

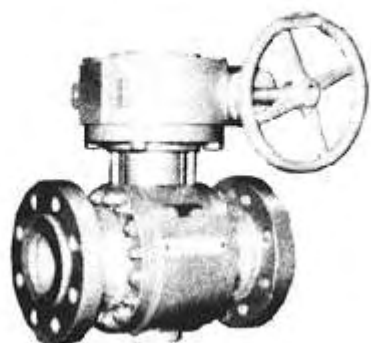
GROVE Series B-5, B-4B & B-4C Ball Valve

INSTALLATION & MAINTENANCE MANUAL

Series B-4B & B-4C

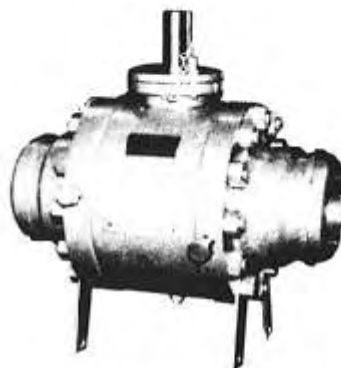


WRENCH OPERATED, 2" - 4"

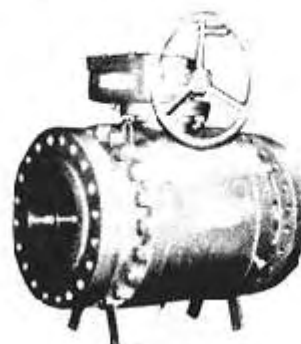


GEAR OPERATED, 2" - 4"

Series B-5



WRENCH OPERATED, 6" - 12"



GEAR OPERATED, 6" - 48"



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Section A (Series B-5 Ball Valves)

PART I - General Information

DESIGN

All Grove ball valves are non-directional and can be installed with either end upstream. Flanged-end valves (sizes 24" & smaller, except 22") have flanges faced and drilled in accordance with ANSI B16.5. 22" and sizes 26" and larger conform to MSS SP-44. Face-to-face and end-to-end dimensions conform to API Spec. 6-D, Table 4.4, "Flanged-End and Welding-End Ball Valves-Full Bore and Reduced Bore".

BLOCK & BLEED

All current B-5 valves have body drain ports per MSS-SP-45, i.e. 3/4" NPT for 6-8" valves and 1" NPT for 10" and up. A special vent valve is supplied as a standard feature for Block & Bleed service.

EMERGENCY SEAT SEALANT SYSTEM

1/2" NPT steel fittings with giant button heads are installed in the mid-section of both closures. On valves 22" and larger, dual fittings are provided on both the front and back side of the valve. Section III-C describes the function of the sealant system.

FIELD WELDABILITY - WELDING END VALVES

Grove ANSI ball valves with welding end connection(s) utilize ASTM A-36, A-572 GR 50, A-537, A-216 GR WCB, A-350 LF2, A-105, and A-106 GR B steel. All are readily field weldable. When welding Grove valves in the line, standard field welding techniques and procedures are satisfactory.

BODY RELIEF VALVE

To protect the body from thermal over pressure in above ground liquid service when valve is in the closed position, a 1/2" NPT steel body Relief Valve, located in the upper body area, is furnished. It has been factory adjusted to a nominal relief setting of 1.6 x rated pressure.

A small hole in the ball equalizes line pressure and body pressure when the valve is in the open position.

PART II - Valve Installation

A. EQUIPMENT

Handling equipment is required for the weight involved. The current Grove Ball Valve catalog furnishes the weight of the specific valve.

B. PROCEDURE

1. Remove end connection protectors.
2. Inspect valve bore for foreign matter and clean, if necessary. Valves are shipped with ends sealed, but during transit foreign material may be introduced into the bore.
3. Install in line; either end may be installed upstream.
4. Install vent valve, if not already factory-installed.
5. On valves having extensions, check all extension piping and fittings to ensure that all are tight prior to placing valve in service.
6. The seat sealant system is intended only for emergency shut-off. Do not lube. (See Part III-C).

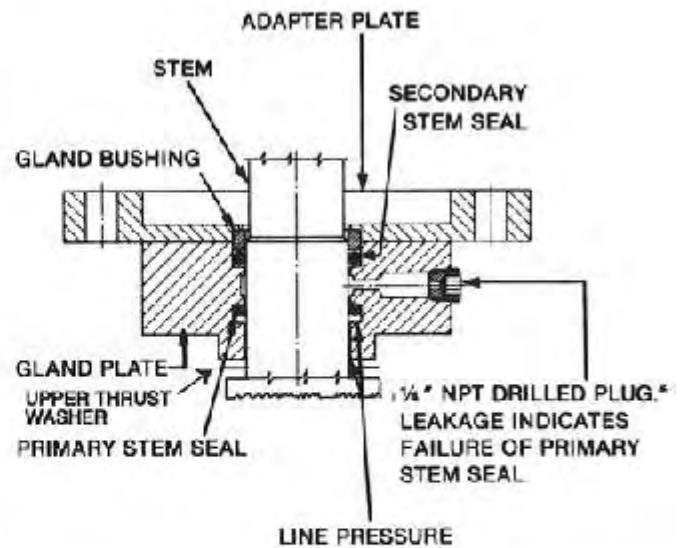
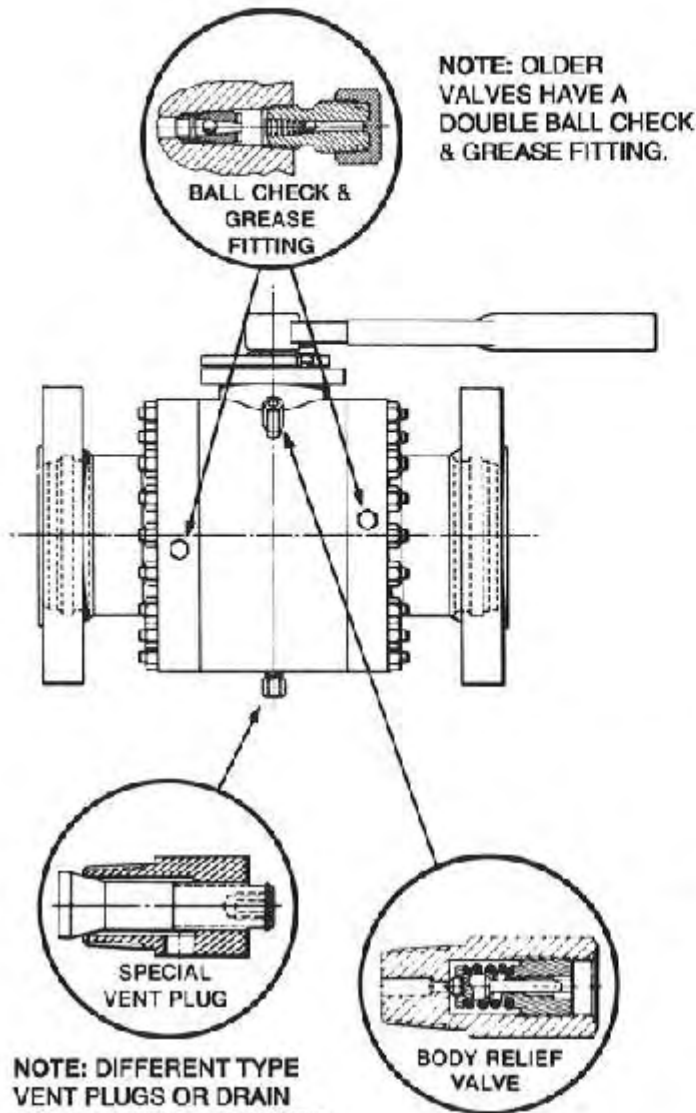
PART III - On Stream Maintenance

This part covers maintenance and repair which can be performed without removing the valve from the line.

A. BLOCK AND BLEED

With the line under pressure the valve body cavity can be vented to atmosphere and completely drained down with the ball in the CLOSED POSITION ONLY. The valve body cavity may be drained and flushed by: (1) removing the special vent valve after pressure has been vented, (2) removing the 1/2" NPT relief valve from the upper body area, and (3) flushing through upper relief valve connection and allowing drainage through the lower vent plug connection.

B. STEM SEAL O-RING REPLACEMENT



NOTE: ON NEWER VERSIONS OF THE B-5 BALL VALVE, THE ADAPTOR PLATE AND STOP COLLAR ARE ONE PIECE. (SEE FIG. A & B, PAGE 2)

* On newer valves a needle valve is supplied in lieu of a vent plug.

The B-5 has two stem seals, one primary seal, backed up by a second independent seal.

If the primary O-Ring seal becomes faulty, a leak will occur through the gland plate vent plug.* In this case remove 1/4" vent plug* and replace with 1/4" solid plug to energize the secondary O-Ring seal.

1. To verify the integrity of the primary stem seal, open the needle on the vent assembly plug*. If the primary seal is faulty, close the needle valve to energize the secondary seal.

