

OPERATION & MAINTENANCE OF NATURAL GAS VALVES



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Manufacturer Qualifications



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Disclaimer

- Gas employees must follow the company's written O&M policies and procedures. Those policies take precedent.
- There is no "perfect" valve. All valves require some type of maintenance, regardless of what a manufacturer may say.
- Improper valve selection cannot be overcome by proper maintenance practices. Selection considerations include environment, pressure differential when closed, and service application.



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Early Plug Valve Design - Pompeii



1st. Century, BC

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Valve Basics

- Valve (valv), n - a mechanical device that is used to control a liquid or a gas in a piping system.
- Most gas valves operate in a "clockwise closed" manner. (With stops.)
- There are different valve types with operating characteristics that vary from manufacturer to manufacturer.
- In order to operate & maintain a valve properly, a technician must know the mechanics of the valve and the consequences involved.
- More grease or a bigger wrench isn't always the answer!
- If you experience leakage, make sure the valve is fully closed!

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Know Your Valve

- What kind of valve is it?
 - Three major valve designs are used in the gas industry. (Ball, Gate, Plug)
- How does it operate?
 - Number of turn(s) to close?
 - Is it clockwise-turn to close?
- What does it serve?
 - Operating the valve fully.
- Is it open or closed?
- What is the maintenance requirement?
- Does it operate properly?
- Are there any unusual problems?
- Can you use a search engine?



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Sealants, Cleaners, Lubricants

- Sealants are designed to provide primary or secondary sealing, depending on valve type.
- Cleaners are designed to flush or remove debris from valve internals.
- Lubricants are designed to displace moisture, provide lubrication to seat assemblies, and prevent corrosion.
- Sealants vary in texture, temperature range, and application.
- Each is introduced into a valve by using sealant injection equipment such as a hand gun.
- Improper selection can hinder valve performance.

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Sealant / Cleaner Cross Reference By Manufacturer

Manufacturer	Sealant	Cleaner
Nordstrom	950	VXX
Val-Tex	No. 80	Valve Flush
Sealweld	Total-lube 911	Valve Cleaner
Climax	950	VCS



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Valve Flush / Cleaner

- In plug valves, cleaners are used to soften old and hardened sealant that is clogged in the sealant chambers. This dried sealant will increase turning torque.
- In ball valves, cleaners are used to remove deposits that adhere to the ball and affect seating performance. Cleaners do not have the same characteristics as sealant.
- Cleaners will evaporate over time. With weakened sealant remaining, a plug valve will eventually leak if new sealant is not injected.

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Lubricated Plug Valve

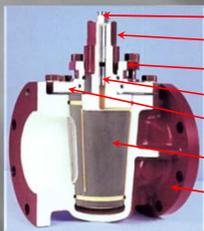
- A quarter-turn valve.
- Two types, cylindrical and tapered.
- Tapered plug, reduced port. (60% - 70%)
- Sealant serves as sealing element.
- Requires maintenance.
- Several designs and pressure classes.
- Reliable downstream shut-off when properly maintained.



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Tapered Plug Valve



- Sealant Fitting
- Wrench Square
- Gland
- Internal Check
- Cover
- Plug
- Body

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Plug Valve Maintenance Tips

- Don't use a pipe wrench or tool that has serrated teeth. The material will weaken over time when a pipe wrench is applied.
- Clean the sealant stem face and giant button head coupler before lubricating valve. **For proper lubrication, the valve must be fully open or fully closed.**
- When injecting sealant into the valve, monitor the injection pressure using the gauge on the gun. Be sure not to over pressurize the sealant system or damage can result.

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- Cycle the valve completely if possible after lubrication. If not, cycle about 45 degrees so the sealant will spread evenly within the valve.
- If the valve is hard to turn or seized, and the sealant injection pressure is acceptable, the problem is likely to be exterior corrosion around the operator and / or gland. *Applying excessive turning torque can possibly damage the valve!*
- Look for abnormal conditions that can affect performance or be a safety concern.

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Corrosion Effects

- Corroded Bonnet Bolt & Nut
- Corroded Gland
 - Stud
 - Nut



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Plug Valve Lubrication

- "Topping Off" of the sealant system should be performed on a routine basis. Usually 20% - 25% of the system capacity.
- Injection pressure will vary with sealant type, ambient temperature, valve condition and size.
- When the injection pressure climbs, plateaus, then falls quickly, the valve is properly lubricated.
- If the pressure continues to climb, a blockage exists, either in the plug, or the sealant fitting.
- If the pressure never reaches a plateau, the valve either needs additional sealant, or the plug adjustment is too loose.

