



KEROTEST CUSTOMER
MODEL-1 GATE VALVE
INSTALLATION, OPERATION, AND
MAINTENANCE MANUAL

NO.: K-1464
REV.: 11
DATE: 06/26/2018
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1 SCOPE

This operations manual defines for gas utility customers the procedures for proper use and common repairs on the Model 1 line of metal seat gate valves.

2 PRODUCT DESCRIPTION AND FEATURES

Below are some of the features of the Kerotest Model-1 steel gate valves:

- Maintenance free
- No gland tightening
- No lubrication required
- Low operating torque
- Field repairable
- Dual integral angled seats and wedge
- Bidirectional installation and operation

The intent of this manual is to acquaint our customers with installation, operation, and maintenance/service repair techniques for Model-1 Gate Valves. Model-1 Gate Valves are cast steel valves used in natural/fuel gas distribution pipelines and are available in NPS 1 through NPS 16, in ASME/ANSI Pressure Classes 150 and 300 and intermediate pressure rating of 500 WOG Maximum Operating Pressure (MOP, psi). The valve end connections are welded, flanged, weld-by-flange, and some threaded and socket ended. Temperature limits of the valves are -20°F to 250°F with allowable pressures as shown in Figure 1.

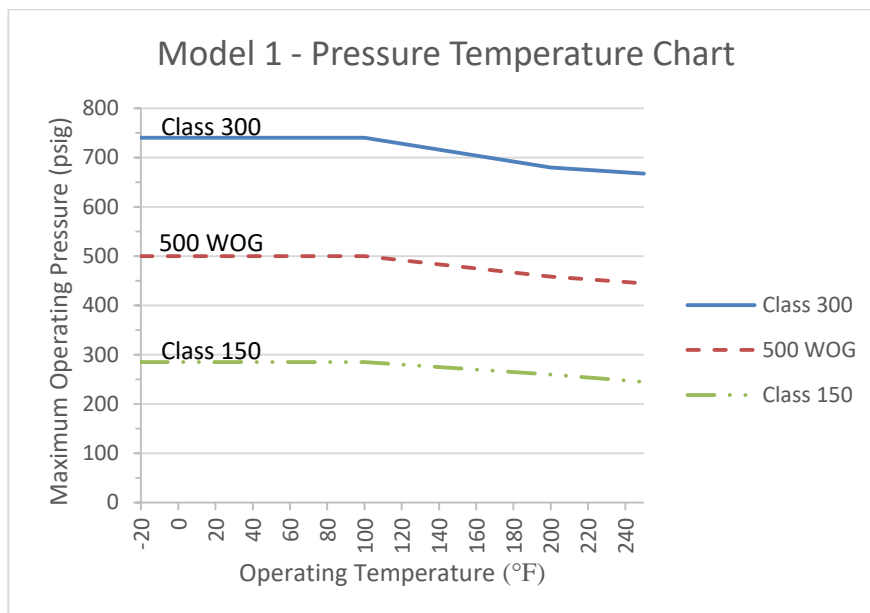


Figure 1: Model 1 Pressure-Temperature Chart



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3 CAUTIONS AND WARNINGS

Within this document, you will see the following symbols;



- General Advisory Marking - for information or operational procedures, order of operation, etc.



- Caution Marking – note designates an action or step that may result in personal injury or death or equipment/property damage. Personnel performing activities should be fully aware of the hazards and take necessary steps to prevent any injuries, damage, or unsafe operating/repair conditions.

4 VALVE IDENTIFICATION

Each valve will have an identification nameplate attached with the following information:

- Manufacturing company
- ASME/ANSI pressure class, or intermediate pressure rating (such as 500 WOG)
- Temperature and pressure ratings
- Body and stem materials
- Serial number¹
- Date of manufacture
- Name of the product line

5 VALVE COMPONENTS

Model-1 Valves are divided into 2 basic designs: (1) Prior to 1988 production date and (2) after 1988 production date. Valves produced after 1988 contain a weather seal O-ring. Figure 3 shows the part differences between the two versions.

¹ Serialization marking on tags began September 2014. As of February 2018, the serial number is also stamped directly on the body of the valve



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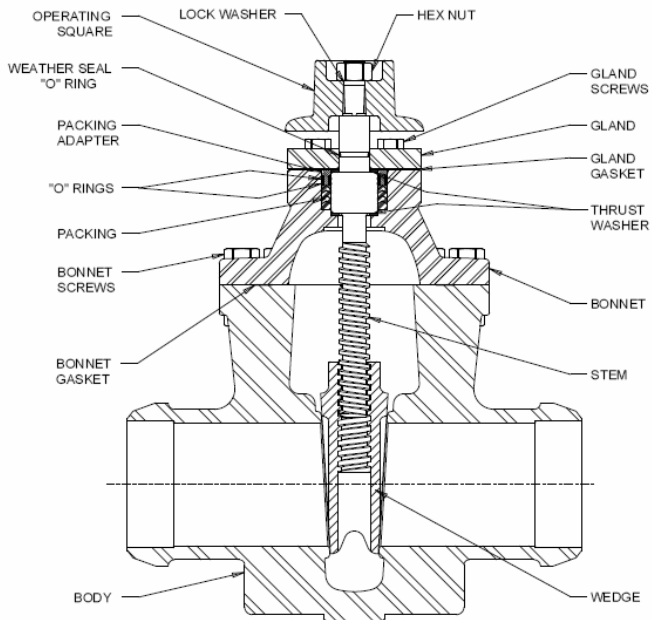


Figure 2: Valve Components

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

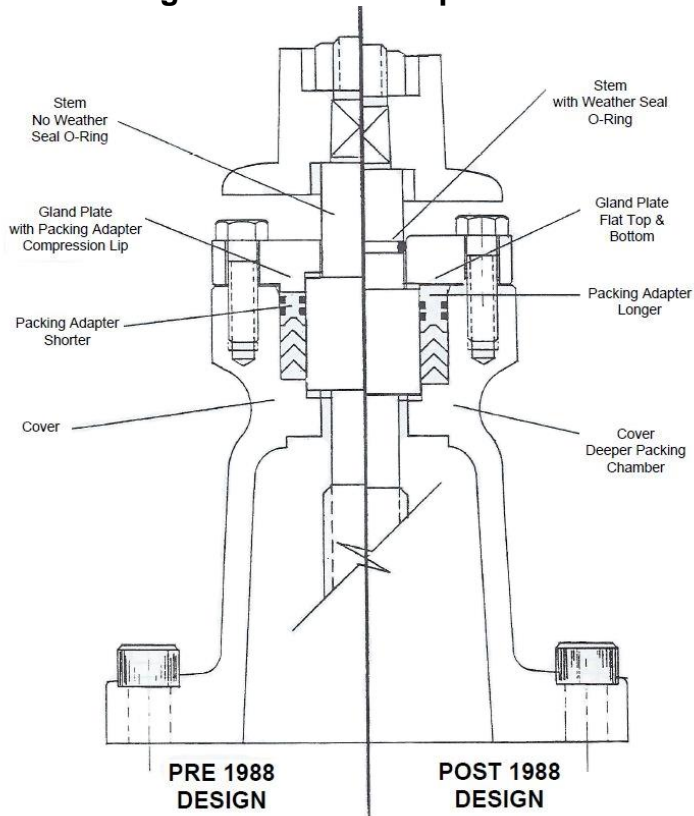


Figure 3: Design Changes



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6 ACCESSORIES

6.1 Handwheel

If required, the 2" operating square may be removed and replaced with a handwheel.

