VALVE MAINTENANCE – BEST PRACTICES

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Agenda

- Preventative vs. Reactive Valve Maintenance
- Trunnion Mounted Ball Valves
- Plug Valves
- Gate Valves
- Lubricants, Flushes & Sealants
- Fittings & Lubrication Equipment
- ?? Test

Safety Moment

This fire resulted from leaving an iPHONE charger/docking station plugged into the vehicle 12v outlet. The connector overheated and started a fire in the vehicle while it was parked overnight in owner's garage. Like any electrical equipment, a short may occur causing overheating and possible fire. It is good practice to unplug these devices when leaving your vehicle.

Preventative and Reactive Valve Maintenance

- **Reactive valve maintenance-** can often be defined as the maintenance performed when the reliability or usefulness of system valves have depreciated and/or failed.
- **Preventative valve maintenance-** suggests that pipeline operators take a proactive approach in mitigating valve issues before they occur.

Reactive

- Why valve maintenance gets a bad name!
- Hard to turn, inoperable valves often stem from neglect
- Repairing / replacing valves is an incredibly costly undertaking
  - Front end maintenance is a much cheaper option
- We cannot predict when issues will occur
- Too often valves are looked at as a commodity

Preventative

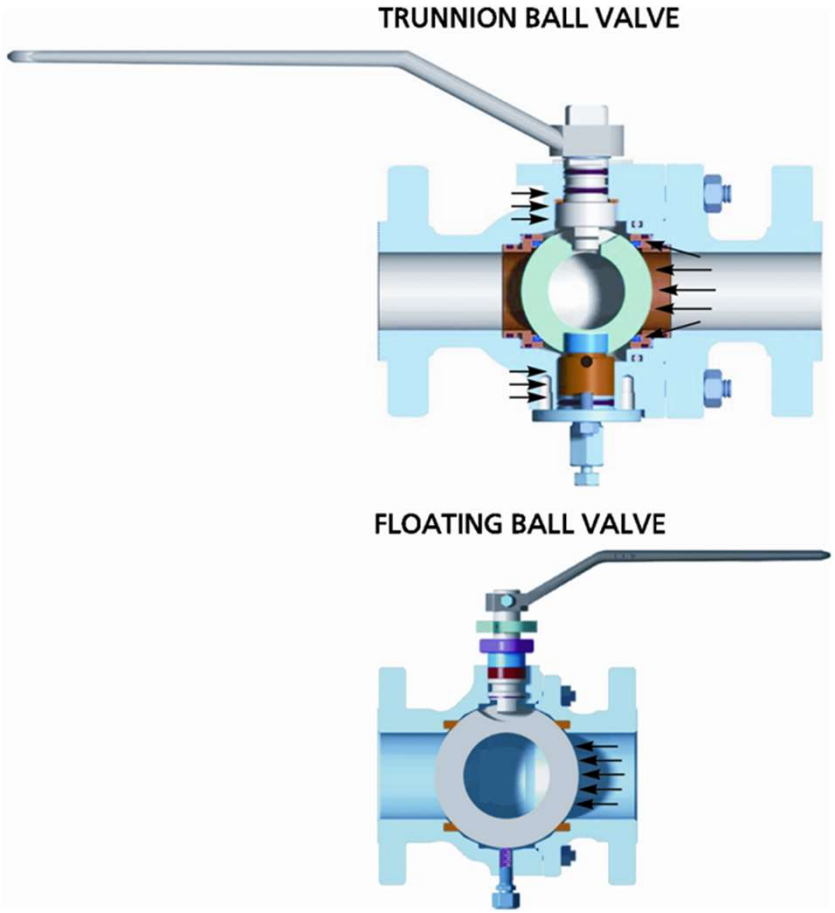
- Questions to ask yourself:
  - How many valves do we have?
  - Which ones are critical?
  - What compliance regulations do we have to follow?
  - What kind of valves are they?
  - How much $$ & resources can we allocate to these assets?
- Training, Training, Training! Know your valves!

Trunnion Mounted Ball Valves

Trunnion vs. Floating Comparison

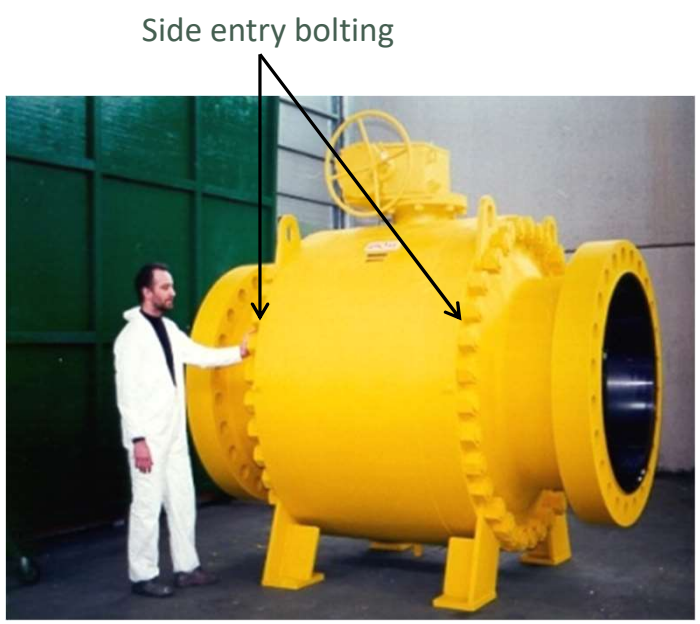
- **Trunnion** - Designed for high pressure and/or large diameter applications in production and transmission.
  - No size limit
  - **Seat moves to ball**
  - Lower Torque
  - Lower actuation cost
  - Ease of operation
  - Double Block and Bleed Capability

- **Floating** - Designed for smaller size and applications in production and process
  - Limited to 12in. Bore size and smaller
  - **Ball moves to downstream seat to seal**
  - Economically Priced
  - Trims available for multiple services

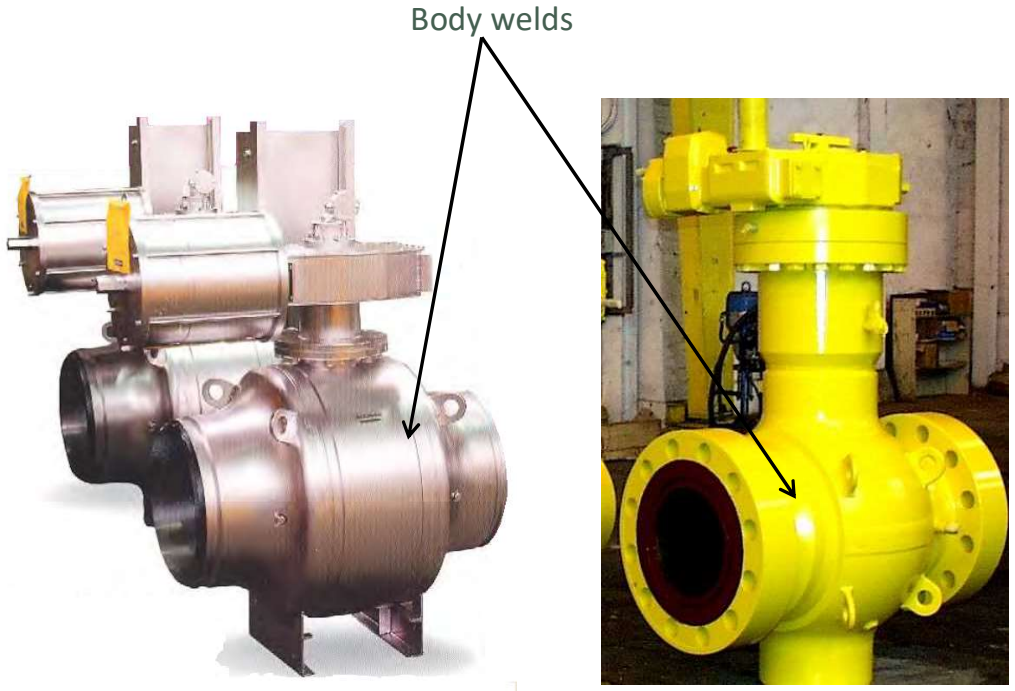


Body Designs

- Side Entry (Bolted Body).

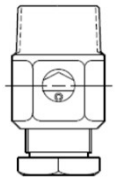


- Welded Body.