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Plug Valve Cleaning

- Calculate the sealant capacity of the valve.
- Inject the cleaner into the valve and cycle a couple of times if possible. Re-inject if needed. Allow to remain in the valve until desired results are reached.
- Follow-up with re-lubrication of valve.
- When new sealant is injected into the valve after the cleaner, the old sealant will be forced into the pipeline.



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Plug Valve Capacities

- **PLUG VALVES**
 - 4" Valve & Smaller - 1 oz./inch size
 - 6" Valve - 12" Valve - 1.5 oz./inch size
 - Greater than 12" Valve - 2 oz./inch size
- **HIGH PRESSURE HYDRAULIC HANDGUN**
 - 1/16th oz./stroke
 - 8.2 oz./"J" Stick
 - 8.2 oz./Gun Pack
- **EXTENDED SEALANT LINES**
 - 1/4" Pipe - 0.5 oz./foot length
 - 1/2" Pipe - 1.5 oz./foot length



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Replacing a Sealant Fitting

If the sealant fitting must be replaced, use caution when removing it.

- a. Defective internal ball check fitting can cause gas leakage. Wiggle the fitting as you remove it as a method of insuring that the check fitting is secure.
- b. Seized threads can strip out the internal threads of the stem. Use penetrating oil and proceed slowly if seized threads are encountered.
- c. Do not allow debris to fall into stem opening.
- d. Replace the fitting with one of identical length.
- e. Screw the fitting into the stem opening completely.

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Plug Valve Adjustment

- Most newer Class 150 styles have no adjustment.
- Adjusting a plug is usually not required if the surrounding environment or product medium remains constant. Don't confuse a plug "set" for a seized plug.
- If an adjustment is required, fine tuning should be at no more than 15 degree increments and should be done evenly when multiple gland cover bolts are involved.
- Loosening a plug too much will compromise the ability of the valve to seal off when closed.
- Be sure to check for leakage and any cycling irregularity.



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Tower of London



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Ball Valves



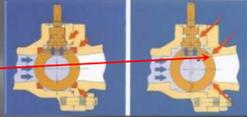
- A quarter-turn valve.
- Both full & reduced port.
- Three basic styles:
 - Floating
 - Trunnion
 - Hybrid
- The sealing mechanism is a stainless steel ball or plated ball, mating with a Teflon, Viton or similar material seat ring.
- May have *secondary* sealing system.
- Several designs and pressure classes.
- Wide variety in price based on application.

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Floating Ball Valve

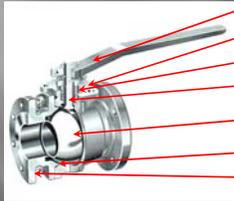
- When closed, the ball pivots forward to the downstream seat in order to make the seal.
- When the valve is closed, the pressure differential determines the breakaway torque.
- Maintenance free.
- Body design may limit repair to valve.



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Floating Ball Valve



- Operator
- Bonnet Cap
- Packing
- Stem
- Ball
- Seat
- Body

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Trunnion Ball Valve

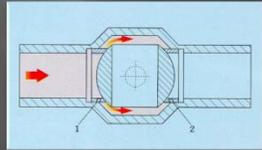
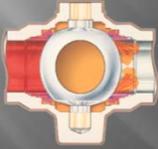
- Trunnion's are short shaft extensions that hold the ball in place so pressure differential has little effect on operating torque, excellent transmission application.
- *Secondary* sealing system.
- Seating mechanism involves upstream and downstream spring loaded seats in constant contact with the ball, assisted by pipeline pressure.
- Block & bleed capability, a technique used to depressurize a valve body cavity in the open and / or closed position. Valve must be "double seated" and have a draining mechanism.

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Seat Differences

- **Cameron - Self Relieving** – Pressure build-up in the body cavity will increase to a pressure that exceeds the spring tension against the downstream seat assembly. The downstream seat will disengage from the ball at 200 PSI and relieve the body cavity pressure.



- **Grove / Delta - Double Piston Effect** – Allows both up and downstream seats to seal against the ball with pressure from the same side of the valve in high pressure applications. Seat springs perform this function in low pressure applications (50 PSI).

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Block & Bleed Feature



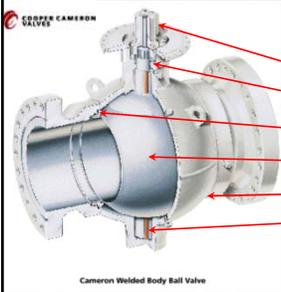
Cameron – Open or Closed
Grove / Delta – Closed Only

- Valve must be completely open or closed. ***Do not operate valve with block & bleed fitting open.***
- Open fitting to blow down body cavity pressure.
 - Seat integrity can be verified.
 - Downstream pressure can be safeguarded.
 - Stem seal can be replaced.

