



Asset Type: **Gas Distribution and Transmission**

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Title: Gas Valve Maintenance Requirements and Procedures

Overview

This work procedure provides maintenance requirements and procedures for plug, ball, and gate valves (referred to as “valves”) installed in and necessary for the safe or emergency operation of Pacific Gas and Electric Company’s (the Company’s) gas systems and facilities.

Governing Document

S4430, “Gas Facilities Requirements,” *Expected publication 2009*

Safety

Failure to perform required maintenance could pose a risk to public safety in the event of equipment or pipeline failure.

Perform work safely and in accordance with all applicable safety rules, the *Code of Safe Practices*, and Utility Standard Practice (USP) 22, “Safety and Health Program.”

Compliance

The manager of Gas Transmission and Distribution (G&D) Pipeline Engineering and the manager of Gas System Integrity are responsible for establishing and maintaining procedures to comply with this work procedure.

Division and district Maintenance and Construction (M&C) superintendents are responsible for implementing this work procedure within their respective organizations.

Division and district M&C superintendents must ensure that their valve maintenance supervisors are aware of and follow the requirements in this work procedure. Periodic audits by Company personnel may be conducted to ensure compliance with these requirements.

Responsible superintendents and supervisors must measure the implementation and effectiveness of this work procedure through the record reviews described in Attachment 1, “Valve Maintenance Record,” and regular field verifications. The California Public Utilities Commission (CPUC) also conducts compliance audits on the requirements set forth in this work procedure.

Gas Valve Maintenance Requirements

1. Purpose

The purpose of this work procedure is to provide procedural details for inspecting, lubricating, servicing, and operating gas valves.

2. Code Requirements

A. 49 CFR Paragraph 192.745, "Valve maintenance: Transmission lines" requires that:

"Each transmission line valve that might be required during any emergency must be inspected and partially operated at intervals not exceeding 15 months, but at least once each calendar year." and that

"Each operator must take prompt remedial action to correct any valve found inoperable, unless the operator designates an alternative valve."

B. 49 CFR Paragraph 192.747, "Valve maintenance: Distribution systems" requires that:

"Each valve, the use of which may be necessary for the safe operation of a distribution system, must be checked and serviced at intervals not exceeding 15 months, but at least once each calendar year," and that

"Each operator must take prompt remedial action to correct any valve found inoperable, unless the operator designates an alternative valve."

C. G.O. 112E Section 143.2, "Valve Maintenance" requires that:

"Each valve, the use of which may be necessary for the safe operation of a distribution system, must be inspected, serviced, lubricated (where required) and partially operated at intervals not exceeding 15 months, but at least once each calendar year."

D. 49 CFR 192 Subpart N – Qualification of Pipeline Personnel requires that:

All employees performing valve maintenance tasks need to be fully qualified to perform those tasks per the company's Operator Qualification Plan. Refer to the Utility Task and Subtask list in the Operator Qualification Plan.

3. Valve Maintenance Schedule

The responsible operating department must establish a schedule for valve inspection and maintenance. Mandatory work requirements, frequencies, and guidelines for additional recommended inspections and maintenance are as follows:

A. New Valves

All valves must be inspected and operated before installation. When operating a valve, verify that the ball, plug, or gate actually moves.

- 1) If a ball valve is to be buried, inspect the valve to ensure that any lubrication (or backup lubrication) and body cavity drain fitting(s) are extended upward to a serviceable location per Numbered Document F-21.2, "Material Specification for Carbon Steel Ball Valves."

Use the body cavity drain fitting to remove debris and liquids from the valve body and to test the seat integrity. Inspect the ball valve to ensure that all body relief valves are removed and plugged. Valve body relief valves are only necessary for valves in liquid service. Replace the relief valves with steel plugs with a pressure rating at least equal to that of the valve.

Also, inspect the valve to ensure that all shipping tabs are removed, unless they are two-bolt and on buried valves. Remove single-bolt lifting eyes before shipping, unless they are welded to the valve closure. For 14-inch and larger buried valves, two-bolt lifting eyes are required and can remain on the valve. Two-bolt lifting eyes are acceptable on valves smaller than 14 inches. Valves with feet that are single-bolted to the closure must be removed or welded to the closure before shipment. Company employees must never weld lifting eyes or feet to valves.

- 2) Before installing any lubricated-type plug valve, lubricate the valve. This ensures the proper flow and distribution of lubricant throughout the valve body (and lubricant extension pipe, if used). Construction employees must inspect and lubricate the plug valves in cooperation with the operating personnel responsible for the station maintenance after construction. If a valve is operating improperly, and the report needs to be made in the field, print out and submit a Material Problem Report (Company Form 62-0113). To submit the report on-line, go to "Material Problem Reporting Online" at <http://mpro.mpr.com>.

Lubricate other valves that require lubrication before installation. (After lubrication, but before installation, internally inspect the valves to ensure that the lubricant is properly distributed.)

Note: Some valves are designed to be operated without lubrication, but are supplied with backup lubrication systems to provide a good seal if the valve is worn. Do not lubricate these valves unless it is determined in the field that lubrication is necessary for proper operation. Once these valves are lubricated, they may require subsequent lubrication to achieve bubble-tight shut-off.

- 3) Maintenance personnel must prepare a Valve Maintenance Record for each new valve and verify that the proposed (prior to construction) and final (after construction) Operating Diagram and Operating Map, or Division Station Sketch, have been issued and are accurate. Valve position for valves that are normally open or normally closed must be clearly shown on these documents. Automatically controlled valves must be so indicated.

B. Manually Operated Valves

Gas transmission valves classified as “emergency,” gas distribution “critical” main valves, and district regulator station valves, including upstream and downstream fire valves, must be inspected, serviced/lubricated (where required, see the paragraph above), and operated (see [Paragraph 3.A., “New Valves.”](#)) at intervals not exceeding 15 months to the date, but at least once each calendar year. If a valve requiring lubrication (all plug valves and ball valves if a positive shutoff cannot otherwise be obtained. Gate valves do not require lubrication,) is not lubricated regularly, it may become inoperable, not shut off adequately when necessary, or develop external valve stem leakage. Each responsible operating department must identify all gas transmission “emergency” valves, gas distribution “critical” main valves, and district regulator station valves and ensure that these valves are properly maintained. For gas distribution “critical” main valves, see [Attachment 2, “Gas Distribution Critical Main Valves,”](#) and for district regulator station valves, see Work Procedure WP4430-03, “District Regulator Station Maintenance.”