**STOP COLLAR
1963 - 1990**

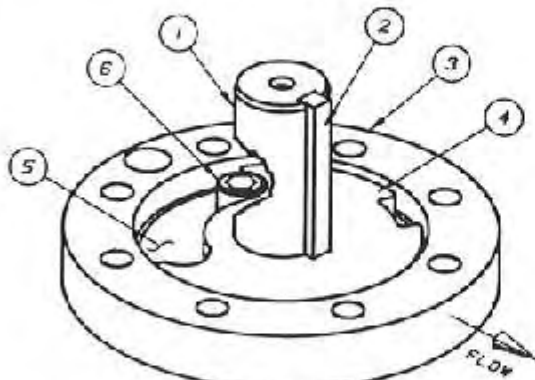


FIG. A

1. STEM
2. KEY
3. ADAPTER PLATE
4. STOP COLLAR
5. NYLON WASHER
6. STOP CAPSCREW

**KEY STOP
1991 -**

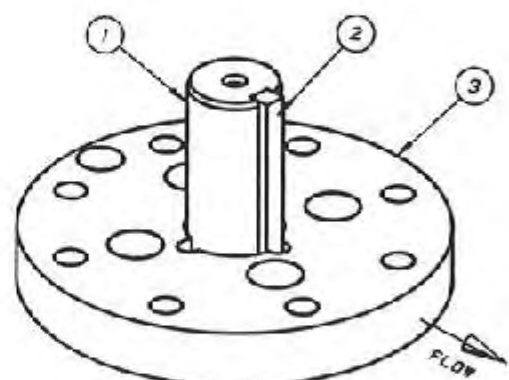
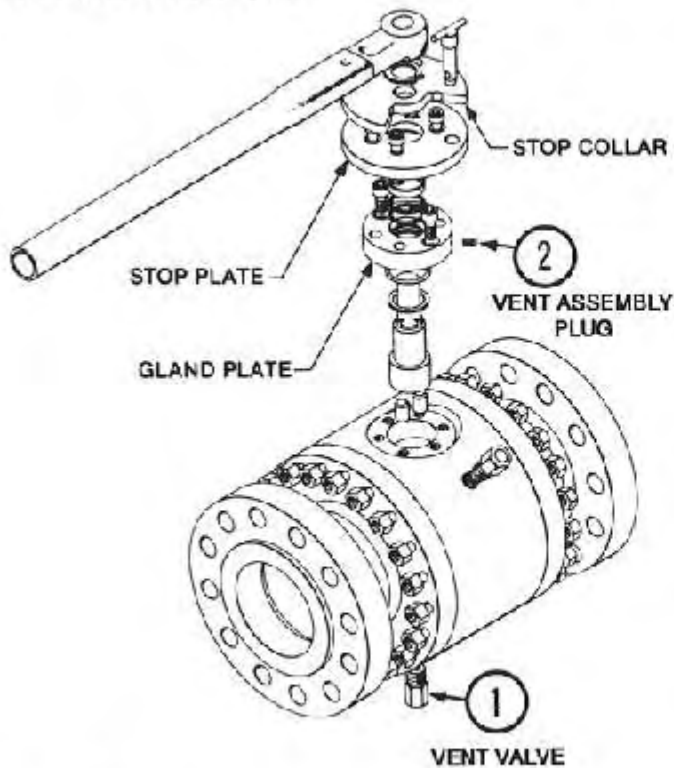


FIG. B

1. STEM
2. KEY
3. ADAPTER PLATE

SHOULD SEALS LEAK, THEY MAY BE REPLACED BY THE FOLLOWING PROCEDURE.



WRENCH OPERATED VALVE

1. Turn valve to fully closed position.
2. Bleed off body pressure - leaving vent valve (1) open.
3. Open 1/4" NPT vent assembly plug (2) on the gland plate.
CAUTION: EXERCISE EXTREME CARE WHEN REMOVING THIS PLUG AS IT IS POSSIBLE, EVEN WITH BODY PRESSURE RELIEVED, TO HAVE TRAPPED LINE PRESSURE BEHIND THIS VALVE.
4. Lift wrench off stem. Do not lose key.
5. Remove lock pin, and cap screws, and lift collar from the stem.
6. Remove cap screws and lift stop plate and key stop off stem.
7. Remove gland plate cap screws.
8. Lift stem unit with gland plate out of body. Do not remove the drive pins.
9. Slip gland plate off of stem. Remove gland bushing, O-Rings, and upper thrust washer(s).
10. Coat new O-Rings with a thin film of non-fibrous grease and install in gland plate.
11. Re-assemble gland plate, thrust washer(s), and stem assembly and insert into body. (See torque table, PART VI).
12. Close vent valve (1).
13. Replace 1/4" NPT vent assembly plug (2).
14. Crack valve to allow body to repressure to check integrity of the new seal.

GEAR OR MOTOR OPERATED VALVE

1. Follow steps 1 and 2 as outlined for wrench operated valve.
2. With valve in fully closed position mark vertical line on operator, adapter flange and body, to insure correct alignment of these parts at re-assembly.
3. Remove mounting nuts from adapter plate and lift operator off plate.

NOTE: EXERCISE CAUTION WHEN REMOVING OPERATOR. IT IS KEYED TO STEM AND MUST BE LIFTED STRAIGHT UP UNTIL STEM IS CLEAR. BE CAREFUL NOT TO DAMAGE OR LOSE KEY.

4. Remove adapter plate (remove stop collar if required).
5. Follow steps 7 through 13 as outlined for wrench operated valve.
6. Replace adapter plate making certain vertical mark line on body and adapter are in alignment.
7. Replace nylon washer and stop collar if required.
8. Replace gear operator making certain vertical mark line on body, adapter plate and operator, are in alignment.
9. Replace key in stem.
10. Replace mounting nuts and tighten evenly all around.
11. Crack valve to allow body to repressure to check integrity of the new seal.

C. EMERGENCY SHUT-OFF

The seat seals of all Grove valves are designed not to require sealants; however, in the presence of excessive line contaminants, the possibility of leakage, due to erosion, is greater than when a valve is used for normal on-off service. If the metal-to-metal primary seal and the secondary "O" ring seal are damaged, an emergency shutoff may be obtained with a sealant injected into a specially designed groove in the seat ring assembly. This feature is especially important in critical underwater applications where it may be impractical to remove a valve from the line. Grove B-5 valves are equipped with fittings for emergency sealant injection. We ship without sealant fittings and drain valves for subsea service.

SEALANT INJECTION INSTRUCTIONS

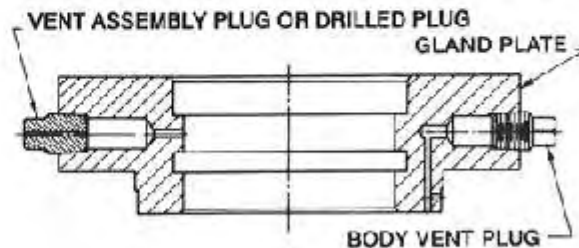
First purge the sealant passages by injecting "SEALWELD" VALVE CLEANER (or equivalent). This operation purges old greases and residual build-up which contribute to seat leakage and excessive operating torque.

With valve in the fully closed position, slowly inject "SEALWELD 91" sealant (or equivalent) through the large buttonhead fitting provided on the upstream closure. If possible, move ball slightly during injection to insure that sealant is evenly distributed over the sealing surfaces of the seat ring and the ball. (For ball valves with damaged balls or seats use "SEALWELD" BALL VALVE SEALANT NO. 5050, or equivalent.)

For low temperature services down to -75 to +400 degrees Fahrenheit, use "SEALWELD" VALVE SEALANT D-1014 (or equivalent). A damaged sealant fitting may be removed and replaced while the valve is under pressure, by first injecting a small amount of sealant to insure the tightness of the single or double ball check valve installed in the sealant passage under the grease fitting.

D. IN-LINE HYDROSTATIC TESTING

1. With zero pressure in the line and in the valve, remove the relief valve and replace with a pipe plug.
2. Make sure that vent plug valve at bottom of valve is closed.
3. On valves 14" and larger, remove the body vent plug from the gland plate to permit evacuating all air from body cavity.



4. Open ball valve about 1/3 to permit pressurizing valve body.
5. Fill line and valve body until liquid flows from gland plate body vent port and pressures the relief port.
6. Replace gland plate vent plug and plug pressure relief port.

7. Raise pressure to desired hydrostatic test pressure. This pressure must not exceed 1-1/2 times the maximum operating pressure of the valve - unless prior approval to test at higher levels is obtained from Grove.
8. After test is completed:
 - a. Close ball valve.
 - b. Vent any remaining body pressure through bottom vent plug valve and close tightly.
 - c. **REINSTALL THE RELIEF VALVE**
This is very important for protection of the body against overpressure when the valve is in the closed position.
CAUTION: DO NOT ALTER THE RELIEF VALVE SETTING.
9. When valve is in the closed position, test pressures must NOT exceed the maximum rated operating pressure of the valve.

PART IV - Off Stream Maintenance

Major repairs which necessitate removing the valve from the line.

EQUIPMENT

Handling equipment as required for weight involved, see current Grove Ball Valve catalog for weight of specific valve. Also required is a plywood sheet to press in large seat rings.

A. DISASSEMBLY PROCEDURE

1. Turn the valve to open position, and open vent valve to relieve line pressure before removing the valve from line.
2. Remove the wrench or gear per instructions in Part III.
3. Remove stem assembly per instructions in Part III.
4. Remove body nuts except four (4) on each flange.
5. Turn the valve on end with the weight spread evenly on one port face of the body, exercising care not to damage the sealing surfaces if the valve is flanged. Loosen body nuts on upper closure one full turn and lift on closure to loosen closure, o-rings, and body.