Table 2: Handwheel Options						
Valve Size NPS	Handwheel Diameters (inches)					
	9	12	14	16	18	24
1						
1-1/4						
2	72530140					
3		72530165				
4		72530165				
6			72530173			
8				72530181		
10					72530199	
12					72530199	
16						72537699

6.2 Locking Device

Model-1 valves can be ordered with a locking device installed or it may be installed by customers. This locking device prevents unauthorized users from changing the valve state (open or close) with a customer supplied lock. When installed, the lock and/or the cap may turn, but no torque is applied to the stem. To install this device, perform the following (see Figure 4);

1. Remove nut which holds operating square in place and replace with swivel assembly (1). Keep the lock washer (2) on the assembly.
2. Place cap (3) on swivel assembly (1).
3. Attach a padlock (not furnished) to swivel assembly to complete locking device

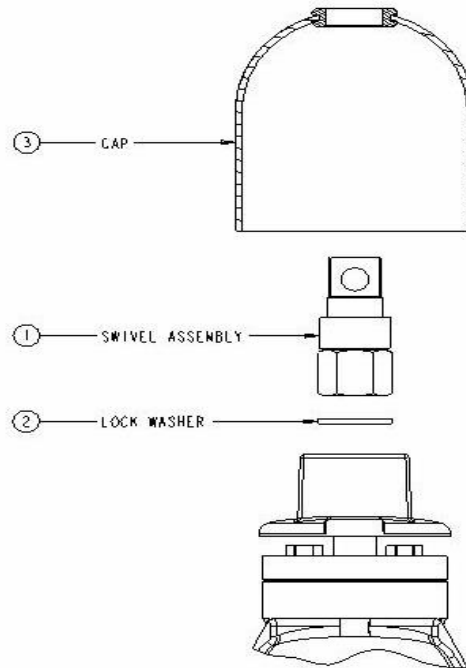


Figure 4: Locking Device

6.3 Coating

The Model-1 valve is ordered with either a zinc chromate gray primer coating or a two-component, high solids green epoxy coating. The gray primer will provide a limited indoor non-exposed protection against corrosion. It is the responsibility of the customer to provide long duration corrosion protection coverings or systems once installed per CFR 192 Subpart I.

The two component, high solids epoxy coating is generally applied 4 to 8 mils dry film thickness (DFT) unless specified by the customer.

If a valve appears corroded prior to installation, particularly on the internal components, contact Kerotest to determine if the valve can be installed.



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7 FACTORY TESTING

To be certain that all valves shipped from the factory are bubble tight, they are subjected to the following tests.

Table 3: Minimum Test Parameters

Table 3a: Hydrostatic Shell Test						
Valve Size NPS	Class 150 (285 MOP)		500 WOG		Class 300 (740 MOP)	
	Time (minutes)	Pressure (psig)	Time (minutes)	Pressure (psig)	Time (minutes)	Pressure (psig)
1 – 4	2	450	2	875	2	1125
6 – 8	5	450	5	875	5	1125
10	5	450	NA	NA	5	1125
12 – 16	15	450	NA	NA	15	1125

Table 3b: Hydrostatic Seat Test						
Valve Size NPS	Class 150 (285 MOP)		500 WOG		Class 300 (740 MOP)	
	Time (minutes)	Pressure (psig)	Time (minutes)	Pressure (psig)	Time (minutes)	Pressure (psig)
2 – 4	2	315	2	550	2	815
6 – 10	5	315	5**	550	5	815
12 – 16	10	315	NA	NA	10	815

* Time Listed Per Each Side

** 10" Not Applicable

Table 3c: Air Shell Test						
Valve Size NPS	Class 150 (285 MOP)		500 WOG		Class 300 (740 MOP)	
	Time (minutes)	Pressure (psig)	Time (minutes)	Pressure (psig)	Time (minutes)	Pressure (psig)
1 – 4	2	150	2	150	2	150
6 – 10	5	150	5	150	5	150
12 – 16	15	150	10	150	15	150

Table 3d: Air Seat Test						
Valve Size NPS	Class 150 (285 MOP)		500 WOG		Class 300 (740 MOP)	
	Time (seconds)	Pressure (psig)	Time (seconds)	Pressure (psig)	Time (seconds)	Pressure (psig)
1 – 8	30	80 – 100	30	80 – 100	30	80 – 100
10 – 16	60	80 – 100	60	80 – 100	60	80 – 100

* Time Listed Per Each Side

The above tests equal or exceed those valve tests required by API 6D.

Note: valves built before changes to US CFR in July 2006 were rated as follows:

Class 150 – 275 MOP

Class 300 – 720 MOP



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8 STORAGE, HANDLING, AND INSTALLATION

8.1 Storage

Store the valve carefully before installation, preferably in a well-ventilated, dry place, on a shelf or a wooden grid/pallet, preferably in the original packaging, to protect it from ground water and moisture. Leave flange and port protectors in place to provide limited internal corrosion and contamination protection.

Protect the valve from sand, dust, and water when storing or transporting.

When properly stored, the Model-1 has a shelf life greater than 10 years.

8.2 Handling



CAUTION: For heavy large valves, use rated lifting slings or straps. The valve or valve assembly must not be lifted by the operating square or handwheel. Most Model-1 valves with the operating square facing up are top-heavy and can shift or rotate in the sling.

Dropping or incorrect lifting of the valve can result in personal injury or damage to nearby equipment or property.

If pressure testing is performed prior to pipeline installation, exercise extreme caution with methods, tools, and procedures for capping and securing the valve.

8.3 Installation

8.3.1 General Notes on Installation



CAUTION: Incorrect installation may result in serious personal injury or damage to nearby equipment or property. These instructions must therefore be followed carefully when installing the valve.



NOTE: The valve must only be installed in intended applications. Valves should be installed with the wedge in the closed position

Prior to installation, remove port and flange protectors and check that the inside of the valve is clean and free of corrosion.

For valves located at the end of a pipeline, it is recommended to install a short pipe pup with pressure rated cap to the valve outlet to reduce potential corrosion issues. Following installation, the pup and cap section should be pressurized to match the main pipeline.

8.3.2 Screwed End Valves

- Screwed End Valves are only available on 2" valves, 500 WOG or Class 300.
- Valve ends have NPT pipe threads machined per ASME B1.20.1
- Apply a suitable threading compound to the threads on the pipe. The threading compound should be applied sparingly.
- By hand, thread the fitting onto the mating component until hand-tight, being careful not to cross thread.



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- The wrench used for installing these valves should be applied to the end of the valve next to the pipe to which it is being connected
- Tighten fitting about 4-5 turns past hand-tight.

8.3.3 *Socket Weld End Valves*



NOTE: in order that the valve seats are not affected during the welding operation, the wedge should be in the closed position

- Socket Weld End Valves are only available on 1" valves, Class 300
- Valve ends are machined per ASME B16.11
- Valves should be installed using either the electric arc or oxy-acetylene welding methods by welders and welding procedures qualified under Section IX of the ASME Boiler and Pressure Vessel Code or an equivalent requirement
- Valve bodies are carbon steel (ASTM A216, GR WCB). Type 7018 Welding Rod is suggested for welding these valves in the pipeline.

8.3.4 *Flanged End Valves*

- End flanged dimensions conform to ASME B16.5²
- The length of the valve must be the same as the distance between the flanges in the pipe line, taking into consideration the gasket.
- Standard end flange facing is 1/16" raised face with phonographic finish. Some valves may be ordered with a flat face finish. Contact Kerotest or your distributor for further information and availability of flat face finished valves. Flat face finished valves are slightly shorter than standard faced valves, as allowed per ASME B16.10.
- Bolting and gasketing practice conforming to ASME B16.5 is suggested. The bolts and gaskets used on installation must be selected to match operating conditions, temperature, pressure and medium. Gasket dimensions must be compatible with sealing faces of the flanges.
- End flange bolts should not be fastened in consecutive order. Each one tightened should be 180° opposite the previous one (see Figure 5). Two passes should be made. Once pass for half tightness and final pass for full tightness. ASME PCC-1 can provide guidelines for assembly of bolted flanges.