- 1) Gas transmission valves classified as “Operational” and “Maintenance” must be inspected, lubricated, and operated annually.
- 2) Use Selig Grand Slam grease to re-lubricate *manual* gearboxes. See www.seligind.com for more information. The product comes in 14 ounce (oz.) tubes for handguns (24 tubes to the case) and in 7 pound (lb.) pails (about the size of a 2 lb. coffee can). This product is not considered a hazardous waste. The grease is good up to 550° Fahrenheit (F). It should never “separate” in the valve gearboxes and is good for extreme contact pressure between mating gear teeth. If grease separation does occur, remove the old grease and replace with new Selig Grand Slam grease.

C. Power-Actuated Valves

All power-actuated valves installed in Company gas systems must be maintained in accordance with the maintenance requirements listed below. The Company specifies more stringent maintenance schedules for these valves because of the following:

- Power-actuated valves have added complexity because of valve actuation and control.
- Power-actuated valves are commonly used in throttling applications.
- Power-actuated valves are typically more critical to system operation.

Power-actuated isolation and block valves must be inspected, serviced, lubricated, and operated twice each calendar year (at approximate 6-month intervals). Power-actuated regulating valves on standby (not required to regulate during normal operations) and power-actuated valves used for overpressure protection (monitors) must be partially operated and inspected once a month and serviced and lubricated (unless exempted by [Paragraph 3.A., “New Valves.”](#)) twice each calendar year (at approximate 6-month intervals). Power-actuated ball and plug valve regulators used frequently during normal operations must be lubricated and inspected at least once every 2 weeks. During the first days of operation or after a significant operating change, closely observe power-actuated valves used as regulators. If a valve is operating often, lubrication may be

needed as frequently as every other day.

D. Modifying the Valve Maintenance Schedule

Modify the valve maintenance frequencies specified in Paragraphs 3.B. "Manually Operated Valves," and 3.C. "Power-Actuated Valves," to provide additional inspecting, servicing, and lubricating, when necessary. This is especially important when valves are operated more frequently or when there are special operating conditions. Reducing any of the specified maintenance frequencies to make them less stringent is not allowed.

4. Inspection Procedures

- A. Before lifting the lid and entering any pit or vault, observe the necessary precautions regarding barricading, identifying sources of ignition, and checking for combustible gases in accordance with Utility Standard 54414, "CGT Confined Space Entry Program," Work Procedure WP4414-01, "Work Procedures in Confined Spaces," and the *Code of Safe Practices*.
- B. If a valve is located in a valve box or a vault, follow these steps:
 - 1) Ensure that the valve box or vault is cleared of any debris that would interfere with or delay the operation of the valve.
 - 2) Ensure that there is adequate access to the valve (the vault cover opens, etc.), the valve is adequately protected (the vault and vault cover have integrity), and the vault is safe for the employee to enter.
- C. Inspect the valve for the following problems:
 - 1) Missing valve number tag.
 - 2) Broken or missing valve components (e.g., lubrication fitting, handwheel, padlock).
 - 3) Any gas or oil leaking on the valve body, high-head extension, or valve operator.
 - 4) Signs of external corrosion and/or degradation of coating. For buried valves with high-head extensions, inspect the air-to-soil transition for signs of corrosion or disbondment of the wrap.
 - 5) Valve not locked in the appropriate position.
 - 6) Identify any issues on the "Valve Maintenance Record" (Attachment 1) and schedule for repair, if appropriate.

5. Operating Valves During Maintenance

- A. When servicing a valve as required in Section 3, "Valve Maintenance Schedule," the valve must be **operated** (or "stroked") through its complete range when operating conditions permit. When operating conditions do not permit full operation of the valve (such as the downstream piping would be over pressured or the flow through the valve would be adversely affected), stroke through the maximum range that is practicable. For normally closed valves, never stroke the valve less than the amount required to establish flow through the valve. Listed below are recommendations for partially operating various types of valves.

- **Plug valves with gearing:** For a normally open valve, take the “slop” out of the gearing and then turn the valve handle three complete turns. For a normally closed valve, just barely initiate flow or until the operator indicates approximately 25% of travel (22.5° open position).

Note: Plug valves do not start to flow until 20-23° open.

- **Plug valves without gearing:** For a normally open valve, take the “slop” out of the keyway, then move through approximately 25% of travel (67.5° open position). For a normally closed valve, just barely initiate flow or until the valve wrench indicates approximately 25% of travel (22.5° open position).
- **Ball valves with gearing:** For a normally open valve, take the “slop” out of the gearing and then turn the valve handle three complete turns. For a normally closed valve, just barely initiate flow.
- **Note:** Ball valves do not start to flow until 6-8° open position.
- **Ball valves without gearing:** For a normally open valve, take the “slop” out of the keyway, then move through approximately 25% of travel (67.5° open position). For a normally closed valve, just barely initiate flow.
- **Gate valves:** For a normally open valve, take the “slop” out of the gearing, and then turn the valve handle one complete additional turn. For a normally closed valve, just barely initiate flow.

B. Verify the number on the valve tag against the Operating Map, Operating Diagram, Division Station Sketch, or Division Plat Sheet and on the Valve Maintenance Record.

- i.) If they do not match, notify the maintenance supervisor immediately.
- ii.) For any changes required on an Operating Diagram or Operating Map, submit revisions to the GT&D Principal Mapper, per the requirements of 34460, Attachment 1.

C. After operating a valve, return it to the “as found” position. Log the “as found” and “as left” positions on the Valve Maintenance Record.

- i.) If a valve is found in the wrong position according to a diagram or maintenance record, investigate the system operation to determine in which position the valve should be left. Notify the appropriate personnel (supervisor, GSO, planning engineer) to validate any valve position change prior to correcting valve position.
- ii.) Log that change on the Valve Maintenance Record along with the reason for the change. Redline local diagrams, or submit changes per section 5-B-ii above.