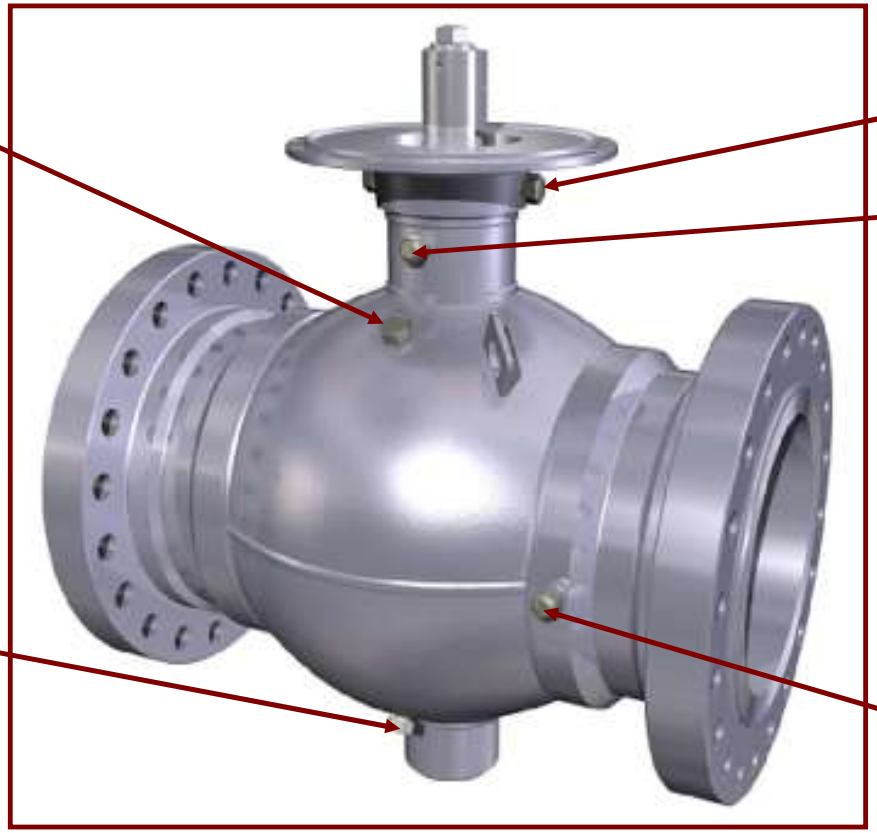


Valve Body Relief, Drain, Injection Points

Body Relief



Body
Blowdown

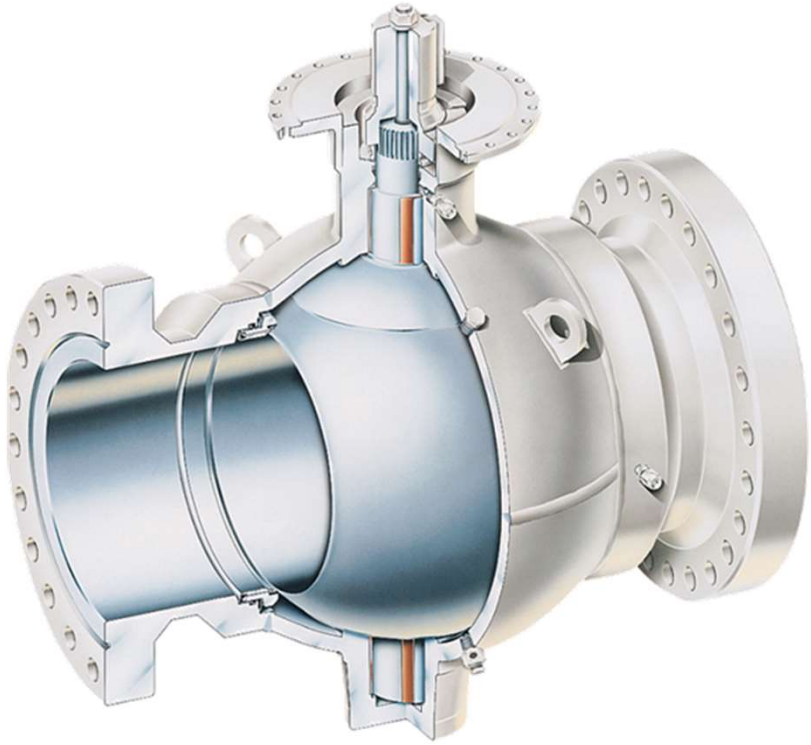


Stop Inspection Port

Stem Sealant Injection Port

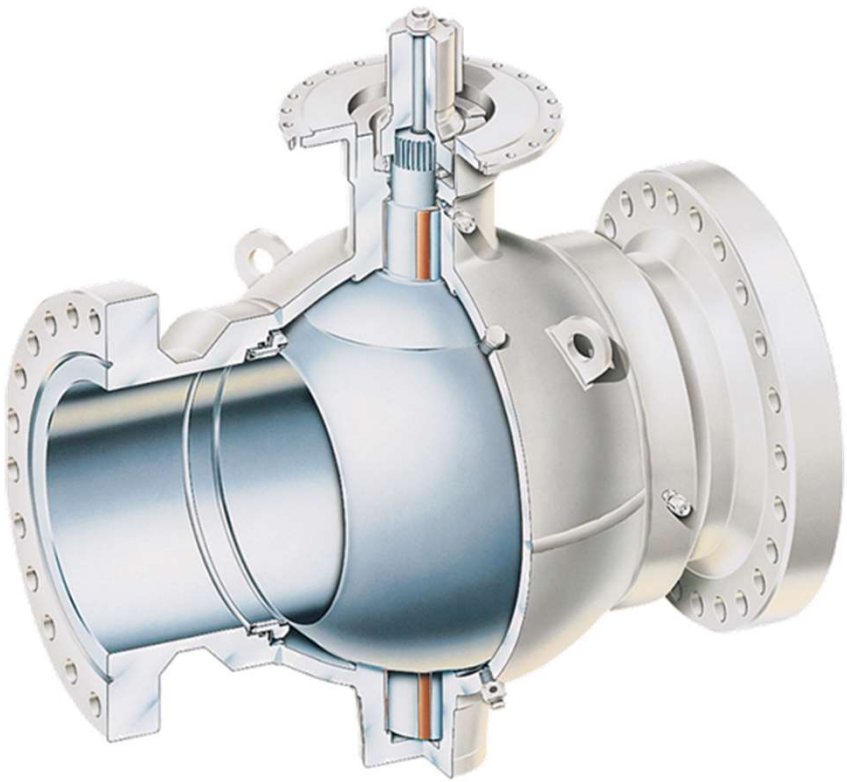
Seat Injection Port

All-Welded Operation

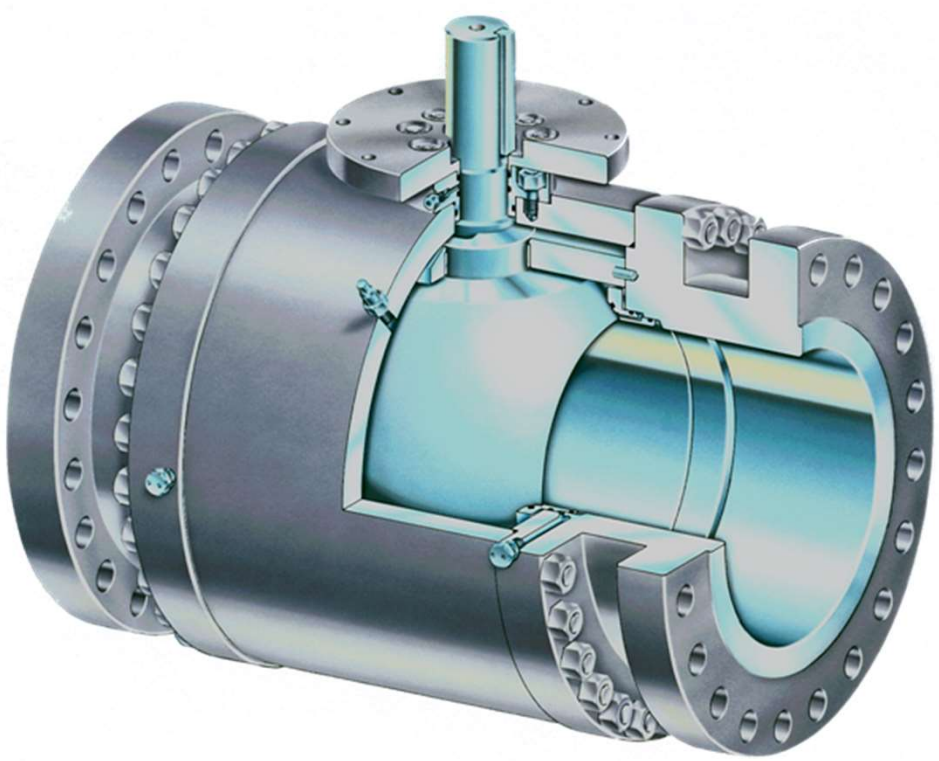


- Post 1985 only valves 14” and larger have rotating seats. Below 14” ball & trunnion is one piece.
- 20” valves and larger have two (2) seat sealant button heads per seat (180˚ apart)