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Cameron Type 31 Valve



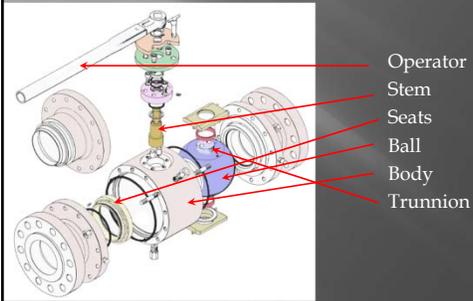
- Operator
- Packing Box
- Seats
- Ball
- Body
- Trunnion

Cameron Welded Body Ball Valve

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Grove B-5 / Delta Valve

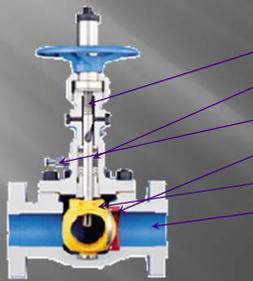


- Operator
- Stem
- Seats
- Ball
- Body
- Trunnion

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Orbit Ball Valve

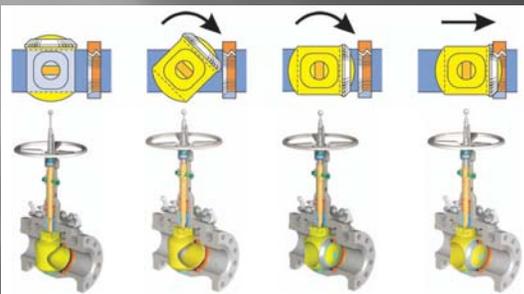


- Rising Stem
- Packing Box
- Packing Fitting
- Seat
- Ball
- Body

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Orbit Ball Valve Operation

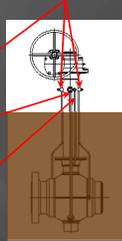


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Buried Valve Configuration

- Fittings are extended above ground along with the valve actuator.
- Capped lube fittings are located at the upstream and downstream points.
- Block & Bleed drain fitting is located at the mid-section of the valve.
- Capped stem lube fitting may be located next to Block & Bleed fitting.



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Buried Valve Configuration



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Ball Valve Seat Cleaning

- Periodic cleaning is necessary to remove pipeline dust and deposits from the seating area.
- Know the composition of the seat material because cleaning may also include seat lubrication. (Nylon vs Buna or Viton)
 - Use care when removing caps from any lube fitting. **NEVER** remove a fitting from a pressurized valve.
 - The hydraulic pressure required to inject a cleaner into a ball valve should be just above the operating pressure within the valve unless a blockage exists.
 - Inject the cleaner into the valve. Cycle the valve. Repeat this 2-3 times if severe debris is suspected. Block & Bleed the valve in order to verify results.



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Ball & Gate Valve Seat Capacities



- BALL & GATE VALVES
 - Most Valve Sizes - 0.5 oz. / inch size / seat
- HIGH PRESSURE HYDRAULIC HANDGUN
 - 1/16th oz. / stroke
- EXTENDED SEALANT LINES
 - 1/4" Pipe - 0.5 oz. / foot length
 - 1/2" Pipe - 1.5 oz. / foot length



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Ball Valve O&M Tips

- Use safety precautions when opening a block & bleed fitting. Be aware that pipeline liquids may be trapped in the body cavity.
- When removing seat sealant fitting caps;
 - Clear cap vent holes of any paint or other debris.
 - Don't stand directly in front of fitting while removing the cap.
 - Use a back-up wrench on the fitting while removing the cap.
 - **Do not** remove the fitting from the valve while the pipeline is pressurized.

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Ball Valve Tips, cont.

- Seats can "set up" if the valve has not been cycled for a long period of time, causing a higher than normal initial break away torque.
- Lubricate the gear box with a standard lithium or moly-type lube. Make sure water has not migrated into the gear housing.
- Insure that valve stops are clear of debris that could prevent the valve from completely closing.

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Ball Valve Tips, cont.

- If possible, fully cycle the valve so the ball is swept clean of debris.
- Ball valves are poor throttling valves because damage to the ball or seat will affect performance. Keep the valve fully open while in service.
- Don't use excessive torque while operating valve or damage will result.
- Open the Block & Bleed fitting on a closed valve when performing downstream repairs.

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Ball Valve Tips, cont.