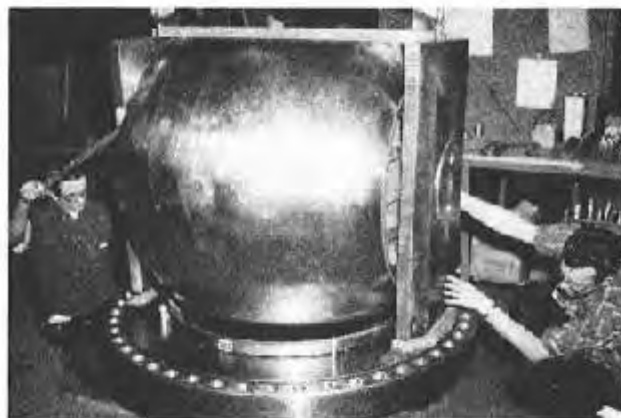


6. Remove remaining body nuts from upper closure and lift closure off body studs. Be careful not to damage body "O" Ring or bearing unit dowel pins. Loosen body nuts on lower closure one full turn and lift on body to loosen body, o-ring, and closure.

7. Remove remaining body nuts from lower closure and remove body. On large valves, body studs may be replaced by eye bolts for this operation.



8. Remove vent valve and relief valve from body for cleaning.
9. Insert lifting eyebolts in threaded holes provided in bearing plates.
10. Using eyebolts and a spreader bar cut to length, lift the ball up out of seat ring.
CAUTION: BALL CAN SLIDE OUT OF THE BEARING BLOCKS.



11. For re-assembly note position of the three or more drilled holes on O.D. of outer seat ring. Seat ring must be re-assembled with these holes at 90° to the vertical center line of the stem and ball.



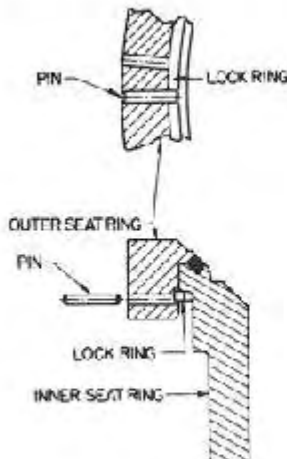
12. Lower ball onto wood blocks with the plates clear, and remove the plates from the ball. Spacer and lower thrust washer are now free. Retainer pins are a press fit in bearing plates and should not be removed.



13. Remove from closures, 4 seat retainer cap screws and bushings (if valve is so equipped.) Carefully pry out the seat ring assembly from both closures, and remove seat ring springs from the closures. Remove buttonhead grease fittings and ball check valves from closures for inspection and cleaning.



14. Disassemble seat ring as follows:
a. Remove seat gasket O-Ring and U-Cup (not shown).



On small valves, the U-Cup remains in the closure when the seat assembly is removed.

- b. Remove lock pin by introducing screw driver between inner and outer seat rings and pry pin outward. Compress locking inward by introducing a punch thru hole adjacent to pin and progressively pry out locking from it's groove.
- c. Separate inner ring from outer ring and remove Seal O-Ring.

B. INSPECTION AND CLEANING

1. Wipe off metal parts with soft cloth, using a petroleum solvent, detergent, or cleaner. Replace O-Rings and gasket.
2. Inspect metal parts for damage or burrs on all moving surfaces.
3. Replace defective parts with only genuine Grove manufactured and supplied parts.
NOTE: O-Rings are made to stretch with a certain tension around a metal shoulder. Any stretching or swelling of O-Rings may cause cutting on re-assembly. Do not re-use O-Rings unless their dimensions are carefully checked against new parts.

C. LUBRICATION

1. DO NOT lubricate the dry bearing plates or the contact surfaces.
2. For temperatures from -50°F to $+225^{\circ}\text{F}$, lubricate all moving contact metal surfaces with a low temperature, high quality



grease. Lubricate O-Rings with heavy grease. (Marfak #3 or equal.)

3. For temperatures $+10^{\circ}\text{F}$ to $+350^{\circ}\text{F}$, lubricate all moving contact metal surfaces and O-Rings with Bracote 622 wide temperature grease or equivalent.

D. REASSEMBLY

1. Place both closures on a clean, solid surface. If flanged, be careful not to damage sealing surface.
2. a. Install check valve and buttonhead grease fittings into sealant passages of closures.
b. Lubricate threads with thread sealant.
c. Fill sealant cavities, through the grease fittings, with a low temperature, high quality, grease until lubricant just appears in the seat ring recess. This process serves to lubricate the check valves, assuring pressure tightness.

3. Reassemble seat rings:

NOTE: A press will make the assembly of the inner and outer seat rings easier. Contact Grove for more information.

- a. Place Seal-O-Ring in inner seat ring and place outer seat ring over inner ring, set the loose seat rings in the press then press together.
- b. Secure with lock ring and pin as follows: Push lock pin inward thru hole in outer set ring until it protrudes slightly

into lock ring groove. Start lock ring into it's groove by abutting the pin and working it into it's groove progressively around the seat circumference. Push lock pin fully thru gap between ends of nested lock ring. Remove from press (refer to illustration, Part IV-A, Step 14).

- c. Grease seat gasket O-Ring. Stretch seat gasket O-Ring over shoulder of inner seat ring.
 - d. Replace U-Cup. Do not stretch. U-Cup is designed to fit with minimum contact. Stretching will make it too large.
4. Insert springs in closure and position seat ring in closure so that the three or more drilled holes on the O.D. of outer seat ring are at 90° to the vertical centerline of the stem and ball.



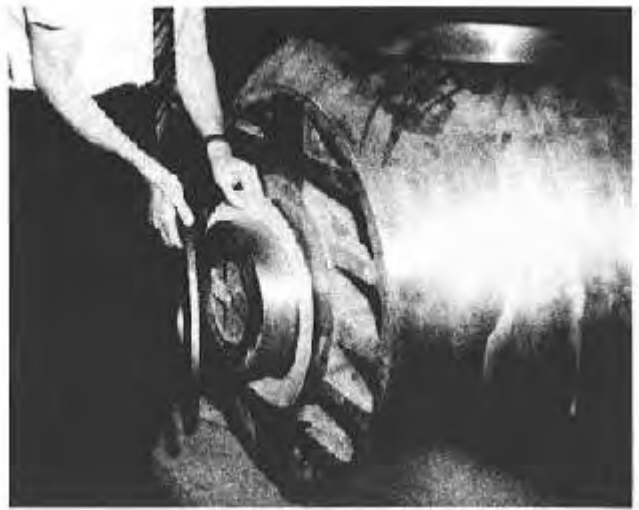
5. Seat ring assembly must be pressed into the closure recess. On large valves, this may be done by using ball as a press, as follows:

NOTE: If your valve has the 4 seat retainers in each seat, these should be used to pull seat into closures which would eliminate steps a, b & c.

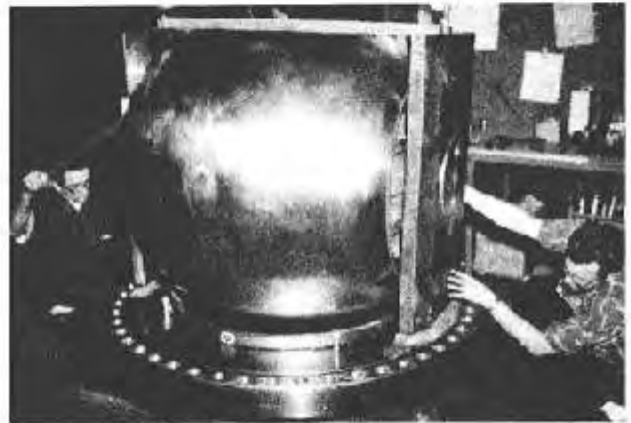
- a. Lay plywood sheet over the entire exposed surface of seat rings.
- b. Place slings around the ball, and suspend the ball over seat rings.
- c. Lower ball onto wood and carefully press seat rings into closure.

CAUTION: Be sure pressure is applied evenly. Seat rings must be properly aligned or ball will bind and valve will leak.

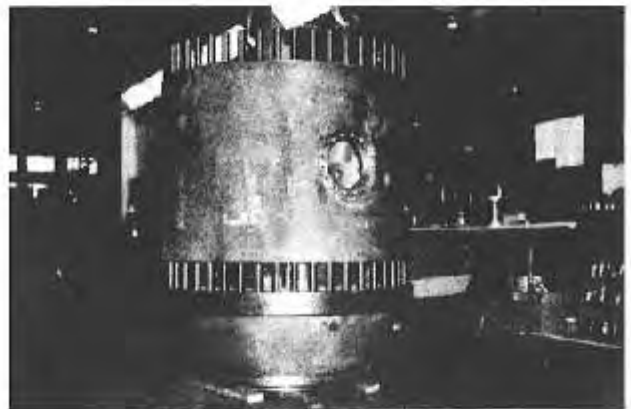
6. Remove slings from ball and block up, so end trunnions are accessible with clearance for bearing plates.
- a. On lower trunnion place lower thrust washer and spacer, if used. The chamber on the inner diameter of the spacer must face the thrust washer.
 - b. Locate the bearing plates on the ball trunnions with lifting eye bolts installed.