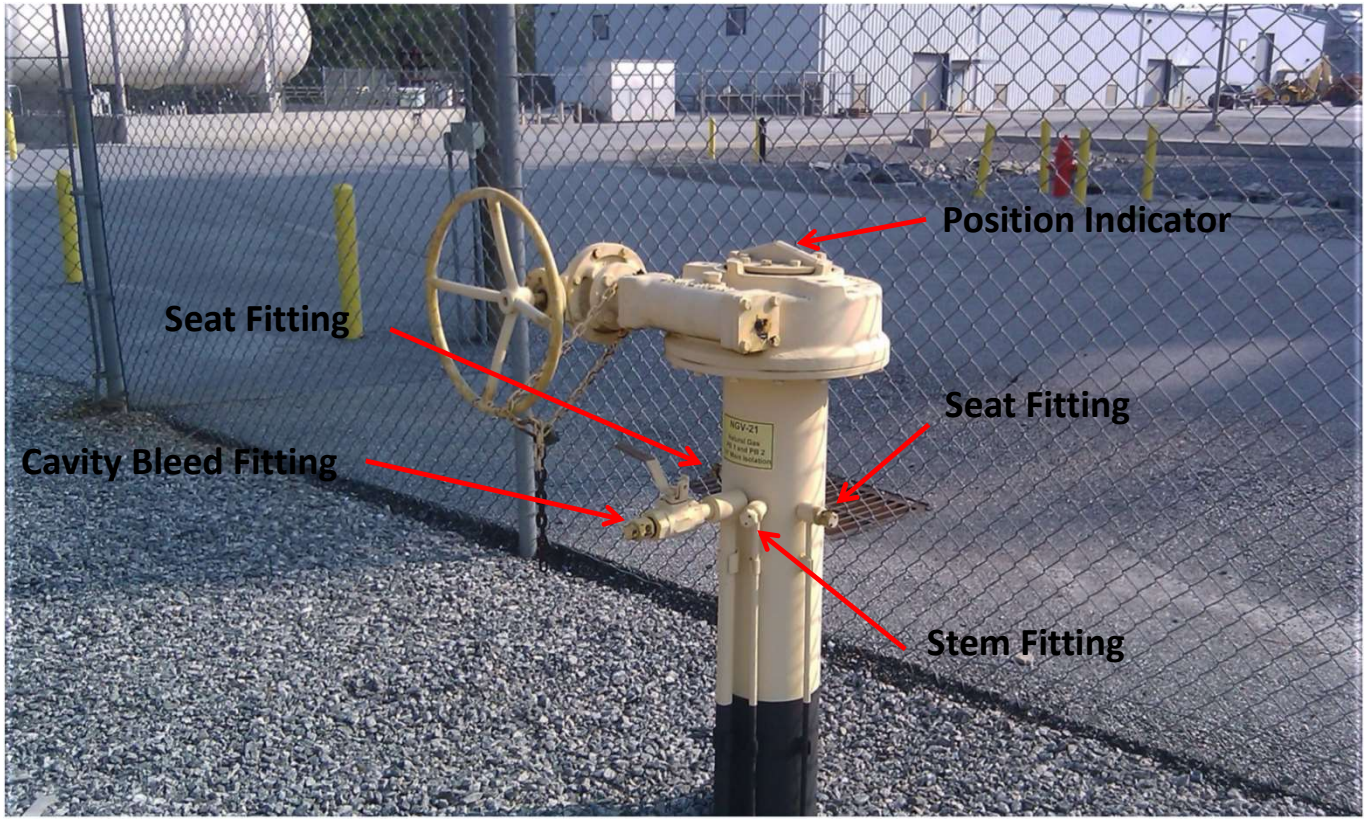
All-Welded Disassembly

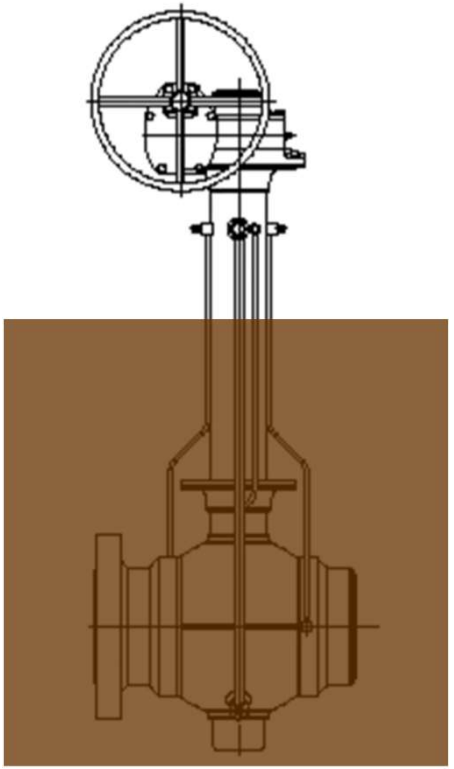


Bolted Body Disassembly



Buried Valve Configuration Example





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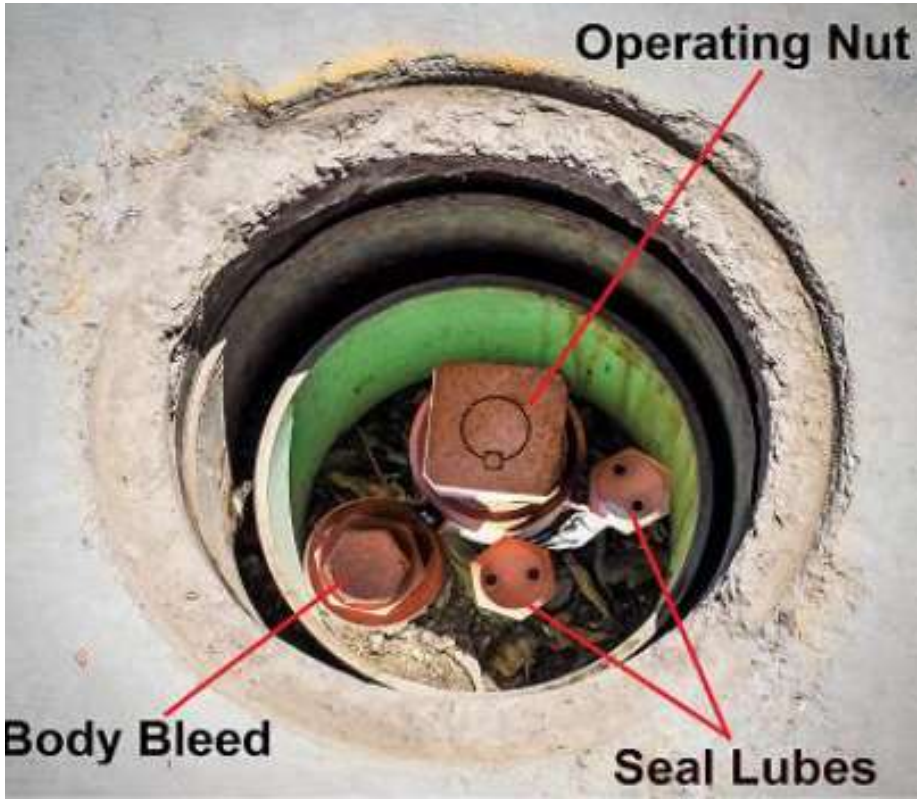
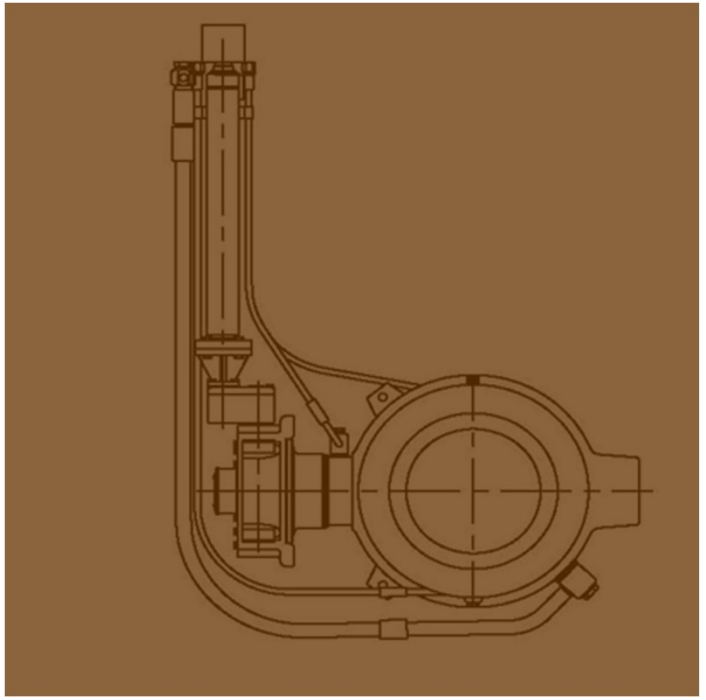
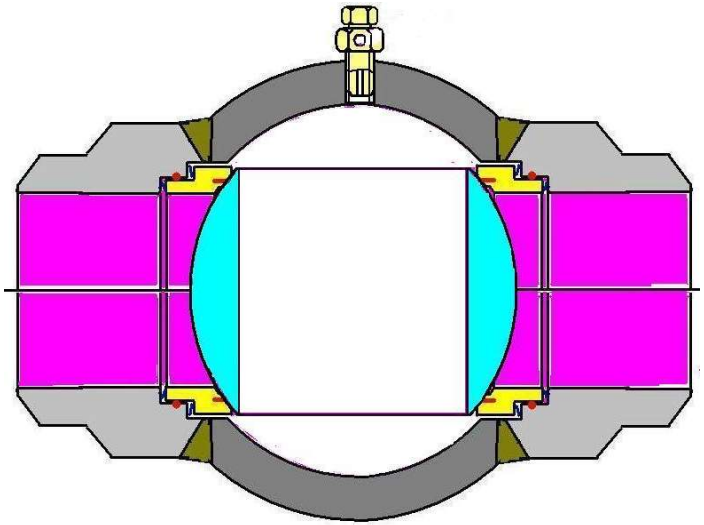