D. To report problems encountered when operating any valve, either during scheduled maintenance or at any other time, either print out and submit a Material Problem Report (Company Form 62-0113), or, to submit the report on-line, go to “Material Problem Reporting Online” at <http://mpro.mpr.mpr.gd>. Complete a PIM Work Request or a Corrective Notification, whichever is appropriate, to correct any problem on a valve.

E. If a valve is inoperable, immediately notify the maintenance supervisor so that prompt action is

initiated to remedy the problem. Also, note the inoperability on the "Valve Maintenance Record" (Attachment 1) and either print out and submit a Material Problem Report (Company Form 63-0118), or, to submit the report on-line, go to "Material Problem Reporting Online" at <http://mopr/mpr/mpr.do>. For inoperable valves that are not under CPUC jurisdiction, the supervisor determines what action to take. At a minimum, identify non-jurisdictional valves left inoperable on the appropriate Operating Diagram, Operating Map, or Division Wall Map.

6. Lubrication Procedures

A. General

Periodic lubrication ensures that valves operate with minimal effort and seal properly to provide shut-off. In addition, lubrication can prevent external stem leaks in plug valves.

All equipment, such as valve lubrication guns, hypoguns, and pumps must be appropriate for the particular valve being maintained. Equipment must be kept in good condition and operated by qualified employees.

- 1) All lubricants must be clean. Only use specific lubricants recommended by the valve manufacturer. Refer to Section 7, "Approved Valve Lubricants," on Page 16. Using lubricants that are not recommended by the appropriate valve manufacturers voids the warranties and leaves the Company vulnerable in any potential lawsuit involving third-party damages that are considered caused by valve leakage. Refer to the manufacturer's lubrication instructions for the proper use of lubricants.
- 2) When lubricating valves equipped with buttonhead lubricating fittings, use a high-pressure grease gun that includes the appropriate pressure gauge. For valves equipped with lubricant screws, use slick-type lubricants.
- 3) **[Optional]** Attach a tag to the valve to indicate if lubrication is required. The tag must state the type of lubricant to use.
- 4) When double block-and-bleed type valves are exposed to water, condensate, or other foreign matter, drain/blow the valve body to prevent damage to the valve. Always drain/blow the valve body after hydrotests.
- 5) If a valve is difficult to operate or leaks from upstream to downstream, it may be necessary to flush out the old lubricant. See Section 8, "Valve Flushing Procedures," on Page 18.
- 6) If a valve will not seal off completely after performing the manufacturer's recommended procedures to stop leakage, inject the valve with limited amounts of Sealweld 5050 (10-oz. cartridge, Code M500042, 10-lb. pail, Code M500041). At the first occurrence that any valve needs Sealweld 5050 to operate properly, bring that valve to the attention of the M&C supervisor and Engineering. The valve may need to be replaced as soon as economically feasible. Note the use of Sealweld 5050 on the "Valve Maintenance Record" (Attachment 1).

B. Plug Valves

- 1) Always lubricate plug valves in the fully-open (preferred) or fully-closed position. In either of these positions, all grease grooves in the body connect with the circular grooves at the top

and bottom of the plug, and the grease grooves in the plug mate to the grease grooves in the body. This ensures a full and even spread of the lubricant over all surfaces. The lubricant then acts as a bearing interface as well as a sealant. (Multi-port valves have special lubrication systems and must only be lubricated in one of the 90° positions.) After lubrication, turn the valve through its complete range or through the maximum range practicable, as described in Section 5, "Operate Valves During Maintenance."

Lubricate plug valves used as regulators that are backed up by monitor valves in the fully open position. This permits the monitor valve to take over the control function. Lubricate plug valve monitors in their normal fully-open position.

- 2) For valves using a lubrication screw to inject stick sealant, do not leave the lubrication screw in the plug stem beyond complete engagement of the threads. (If the screw is left in this position, a pocket is created where water, dirt, or corrosion products could collect and make the lubricant screw difficult to remove.) Insert another stick of the sealant into the valve to allow the lubricant screw to back out.
- 3) When lubricating valves, the grease gun's pressure gauge should indicate steadily increasing pressure with each stroke until the pressure gauge reading no longer rises but begins to drop and the pumping effort decreases. At this point, the valve is sufficiently lubricated. Stop injecting the lubricant.

Estimate the quantity of plug valve sealant required using the following table:

Table 1. Plug Valve Sealant Quantity

Plug Valve Size	Amount of Sealant (for periodic lubrication) ¹
12" and smaller	0.5 oz./inch of valve size
14" through 18"	0.75 oz./inch of valve size
20" and larger	1.00 oz./inch of valve size

¹For new valves or a valve with sealant flushed out, use four times the amount stated in Table 1.

Note: If the sealant in the riser pipe must be purged with new sealant, estimate additional sealant to be used based on the following: For ½-inch and ¾-inch riser pipe, inject an additional 2.0 oz. and 4.0 oz. respectively, per foot of riser pipe.

CAUTION: All regulator/meter station plug valves and all gas distribution low pressure system main plug valves must be lubricated as follows:

Inject the minimum amount of sealant to maintain operability (the valve operates with a reasonable amount of effort and it seals off the gas flow when closed). Do not to exceed one half of the amount shown in Table 1 above.

- 4) The lubricant pressure on the grease gun gauge must read a minimum of 2,000 lbs. per square inch gauge (psig) for any plug valve. The lubricant pressures must not exceed 5,000 psig when lubricating semi-steel valves, and 12,000 lbs. per square inch (psi) when lubricating steel valves. Very low pressure or no static pressure on the gauge during injection indicates one of the following problems:
 - a) The gun is empty.
 - b) The valve plug is loose. See Paragraphs (6) and (2) below.

- c) The gun is malfunctioning and must be checked.

Make no repairs to the hydraulic system. If the gun is broken, recondition it. If excessive clearance exists between the plug and the body, either because the adjustment gland or the adjustment screw is backed off too far, the lubricant migrates into the pipeline and the lubricant pressure will not build up properly. If the lubricant pressure immediately becomes high, it may indicate a defective lubricant fitting which could prevent lubricant from entering the valve.

Caution: Do not attach or detach couplers while guns are under pressure. Relieve gun pressure by opening the gun by-pass valve.

