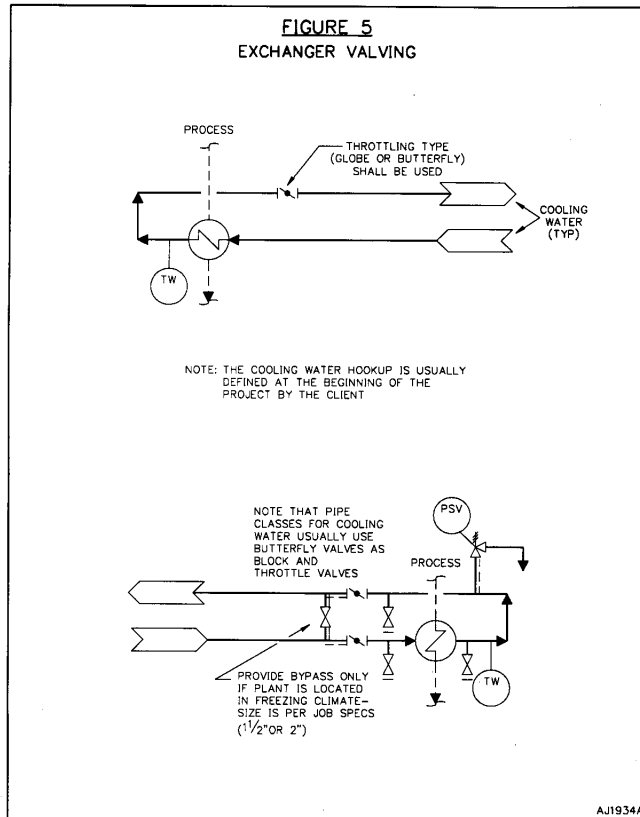
- Pump in dirty service
- seal flush with rotameter
- pressure gauges with diaphragm seals

Valve Philosophy



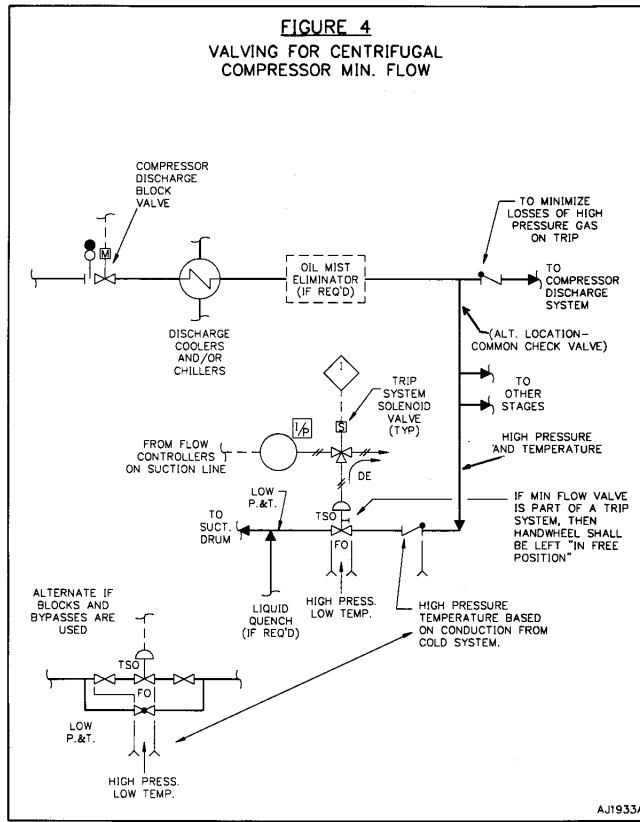
- Vertical reboiler with steam on shell
- continuous drainer vent to steam line
- isolation and relief device required if reboiler is spared.