Block Valve vs. Double Block & Bleed Valve

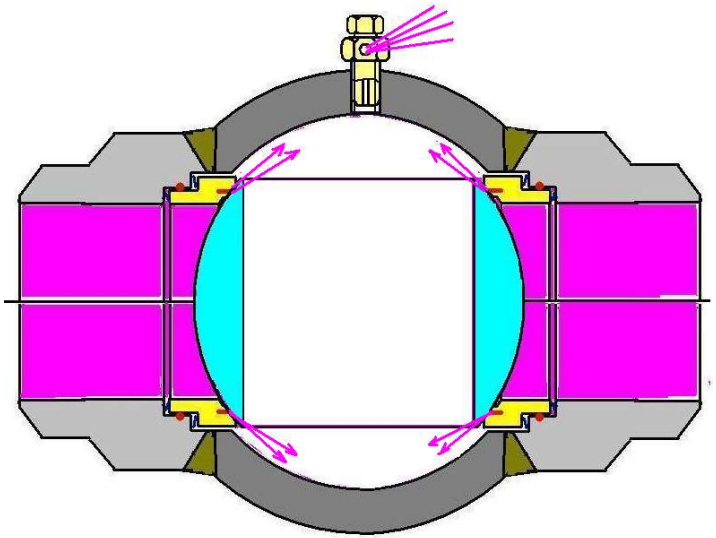
Defines how the valve works when pressure is applied to both sides of the valve and when the body cavity is blown down.

Double block & bleed



Seats are tight

Block valve



Seats leak

Causes of Hard To Operate, leaking & inoperable Ball Valves

- **External Causes** -
  - Actuator / manual gear operator stops set incorrectly – Verify full 90 degree travel
  - Damaged pressure relief, buttonhead fittings, stem seals or body seals

- **Internal Causes** -
  - Debris
  - Seat / Ball damage
  - Hardened sealants that contain solids
  - Seat to ball seizure / icing
  - Stem seals / packing damage

General Ball Valve Maintenance

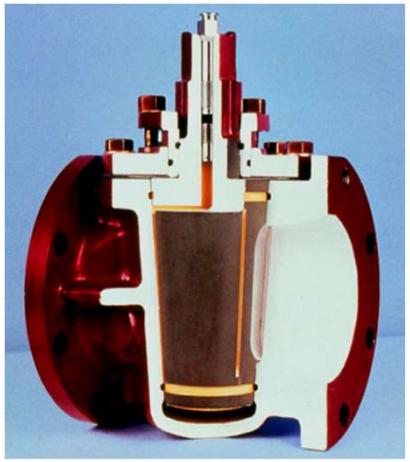
- Visual inspection
- Periodically operate the valve
  - Prior to operating the valve inject valve flush!
  - Generally, these valves should be lubricated/greased in the **Closed Position**, however Open position can be used if the valve cannot be cycled fully and/or during commissioning activities
- Periodically drain the valve cavity of solid debris & liquids
- DO NOT inject products in to the emergency stem seal injection port unless you have a stem seal leak!
- Abide by specific "OEM published" injection pressures. Some examples of which are;
  - All-Welded | <= 4" – 4000 PSI
  - All-Welded | >= 6" – 6000 PSI
  - Bolted Body | All sizes <= 1,800 PSI
  - Stem seal area | All sizes <= 1,500 PSI
- Field formula for problem valves, an ounce of lube sealant per inch of valve size
- Field formula for annual maintenance, a quarter of that amount
- Inspect manual gear operators, buttonhead fittings, blowdown fittings, breathers, weather seals etc.
- Lubricate manual gear operator using a marine grade grease (i.e. one that is not water soluble)

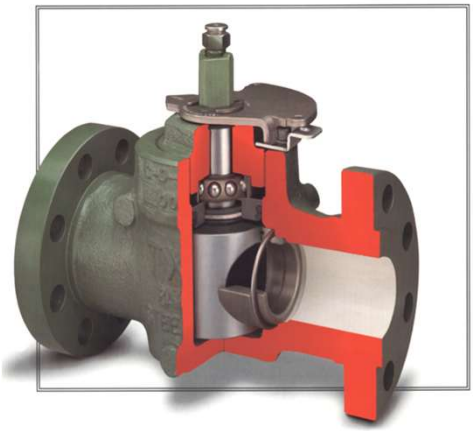
Plug Valves

Plug Valve Types

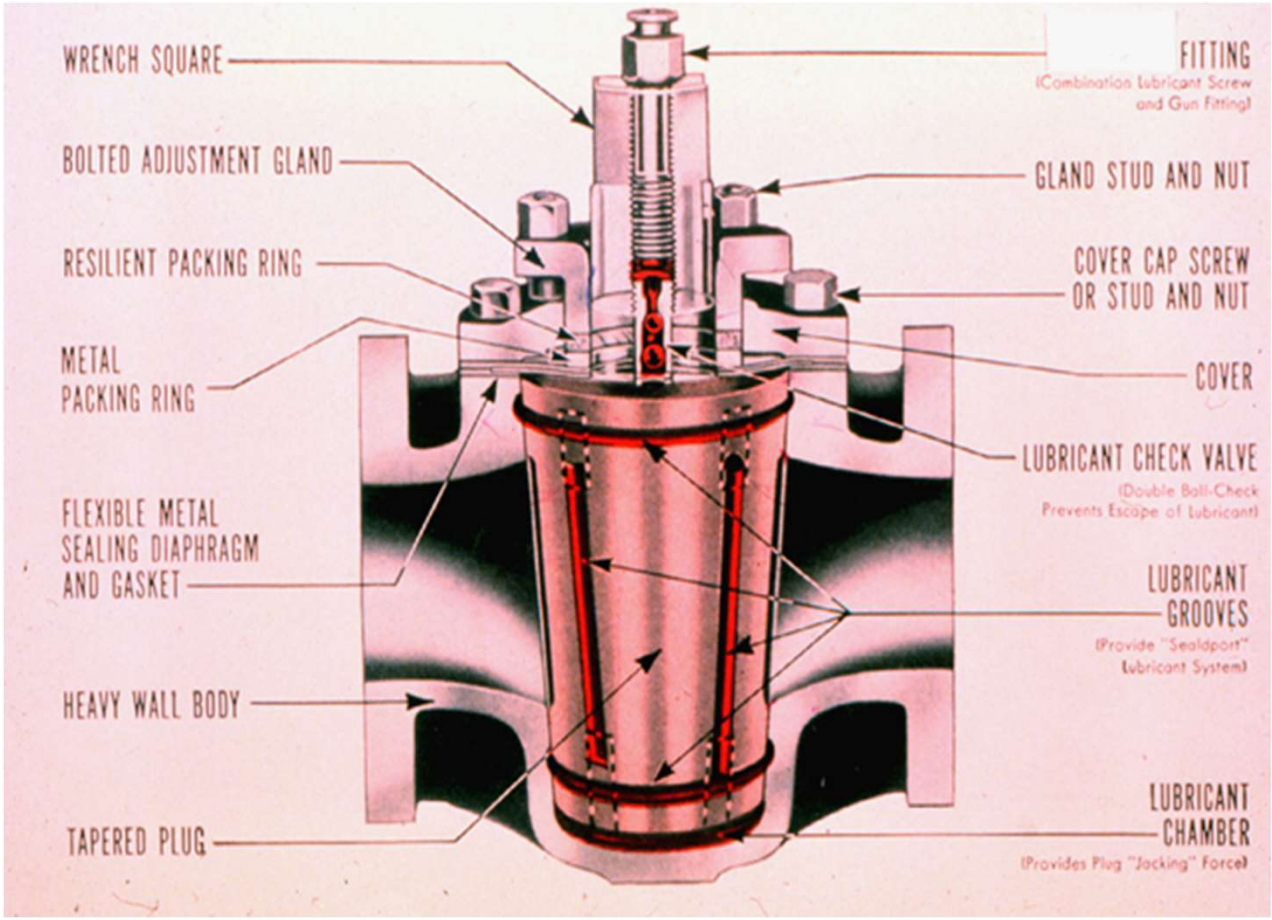
There are four types commonly found:

1. Tapered Plug Valves
2. Hypreseal or Bottom Entry Valves
3. Dynamic Balanced Plug Valves
4. Cylindrical Plug Valves



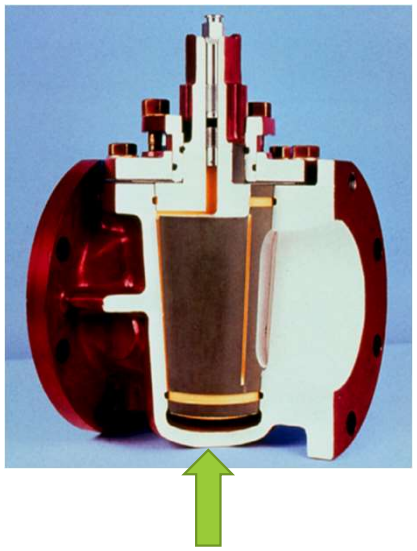


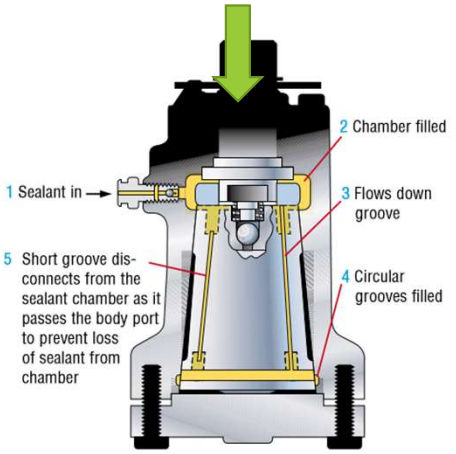
Plug Valves Parts Breakdown



Why use Sealant in a Plug Valve?

- To act as a hydraulic medium:
  - For the majority of plug valves, application of sealant under pressure lifts a tapered plug off its tapered seat
- Lubricity:
  - Sealant coats both the tapered plug and the tapered body in the valve body, making them slippery and allowing easier turning at reduced operating torque
- To act as a seal:
  - The valve sealant must fill the clearance between the plug and the body to keep the valve from leaking. Sealant must be replenished periodically or the valve will leak. Injection frequency depends on the resistance of the sealant to wash-out, pressure extrusion and frequency of operation

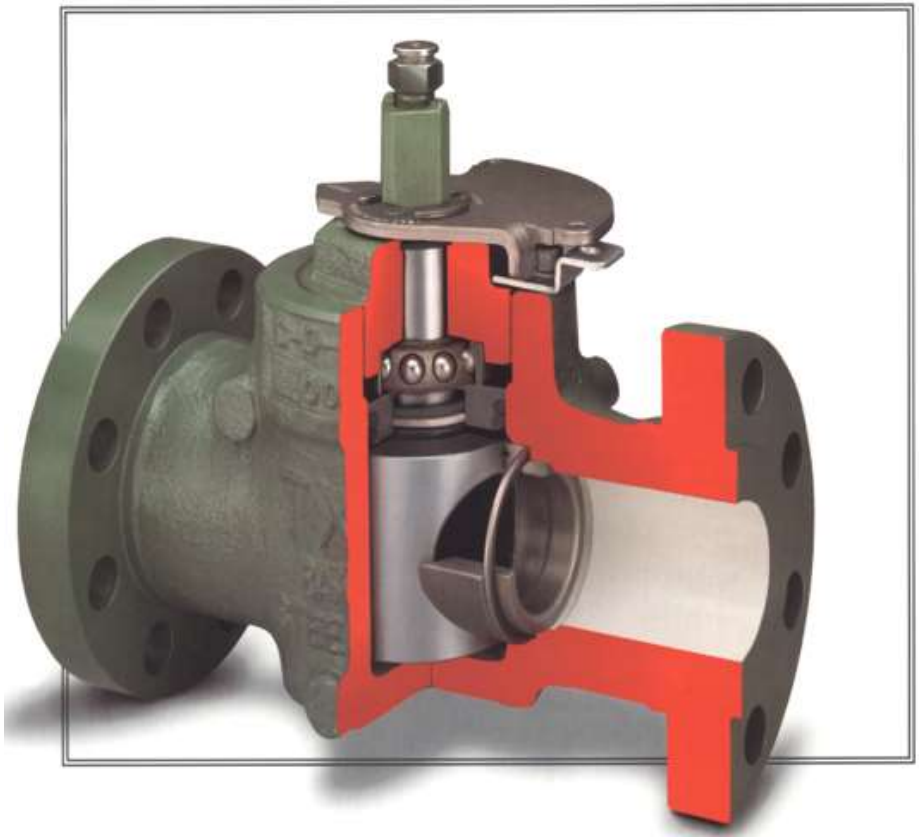




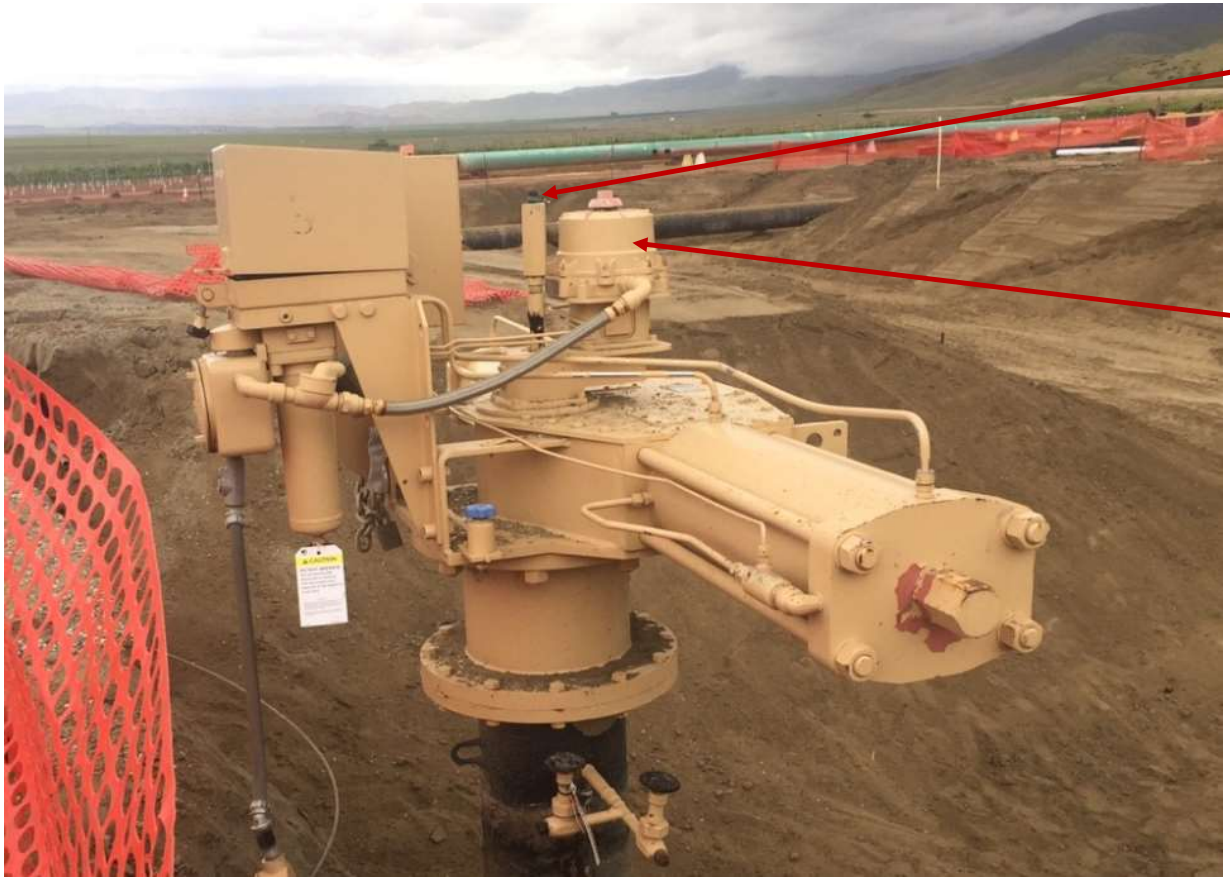
When the valve lifts from the seat, sealant spreads along the plug/body contact surfaces. This sealant spreads when the plug operates.