² NPS sizes 10, 12, and 16 Class 150 valves conform to Class 300 flange thickness and flange outside diameter requiring longer bolts.

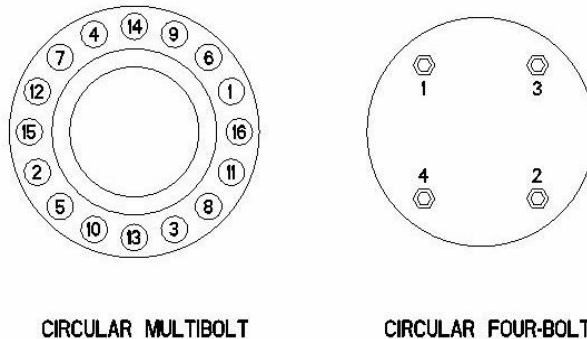


Figure 5: Bolt Torquing Pattern Examples

8.3.5 *Butt Weld End Valves*



NOTE: in order that the valve seats are not affected during the welding operation, the wedge should be in the closed position.

- Valve ends are machined per ANSI B16.25
- Valves should be installed using either the electric arc or oxy-acetylene welding methods by welders and welding procedures qualified under Section IX of the ASME Boiler and Pressure Vessel Code or an equivalent requirement
- Valve bodies are carbon steel (ASTM A216, GR WCB). Type 7018 Welding Rod is suggested for welding these valves in the pipeline.

8.3.6 *Butt Weld End X Flange End Valves*

- Refer to Butt Weld End Valves and Flanged End Valves for installation



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9 OPERATION

9.1 General Valve Operation

- Standard valves are equipped with a 2" operating square and can be operated with an adaptor tool or wrench.
- Standard valves operate clockwise to close, and counterclockwise to open. See Table 1 for the number of turns required to fully open/fully close a valve based on NPS. See Table 4 for torque required to fully close the valve.
- If valves are in the open position in a pipeline for a period of time, there is a chance that sediment or dirt may collect inside the valve. When these valves are to be closed, it should be done slowly. The valve should not be closed completely but "throttled" for a short time in order that the turbulence created will flush away any sediment or dirt that might have settled in the valve.



Note: In the event of an emergency, the above method need not be followed, as the valve should be closed as quickly as possible.

9.2 Operating Torque

Valves are designed to operate at the prescribed torque values below in Table 4.

9.3 Critical Torque

Excessive or unlimited torque will ultimately cause a structural failure of the valve. Table 4 indicates the torque value where stem failure is designed to occur. This failure location is below the operating square and does not create a leak.

Table 4: Valve Torque Values

Valve Size NPS	Operating Torque (ft-lbs)	Min Stem Failure Torque (ft-lbs)	Min Safety Factor**
1	50	130	2.6
1-1/4	50	130	2.6
2	60	309	5.2
3	70	309	4.4
4	75	350	4.7
6	125	735	5.8
8	150	735	4.9
10	210	1170	5.6
12	280	1170	4.2
16	450	3700	8.2

** Minimum Safety Factor = Minimum Stem Failure Torque / Operating Torque



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9.4 Pressure Drop

Valve pressure drop (equivalent length in feet of pipe) and Cv (Flow Coefficient) are indicated in Table 5.

Valve Size NPS	Equivalent Length in Feet of Pipe	Cv
1	1.1	60
1-1/4	1.5	105
2	2.3	255
3	3.4	610
4	4.5	1370
6	6.8	2447
8	8.9	4408
10	10.2	7000
12	13.0	10473
16	16.5	16750

10 REPAIR SERVICE



Note: If the service methods described below do not solve the problem, call your Customer Service Representative at Kerotest Manufacturing at (412) 521-4200, email Sales at sales@kerotest.com, or contact your local Sales Representative.

10.1 Shut-Off or Seat Leak

If valve shutoff does not occur using normal operation, fully open the valve, then, using Table 1 count the number of turns to close until it stops. If the turn count is less than the table, then there may be an obstruction. Follow the instructions in 10.1.1, otherwise, follow 10.1.2. If these steps do not correct the problem, contact Kerotest.

10.1.1 Clearing Internal Debris

If valves are in the open position in a pipeline for a period of time, there is a chance that sediment or dirt may collect inside the valve. When these valves are to be closed, it should be done slowly. The valve should not be closed completely until "throttled" for a short time in order that the turbulence created will flush away any sediment or dirt that might have settled in the valve.

10.1.2 Body and Wedge Seating

When complete shut-off is not obtained, the valve can be reseated in the following manner. Drive wedge into seats with moderate effort, turn back 1 or 2 complete turns and again drive into seats with moderate effort. Continue this procedure until shut-off is obtained. Do not exceed the maximum operating torque specified in Table 4



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10.2 External Stem Packing Leak

Valve leaks are generally caused by the failure of the packing seal, typically from worn packing or utilizing a valve outside of packing temperature limitations.



CAUTION: These procedures may remove the Gland Plate from the valve while under operating pressure, exposing the operator to potential personal injury or damage to nearby property if the steps are not followed explicitly.



Note: Repairs should only be made using Kerotest repair parts as listed in Table 7, Table 11, or Table 12. A diagram of valve parts is shown in Figure 6. All-thread information by valve size is shown in Table 8.

10.2.1 Packing Shim Installation Under Pressure

For a stem leak perform this repair first. Refer to Figure 6 for a diagram of the area of the valve affected by this repair and the corresponding components. Shims are required for this repair and can be obtained by contacting Kerotest. See Table 7 for corresponding part numbers and recommended quantities.

1. Open valve fully. Apply an additional opening torque equal to the Operating Torque in Table 4 to stop gas flow between the lower thrust washer (13) and the stem shoulder (12).
2. Remove nut (1), and operating square (2).
3. Remove two of the cap screws (3) that are opposite each other. Replace with two all-thread studs (size and length recommended in Table 8). Thread all-thread studs into bonnet until they bottom. Install a nut on each stud and tighten. Remove all remaining cap screws (3).
4. Slowly and evenly loosen the two nuts on the all-thread studs, watching that the studs do not unthread from bonnet as the nuts are turned. If gland (4) rises as the nuts are loosened, the flow was not stopped in Step 1. Retighten the nuts, replace and retighten the missing cap screws (3), and repeat Step 1 applying a higher torque in the opening direction.

Repeat this process until you are able to loosen the nuts without the gland rising. Continue to loosen the nuts until the top of the nuts are flush with the top of the safety studs.

5. Remove nuts and gland (4). The upper thrust washer (7) may remain on the gland (4) or on the stem (11). If the upper thrust washer (7) was removed with the gland (4), replace it on the stem (11).



Note: If the valve was manufactured prior to 1988, there will not be a weather seal O-ring (5).

6. Place 2-3 additional shims on the top packing adapter (8).
7. Position gasket (6) and gland (4), with weather seal lead-in chamfer side down, on bonnet being careful not to cut the O-ring (5). Insert cap screws (3) in open holes and hand tighten. Remove the all-thread studs and insert remaining cap screws (3). Tighten all cap screws (3) to torque shown in Table 6. Place operating square (2) on stem (11) and then secure with nut (1).



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8. Slowly close the valve to allow pressure on the packing and check for leaks. If repair is unsuccessful, section 10.2.1 may be repeated a few times and more shims added.
9. If the leak remains, contact Kerotest for support in servicing the valve as described at the beginning of this section.