- 5) If a valve plug is difficult to operate or is stuck, inject it with Rockwell No. 1033 sealant to free it. After lubrication, operate the valve until it turns freely. If lubricating the valve fails to loosen it, flush the valve as specified in Section 2, "Valve Flushing Procedures."
- 6) The practice of loosening plug adjustment screws to obtain a temporarily free turning plug invariably results in undesirable secondary effects. The following are secondary effects of improper plug adjustment:
- Valve leakage. The lubricant may be ineffective since too much clearance does not allow the lubricant to distribute properly within the valve.
 - Excessive clearance, which allows foreign or abrasive materials to be trapped between the plug and seat can result in damaged sealing surfaces.
 - Higher torque characteristics as damage occurs.
 - Possible gear and operator damage as the torque becomes excessive.
 - An ultimate need to replace the valve.
- 7) Adjusting the packing gland on fixed-adjustment gland valves is generally not necessary. Do not adjust the gland except as specified by the manufacturer.
- 8) When the valve plug is not properly seated or when lubrication is not effective in loosening a difficult-to-operate (malfunctioning) valve and an approved valve flush is used, tighten the gland adjustment nuts. Tightening the nuts seals off lubricant leaks and helps to develop the proper hydraulic pressure during lubrication. Do not attempt to tighten the gland adjustment nuts without consulting the valve manufacturer, unless the operator is experienced with the particular adjustment of the specific valve type.
- Note: Never loosen the packing gland before lubrication!**
- 9) Rockwell Hypreseal-type valves have an adjustment screw in the bottom cover. This screw is adjusted at the factory to strict specifications. To prevent tampering, a cover is tack welded over this screw. Do not adjust the screw position in the field unless trained personnel are on site.
- 10) When specified adjustments to adjustable valves are unsuccessful and the valves cannot be properly lubricated or when an inoperable plug valve requires adjustment, either print out and submit a Material Problem Report (Company Form 62-0111), or, to submit the report online, go to "Material Problem Reporting Online" at <http://mprr.mpr.mds>.

C. Ball Valves

- 1) Rockwell Hypresphere Ball Valves (old floating ball model, manufacture ended in 1973)
 - a) Lubricate the Hypresphere valve when the valve is fully open or fully closed. Some sizes have three lubricant fittings, one for each seat and one for the stem. The stem must only be lubricated if stem leakage occurs. Keep all valves lubricated for satisfactory operation. Thoroughly lubricate the seat on the low-pressure side of the valve, especially if the valve is difficult to operate.

Note: When a valve is closed and the line is blown down on what is normally the upstream side of the valve, seat reversal occurs. Before the line is pressurized and returned to service, lubricate **both** valve seats.
 - b) Rockwell's specified lubricant for Hypresphere valves is Rockwell No. 1033. Do not use any other lubricant in Rockwell valves (see [Table 4](#) on Page 17).
- 2) Rockwell TM Hypresphere Ball Valves (trunnion mounted ball, manufactured since 1972)
 - a) The Rockwell TM Hypresphere ball valve needs no lubrication for a tight shutoff. However, as noted below, perform periodic maintenance according to a schedule designed to keep the valve in good working order. Obtain a longer seat life and easier operation by periodically injecting the valve with lubricant.
 - b) The valve has a lubricant injection system to provide a backup seat seal if the seats become damaged and tight shutoff is not possible. Both valve seats have lubricant injection fittings on the sides of the valve body. In addition, there is a lubricant injection fitting at the base of the valve stem to provide a secondary stem seal. The stem must only be lubricated if stem leakage occurs. Valve sizes 20 inches and larger have five lubricant injection fittings.
 - c) Although lubricant injection is not necessary for shutoff, Rockwell states that "periodic lubricant injection with approved Rockwell lubricants helps maintain good operating conditions and minimizes wear and abrasion on the seats and ball." Depending on the severity of the service environment, inject lubricant at least annually.
 - d) Lubricate Rockwell TM Hypresphere ball valves before installation. Construction employees, in cooperation with operating employees responsible for the station after construction, lubricate the ball valves. Visually check the valves for lubricant excretion around the ball port and valve body to verify proper flow and distribution of lubricant throughout the valve body (and lubricant extension pipe, if used). Lubricate as often as necessary to ensure smooth operation while the valve is being throttled. Lubricate the valves in the closed position, if possible. To report any problems with the operation of these valves, either during scheduled maintenance or at any other time, either print out and submit a [Material Problem Report \(Company Form 62-02133\)](#), or, to submit the report on-line, go to "Material Problem Reporting Online" at <http://mpri/ncor/mpri.do>.
 - e) Rockwell's specified lubricant for Hypresphere valves is Rockwell No. 1033. Do not use any other lubricant in Rockwell valves (see [Table 4](#) on Page 17).
- 3) Grove Ball Valves

- a) Grove Model B-4, B-5, B-6, and B-8 ball valves normally need no lubrication for bubble-tight shutoff. Lubricate the valves not used as monitors or standby regulators (using the fittings provided) only if a positive shutoff cannot otherwise be obtained. Inspect valves that do not provide positive shutoff for possible valve seat or ball damage. Once the valve is lubricated, it may need lubrication in the future to achieve bubble-tight shutoff.
- b) The manufacturer's specified lubricant for shutoff on Grove Model B-4, B-5, B-6, and B-8 ball valves, and for Grove BVR-4 and BVR-5, and Becker ball valve regulators is Sealweld 911 (see Table 5 on Page 17). Do not use any other lubricants in Grove or Becker ball valve regulators.
- c) Lubricate Grove Model BVR-4 and BVR-5 ball valve regulators (and Becker ball valve regulators) before installation. Construction employees, in cooperation with operating employees responsible for the station after construction, lubricate the ball valve regulators. Visually inspect the valves for lubricant excretion around the ball port and valve body to verify the proper flow and distribution of lubricant throughout the valve body (and lubricant extension pipe, if used).

Note: After release to operations, lubricate the valves as often as necessary to ensure smooth operation when the valves are throttling. Lubricate the valves in the closed position, if possible.