7. Using eye bolts in bearing plates with a spreader bar lift ball into position over seat assembly in closure.
8. Lower ball into seat rings while rotating bearing plates so that pins fit into matching holes in closure. Remove lifting eye bolts.



9. Apply grease to the closure O-Ring and body O-Ring groove. Place body O-Ring over shoulder on closure.
10. Lift body over ball and set into position with studs matching closure holes and ball.



11. Lower other closure over body studs with the bearing plate pins seating into the matching closure holes. CAUTION: Be sure to lower closure evenly.



12. Replace 4 evenly spaced body nuts on each closure. Tighten these nuts, replace all body nuts. Tighten all body nuts.
13. Turn valve assembly upright.



14. The stem and gland plate are installed in the valve as a unit.
 - a. Install the lower and upper stem O-Rings with assembly grease.
 - b. Install the gland bushing.
 Securely block the stem vertically. If available, set in a press.
 Lubricate the stem O-Ring area.



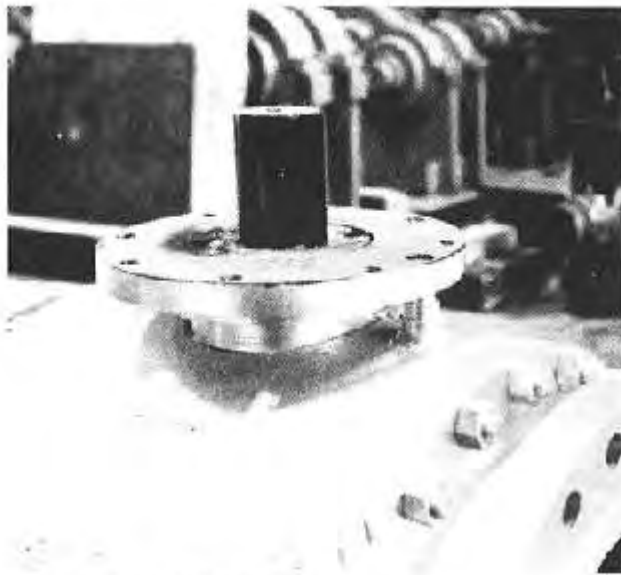
Set the thrust washer on the stem shoulder.
 Set the gland plate on the stem.
 Orient the gland plate to the key slot witness mark.
 Set the adapter plate on the gland plate.
 Firmly press the adaptor plate until the gland plate and thrust washer make contact with the stem shoulder.
 Set the adapter plate off to one side.

15. Install the gland plate O-Ring with grease. Inspect the gland plate O-Ring groove in the body. Grease the O-Ring groove.
16. Insert the stem/gland plate unit into the body. Align the stem pins and key. If the ball is closed, the keyway should be over the name plate. If the ball is open, the keyway should face the right side of the valve. Secure the gland plate cap screws. (Refer to torque table, Part VI, Page 10.)

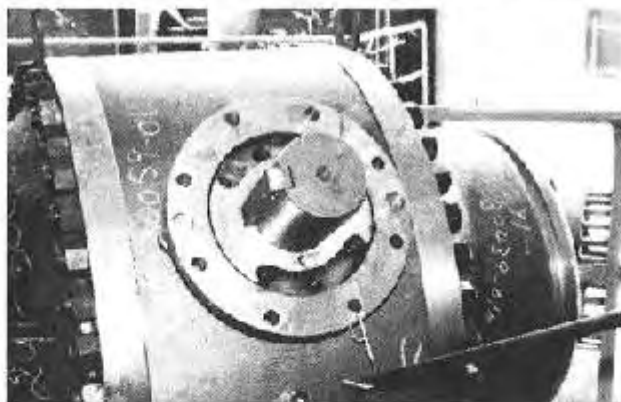


17. Install vent plug assembly
18. Finish tightening body nuts with wrench evenly all around. (Refer to torque table. Part VI, Page 10.)
19. Replace gland plate gasket.





19. Replace gland plate gasket.
20. If valve has gear operator:
 - a. 1. Replace adapter plate with stop collar over gland plate with anchor pin engaged. Secure with cap screws. (See torque table, Part VI.) Replace stop collar cap screws.
 - a. 2. Replace adapter plate with keystone over gland plate with anchor pin engaged. Secure with cap screws. (See torque table, Part VI.)



- b. Replace washer and stop collar.
- c. Replace key in valve stem, engaging keyway in stop collar.
- d. Replace operator (observing the reference marks on

operator, adapter flange and body) and secure to adapter plate with cap screws. (See Part VI for torque.)

- e. Refer to operator mounting instructions for adjustment of stops. (See Part V.)
21. If valve is wrench operated:
 - a. Replace stop plate and secure to gland plate with cap screws. (See torque table, Part VI.)
 - b. Replace washer and stop collar over stop plate. Rotate so the lock pin holes line up and replace lock pins and stop collar cap screw.
 - c. Replace wrench if stem has square end. Otherwise, replace key in stem, engaging keyway in stop collar. Replace wrench.

E. TESTING FOR LEAKAGE

1. Install pipe plug in drain valve port at bottom of valve.
2. Close valve fully. Install body vent plug (if required).
3. Admit 50-100 psi air or nitrogen pressure into body cavity through relief valve port. Lock off body pressure.
4. If body pressure falls steadily, apply soap solution to ball/seat circumference closure, flange to body interface and to vented assembly plug in gland plate. Release pressure, disassemble and repair area of leakage.
5. Vent air pressure from body and install relief valve.
6. Remove pipe plug from drain port and install drain valve assembly, close drain valve.

PART V - Accessory Installation

A. GROVE SY Scotch Yoke Operator Mounting - and setting stops

1. Before mounting the operator on the valve, grease the valve stem. Check the key to see that it is the proper length and fits the key slot without excessive play. Lower the operator over the stem and bolt down to the valve adaptor plate. Tighten bolts securely.

NOTE: If operator fits tight over the valve stem, do not force down by taking up on the bolts. This will lock-up the ball and cause excessive torque. Check for scratches or burrs and polish to provide smooth sliding surfaces.

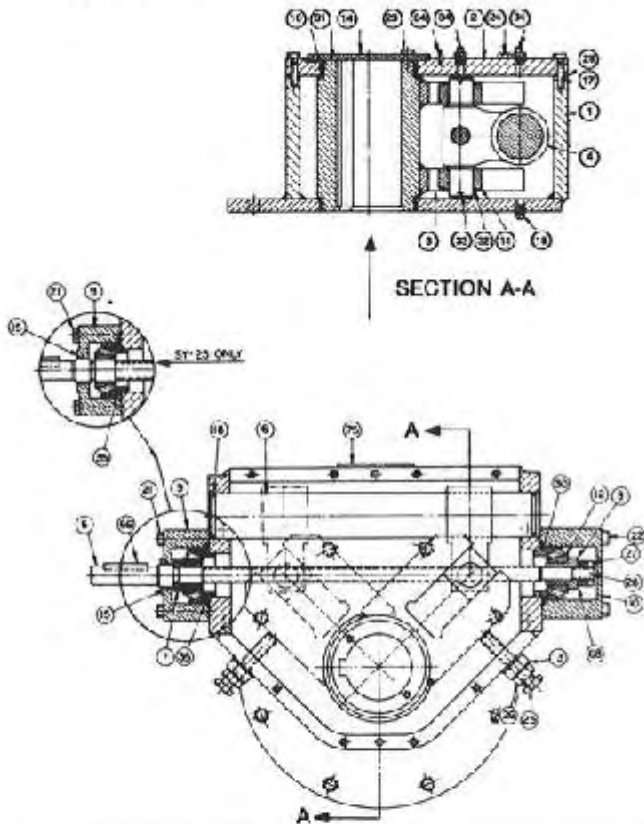
2. The valve internal stop is designed to serve as an indicator of the ball open and closed positions. This stop permits slightly more than 90° travel in order that the stops in the operator can be set to serve as the ACTUAL stopping means. After the operator has been properly installed on the valve, the operator stops can be set as follows:

NOTE: ON NEWER VERSIONS OF THE B-5 BALL VALVE, THE ADAPTOR PLATE AND STOP COLLAR ARE ONE PIECE. (SEE FIG. A & B, PAGE 2.)

Off-stream (Valve removed from line)

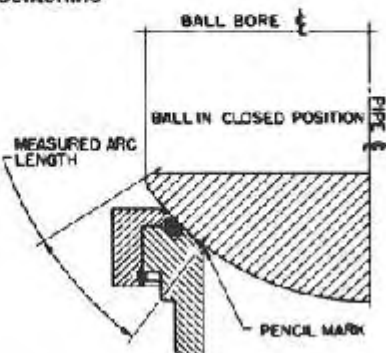
- a. Back-off locknuts and stop screws on both sides of the operator.
- b. Turn handwheel clockwise until ball is about 1/2 closed.
- c. From the table, find the arc length for the size and pressure class of the valve, and measure off this distance from ball bore lip along horizontal center line. Make a pencil mark on the ball at this point. (Refer to sketch.)
- d. Continue to turn valve towards the closed position until the pencil mark is flush with the I.D. of the seat ring.
- e. Turn the operator "close" stop screw (farthest from the handwheel) until it can go no further. Tighten the locknut.
- f. Turn operator handwheel counter-clockwise until bore of the ball lines up visually with bore of seat ring.