Bottom Entry Plug Valve Assembly

Cylindrical Plug Valve Disassembly



Buried ?? Valve Configuration Example



Causes of Hard To Operate, leaking & inoperable Plug Valves

- Lack of periodic lubrication and/or not injecting enough product
- Using the wrong product (for service conditions)
- Hard / dried out old stem packing
- Corrosion between the bonnet packing gland and the stem on the tapered plug
- The valve is not in properly adjustment. There is usually a tendency to loosen the bonnet on valves that are hard to turn, do not.
- Formation of solid fillers in the lubrication grooves such as clay, Teflon or other solids
- Any combination of the above

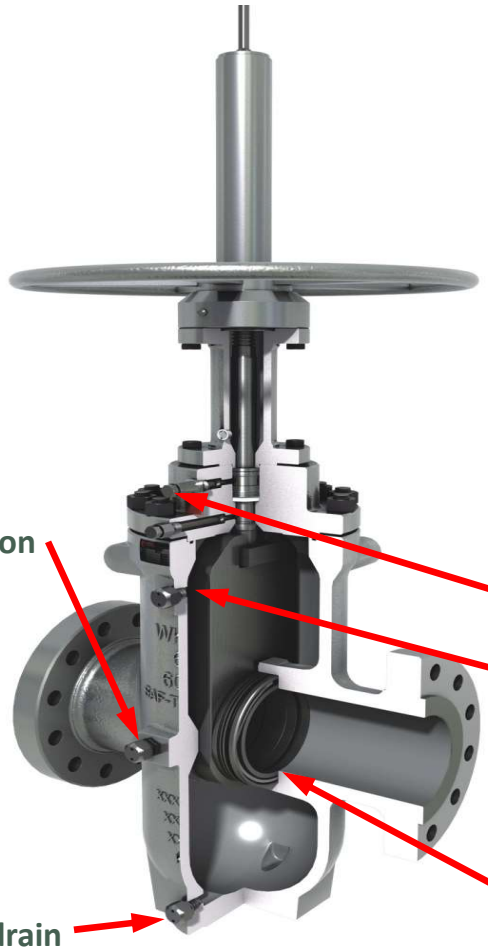
General Plug Valve Maintenance

- Visual inspection
- Periodically operate the valve
  - Should be lubricated/greased in the **Open Position**
- Abide by specific “OEM published” injection pressures. Some examples of which are;
  - Cast plug Valves | <= 4” – 4000 PSI
  - Cast Plug Valves | >= 6” – 6000 PSI
- Field formula for problem valves, an ounce of lube sealant per inch of valve size *
- Field formula for annual maintenance, a quarter of that amount
- Inspect manual gear operators, buttonhead fittings & weather seals etc.
- Lubricate manual gear operator using a marine grade grease (i.e. one that is not water soluble)