10.2.2 *Repacking a Valve with Zero Pressure*

This procedure requires a repair kit available from Kerotest. Each repair kit will contain two upper packing adapters. Use the new packing adapter that visually matches the one removed. Reference Table 7.

1. Close valve tightly with wrench.
 2. Remove nut (1) and operating square (2).
 3. Remove all cap screws (3) and gland (4). Remove weather seal O-ring (5). Upper thrust washer (7) may remain in gland (4) or on stem (11).
-  **Note:** If the valve was manufactured prior to 1988, there will not be a weather seal O-ring (5).
4. Rotate stem (11) in same direction as closing the valve until it is free from the wedge. Withdraw stem from valve. Lower thrust washer (13) may remain in the bonnet or on the stem (11).
 5. Remove packing shims (14), top packing adapter (8), v-rings (9), and lower packing adapter (10).
 6. Replace lower thrust washer (13) in bonnet if removed.
 7. Lubricate new parts with light oil and insert in packing chamber as follows: Lower packing adapter (10), v-rings (9), top packing adapter (8), and packing shims (14).
 8. Insert stem (11) in bonnet and rotate slowly by hand in the opening direction of the valve. Continue rotation until stem shoulder (12) contacts lower thrust washer (13).
 9. Place upper thrust washer (7) on stem (11) if removed. If the valve has the weather seal O-ring (5), install it in the stem groove. Position gasket (6) and gland (4), with weather seal lead-in chamfer side down, on bonnet, being careful not to cut the O-ring. Insert cap screws (3) fully and tighten to torque shown in Table 6. Place operating square (2) on stem (11) and then secure with nut (1).



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Valve Size NPS	Torque (ft-lbs)
1	15 – 20
1-1/4	15 – 20
2	20 – 30
3	20 – 30
4	20 – 30
6	20 – 30
8	20 – 30
10	45 – 60
12	45 – 60
16	125 – 175

Part Number	Description	QTY	NPS 1 Model 1	NPS 1¼ Model 1	NPS 2 Model 1	NPS 3 Model 1	NPS 4 Model 1	NPS 6 Model 1	NPS 8 Model 1	NPS 10 Model 1	NPS 12 Model 1	NPS 16 Model 1
			72552508	PACKING KIT	1	X	X					
72552516	PACKING KIT	1			X	X						
72552524	PACKING KIT	1					X					
72552532	PACKING KIT	1						X	X			
72552540	PACKING KIT	1								X	X	
72552557	PACKING KIT	1										X
72546068	PACKING SHIM	10	X	X								
88366968	PACKING SHIM	10			X	X						
88366976	PACKING SHIM	10					X					
88366984	PACKING SHIM	10						X	X			
88366992	PACKING SHIM	10								X	X	

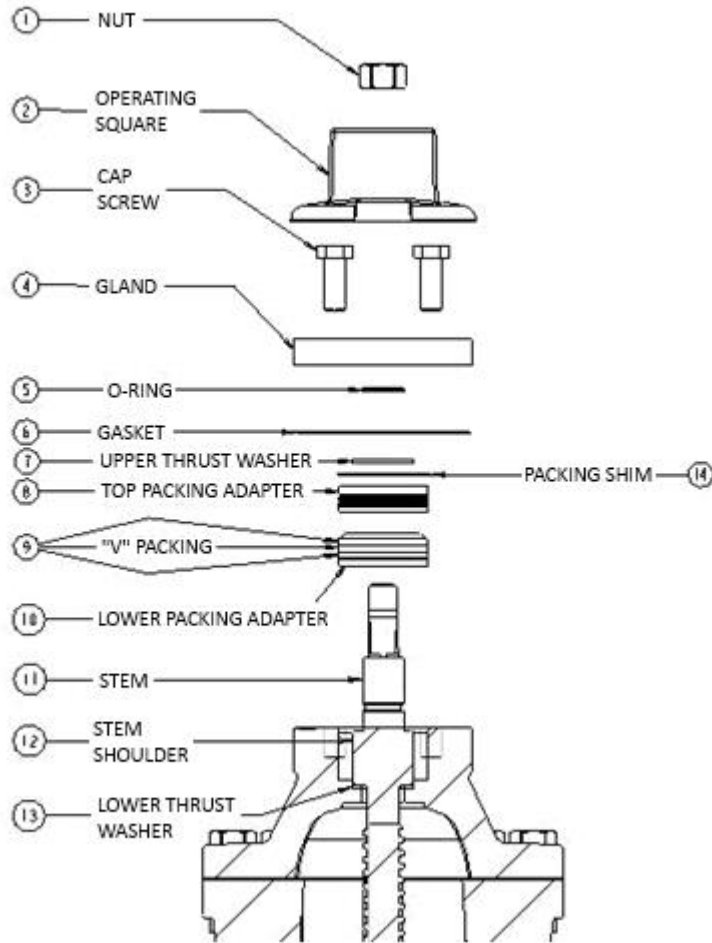


Figure 6: Valve Packing Components

Valve Size NPS	All-Thread Stud and Nut Size	All-Thread Stud Length (inches minimum)
1-1/4	5/16 – 18 UNC	2.00
2 and 3	3/8 – 16 UNC	2.50
4, 6 and 8	3/8 – 16 UNC	3.00
10 and 12	1/2 – 13 UNC	4.25
16	3/4 – 10 UNC	6.25



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10.3 External Bonnet Seal Leak

Another possible cause for an external leak could be a failure at the seal between the valve bonnet and body.



Caution: When a bonnet leak is detected, do not attempt to re-tighten the existing bonnet bolts and, do not attempt to operate the valve since loads applied could cause damaged bolts to break.

10.3.1 Sealing a Bonnet Leak with Zero Pressure

1. Depressurize then fully open the valve.
2. Remove all bonnet bolts.



Note: Refer to APPENDIX A: BROKEN BOLT REMOVAL for instructions on removing broken bolts.

3. Remove the bonnet assembly. This will include the stem and gate.



Note: When removing the bonnet, lift straight up so that no side load or impact can occur to the stem during removal. Mark the orientation of the bonnet and the wedge to the body during removal. During reassembly, match the original orientation.

4. Replace the gasket with only factory authorized replacement. Coat the gasket on both sides with Slic-Tite[®] PTFE paste prior to installation.
5. Lower the bonnet back on to the body. Ensure that the gate is in line with the internal seats of the body and the gasket remains in position and does not shift when the bonnet makes contact.
6. Install new factory authorized bolts into the bonnet. Tighten them in the sequence and to the torques specified in APPENDIX B: BONNET SCREW TIGHTENING PROCEDURE.



Note: Kerotest part numbers for bonnet gaskets and bonnet bolts (cap screws) are listed in Table 11 and Table 12 respectively.

10.3.2 Sealing a Bonnet Leak Under Pressure

1. Remove and replace bolts one at a time (see Table 12). Torque each new bolt to the recommended value specified in Table 10 as it is replaced. If using support clamps to replace the bolts, follow Step 2.



Note: For valve sizes NPS 2 to 6 it is strongly recommended that support clamps be used during bolt replacement. For valve sizes NPS 8 to 12, there is a support clamp available but it is not required. These clamps are available from Kerotest, see Table 9 for associated part numbers.



Note: When replacing bonnet bolts on NPS 1 or NPS 1-1/4 size valves, a special Kerotest bolt replacement fixture and procedure must be used. This is shown in APPENDIX C: MODEL-1 – NPS 1 AND 1 ¼ BOLT REPLACEMENT FIXTURE FOR FIELD SERVICE REPAIR.



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Table 9: Bolt Replacement Support Clamps	
Clamp Part Number	Compatible Valve Sizes
72544794	2" and 3"
72544802	4" and 6"
72546093	8", 10", and 12" ¹

¹This support clamp is not required for bolt replacement.