- d) Do not lubricate Grove regulating valves with retractable seats (commonly known as the Arcon Model). This destroys the retractable seat feature. The valve has no lubrication fittings to lubricate the valve seats. It does, however, have Zerk fittings under the Arcon cover for lubricating the operator. Use Sealweld No. 911 lubricant to grease these fittings.
- 4) TK and KF (Series P3) Ball Valves
- a) TK and KF (Series P3) ball valves normally do not need lubrication for bubble-tight shutoff. Lubricate the valves not used as monitors or standby regulators (using the fittings provided) only if a positive shutoff cannot otherwise be obtained. Inspect valves that do not provide positive shutoff for possible valve seat or ball damage. Once the valve is lubricated, lubricate it in the future to achieve bubble-tight shutoff, as necessary.
 - b) The manufacturer's specified lubricant for shutoff on TK and KF (Series P3) ball valves is Sealweld 911 (see Table 5 on Page 17). Do not use any other lubricants in these ball valves.
- 5) PBV-USA Ball Valve
- a) PBV-USA Series 6700 trunnion mounted ball valves do not require periodic lubrication since they are manufactured with permanently lubricated seals and bearings. These valves are also equipped with seat seals that are designed not to require sealants.
 - b) Although lubricant injection is not normally necessary, periodic injection of Sealweld 911 helps maintain the valve in good operating condition by minimizing wear on the ball and seats. This operation purges old grease and residual buildup, which contribute to seat

leakage and excessive valve operating torque.

- c) In the presence of excessive line contaminants, the possibility of leakage due to erosion is greater when throttling the valve than when the valve is used for normal on/off service. If the primary seal and the secondary metal-to-metal seal are damaged, obtain an emergency shutoff with a sealant injected through buttonhead grease fittings located in the end closures. First, purge the sealant passages by injecting Sealweld Valve Cleaner (see [Table 6](#) on Page 18). Then, with the valve in the fully closed position, slowly inject Sealweld 5050 ball valve sealant through the large buttonhead fitting provided on the upstream end closure. If possible, move the ball slightly during injection to ensure that the sealant is evenly distributed over the seating surfaces of the seat ring and ball.

6) WKM Dynaseal Ball Valves

- a) WKM Dynaseal ball valves normally do not require lubrication for bubble-tight shutoff. However, it may be necessary to inject lubricant (emergency seat renewal) if the seats become damaged. The recommended lubricant for shutoff is WKM Lubricant No. 103 or an approved equivalent, such as Rockwell No. 1033. Close the valve and inject lubricant at both seats under block-and-bleed conditions.
- b) If a leak develops around the stem, it can be stopped under pressure by injecting WKM plastic stem packing No. 107 or Sealweld Slick Stick.

7) Cameron Ball Valves

- a) Cameron all-welded ball valves do not normally require lubrication. The valve is sealed for life. Seats and stem bearings are self-lubricating and designed for the life of the valve. Although lubricant injection normally is not necessary, periodic injection of Sealweld 911 helps maintain the valve in good operating condition by minimizing wear on the seats and ball and ensuring free movement of the valve seats.
- b) The valve has lubricant-injection ports with check valves to provide a backup seat seal if the sealing surfaces become damaged and bubble-tight shutoff cannot be obtained.
Note: 2-inch through 4-inch valves have a smaller buttonhead fitting, requiring a 5/8--inch coupling on the handgun.
- c) Use the injection system for flushing the seat ring area, when necessary.
- d) If the primary seats become damaged, it may be necessary to inject lubricant through the lubricant injection fittings. The recommended lubricant for Cameron ball valves is Sealweld 911.
- e) For Cameron valves 14 inches and larger, the rotating seat design creates an increased torque for the last 15° when the valve is being closed. Although lubricant injection is not normally necessary, periodic injection of Sealweld 911 helps ensure easy rotation of the valve seats, which minimizes operating torque. Use the valve position indicator to determine when the valve is fully closed. Some early-version Cameron valves have excessive stem wind-up, which must be accounted for when determining the position (open, closed, etc.) of the valve.

8) Broen Ballomax and Kerotest Weldball Valves

- a) Broen Ballomax and Kerotest Weldball valves do not require lubrication or any maintenance. These valves are sealed for life. Seals and stem bearings are self-lubricating and designed for the life of the valve.
- b) Refer to the following Numbered Documents for any restrictions on the use of these valves:
 - Numbered Document F-22, "Kerotest Weldball Valve"
 - Numbered Document F-24, "Broen Ballomax Floating Ball Valves"

9) VSI Cam Valve (considered a ball valve by the Company)

- a) The VSI Model 111 valve does not require lubrication or any maintenance. The valves are sealed for life. Seals and stem bearings are self-lubricating and designed for the life of the valve.
- b) The opening torque for a VSI valve may be higher than normal if there is a high differential pressure across the valve.
Note: VSI valves only operate 87° from fully open to completely closed.
- c) Before removing the bonnet from a VSI valve (no pressure in the line), the valve must be in the fully open position. In any other position, the internal parts cannot be removed.

10) Delta Valves

- a) Delta (Type 55) ball valves normally need no lubrication for bubble-tight shutoff. Lubricate the valves not used as monitors or standby regulators (using the fittings provided) only if a positive shutoff cannot otherwise be obtained. Inspect valves that do not provide positive shutoff for possible valve seat or ball damage. Once the valve is lubricated, it may need lubrication in the future to achieve bubble-tight shutoff.
- b) The manufacturer's specified lubricant for shutoff of Delta (Type 55) ball valves is Sealweld 911 (see Table 5 on Page 17). Do not use any other lubricants in these ball valves.

11) Orbit Valves

After 1970, Orbit valves have been used almost exclusively for blow-down applications.

These valves are normally unidirectional and do not have ball lubrication capability.

D. Ball Valve Lubrication

The basic requirement for ball valves is 1 oz. per inch of valve size per seat for flushing and ½ oz. per inch of valve size per seat for routine maintenance.

Each ball valve has two seats and can have one or two injection fittings per seat.

- 1) GROVE, TK, KF, PBV, and DELTA (See Table 2 below.)

These ball valves in sizes 2-inch, 3-inch, and 4-inch have only one injection fitting and it is into the body cavity of the valve. **Do not lube these valves unless absolutely necessary, because the body cavity and the valve bore will be filled with lubricant.**

Table 2. Grove, TK, KF, PBV, and Delta Valve Body Capacities

Ball Valve Size	Amount of Lubricant
2"	15 oz.
3"	75 oz.
4"	151 oz.