* > 12” plug valves can be substantially more than a x1 factor

Gate Valves

Slab Gate Valves



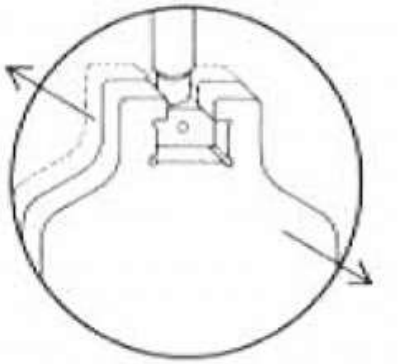
Seat Injection

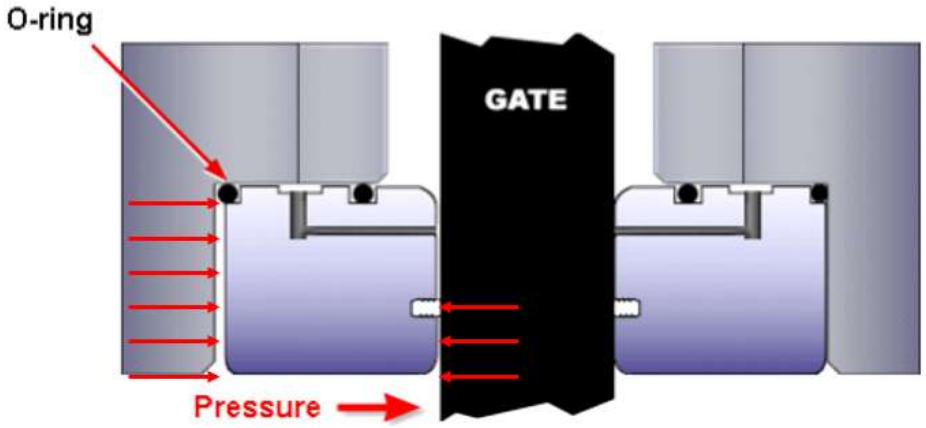
Packing plug

Cavity relief

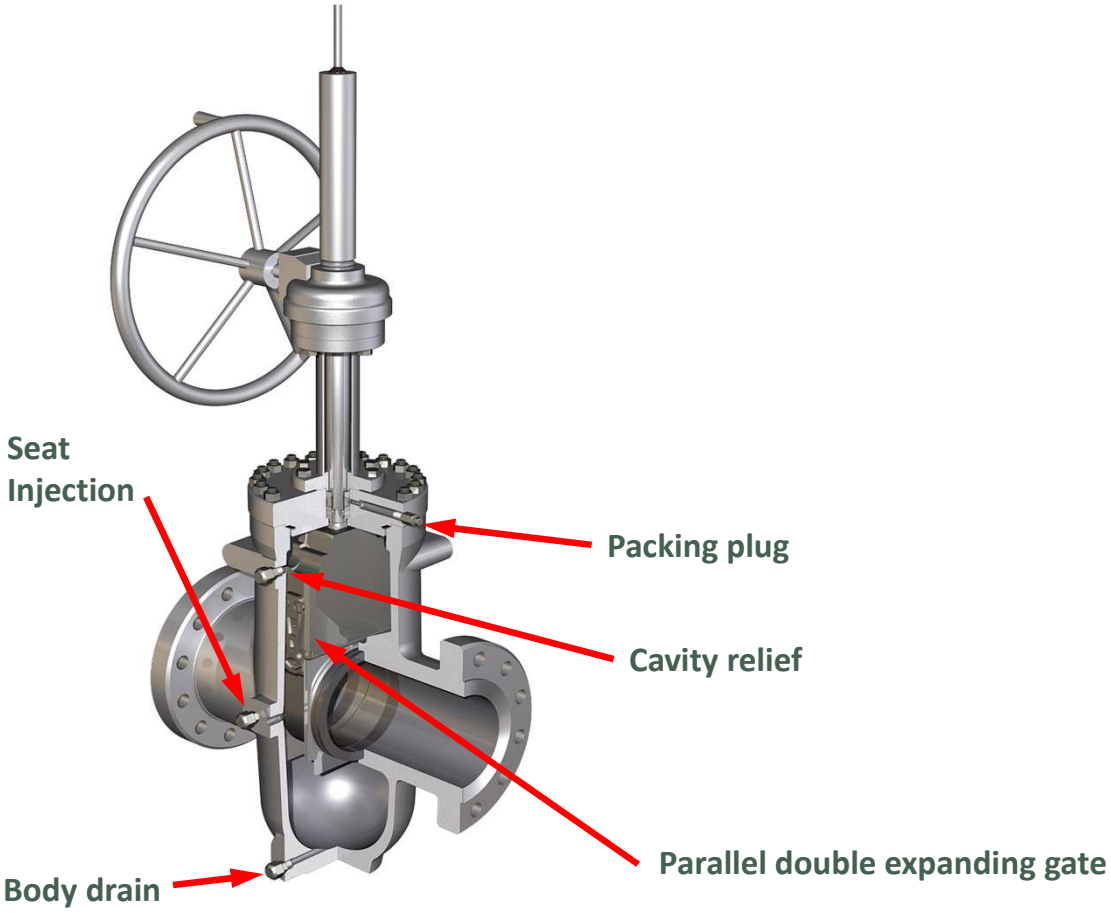
Body drain

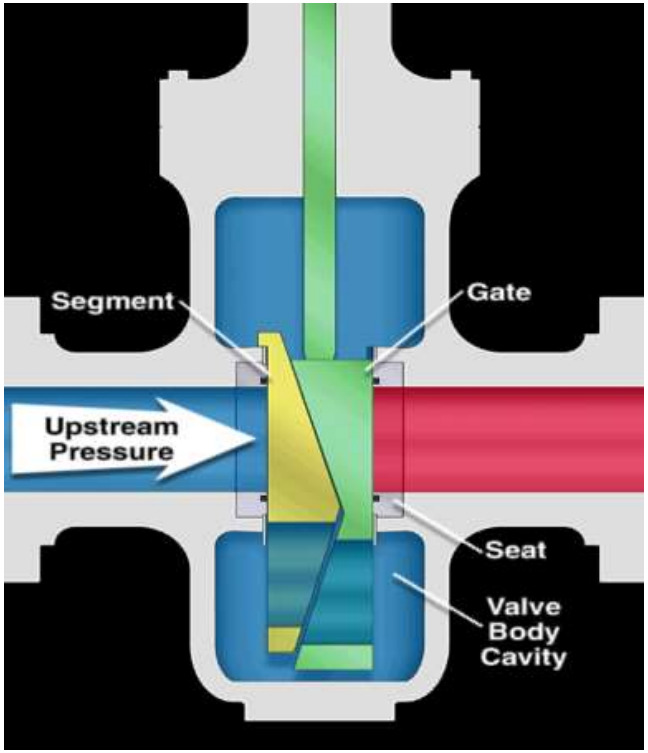
Spring loaded floating seats





Mechanical Gate Valves





Mechanical Gate Valves

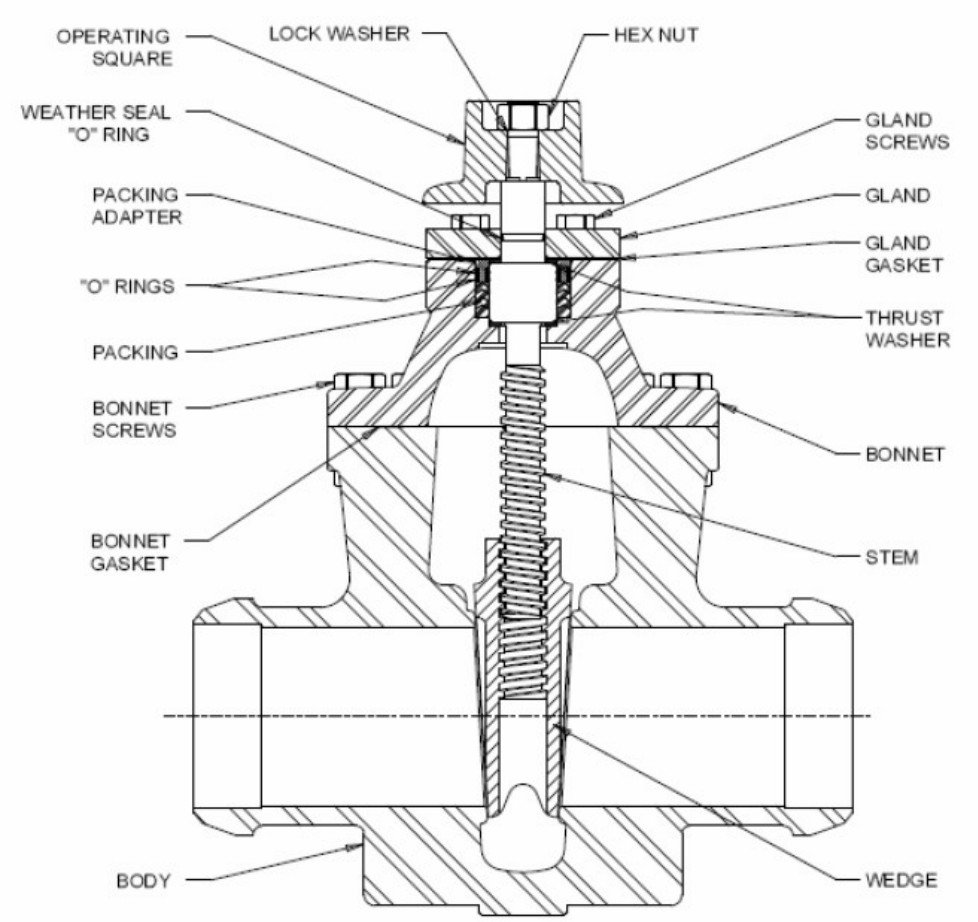


Table 1: Valve Specifications		
Valve Size NPS	**C/L to Top (in)**	**Number of Turns to Open/Close**
1	7.25	5.5
1-1/4	7.25	5.5
2	8.75	7.3
3	10.43	10.3
4	12.68	13.3
6	16.43	19.8
8	20.25	26.3
10	27.00	21.8
12	30.75	25.8
16	41.37	69.0

General Gate Valve Maintenance

- Visual inspection
- Periodically operate the valve
  - Prior to operating the valve inject valve flush!
  - Lubricate the valve seats once a year
  - Refresh stem packing as needed
- Abide by specific “OEM published” injection pressures.
- Periodically drain the valve cavity of solid debris & liquids
- Inspect buttonhead fittings & weather seals etc.
- Grease handwheel/bevel gear operator bearings using a marine grade grease (i.e. one that is not water soluble)

Overview Lubricants, Flushes & Sealants

Grease Guns

Lubricants/Sealants

Valve Cleaner

Valve Lubricant

Valve Sealant

Valve Fittings/Adaptors

Flush - Sealant Progression

Pipeline Debris

Pressure

Penetration

Valve Flush / Valve Cleaner

- Until we move pipeline debris or old hardened sealants that contain solids out of the way, we can not create a bead of sealant where we want it.
- Do NOT grease until you Flush!!!

Product Progression – TMBV & Plug Valve

TMBV

Lubricant
- 2000 Equa-Lube 80
- Regular maintenance
- Post Hydro
- Post Pigging

Flush
- Flush
- Valve Cleaner Plus
- Regular maintenance
- Hard to operate
- Seat leaking

Light Sealant
- 80
- Seat leaking

Medium Sealant
- 70/30
- Seat leaking

Heavy Sealant / **Sealant W/PTFE**
- 50/50
- Seat leaking

In Service "Valve OPEN"

Lubricant/ Flush
- 2000
- Flush
- Reduces operating torque

Plug V.

Flush
- Flush
- Valve Cleaner Plus
- Hard to operate and/or in-operable

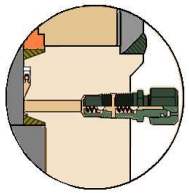
Light Sealant
- 80
- 70/30
- Regular Maintenance
- Seat leaking

Medium Sealant
- 911
- Seat leaking

Heavy Sealant / **Sealant W/PTFE**
- 8" > 50/50
- Seat leaking

Sealant
- Must have sealant to operate correctly

Steam S.



Medium Sealant
- 70/30
- Stem seal leak

OR

Sealant W/PTFE
- 50/50
- Stem seal leak

Flush - Sealant Capacity Guides

Valve Capacity Guide

Houston, Texas
Email: help@valtex.com
www.valtex.com
1-800-627-9771
1-281-530-4848

VALVE LUBE SEALANT CAPACITY IN OUNCES

These minimum capacities are provided by the manufacturer.
Twice the minimum capacity may be required to achieve the desired result.

SIZE	CAMERON BALL VALVE	GROVE-PBV BALL VALVE	PLUG VALVE
1/2	–	–	1/2 oz.
3/4	–	–	1/2 oz.
1	–	–	1 oz.
1 1/2	–	–	1 oz.
2	2 oz.	–	3 oz.
3	2 oz.	–	4 oz.
4	3 oz.	–	5 oz.
6	4 oz.	3 oz.	9 oz.
8	6 oz.	3 oz.	11 oz.
10	6 oz.	4 oz.	14 oz.
12	10 oz.	4 oz.	17 oz.
14	10 oz.	4 oz.	32 oz.
16	12 oz.	5 oz.	40 oz.
18	18 oz.	5 oz.	56 oz.
20	20 oz.	8 oz.	72 oz.
22	22 oz.	10 oz.	80 oz.
24	24 oz.	10 oz.	88 oz.
26	26 oz.	12 oz.	96 oz.
28	26 oz.	13 oz.	–
30	30 oz.	14 oz.	112 oz.
32	–	14 oz.	–
34	34 oz.	15 oz.	–
36	42 oz.	16 oz.	–
38	–	16 oz.	–
40	64 oz.	18 oz.	–
42	68 oz.	18 oz.	–
48	102 oz.	22 oz.	–

When using **Valve Flush** it may be necessary to perform the **flushing procedure twice.** ***See instructions on reverse side.***

LUBRICATION PROCEDURE FOR PLUG VALVES

1. Make sure the valve is in the full open position.
2. Load the gun with the proper amount of lube sealant called for on the capacity chart. Return the piston in the hydraulic gun to the desired depth using the markings on the gun handle. Do not force the stick into the barrel. If the stick is out of round, before unwrapping, roll it in your hands and reduce the diameter. Rewrap any unused portion.
3. Pump the lube sealant into the valve.

CAUTION: Do not exceed 4000 PSI on valves 4" or smaller and 6000 PSI on valves 6" and larger. Consult your manufacturer's catalog and assess the general condition of your valve to determine a safe injection pressure.

NOTE: It takes approximately 350 strokes of a hydraulic gun to pump 8 ounces of material.

REMEMBER THESE TWO POINTS

ROUTINE MAINTENANCE WITH THE PROPER LUBE SEALANT IS YOUR BEST ASSURANCE OF TROUBLE FREE VALVES.

SOLID FILLERS IN YOUR LUBRICANTS OR SEALANTS ARE A MAJOR CAUSE OF VALVE MALFUNCTIONS.