Table 10: Bonnet Cap Screw Torque Values	
Valve Size NPS	Torque (ft-lbs)
1	38-42
1 ¼	38-42
2	71-79
3	109-121
4	109-121
6	109-121
8	213-237
10	351-389
12	351-389
16	1140-1260

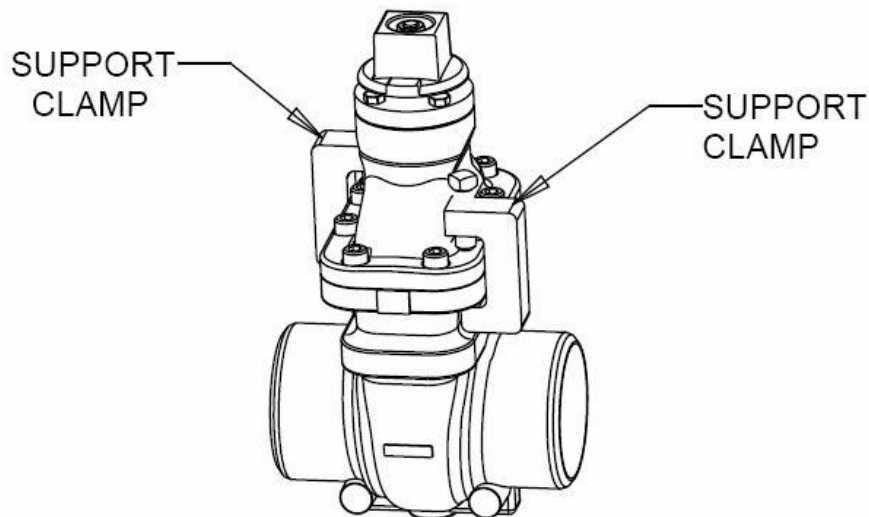


Figure 7: Support Clamp Installations

2. If using these clamps, initially place one in between the two bolts that are closest to the leak location. Another clamp should be placed on a diametrically opposite location on the bonnet. See Figure 7.
3. Replace the bolts on either side of both clamps, tightening the new bolts to the torques listed in Table 10. Then move both clamps in between the next two bolts to be replaced. Remember to always keep both clamps diametrically opposite of each other.
4. After replacing all of the existing bonnet bolts if the leakage has stopped the repair is complete and the valve is ready for service.

If the leakage continues, contact Kerotest for support in servicing the valve.

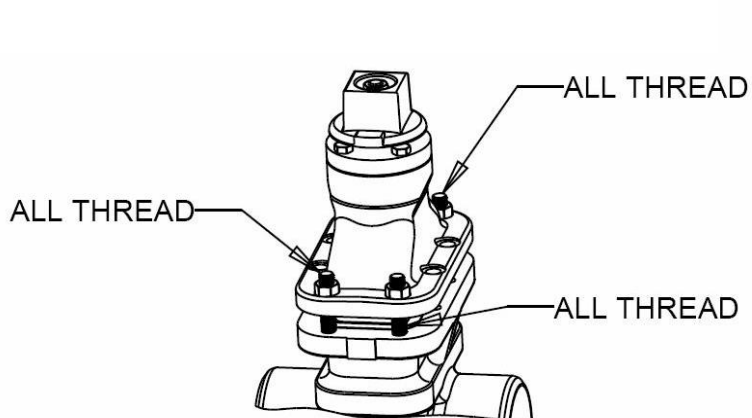


Figure 9: All-Thread Installation Diagram

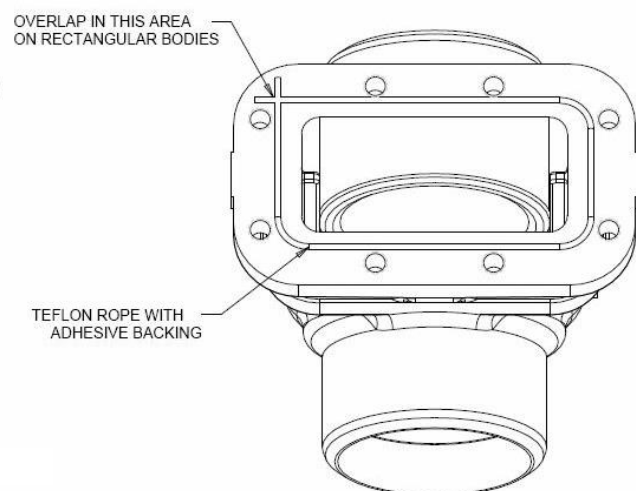


Figure 8: Teflon Rope Installation Diagram



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Table 11: Bonnet Gaskets

Part Number	Description	Qty	NPS 1	NPS 1½	NPS 2	NPS 3 CL 150, 500 WOG (WxW)	NPS 3 CL 300, 500 WOG (FxW, FxF)	NPS 4 CL 150, 500 WOG (WxW)	NPS 4 CL 300, 500 WOG (FxW, FxF)	NPS 6 CL 150, 500 WOG (WxW)	NPS 6 CL 300, 500 WOG (FxW, FxF)	NPS 8	NPS 10	NPS 12	NPS 16
			1 FT	1 FT	1.5 FT	2 FT	2 FT	2.5 FT	2.5 FT	3 FT	3 FT	3.5 FT	4 FT	4.5 FT	5 FT
88231220	GASKET	1	X	X											
88231865	GASKET	1			X										
88232087	GASKET	1				X									
88232186	GASKET	1					X								
88232350	GASKET	1						X							
88232384	GASKET	1							X						
88232509	GASKET	1								X					
88232525	GASKET	1									X				
88232558	GASKET	1										X			
88231709	GASKET	1											X		
88231766	GASKET	1												X	
88232004	GASKET	1													X

Table 12: Bonnet Cap Screws

Part Number	Description	NPS 1	NPS 1½	NPS 2	NPS 3 Class 150, 500 WOG (WxW)	NPS 3 Class 300, 500 WOG (FxW, FxF)	NPS 4 Class 150, 500 WOG (WxW)	NPS 4 Class 300, 500 WOG (FxW, FxF)	NPS 6 Class 150, 500 WOG (WxW)	NPS 6 Class 300, 500 WOG (FxW, FxF)	NPS 8 Model 1	NPS 10 Model 1	NPS 12 Model 1	NPS 16 Model 1	
		4	4	6	6	10	8	10	12	14	16	18	20	20	40
88370085	CAP SCREW, 3/8-16X1.25	4	4												
88232541	CAP SCREW, 7/16-14X1.25			6											
88231303	CAP SCREW, 1/2-13X1.50				6	10	8								
88231329	CAP SCREW 1/2-13X1.75							10	12	14					
88232434	CAP SCREW, 5/8-11X2.25										16				
88232236	CAP SCREW, 3/4-10X3.25											18	20		
88231253	STUD, 1-1/8-8X7.00														20
88231246	NUT, HEX, 1-1/8-8, GR 2H														40
	ALL THREAD, 3/8-16X6.00 ⁴	X	X	X	X	X	X	X	X	X	X				
	NUT, HEX, 3/8-16, GR 2H ⁵	X	X	X	X	X	X	X	X	X	X				

¹ The numbers in the body of this table represent the quantity of each part required for one valve.

³ Purchase from Sealing Specialists & Service Co., (866) 487-8283, www.sealingspec.com or from SealPro LLC, (800) 732-5776, www.sealproweb.com (PN TR-025)

⁴ Purchase from McMaster-Carr, www.mcmaster.com (PN 90322A120) or another hardware supplier.

⁵ Purchase from McMaster-Carr, www.mcmaster.com (PN 90521A225) or another hardware supplier.