Note: If the lubricant in the riser pipe must be purged with new lubricant, estimate additional lubricant as follows: For ½-inch and ¾-inch riser pipe, inject an additional 2 oz. and 4 oz., respectively, per foot of riser pipe.

2) CAMERON and ROCKWELL

Cameron valves start at 2 inches and Rockwell valves start at 8 inches in size. These valves have seat lubrication fittings so injection into the body cavity is never required.

E. Gate Valves

1) Kerotest M-1 Gate Valves

- a) The Kerotest M-1 gate valve does not normally require lubrication or gland tightening. A stem leak requires replacing the packing seals and gland gasket. Repack the valve and lubricate it as described in Kerotest's procedure for "primary or secondary" repacking. The primary repacking procedures may be performed with the line pressurized. See the *Kerotest M-1 Gate Valve Operations Manual* for more information.
- b) If the bonnet gasket leaks, retighten the bonnet screws per torque specifications found in the *Kerotest M-1 Gate Valve Operations Manual*. If leakage persists, remove the valve from service, disassemble it, and inspect it for damage to the gasket or sealing area. Replace the gasket and/or polish the sealing area with a very fine emery cloth. Coat the bonnet gasket with a light film of multipurpose grease and reassemble it.
- c) Use caution when the valves are in the open position in a pipeline for a period of time. Sediment or dirt can collect inside the valves and prevent the wedges from fully closing. Close these valves slowly. Do not close the valves completely, but "throttle" them for a short period of time so that the turbulence created flushes away any sediment or dirt that might have settled in the valves. In the event of an emergency, close the valves as quickly as possible.
- d) If a valve does not shut off completely, the valve can be reseated using the following procedure:
 - i) Throttle the valve to flush out loose sediment.
 - ii) Close the valve using moderate effort. This forces the wedge partially into the seat and loosens accumulated sediment.
 - iii) Open the valve 1 or 2 turns to retract the wedge from the seat.
 - iv) Repeat the above procedure, if necessary.

2) Kerotest Model EV-11 "Stirrup" Gate Valve

- a) The EV-11 gate valve does not normally require lubrication for a bubble-tight seal. Lubrication is required only during cleaning and inspection, as specified in Kerotest's maintenance procedures.
- b) If a leak develops in the bonnet, retighten the bonnet screws to Kerotest's torque specifications. If leakage persists, replace the bonnet O-ring. **Do not perform this repair under pressure.**
- c) A stem leak requires replacing the stem seal and gland bushing O-rings. Replacing the stem seal and gland bushings O-rings can be performed under pressure if Kerotest's repair procedure is followed.
- d) If the valve does not shut off completely, it may be necessary to disassemble the valve and clean or replace the gate seal.
- e) For repair procedures and torque requirements, refer to EV-11 gate valve maintenance instructions.

3) RMI Weld Patent Gate Valve (WPV)

- a) The WPV does not require lubrication for a bubble-tight seal.
- b) A stem leak requires replacing the stem O-rings. Replacing the stem O-rings can be performed under pressure if the WPV repair procedure is followed.
- c) The WPV is an all-welded design; therefore, the valve cannot be disassembled to replace the stem, wedge, or seals.

F. Perfection, Kerotest, and Nordstrom Plastic Valves

- 1) The Perfection, Kerotest, and Nordstrom plastic valves listed in Numbered Document 1-99, "Plastic System Valves," do not require lubrication.
- 2) Ensure that the valve stem is vertical, the valve is not under strain, the top of the valve is exposed, and the valve box does not rest on the plastic pipe or the valve.

7. Approved Valve Lubricants**A. Plug Valve Lubricants**

- 1) Specific general purpose lubricants for plug valves are listed in Table 3, below. Currently, Rockwell No. 1033 Sealant is the only recommended lubricant. Standard sizes and packages of approved lubricants are available by specifying the code number provided.

Caution: Avoid the routine use of lubricants that contain Teflon, such as Sealweld 5050, in plug valves. Teflon particles can clog orifices in the Company's pneumatic-control equipment and customers' appliances, resulting in serious problems. If Sealweld 5050 must be used to stop internal leakage, the valve may need to be scheduled for replacement. See Section 6.A(6), "Lubrication Procedures -- General".

Note: A Material Safety Data Sheet (MSDS) must be on file in each operating department for each valve lubricant used.

- 2) Rockwell No. 1033 sealant is also the recommended lubricant for Resun, Serck Audco, and Walworth plug valves (see [Table 3](#) below). Its use will not void the manufacturer's warranty. Rockwell No. 386 and No. 555 lubricants are not allowed for use on the above-referenced valve brands.

Table 3. Recommended Lubricants for Rockwell, Serck Audco, Resun, and Walworth Plug Valves¹

Lubricant Fitting Type	Thread Size (Inches)	Lubricant Form Designation (Units per Box)	Codes
			Rockwell No. 1033
Threaded	1/2	B (24) stick	Not available
Buttonhead fitting ²	3/8	C (24) stick	Not available
	1/2	D (24) stick	Not available
	3/4	G (24) stick	Not available
		K (12) stick	M500007
		J (6) stick	M500003
		GP (6) gun pack ³	M500029
	Cartridge (4) ⁴	M500005	
	Bulk (1) 5-quart can ⁵	M500014	

1. The color of Rockwell No. 1033 lubricant is green.
2. Requires a lubricant handgun.
3. Use with Rockwell No. 400A handgun or Sealweld SuperGun.
4. Use with Rockwell No. 400D handgun.
5. Use with Rockwell Hypregun or Sealweld Activ-8.

B. Ball Valve Lubricants

- 1) The recommended general purpose lubricants for ball valves are summarized in [Table 4](#) and [Table 5](#) on page 17. Use **only** the manufacturer's recommended lubricant in these tables for each valve. Standard sizes and packages of approved lubricants are available by specifying the code numbers provided.

Note: A MSDS must be on file in each operating department for each lubricant used.

- 2) The recommended lubricant for TK, Grove, Cameron, KF, Delta, and PBV-USA ball valves is Sealweld No. 911. Sealweld No. 911 contains micro-fine Teflon particles, which can cause serious problems if used in plug valves and other valves requiring more frequent lubrication or large quantities of lubricant. However, a limited amount of Teflon-bearing lubricant (if used in TK, Grove, Cameron, KF, Delta, and PBV-USA ball valves to obtain a bubble-tight shutoff) should not cause a problem.