Valve Philosophy



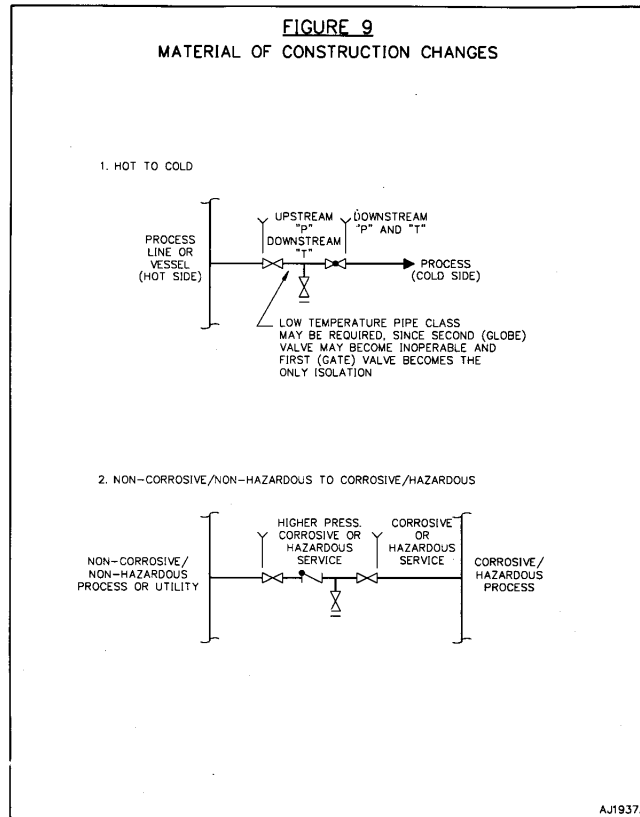
- Typical cooling water hookup.
- Upper detail is cheaper, however, it requires a complete shutdown of cooling system and is not recommended.
- Lower detail is preferred by most clients, as it allows for servicing users without a complete shutdown and drainage of the cooling system.
- Client will usually determine which one they want.

Valve Philosophy



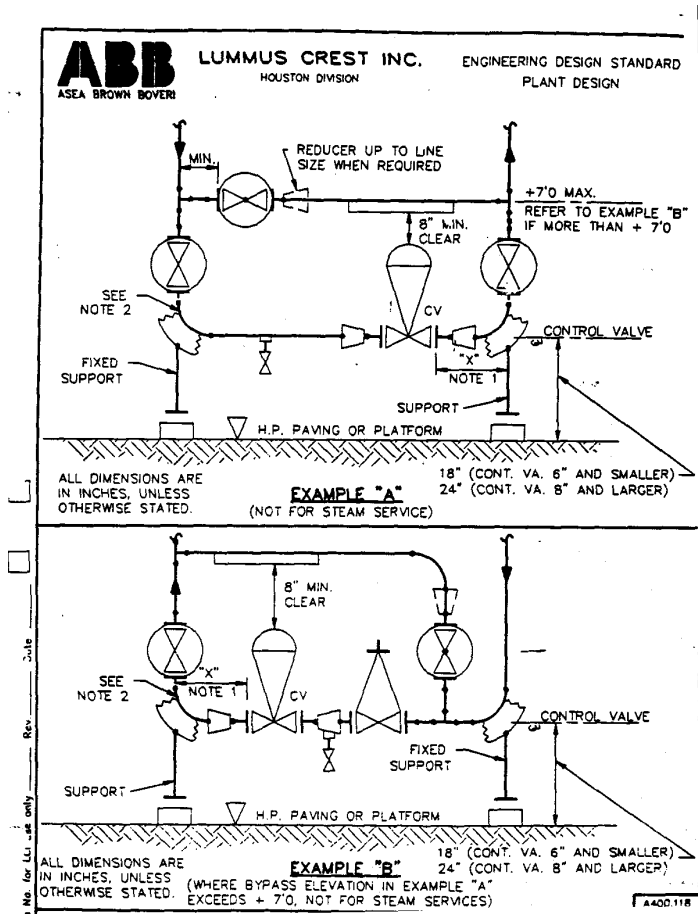
- Discharge block valve (usually) motor-operated.
- Min flow taken after discharge cooler
- Material changes if suction class/material is different than discharge.

Valve Philosophy



- Valve materials to be the “most severe” at the change of materials.

Valve Philosophy



- Blocks and bypasses for line sizes 4" and smaller.
- Hand wheel for line sizes 6" and larger.
- Some clients want blocks and bypasses for all control valves.

Valve Philosophy



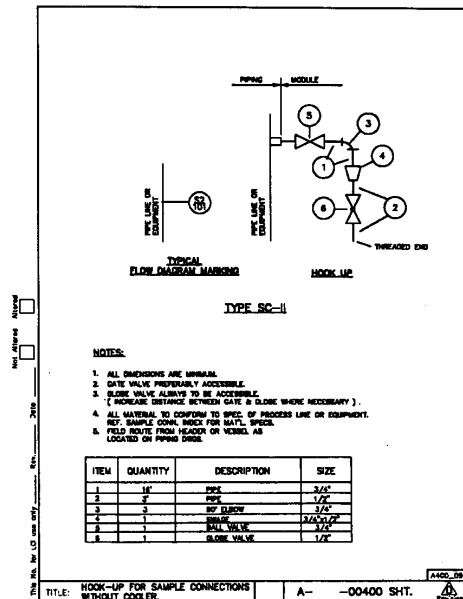
ABB Lummus Crest Inc.