- g. Advance "open" operator stop screw nearest the handwheel until it can go no further and tighten the locknut.



	CLASS 150/300	CLASS 900	CLASS 1500
SIZE	MEASURED ARC LENGTH (Inches)	MEASURED ARC LENGTH (Inches)	MEASURED ARC LENGTH (Inches)
6"	1 1/4" ± 1/16"	1 1/4" ± 1/16"	1 1/4" ± 1/16"
8"	1 ± 1/16"	1 ± 1/16"	1 3/16" ± 1/16"
10"	1 1/4" ± 1/16"	1 1/4" ± 1/16"	1 1/4" ± 1/16"
12"	1 3/4" ± 1/16"	1 3/4" ± 1/16"	1 3/4" ± 1/16"
14"	1 7/8" ± 1/16"	1 7/8" ± 1/16"	2" ± 1/16"
16"	1 7/8" ± 1/16"	2" ± 1/16"	2" ± 1/16"
18"	1 7/8" ± 1/16"	2 1/8" ± 1/16"	2 1/8" ± 1/16"
20"	1 7/8" ± 1/16"	2 1/8" ± 1/16"	
22"	1 7/8" ± 1/16"	2 1/8" ± 1/16"	
24"	2" ± 1/16"	3" ± 1/16"	
26"	2" ± 1/16"	3" ± 1/16"	
28"	2" ± 1/16"	3" ± 1/16"	
30"	2" ± 1/16"	3" ± 1/16"	
32"			
34"	2 1/8" ± 1/16"	3 1/8" ± 1/16"	
36"	2 1/8" ± 1/16"	3 1/8" ± 1/16"	
38"			
40"	2 1/8" ± 1/16"		
42"	2 1/8" ± 1/16"		
44"			
46"			
48"	4 1/8" ± 1/16"		

Section on Horizontal Plane Thru Valve Bore Centerline



NO. PART NAME	
1. Housing	21. Capscrew (Bearing Cover)
2. Cover	22. Capscrew (Bearing Cover)
3. Drive Sleeve & Yoke	23. Capscrew (Indicator Cover)
4. Trunnion	24. Capscrew (Cover)
5. Stem	25. Stop Screw
6. Guide Bar	26. Lock Nut
7. Bearing Bushing (Left)	27. Slotted Nut (Stem)
8. Bearing Bushing (Right)	28. Cotter Pin
9. Bearing Cover (Left)	29. Gasket (Cover)
10. Bearing Cover (Right)	30. O-Ring (Bearing Cover)
11. Torque Arm Shoe	31. Gasket (Indicator Cover)
12. Bearing (Stem)	32. Washer
13. Seal Washer	33. Cotter Pin
14. Indicator Cover	34. Grease Fitting
15. O-Ring (Stem)	35. Bearing Spacer
16. O-Ring (Drive Sleeve)	64. Groove Pin
17. Roll Pin	68. Key
18. O-Ring (Guide Bar)	69. Spacer (SY-25 Only)
19. 1/4" Pipe Plug	75. Emblem

On-Stream (Valve in pipeline and under pressure)

- Back-off locknuts and screws on both sides of the operator.
- Turn handwheel in a clockwise direction as far as it will go. This places valve in maximum closed position as permitted by the stop collar of the valve.
- Vent body cavity pressure thru special vent valve. If CONTINUOUS drainage occurs, slowly turn handwheel counter-clockwise until drainage just stops.
- From this handwheel position, count the number of handwheel turns in counter-clockwise direction required to initiate flow from vent port. Do not overshoot.
- Turn handwheel clockwise one half the counted number of turns determined in "d" above.
- Turn the operator stop screw (farthest from the handwheel) until it will go no further. Tighten the locknut.
- Tighten the vent plug assembly. Close vent valve.
- From the handwheel position in step "f", turn the handwheel counter-clockwise the number of turns for 90° rotation indicated in the table for the operator involved.

OPERATOR	TURNS FOR 90°
SY-25	40
SY-50	40
SY-150	56
SY-300	72
SY-500	80

- Advance the operator stop screw (nearest the handwheel) until it will go no further. Tighten the locknut.

NOTE:

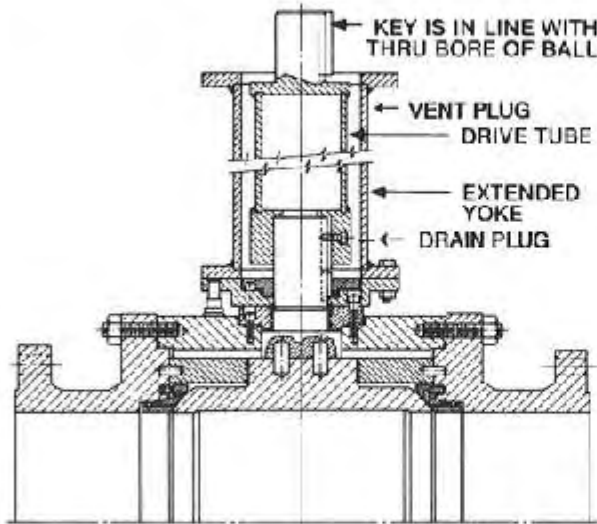
- For valves isolated from line pressure, the above stop setting procedure may be accomplished by using 50-100 psi air or nitrogen pressure introduced into body cavity of closed valve.
- For setting stops on other gear or power operators, refer to the manufacturer's instruction.

B. OPERATOR EXTENSION - FIELD MOUNTING

Move ball slightly off of the open or close position. Remove key from stem. Remove primary gear and clean adapter plate surfaces. Install gasket on adapter flange. Insert eye bolt in drive tube and install over stem, being careful not to damage key. Install extended yoke onto adapter flange, bolting up tight to torque specifications in Part VI. Install gasket on extended yoke mounting flange. Install "alignment lugs" on adapter plate and extended drive yoke. Mount primary gear on extended yoke.

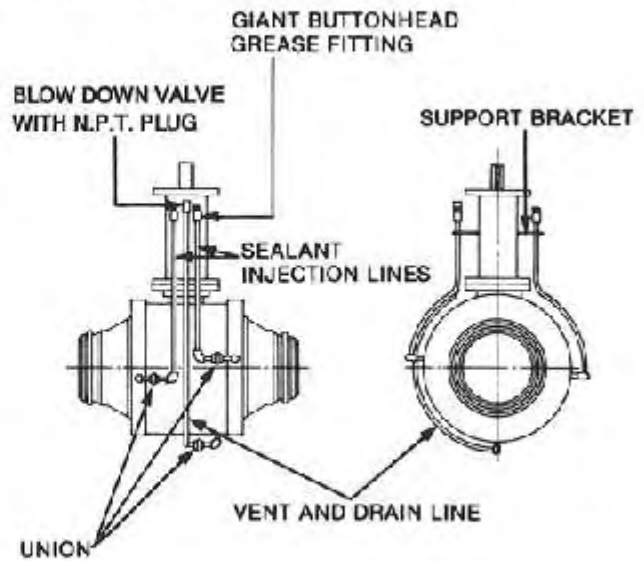
Refer to above section on mounting primary gear operator for instructions on setting stops.

NOTE: After field mounting extension on Grove Standard ball valve, primary gear operator stops will have to be reset.



EXTENDED BLOW-DOWN AND EXTENDED SEALANT INJECTION LINES

Recommendation for extending vent and seat sealant, injection lines on valves having extended operators. 1/2" Sched. 80 piping is suggested for all lines.



PART VI. - Miscellaneous - A. Bolting Torques

Body Stud Torque (B-5)

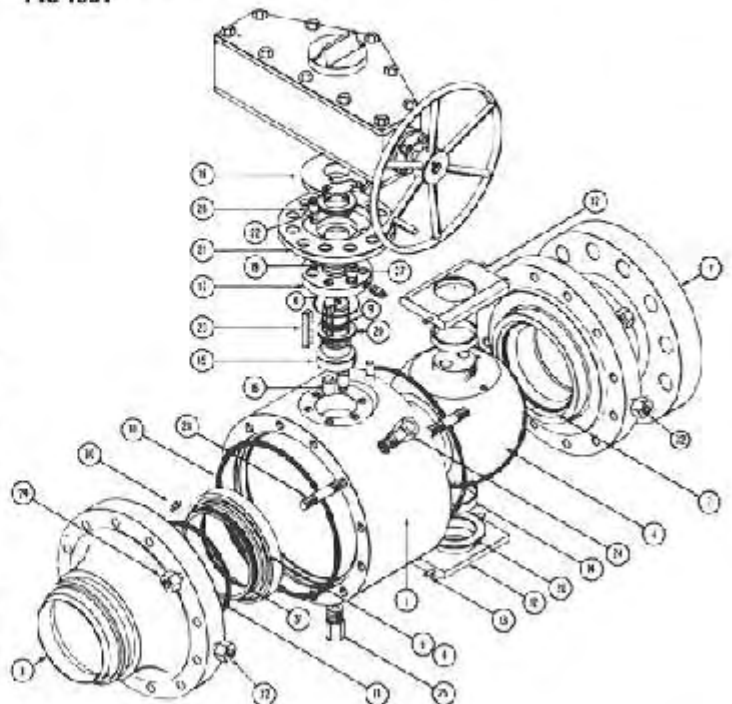
STUD SIZE	Torque* (ft.-lb.) Lubed (Moly)
1/2 - 13 UNC	55
5/8 - 11 UNC	105
3/4 - 10 UNC	180
7/8 - 9 UNC	300
1" - 8 UNC	440
1 1/8" - 8 N	640
1 1/4" - 8 N	920
1 3/8" - 8 N	1240
1 1/2" - 8 N	1640
1 5/8" - 8 N	2120
1 3/4" - 8 N	2675
1 7/8" - 8 N	3325
2" - 8 N	4070
2 1/4" - 8 N	5815
2 1/2" - 8 N	8000

Capscrew Torque (B-5)

CAPSCREW SIZE	MINIMUM TORQUE
1/2" - 13	50 ft. - lbs.
5/8" - 11	100 ft. - lbs.
3/4" - 10	170 ft. - lbs.
7/8" - 9	250 ft. - lbs.
1" - 8	350 ft. - lbs.