3/06

Houston, Texas
Email: help@valtex.com
www.valtex.com
1-800-627-9771
1-281-530-4848

THE PROPER USE OF "VALVE FLUSH" ON PLUG VALVES

1. Before using "VALVE FLUSH" try to turn the valve. This could loosen some of the particles that are binding the plug.
2. Make sure that the valve is in the full open position.
3. Tighten the bonnet bolts snugly with a box or open end wrench. Use a crisscross method to insure even tightening.
4. Add "VALVE FLUSH" equal to the sealant capacity listed for the valve.
5. Load the required amount of "VALVE FLUSH" into the gun and pump it into the valve. We recommend that you do not exceed an injection pressure of 4000 PSI for valves 4" and smaller and 6000 PSI on valves 6" or larger. Please consult your manufacturer's catalog or assess the general condition of your valve to determine a safe injection pressure.

   NOTE: Remember to use the markings on the gun handle to determine how far to push the piston down. It will be your measuring stick. Each mark is 1 1/8 inch and is equal to approximately one ounce.
6. If the gun will not build pressure, check the following:
   a. Seepage around the fitting: Inspect the coupler washer and the fitting for defects or trash.
   b. Leakage around the bonnet: Tighten the bonnet bolts again.
7. Try to keep the pressure above 1000 PSI. If the pressure drops rapidly or never builds (after following procedures in number 6) you are probably relieving in one or two veins only.

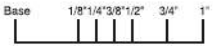
   NOTE: You can try to build a false blockage by injecting a small amount of lube sealant (approx. 10 to 20% of its capacity) to temporarily plug the open veins and allow the "VALVE FLUSH" to build pressure against the veins that are still clogged.
8. After injecting "VALVE FLUSH" let it soak for 30 minutes or as long as possible to allow it time to soften the hardened deposits.

   CAUTION: Never remove the coupler before opening the bleeder valve on the gun. Keep your hand away from the coupler and wiggle the hose to release trapped pressure.
9. Flex the valve approximately 10 times by turning it from an open to a closed position. Any valve that cannot be closed completely should be closed as much as possible.
10. Tighten the bonnet bolts again.
11. If required repeat the procedure from step 2.

Riser Pipe/Extension Calculation

Inside Diameter	Ounces Per Foot
1/4"	.5
3/8"	1.3
1/2"	2.0
3/4"	4.0

Fitting Reference



Grease Guns – Hand, Pneumatic, Electric & Foot

Hydraulic Hand Grease Gun.

- 352 Strokes to pump J Stick (8 oz.)
  {44 pumps / ounce}

Pneumatic/Hydraulic Grease Gun.
Electric Grease Gun.

- Injects a J Stick (8 oz.) in as little as 1 minute

Foot Grease Gun.

- 88 Strokes to pump an entire J Stick (8 oz.)
  {11 pumps / ounce}

Foot Grease Gun.

- 88 Strokes to pump an entire J Stick (8 oz.)

Grease Guns - Pneumatic

Grease Gun.
- 40# pails
- Controls on handle
- Bulk volume & speed

Grease Gun.
- 10# cans
- Controls on hand

Grease Gun.
- 10# cans
- Controls on handle
- Smaller and more portable

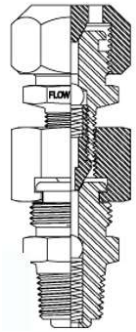
Grease Gun.
- 40# pails
- Bulk volume & speed

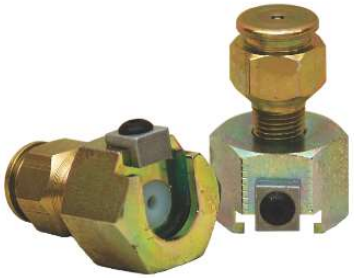
Pressure Gauge Reading Techniques

In order to determine what is happening inside the valve, every gun or pump should be equipped with a working high-pressure gauge. Watch the gauge climb as sealant is injected; if the valve seat sealant system is empty, the gauge will build pressure with each stroke and drop off very quickly. As the seat sealant system fills, the gauge will drop off more slowly. The slower the gauge drops off, the tighter the fit between the seal faces. This is usually a good indication that the valve will seal when required. Cold weather will effect the viscosity of the sealing compounds and can give confusing signals. Practice pumping in all climates and conditions so you better understand by watching the movement of the gauge when the lubricant / sealant is moving into the valve passages

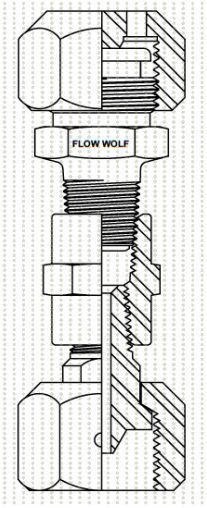
Specific Adaptors

Part Number
H-ASSY-COUP





Part Number	Thread Size
AF-1	For Giant Buttonhead
AF-2	For Standard Buttonhead

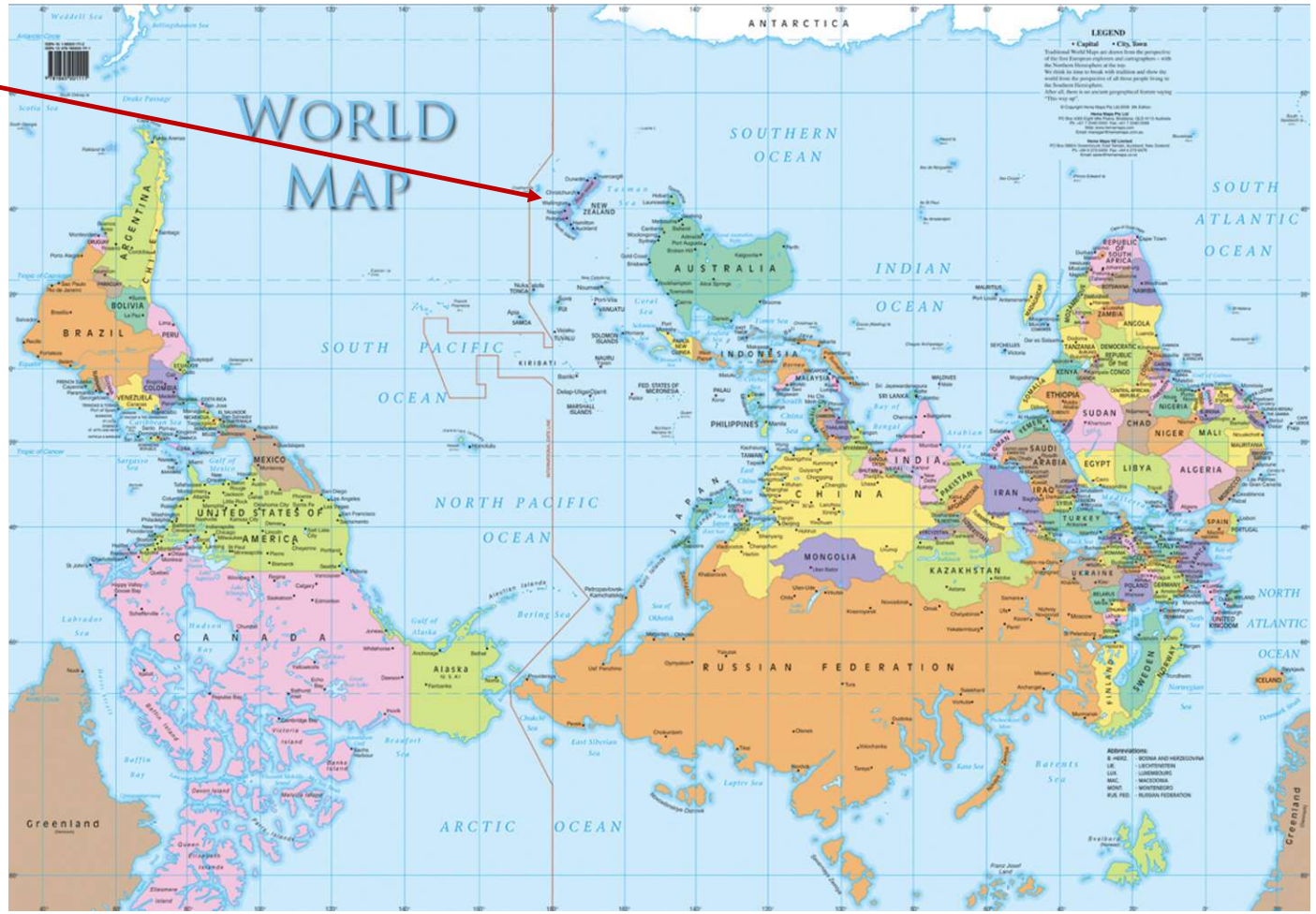


Material	Part Number
Carbon Steel	D-FW-SO-BH

Part Number
PRT-12

Where is New Zealand?

Bingo!



Closing Questions

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