TECHNICAL PROCEDURE

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- Sample connection piping shows the connections and bill of material for the sample connection.



Valve Philosophy



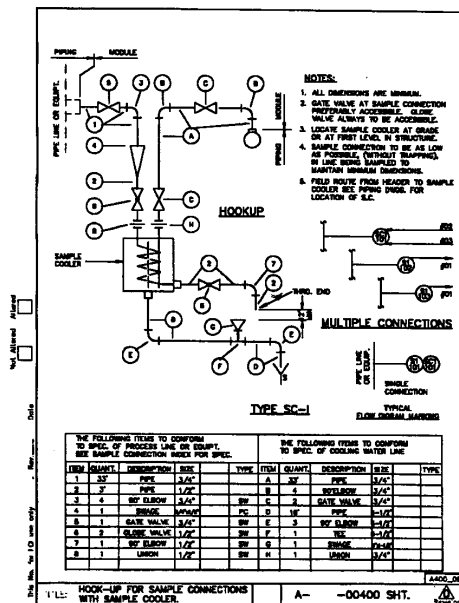
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TECHNICAL PROCEDURE

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- Sample connection with cooler detail shows all the piping, valving, etc. that is furnished with a sample connection with cooler.

Valve Philosophy

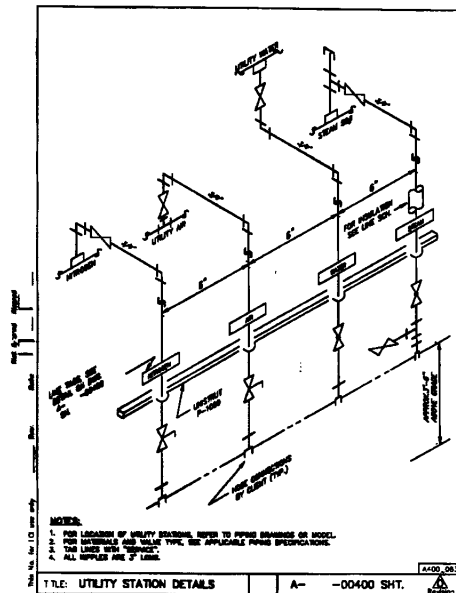
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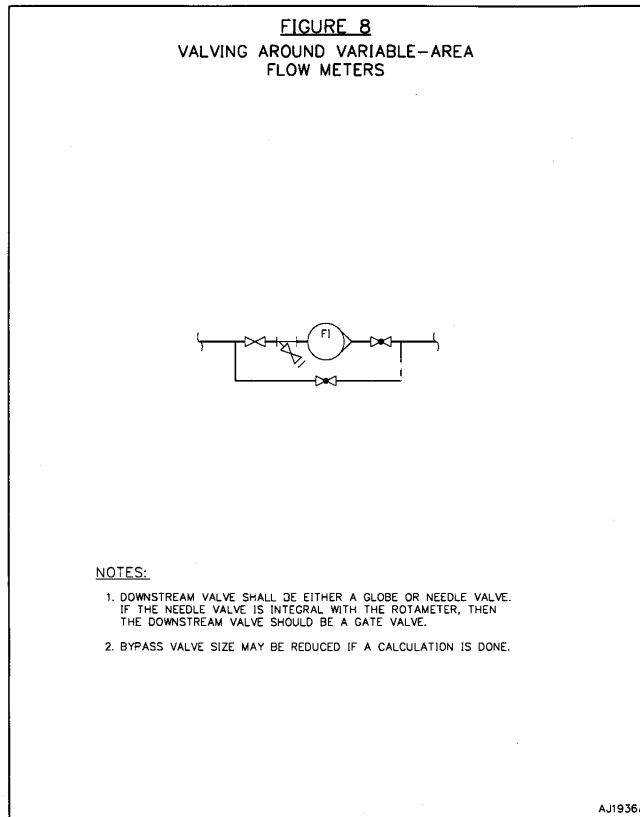
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Tab TP06.414



- Typically used to provide utilities (I.e. water, steam, air, nitrogen) to various areas of a plant.
- Usually specified and located by the detailed engineering contractor.

Valve Philosophy



- Used for rotameter type flow instruments
- Strainer with valve is used to keep dirt out of the flow meter.
- Bypass provided to allow servicing of the flow meter without shut down.