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10.4 Broken Stems

This can be due to one of two possibilities: External damage (i.e. backhoe, etc.) or if the valve, when in the full open or full closed position, is over torqued (see Table 4: Valve Torque).

10.4.1 Valve Operation with Broken Stem

The valve stem is designed to shear at a minimum cross-sectional area at the top of stem. This should enable you to utilize a pipe wrench on the remainder of stem protruding above the gland. If the torque necessary for the pipe wrench exceeds the minimum stem failure torque per Table 4, care should be taken when operating at these levels. Follow the steps in Section 10.1.1 to clear any debris that may prevent the valve from fully closing.

10.4.2 Stem Repair

A service pack is available from Kerotest Manufacturing that provides all parts and tools needed to perform this repair. See Figure 10 for a diagram of this repair assembly, and Table 13 for the repair kit part numbers listed by valve size.

1. Place the broken stem adapter over the top of the broken stem.
2. Using the drill bit provided in the repair kit, drill a hole fully through the stem. The existing hole on the adapter provided should be used as a guide/pilot hole.
3. Insert the locking pin provided into the drilled hole. Hammer the pin until it is flush with the side of the adapter.



Caution: Hammering with excessive force can bend or damage the stem.

4. Reinstall the operating square on the broken stem adapter.

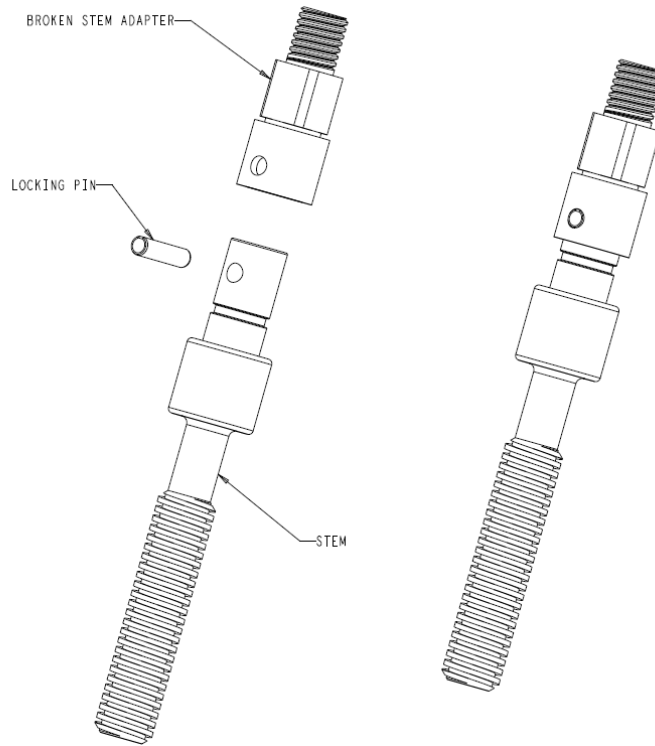


Figure 10: Broken Stem Repair

Table 13: Broken Stem Repair Kit Part Numbers

			NPS 1	NPS 1¼	NPS 2	NPS 3	NPS 4	NPS 6	NPS 8	NPS 10	NPS 12
Part Number	Description	QTY									
72546394	STEM REPAIR KIT	1	X	X							
72546395	STEM REPAIR KIT	1			X	X					
72546396	STEM REPAIR KIT	1					X				
72546397	STEM REPAIR KIT	1						X	X		
72546398	STEM REPAIR KIT	1								X	X

10.5 Service Parts Ordering Procedure

Proper identification of replacement parts or valves will improve deliveries and eliminate order-processing errors.

When ordering replacement parts and the service part numbers are not identified in the reference tables, first identify the part from the illustration in the introduction. Locate the valve size, pressure class rating, and serial number or date code off the identification tag.

A typical replacement part order should read as follows:

3 Pieces – Stem for 8" Class 150 (or 285 MOP), Serial Number, Date 5 18

APPENDIX A: BROKEN BOLT REMOVAL

Information and Background

If bolt is not broken below the top of bonnet flange shown in Figure 11, a small chisel or punch could be used to try and extract the bolt.

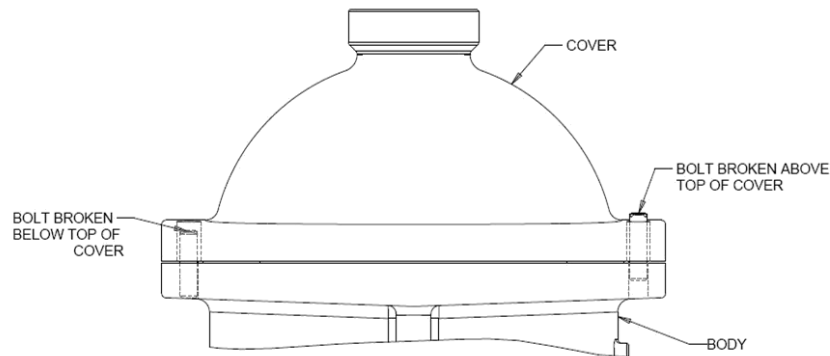


Figure 11: Bonnet Broken Bolt Diagram

When bolt is broken down below the flange, an easy out screw extractor must be used to extract it. If available, a left handed drill bit will sometimes remove the bolt during drilling.

The centers of these bolts are softer than the outer threaded edges. A sharp drill bit will easily penetrate the bolt with or without cutting oil. Cutting oil is preferred because it reduces the likelihood of sparks occurring during drilling.

A good quality center punch will be needed. Bolts should be punched and drilled as close to the center of the bolt as possible.

Kerotest offers a Model-1 Bolt Repair Tool Kit, Part Number 72631146. This kit includes all necessary punches, drill bits and easy-outs for removing bonnet bolts on valve sizes NPS 1 through 8.

Model-1 Bolt Removal Procedure

1. Secure bonnet to body with the appropriate clamps listed in Table 9. If replacing bolts on an NPS 1 or 1-1/4 valve, use the procedure in APPENDIX C: MODEL-1 – NPS 1 AND 1 ¼ BOLT REPLACEMENT FIXTURE FOR FIELD SERVICE REPAIR
2. Spray penetrating oil (not provided) on bolt surface.
3. Tap bolt with a hammer 3 to 4 times to loosen rust around threads.
4. Position punch at the center of the bolt and tap 3 to 4 times.
5. Apply cutting oil (not provided) to bolt surface.
6. Drill shallow hole (1/4" to 3/8" deep) into bolt head with proper size cobalt bit (see Table 14: Bonnet Bolt Removal Chart).
7. Tap easy-out into drilled hole until tight.
8. Turn easy-out in a counter clockwise direction with a small wrench to remove bolt.



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Table 14: Bonnet Bolt Removal Chart

Valve Size NPS	Easy Out Screw Extractor	Drill Bit Size
1-1/4	#2	7/64"
2 through 6	#3	3/16"
8	#4	1/4"
10 and 12	*#5	*17/64"

*Not included in Model-1 Bolt Repair Tool Kit.