Table 4. Recommended Lubricants for WKM Dynaseal and Rockwell Hypersphere Ball Valves¹

Lubricant Fitting Type	Thread Size (Inches)	Lubricant Form Designation (Units per Box)	Specified Lubricants Codes
			Rockwell No. 1033
Threaded	1/2	B (24) stick	Not available
	3/8	C (24) stick	Not available
	1/2	D (24) stick	Not available
	3/4	G (24) stick	Not available
Buttonhead fitting ²		K (12) stick	M500007
		J (6) stick	M500003
		GP (6) gun pack ³	M500029
		Cartridge (4) ⁴	M500006
		<u>Bulk (1) 5-quart can⁵</u>	M500014

1. The recommended lubricant for Dynaseal and Rockwell valves is Rockwell No. 1033 – green
 2. Requires a lubricant handgun.
 3. Use with Rockwell No. 400A handgun or Sealweld SuperGun.
 4. Use with Rockwell No. 400D handgun.
 5. Use with Rockwell Hypregun.

Table 5. Recommended Lubricant for Grove (BVR-4 and BVR-5) and Becker Ball Valve Regulators and TK, KF, PBV-USA, Grove (Model B-4, B-5, and B-8), Delta, and Cameron Ball Valves¹

Cartridge Designation (Units per Case)	Codes
#1 Gun cartridge (16) 10 ounce ²	M500004
5-quart can	M500012

1. The recommended lubricant is Sealweld 911.
 2. Can be used in a Rockwell 400 handgun.

8. Valve Flushing Procedures

- A. Inject an approved cleaning solvent into plug valves that are seized or difficult to turn, or ball valves and gate valves that leak. (This softens old lubricants and purges the grease grooves.) Then lubricate the valves with the manufacturer’s recommended lubricant to provide proper lubrication on the mating surfaces when the valves are operated.
- B. Follow the valve flushing agent manufacturer’s procedures when performing any valve cleaning operation.
- C. Table 6 below provides the approved valve flushing agents for use on any brand of valve and with existing valve lubrication equipment.

Table 6. Recommended Valve Flushing Agents

Agent Name	Quantity	Code
Nordstrom VXX Valve Cleaner	Gun Pak (6 per box)	M490778
	Cartridges (4 per box)	M490779
	5-quart can	M490780
Sealweld Equa-Lube Gold Flush	One 32-oz. bottle (4 per box)	M490177
	1-quart bottle (4 per box)	M490781
Val-Tex Valve Flush	5-quart can	M490523
	16-oz. cartridge	M490503
Sealweld Valve Cleaner	10-lb. (5-quart) pail	M490519

Leave the valve-flushing agent in the valve from a minimum of 12 hours to a maximum of 3 days.

Caution: Valve flushing agents can damage elastomers if they are left in contact for extended periods. Minimize contact time with rubber sealant gun components by cleaning valve-flushing agents out of the gun. Do this by pumping sealant through the handgun. When the softening process is complete, always inject fresh lubricant (as recommended by the valve manufacturer) into the valve.

Note: A MSDS must be on file in each operating department for each valve-flushing agent used.

9. Valve Maintenance Records

Record valve maintenance on the appropriate "Valve Maintenance Record." See Attachment 1 for the "Valve Maintenance Record" and instructions for completing a "Valve Maintenance Record." Record the maintenance history of each valve on an individual sheet. The Maintenance department must keep "Valve Maintenance Record" documents for a minimum of the previous 5 years.

10. Miscellaneous Lubricant-Sealant Injection Fittings

A. Rockwell Fittings

Table 7 below lists Rockwell-manufactured combination buttonhead fittings and lubricant screws for use with Rockwell plug valves. These fittings have parallel (straight) pipe threads. Do not use them with the tapered pipe threads of ball valves or screwed pipe fittings.

Table 7. Miscellaneous Rockwell Fittings

Parallel Pipe Threads Size (Inches)	Size of Stick for Valves Using Rockwell Lubricant	Rockwell Part Number	Code
1/4"	B	37415	M208416
3/8"	C	37416	M208417
1/2"	D	37417	M208418
3/4"	G	37418	M201048

B. Sealweld Flow Wolf Fittings (Ball Valves)

Table 8 below lists Sealweld Flow Wolf buttonhead fittings used as the seat lubricant-sealant injection fitting on ball valves. These fittings have low internal flow restriction to minimize plugging the fitting's internal ball check valve when injecting the sealant. These fittings have tapered pipe threads. Never use them on the straight pipe threads found on plug valves.

Table 8. Miscellaneous Sealweld Flow Wolf Fittings

Tapered Pipe Threads Size (Inches)	Sealweld Flow Wolf Part Number	Code
3/8"	F-FW-3/8	M441174
1/2"	F-FW-1/2	M441175

11. Valve Lubrication Equipment ("lubricants" means lubricants and sealants)**Rockwell/Nordstrom**

Model #	Injection
400A	1 oz./25 strokes
400D	1 oz./50 strokes
Hypregun	16 oz./9 minutes for light lubricants (estimate) 16 oz./16 minutes for heavy lubricants (estimate)

Note: The Hypregun uses a 10-lb. (160 oz.) pail. Each 1/8-inch drop in the level of the lubricant in the pail is approximately 3 oz.

Sealweld

Model #	Injection
Activ-8	10 lb. pail to 16 oz. loading chamber is 2 oz./stroke. Loading chamber to valve is 16 oz./70 seconds for light lubricants and 16 oz./120 seconds for heavy lubricants.
Uni-Seal	16 oz./70 seconds for light lubricants 16 oz./120 seconds for heavy lubricants
Supergun	1 oz./20 strokes
Hand gun	1 oz./50 strokes

Valtex

Model #	Injection
1000	1 oz./15 strokes
1400	1 oz./24 strokes

Valtex

Model #	Injection
626B	1 oz./44 strokes
QS-2000A	8 oz./30 seconds for light lubricants 8 oz./60 seconds for heavy lubricants
QS-5000	8 oz./30 seconds for light lubricants

8 oz./60 seconds for heavy lubricants

For PG&E: Heavy lubricants are Sealweld 5050 and Sealweld 911. Light lubricants are Rockwell/Nordstrom/FlowServe 1033 and all brands of valve flushing agents.