- Sealant, when used as a *secondary* sealing feature, can be smeared along the ball and damage or dislodge the seat when cycled. Flush the seat with valve cleaner prior to cycling the valve. *Do not use a sealant enriched with PTFE particles.*
- Ball valves have very little tolerance between the bore and the seat ring. If the valve has a gear operator or actuator as the turning mechanism, be sure the stops are properly set and are completely closing the valve. One or two degrees from being fully closed can make the difference between a proper seal off or not.

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Gate Valves

- A multi-turn valve.
- Both full and reduced port.
- Have several different sealing features, depending on type of gate or wedge.
- May have *secondary* sealing features.
- Several designs and pressure classes.
- More expensive than quarter-turn valve.



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Wedge Gate Valve

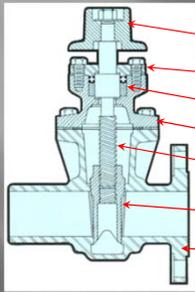


- Primarily used in distribution pressure applications.
- A non-rising stem style does not allow for visual verification of the gate position.
- Usually a metal to metal seat design both upstream and downstream.
- Lower profile design than conduit counterpart.

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Wedge Gate Valve with Non-rising Stem



- Operator Square
- Gland
- Packing
- Bonnet
- Stem
- Wedge
- Body

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General Gate Valve Tips

- Cycle the valve fully if possible so the stem is wiped clean of any debris. Paint, pipeline dust, etc. can affect turning torque.
- Don't use excessive torque or damage can result. Know the mechanics of the valve.
- Stem leakage is usually caused by ineffective packing. In most cases, the packing can be replaced with the valve in the fully open position.
- Improper packing adjustment can affect the operating torque of the valve.

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Hydraulic Hand Gun

- Injects sealant at pressures up to 10,000 PSI.
- Pressure gauge range from 0 - 15,000 PSI.
- Internal relief valve prevents the over pressuring of the sealant barrel (8,000 - 10,000 PSI).
- Hydraulic oil should be periodically checked and replenished.



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Observations Abnormal Conditions



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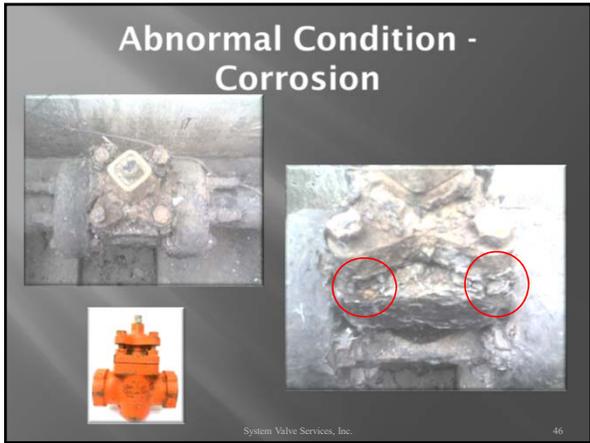
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Abnormal Condition - Corrosion

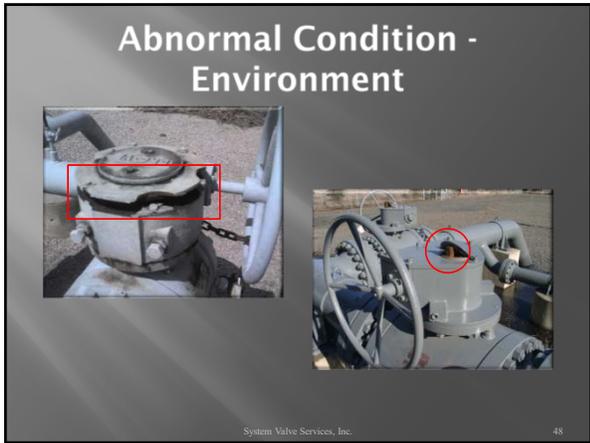


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Abnormal Condition - Idiocy



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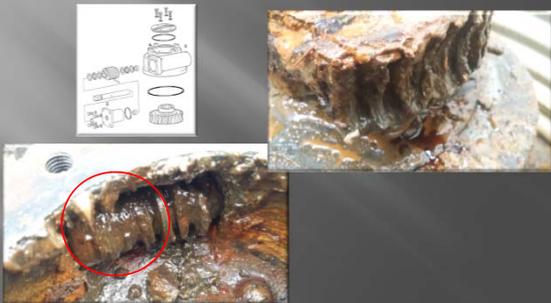
Abnormal Condition - Corrosion



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Abnormal Condition - Operator Error



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Abnormal Condition - Corrosion



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Abnormal Condition - Operator Error



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Abnormal Condition - Material Failure



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*Repeat:
Always refer to the manufacturer's guidelines and
your company's O&M plan before performing
maintenance or repairs.*

Questions?



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Metropolis, Illinois

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