NOTE: ON NEWER VERSIONS OF THE B-5 BALL VALVE, THE ADAPTOR PLATE AND STOP COLLAR ARE ONE PIECE.

Exploded Isometric Pre 1991



PART NAME	
1. Body	17. Gland Plate
2. Closure-Flanged End	18. Stop Collar
3. Closure-Weld End	19. Gland Bushing
4. Ball	20. Thrust Washers
5. Inner Seat Ring	21. Adapter Plate
6. Outer Seat Ring	22. Washer
7. C-Ring (Seat Seal)	23. Key (Stem)
8. C-Ring (Gland Plate)	24. Relief Valve Assembly
9. C-Ring (Stem)	25. Vent Plug or Drain Valve
10. C-Ring (Body)	26. Capscrew (Adapter Plate)
11. C-Ring (Seat Gasket)	27. Capscrew (Gland Plate)
12. Bearing Retainers	28. Stud
13. Dowel Pins (Retainer)	29. Nut
14. Bearings	30. Seat Springs
15. Stem	31. U-Cup Ring
16. Drive Pins	32. Check Valve & Grease Fitting

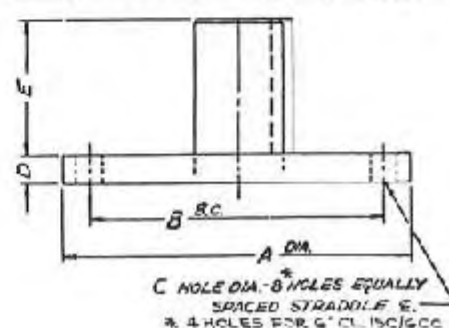
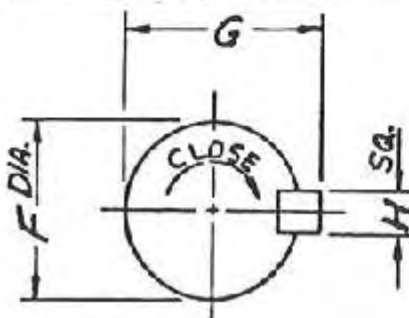
B. TOP MOUNTING DIMENSIONS FOR GROVE B-5 BALL VALVES LESS GEAR OPERATORS

NOTE: TO OPERATOR MANUFACTURERS.

1. Key is in line with bore of ball.
2. Operator must be arranged for 91° rotation including adjustable 1/2° rotation at each end of travel. Adjustment to be external type.
3. All operators and mounting adaption to be fully enclosed and weather proof.
4. For top mounting clearance dimensions for mounting cylinder operator or top mounting dimensions for class 1500 B-5's, contact Grove direct.
5. For top mounting dimensions for operators on extensions contact Grove direct.

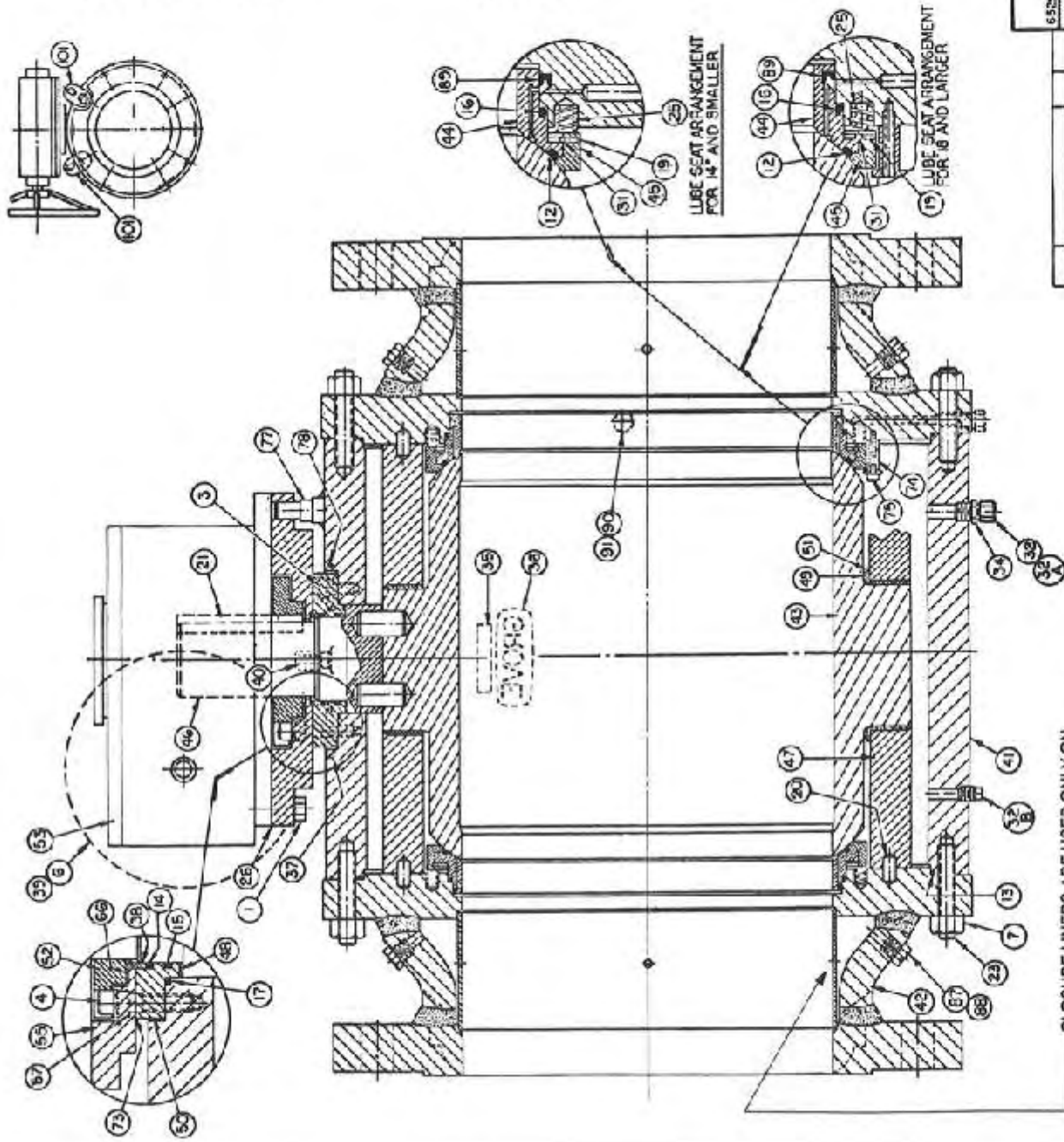
CAUTION: MINIMUM OPERATOR STEM ENGAGEMENT (E-1") Dim. must be fully engaged by operator drive sleeve.