Note: The Hypregun, Activ-8, and Uni-Seal equipment delivery rates are based on operating these units at their optimum air or gas pressure of 125 psig.

Grease Gun Pressure

The normal pressure range for injecting product into valves is as follows:

Cast iron plug valves	0 to 2,000 psig maximum
Steel plug valves	6,000 to 10,000 psig maximum
Ball valves	2,000 to 6,000 psig maximum

Caution! Never exceed the maximum pressures listed above when injecting product into valves.

12. Approved Grease Guns for Lubricating Gas Valves

Code	Short Description	Long Description
M041013	Grease gun, hydraulic	Grease gun Sealweld # G-S-Gunc Hydraulic super gun with high pressure check valve and 15,000 psi gauge Complete with EZ loader and case WP4430-04
M041014	Grease gun, pneumatic	Grease gun, pneumatic Sealweld # G-A8-Gunc Activ-8 Air operated 15,000 psi gauge 5-quart sealant capacity and 10' hose WP4430-04
M041015	Grease gun, pneumatic	Grease gun, pneumatic Nordstrom # 5Q Hypregun Air operated 15,000 psi gauge 5-quart sealant capacity and 10' hose WP4430-04
M041016	Grease gun, hydraulic	Grease gun Nordstrom # 400D Hydraulic hand gun with internal relief valve and pressure gauge WP4430-04
M041017	Grease gun, spring loaded	Grease gun Nordstrom # 400A Spring loaded hand gun with check valve and bleeder relief valve 15,000 psi gauge and shoulder strap WP4430-04

Definition of Terms

49 CFR: Title 49, "Transportation," of the Code of Federal Regulations.

BTU: British Thermal Unit.

CPUC: California Public Utilities Commission.

DOT: Department of Transportation.

Distribution regulator station valves: Those valves identified in Work Procedure WP4430-03, "District Regulator Station Maintenance."

Emergency: An emergency is defined as: Any unsafe condition that requires the **immediate shutdown and isolation** of an entire station or pipeline section in order to protect employees or the public, and to prevent or minimize equipment damage and property loss.

Emergency valves: Gas transmission valves used to isolate a pipeline facility or pipeline section in an emergency. Valves in this category include transmission mainline valves, cross-tie valves, tap valves, pipeline blowdown valves, station upstream and downstream block valves, line rupture-control valves, and all of the valves controlled by a station emergency shutdown (ESD) system (varies by station and includes uphole safety valves at storage fields).

Note: Classify British Thermal Unit (BTU) Zone isolation valves as "Emergency Valves" because leakage across the valve may create a hazard for customers due to excessive BTU variations.

ESD: Emergency shutdown.

Gas distribution critical main valves: Gas distribution main valves that may be necessary for the safe operation of a distribution system. See Attachment 3, "Hatched Valve Identification," for criteria to identify gas distribution's "critical" main valves.

GO 112-E: CPUC General Order 112-E, "State of California Rules Governing Design, Construction, Testing, Operation, and Maintenance of Gas Gathering, Transmission, and Distribution Piping Systems."

Maintenance valves: Gas transmission valves used to isolate equipment to facilitate maintenance or repairs. Valves in this category include, but are not limited to, equipment isolation valves (e.g., separators, filters, coolers), block valves installed on either side of a meter or individual regulator/monitor or load valve/trimmer runs, unit block valves (compressor stations), bypass valves (unless controlled by an ESD system), fuel gas valves (unless controlled by an ESD system), valves on gas well Christmas trees (except uphole safety valves), tap valves for power and control gas, and valves on power gas or instrument supply piping (supply racks). Valves are typically in open/close service and are generally manually operated. A few valves may

be power-actuated.

MAOP: Maximum allowable operating pressure.

MSDS: Material Safety Data Sheet.

Operational valves: Gas transmission valves used to facilitate system operations. Valves in this category include, but are not limited to, maximum allowable operating pressure (MAOP) separation valves and valves used to change routing through a station (primarily terminals and compressor stations). Valves are typically in open/close service and may be manually operated, but are more likely power-actuated.

Revision This work procedure replaces U.O Standard S4220, "Gas Valve Maintenance Requirements," dated May 2003.

Reference Documents

Code of Federal Regulations (CFR) 49, Paragraph 192.745, "Valve maintenance: Transmission lines"

CFR 49, Paragraph 192.747, "Valve maintenance: Distribution systems"

CPEC GO 112-E, Section 143.2, "Valve Maintenance"

Kerotesi M-1 Gate Valve Operations Manual

Material Problem Report, Company Form 62-0113

Material Problem Reporting Online

Numbered Document F-20, "Standard Ball Valve List: 1/4" Through 2"

Numbered Document F-21, "Standard Ball Valve List: Carbon Steel 2" Through 24"

Numbered Document F-21.1, "Material Specifications for Carbon Steel Ball Valves"

Numbered Document F-22, "Kerotesi Weirball Valve"

Numbered Document F-23, "VSI Gate Valve List 2" - 8"

Numbered Document F-24, "Broen Ballomas Blowing Ball Valves"

Numbered Document F-90, "Plastic System Valves"

Utility Standard 4430, "UGI Gas Facilities Requirements"

Utility Standard 4460, "Gas Transmission Operating Plans and Operating Diagrams"

*Work Procedure WP4414-01, "Work Procedures in Confined Spaces" –
Expected publication 2009*

Work Procedure WP4430-03, "District Regulator Station Maintenance"
Expected publication 2009

Attachments

Attachment 1, Form WP4430-04-1, "Valve Maintenance Record"
 (instructions and form)

Attachment 2, "Gas Distribution District Main Valves (Operating at 60 psig or less)"

Attachment 3, "Buried Valve Identification"

Attachment 4, "Guidelines for Using Hydraulic Wrenches and Other High-Torque Devices on Gas Transmission and Distribution Valves"

Attachment 5, "Estimating Torque When Manually Operating a Valve"

Contact for More Information



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Approved by



Manager

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Chg No.	Date	Description	By (LAN ID)
00	April 2008	Updated per CPUC requirements and current work practices	
01	Jan/Feb 2009	Revised per SME input	