Table 15: 72631146 Repair Kit Components

Description	QTY	NPS 1 Model 1	NPS 1¼ Model 1	NPS 2 Model 1	NPS 3 Model 1	NPS 4 Model 1	NPS 6 Model 1	NPS 8 Model 1	NPS 10 Model 1	NPS 12 Model 1
		BONNET BOLT REMOVAL GUIDE CHART	1	X	X	X	X	X	X	X
TOOL,PUNCH,3/16"	1	X	X	X	X	X	X	X	X	X
TOOL,#3 EASY OUT SCREW EXTRACTOR	1			X	X	X	X			
TOOL,CENTER,PUNCH	1	X	X	X	X	X	X	X	X	X
TOOL,#2 EASY OUT SCREW EXTRACTOR	1	X	X							
TOOL,#4 EASY OUT SCREW EXTRACTOR	1							X	X	X
TOOL,DRILL,3/16",COBALT,TIN	1			X	X	X	X			
TOOL,DRILL,1/4",COBALT,TIN	1							X	X	X
TOOL,DRILL,7/64",COBALT,TIN	1	X	X							



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APPENDIX B: BONNET SCREW TIGHTENING PROCEDURE

When tightening the bonnet screws or all-thread and nuts, use an incremental torque tightening procedure in the cross-pattern outlined below (taken from ASME PCC-1 – 2010, Table 2 and Table 4 respectively):

Incremental Tightening Procedure:

1. Hand tighten, then “snug up” to 10 ft-lb to 20 ft-lb (not to exceed 20% of Target Torque, see Table 10). Check flange gap around circumference for uniformity. If the gap around the circumference is not reasonably uniform, make the appropriate adjustments by selective tightening before proceeding.
2. Tighten to 20% to 30% of Target Torque (see Table 10). Check flange gap around circumference for uniformity. If the gap around the circumference is not reasonably uniform, make the appropriate adjustments by selective tightening/loosening before proceeding.
3. Tighten to 50% to 70% of Target Torque (see Table 10). Check flange gap around circumference for uniformity. If the gap around the circumference is not reasonably uniform, make the appropriate adjustments by selective tightening/loosening before proceeding.
4. Tighten to 100% of Target Torque (see Table 10). Check flange gap around circumference for uniformity. If the gap around the circumference is not reasonably uniform, make the appropriate adjustments by selective tightening/loosening before proceeding.
5. Continue tightening the bolts, but on a circular clockwise pattern until no further nut rotation occurs at the final Target Torque value. For indicator bolting, tighten bolts until the indicator rod retraction readings for all bolts are within the specified range.
6. Time permitting, wait a minimum of 4 hours and repeat Step 5; this will restore the short-term creep relaxation/embedment losses. If the flange is subjected to a subsequent test pressure higher than its rating, it may be desirable to repeat this round after the test is completed.

Cross-Pattern Tightening Sequences:

Number the bolt holes sequentially in a clockwise direction moving around the valve. Using the Incremental Tightening Procedure, tighten the bolts using the correct pattern from Table 16.

Table 16: Cross-Pattern Tightening Sequences					
No. of Bolts	Sequentially Clockwise Sequence				
4	1-3-2-4				
6	1-4-2-5	3-6			
8	1-5-3-7	2-6-4-8			
10	1-6-3-8	4-9-2-7	10-5		
12	1-7-4-10	2-8-5-11	3-9-6-12		
14	1-8-5-12	3-10-7-14	2-9-6-13	4-11	
16	1-9-5-13	3-11-7-15	2-10-6-14	4-12-8-16	
18	1-10-6-15	3-12-8-17	4-13-9-18	2-11-7-16	5-14
20	1-11-6-16	3-13-8-18	5-15-10-20	2-12-7-17	4-14-9-19

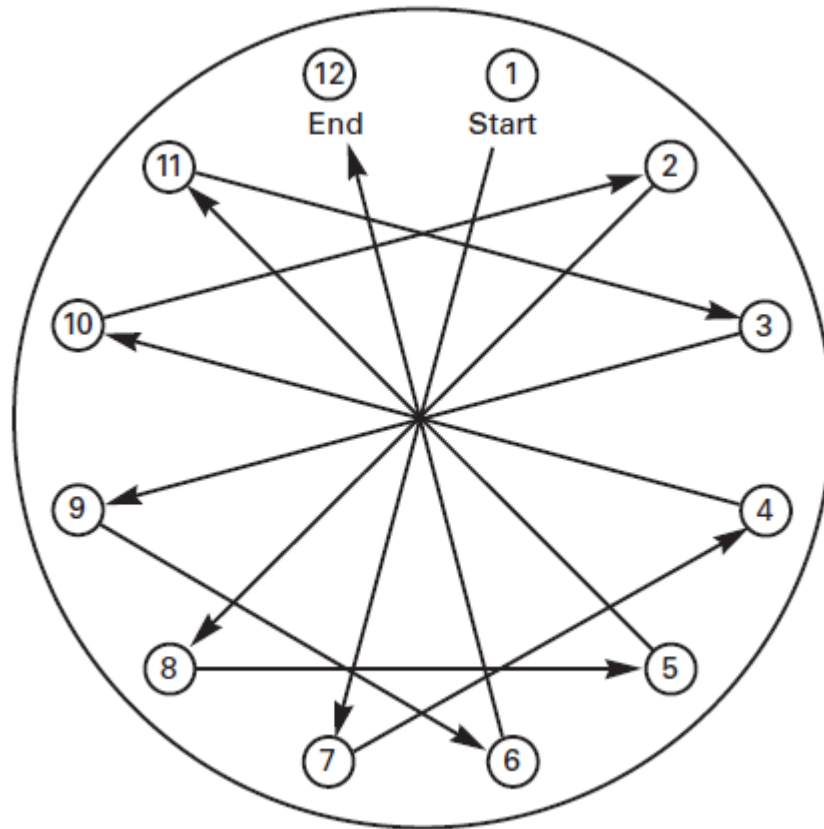


Figure 12: Example Pattern for 12-Bolt Tightening Sequence



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APPENDIX C: MODEL-1 – NPS 1 AND 1 ¼ BOLT REPLACEMENT FIXTURE FOR FIELD SERVICE REPAIR

BILL OF MATERIAL

ITEM	QTY	PN	DESCRIPTION	MATERIAL
1	1	58990055	PLATE,BOTTOM	STEEL,COLD ROLLED,PAINTED OR PLATED
2	12	58990056	NUT,FLANGED,1/2"-13	STEEL,1113,CARB HARDENED,BLACK OXIDE
3	2	58990057	ROD,ALL THREAD,1/2"-13	STEEL,ASTM A193,B7-4140 ALLOY
4	1	58990048	GLAND PLATE,MI FIXTURE	STAINLESS STEEL,304
5	1	58990058	STEM BUSHING,THREADED	STEEL,COLD ROLLED,PAINTED OR PLATED
6	1	58990059	PLATE, TOP	STEEL,COLD ROLLED,PAINTED OR PLATED
7	1	58990060	PLATE,MIDDLE	STEEL,COLD ROLLED,PAINTED OR PLATED
8	1	58990061	DRILL BUSHING,1/8"	STEEL,OIL HARDENED. TS
9	1	58990062	DRILL BUSHING,3/16"	STEEL,OIL HARDENED. TS
10	1 PRINT	72630510	REPAIR PROCEDURE DRAWING	PAPER

PROCEDURE

1. REFER TO M-1 OPERATIONS MANUAL FOR DETAILED BOLT TORQUE INFORMATION. MANUAL AVAILABLE AT WWW.KEROTEST.COM
2. ASSEMBLE AND SECURE FIXTURE TO VALVE AS SHOWN IN FIGURE 1.
3. BACKSEAT VALVE USING 50 ft-lbs OF TORQUE.
4. CAREFULLY REMOVE OPERATING SQUARE NUT AND OPERATING SQUARE.
NOTE: A GEAR PULLER DEVICE ALLOWS FOR EASY REMOVAL.
5. SCREW THREADED STEM BUSHING ON TOP OF STEM.
6. SECURELY INSTALL TOP PLATE AS SHOWN IN FIGURE 2.
7. REMOVE GLAND BOLTS AND GLAND PLATE.
NOTE: IF LEAKING IS DETECTED BETWEEN GLAND AND BONNET DURING GLAND BOLT REMOVAL, RESECURE GLAND PLATE AND VERIFY STEM IS PROPERLY BACKSEATED.
8. RAISE UP GLAND AND INSTALL MIDDLE PLATE SECURELY AS SHOWN IN FIGURE 3.
NOTE: SECURE GLAND TO TOP PLATE USING A 1/4"-20 x 1.25" HEX BOLT & NUT (NOT INCLUDED) IF NEEDED.
9. REMOVE TOP PLATE AND THREADED BUSHING AS SHOWN IN FIGURE 4.
10. REMOVE BROKEN BOLTS 1 AT A TIME AND REPLACE WITH NEW HARDWARE.
NOTE: USE HARDENED DRILL BUSHING TO GUIDE 3/16" OR 1/8" DRILLS FOR USE WITH "EASY OUTS."
11. REMOVE REPAIR FIXTURE AND REASSEMBLE VALVE AS SHOWN IN FIGURE 5.