VALVE SIZE	CLASS	A	B	C	D	E	F $\begin{smallmatrix} +.000 \\ -.004 \end{smallmatrix}$	G $\begin{smallmatrix} +.000 \\ -.010 \end{smallmatrix}$	H $\begin{smallmatrix} +.000 \\ -.002 \end{smallmatrix}$
6"	150/600	9-3/4	8-1/4	13/16	7/8	3-9/16	1.750	1.917	.375
6"	900	11-1/2	10-1/4	11/16	1-5/16	3-3/4	2.374	2.646	.625
8"	150/900	11-1/2	10-1/4	11/16	1-5/16	3-3/4	2.374	2.646	.625
10"	150/900	11-1/2	10-1/4	11/16	1-5/16	3-3/4	2.374	2.646	.625
12"	150/600	11-1/2	10-1/4	11/16	1-5/16	3-3/4	2.374	2.646	.625
12"	900	15-5/8	14	13/16	1-5/16	4-1/2	2.874	3.200	.750
14"	150/300	11-1/2	10-1/4	11/16	1-5/16	3-3/4	2.374	2.646	.625
14"	400/900	15-5/8	14	13/16	1-5/16	5-1/2	3.499	3.882	.875
16"	150	11-1/2	10-1/4	11/16	1-5/16	3-3/4	2.374	2.646	.625
16"	300/900	15-5/8	14	13/16	1-5/16	5-1/2	3.499	3.882	.875
18"	150/900	15-5/8	14	13/16	1-9/16	5-1/2	3.499	3.882	.875
20"	150/800	15-5/8	14	13/16	1-9/16	5-1/2	3.499	3.882	.875
20"	900	15-5/8	14	13/16	1-9/16	6	4.748	5.292	1.250
22"	150	15-5/8	14	13/16	1-9/16	5-1/2	3.499	3.882	.875
22"	300/800	15-5/8	14	13/16	1-9/16	6	4.748	5.292	1.250
22"	900	18	16	1-1/16	1-9/16	6	4.748	5.292	1.250
24"	150/600	15-5/8	14	13/16	1-9/16	6	4.748	5.292	1.250
24"	900	18	16	1-1/16	1-3/16	6	4.748	5.292	1.250
26"	150/400	15-5/8	14	13/16	1-7/8	6	4.748	5.292	1.250
26"	600	18	16	1-1/16	1-9/16	6	4.748	5.292	1.250
26"	900	18	16	1-1/16	1-3/4	6	4.748	5.292	1.250
28"	150	15-5/8	14	13/16	2-1/16	6	4.748	5.292	1.250
28"	300/600	18	16	1-1/16	1-13/16	7	5.998	6.655	1.500
28"	900	18	16	1-1/16	1-13/16	7	5.998	6.655	1.500
30"	150	15-5/8	14	13/16	2-1/16	6	4.748	5.292	1.250
30"	300/600	18	16	1-1/16	1-13/16	7	5.998	6.655	1.500
30"	900	22	20	1-1/16	2-1/16	7-1/2	6.498	7.162	1.500
32"	150	15-5/8	14	13/16	2-1/16	6	4.748	5.292	1.250
32"	300/600	18	16	1-1/16	1-13/16	7	5.998	6.655	1.500
32"	900	22	20	1-1/16	2-1/16	7-1/2	6.498	7.162	1.500
34"	150/600	18	16	1-1/16	2-3/16	7	5.998	6.655	1.500
36"	150/600	18	16	1-1/16	2-3/16	7	5.998	6.655	1.500
36"	900	22	20	1-1/16	2-3/16	7-1/2	6.498	7.162	1.500
40"	150/400	18	16	1-1/16	2-3/16	7	5.998	6.655	1.500
40"	600	22	20	1-1/16	2-1/16	7-1/2	6.498	7.162	1.500
42"	150/300	18	16	1-1/16	2-3/16	7	5.998	6.655	1.500
42"	400/600	22	20	1-1/16	2-1/16	7-1/2	6.498	7.162	1.500
42"	900	25	22	1-1/16	3-1/4	8	7.496	8.364	2.000



ITEM	PART NAME	MATERIAL
1	CAPSCREW (OPERATOR MOUNT)	STEEL
2	CAPSCREW (ISLAND PLATE)	ALLOY STEEL
3	CAPSCREW (ISLAND PLATE)	ALLOY STEEL
4	CAPSCREW (ISLAND PLATE)	ALLOY STEEL
5	CAPSCREW (ISLAND PLATE)	ALLOY STEEL
6	BET SCREW (HANDWHEEL)	STEEL
7	NUT (BODY)	STEEL
8	SEAL O-RING	GROVEX
9	O-RING (BODY)	GROVEX
10	O-RING (UPPER STEM SEAL)	GROVEX
11	O-RING (LOWER STEM SEAL)	GROVEX
12	O-RING (SEAT GASKET)	GROVEX
13	O-RING (ISLAND PLATE)	GROVEX
14	O-RING (SEAT PLUG)	GROVEX
15	PIN (BEARING RETAINER)	STEEL
16	KEY (STEM)	STEEL
17	STUD (BODY)	STEEL
18	SPRING	160 C. H.S.
19	GASKET (DISTRIBUTOR MOUNT)	FIBER
20	SEAT LOCK RING	160 C. H.S.
21	DRAIN VALVE	STEEL
22	PIPE PLUG (BODY)	STEEL
23	NAME PLATE	160 C. H.S.
24	GROVE ENGLISH	A.B. PLASTIC
25	VENTED ASSY. PLUG	STEEL
26	G. AND BUSHING	STEEL
27	HANDWHEEL	STEEL
28	RELEF VALVE	STEEL
29	BODY	STEEL
30	CLOSURE	INCAST IRON OR STEEL
31	INNER SEAT RING	STEEL
32	OUTER SEAT RING	STEEL
33	STEM LINER	STEEL
34	BEARING UNIT/BEARING	STEEL & TEFLON**
35	UPPER T-FLUST WASHER	STEEL & NYLON#
36	LOWER T-FLUST WASHER	STEEL & NYLON#
37	G. AND PLATE	STEEL
38	SPACER (LOWER T-FLUST WASHER)	STEEL
39	STOP COLLAR	STEEL & IRON
40	OPERATOR	STEEL
41	ADJUSTER PLATE	STEEL
42	WASHER	ALLOY STEEL
43	WASHER	ALLOY STEEL
44	GASKET (ISLAND PLATE)	NYLON
45	GASKET (ISLAND PLATE)	FIBER
46	PULLER BUSHING (SEAT RING)	STEEL
47	PULLER BUSHING (SEAT RING)	ALLOY STEEL
48	CAPSCREW (PULLER BUSHING)	STEEL
49	ANCHOR PIN	STEEL
50	VENT PLUG (ISLAND PLATE)	STEEL
51	SEAL PLUG	GROVEX
52	U-GUIP PACKING	STEEL
53	CHECK VALVE	GROVEX
54	BREASERTING	STEEL
55	LIFTING LUG	STEEL

* ELECTROLESS NICKEL COATED
 † RECOMMENDED FOR SPARE PARTS (SPARE PARTS, KITS, A, B, & C)
 ‡ A GROVE TRADENAME COVERING A VARIETY OF ELASTOMERIC MATERIALS
 § TRADEMARK OF ELLIPONT CO.
 ¶ TRADEMARK OF PHILLIPS 66 CO.



CLOSURE LINERS ARE USED ONLY ON CERTAIN SIZES & PRESSURE CLASSES. CHECK WITH FACTORY FOR MORE DETAILS. MOST SIZES HAVE ONE PIECE FORGED CLOSURE.

6520 HOLLY STREET		OAKLAND, CALIF.	
DATE	DATE	CHG'D	APP'D
BY	DATE	DESCRIPTION	TITLE
		FLANGED B WELD END CLASS 150 THRU 500 REAR OPERATED	TYR CONSTRUCTION BALL VALVE
MODEL		B-5	

DATE	BY	DATE	BY

Section B (Series B-4B & B-4C Ball Valves)

PART VII - General Information

DESIGN

B-4B & B-4C ball valves are non-directional and can be installed with either end upstream. Flanged end valves have flanges faced and drilled in accordance with ANSI B16.5. Certain sizes in class 150 and 300 are supplied with line flanges drilled and tapped to accept studs in sizes conforming the ANSI standards. Studded flanges are permitted by API Spec. 6D when required by the body design.

Since the B-4B line was introduced, there have been some design changes which alter maintenance instructions.

- A. Early gear operated valves featured a combined adapter plate/bearing housing. Later valves have separate adapter plates and bearing housings to facilitate field conversion from wrench to gear operation. If this conversion is being made, determine whether there are spacers under the heads of the bearing housing capscrews. If there are, remove the capscrews and spacers, replace the spacers with an adapter plate and re-install the capscrews. If spacers are not found, it is necessary to replace the bearing housing with the current design before installing the adapter plate.
- B. A weather seal O-Ring has been added between the bearing housing and stop collar to prevent moisture from seeping past the upper stem bearing. This O-Ring can only be used in current style bearing housings which have a counter-bore above the bearing. The weather seal will not function as a stem seal should both stem O-Rings fail.
- C. Current 2" - 4" Class 600 - 1500 (B-4C) valves have a two-piece O-Ring seat similar to the B-5, except that no emergency sealant feature is available and, therefore, no U-Cup is used. If a valve has this seat design, it will have a B-5 type relief valve in the upper body. This seat is not interchangeable with the single-piece nylon seat; new closures and a body modified for the relief valve are required.
- D. The GV-2 operator, used on 4" valves, has a drive sleeve which fits directly over the valve stem without requiring a stem adapter sleeve and key. Valves with 5M or 8M operators use stem adapters.

FIELD WELDABILITY - WELDING END VALVES

The B-4B design, with welding end connections utilize ASTM A-216 Gr. WCB or WCC steel castings or A105 or A350 Gr. LF2 forgings which are readily field weldable. When welding Grove valves in the line, standard field welding techniques and procedures are satisfactory.

BODY RELIEF

The B-4B design, with the nylon seat, affords internal self relief of excess body pressure as might be caused by thermal expansion of liquids entrapped in valve body. A body relief valve is not required. The O-Ring seat B-4C design is not self relieving. A body relief valve is used on these valves.

BLOCK AND BLEED

Grove B-4B ball valves are equipped with a special 1/4" NPT vent plug installed in the trunnion in the lower body area. A socket head needle valve located in the vent plug permits venting and draining of the body cavity with the valve in the closed position under pressure: confirming block and bleed capability.

PART VIII - Valve Installation

A. EQUIPMENT

1. Handling equipment as required for the weight involved. The current Grove Ball Valve catalog furnishes the weight of the specific valve.
2. Standard hand tools.