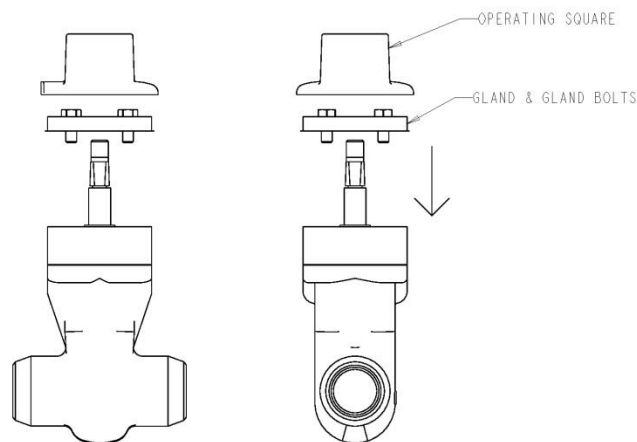


FIGURE 5

Figure 13: Bolt Replacement Instructions (1 of 2)⁶

⁶ The Figure references in the text of Figure 13 refer to the internal figure numbers in this document's Figure 13 and Figure 14.



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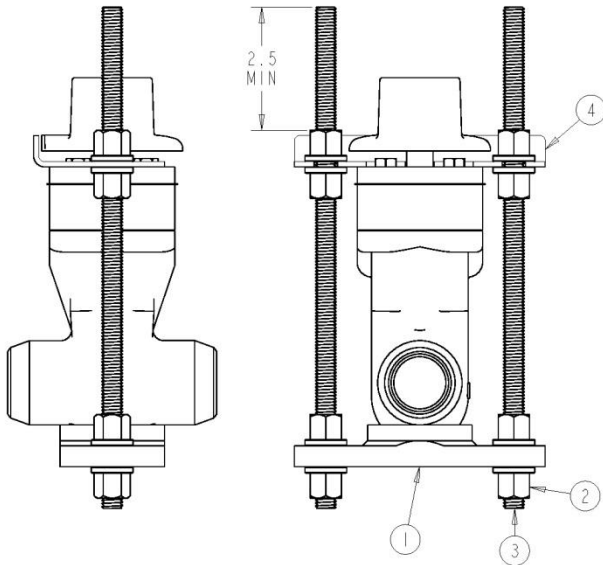


FIGURE 1

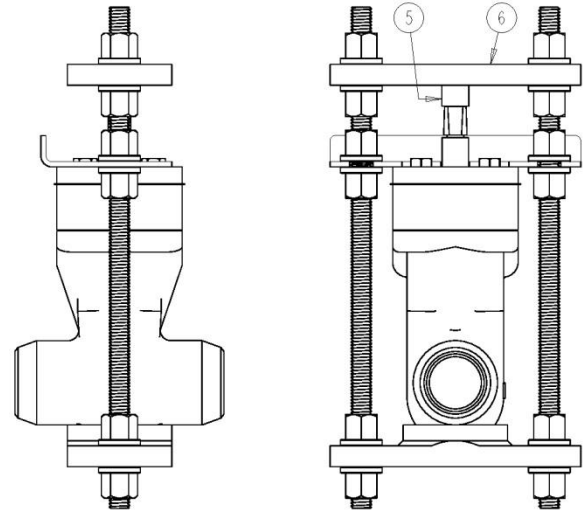


FIGURE 2

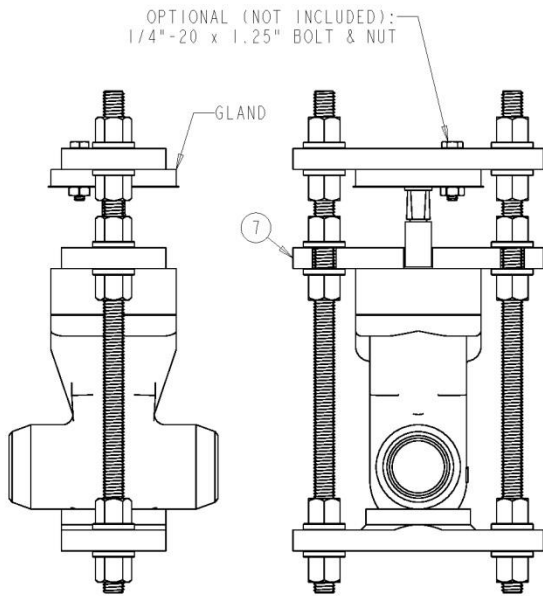


FIGURE 3

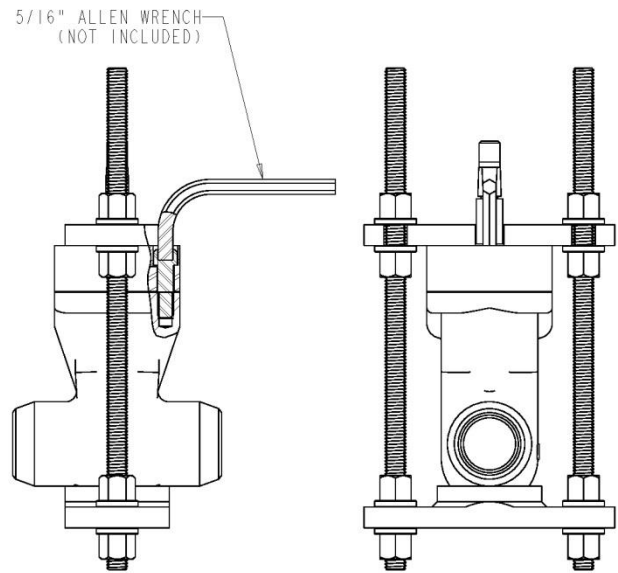


FIGURE 4

Figure 14: Bolt Replacement Instructions (2 of 2)



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Document History:

Rev	Description	Written By	Approval	Approval	Date
11	Update procedure. Remove repair procedures for factory personnel only. Initial Release EAN S-1418	Greg Zetwo			06-26-2018

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Prior Document Releases

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Rev	Date	Description
--	12/15/1988	
1	11/28/1990	
2	09/04/1991	
3	07/16/1993	
4	03/28/1996	
5	05/30/1997	Added Bonnet Leak Repair, Attachment 2
6	11/21/1997	Added Table 1 and reference to it and revised Attachment 2
7	03/15/1999	Retyped. Made various editorial changes such as deleting page number references. Revised packing temperature limitations under body/wedge seating. Revised 1" and 1-1/4" sizes overtorque to failure.
8	11/17/1999	Revised Bonnet Leak Repair Procedure, Attachment 2
9	05/22/2001	Revised Bonnet Leak Repair Procedure, Attachment 2
10	07/12/2007	Retyped in its entirety