B. PROCEDURE

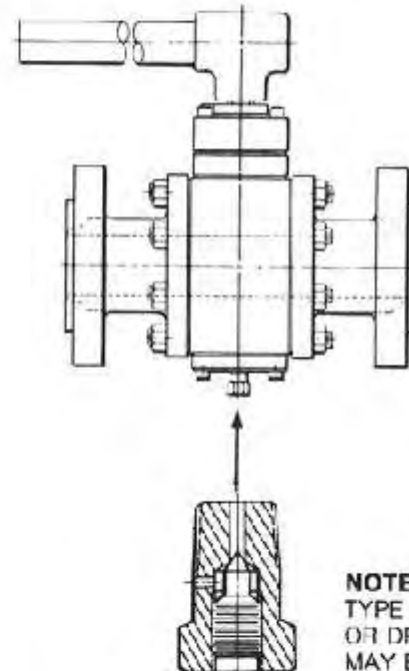
1. Inspect valve bore for foreign matter and clean, if necessary.
2. Install in line; either end may be installed upstream.

PART IX - On Stream Maintenance

This part covers maintenance and repair that can be performed without removing the valve from the line.

A. BLOCK AND BLEED

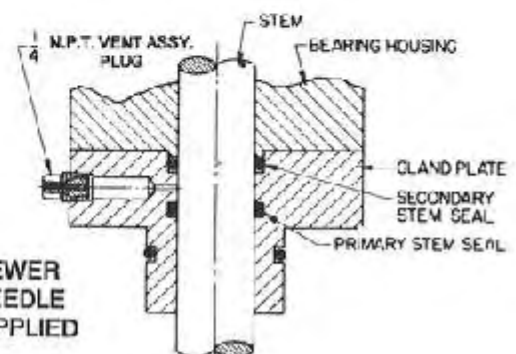
With the line under pressure the valve body cavity can be vented to atmosphere and completely drained down with the ball in the closed position by opening the bleeder valve in the special vent plug.



VENT ASSEMBLY PLUG

NOTE: DIFFERENT TYPE VENT PLUG OR DRAIN VALVE MAY BE SUPPLIED.

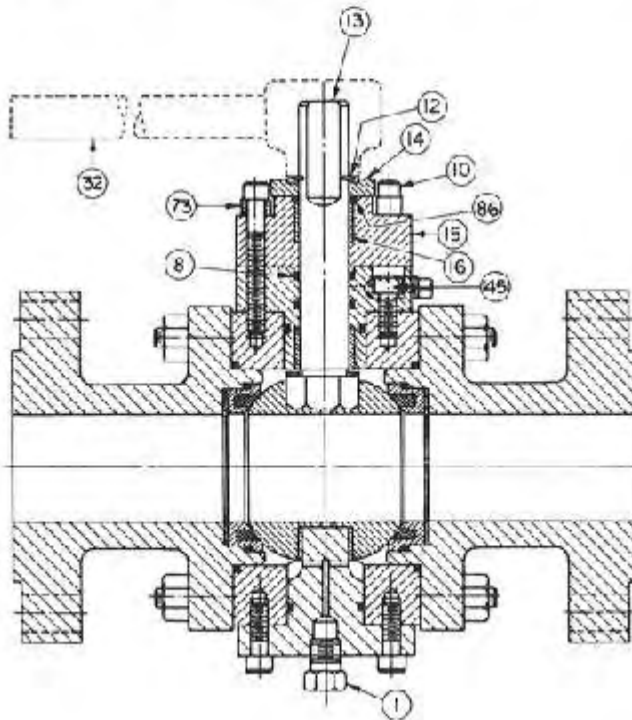
B. STEM SEAL O-RING REPLACEMENT



NOTE: ON NEWER VALVES A NEEDLE VALVE IS SUPPLIED IN LIEU OF A VENTED PLUG.

The B-4B & B-4C have two stem seals, one primary seal, backed up by a secondary independent seal.

If the primary O-Ring seal becomes faulty, a leak will occur through the gland plate vent plug or needle valve. In this case, remove 1/4" vent plug and replace with 1/4" solid plug to energize the secondary O-Ring seal: **SHOULD BOTH SEALS LEAK, THE UPPER SECONDARY STEM SEAL MAY BE REPLACED AS FOLLOWS:**



WRENCH OPERATED VALVE

1. Turn valve to fully closed position.
2. Bleed off body pressure - leaving vent valve (1) open.
3. Remove 1/4" NPT pipe plug or vent plug assy. on the gland plate.
CAUTION: EXERCISE EXTREME CARE WHEN REMOVING THIS PLUG AS IT IS POSSIBLE, EVEN WITH BODY PRESSURE RELIEVED, TO HAVE TRAPPED LINE PRESSURE BEHIND THIS PLUG.
4. Lift off the wrench (32).
5. Remove retaining ring (12) and stop collar (14).
6. File off any burrs and remove all paint from the protruding stem (13). Stem must be perfectly clean and smooth to prevent damage to stem bearing.
7. Remove two bearing housing cap screws (10), and spacers (73). Strike cap screws with hammer and line up punch.
8. Remove, as a unit, the weather seal (86), bearing housing (15), and stem bearing (16). Lift straight up off the stem. Do not cock. Two pry bars may be used to accomplish this.
9. Remove upper stem O-Ring (8) from gland plate recess. Do NOT remove the 2 cap screws (45) which attach the gland plate to the body.
10. Coat new O-Ring with a soft, non-fibrous grease and install in gland plate.
11. Inspect stem bearing for excessive water or damage. Replace is necessary.
12. Clean bearing housing and stem and lubricate with high quality grease.
13. Reassemble parts in reverse order to their removal. Tighten cap screws per torque table, Part XII.

14. Replace 1/4" NPT vent plug or vent plug assembly on gland plate.
15. Close vent valve (1).
16. Open valve partially to repressure body and check integrity of new stem seal.

GEAR OR MOTOR OPERATED VALVE

1. Follow steps 1, 2 and 3 as outlined above for wrench operated valve.
2. With valve in fully closed position, mark vertical line on operator, adapter flange, bearing housing and gland plate to insure correct alignment of these parts at reassembly.
3. Remove cap screws from adapter plate and lift operator off plate. Remove gasket.
NOTE: Exercise caution when removing operator. It must be lifted straight up until stem is clear.
4. Pull stem adapter, if used, off stem or remove from operator should it remain inside operator.
5. Remove retaining ring and stop collar.
6. Remove bearing housing cap screws and adapter plate.
7. Follow step 6 and 8 thru 13 as above for wrench operated valves.
8. Install adapter plate so that witness marks (step 2) line up and secure with bearing housing cap screws.
9. Replace stop collar and retaining ring.
10. Replace stem adapter, if used, over stem and replace key in adapter.
NOTE: When valve is in the fully closed position, the flats on stem and adapter keyway are at 90° to valve centerline.
11. Install fiber gasket and lower operator over stem adapter so that operator drive sleeve engages key in adapter, witness marks line up and mounting holes match those on adapter plate.
12. Tighten operator mounting cap screws evenly all around.
13. Replace 1/4" NPT vent plug or vent plug assembly in gland plate.
14. Close vent valve.
15. Check alignment of operator by cycling from closed to open.

C. IN-LINE HYDROSTATIC TESTING

1. Open ball about 1/3". This permits line pressure to enter body cavity.
2. Hydrostatic testing pressure must not exceed 1-1/2 times the maximum rated operating pressure of the valve, unless prior approval to exceed this limit is obtained from Grove.
3. In the fully closed position, test pressures must not exceed the rated operating pressure of the valve.

NOTE: On 2"-4" CL 600-1500 B-4C valves, prior to test, remove the relief valve and install a pipe plug. After the test is completed:

- a. Close ball valve.
- b. Vent any remaining body pressure thru bottom vent plug valve and close tightly.
- c. **RE-INSTALL THE RELIEF VALVE**

This is very important for protection of the body against over pressure when the valve is in the closed position.
CAUTION: DO NOT ALTER THE RELIEF VALVE SETTING.

PART X - Off Stream Maintenance

This part covers major repairs which require removing the valve from the line.

EQUIPMENT

Handling equipment as required for weight involved, see current Grove Ball Valve catalog for weight of specific valve.

A. DISASSEMBLY PROCEDURE

1. If valve is in line, isolate valve from line pressure. Release pressure from inlet and outlet ports.
2. Loosen bleeder screw of vent plug in bottom of valve.
3. Place valve in open position (Flats on stem parallel with bore).
4. Remove valve from line.
5. Remove the wrench or operator per instructions in Part IX.
6. Remove stop collar, adapter plate and bearing housing per instructions in Part IX.
7. Remove two gland plate cap screws. Strike with hammer and line up punch.
8. Remove stem and gland plate assembly as a unit. Two pry bars may be useful in separating the gland plate from the body.
9. Position valve so that it rests on one port face.
10. Scribe witness marks across interface of body and both closure flanges. Also across trunnion flange and body.
11. Remove four trunnion cap screws and withdraw trunnion assembly as a unit.
12. Remove nuts from studs on upper closure flange and remove closure assembly.
13. Remove ball and bearing as one unit.
14. Back-off nuts from lower closure flange and lift body from closure.
15. Separate body O-Rings from body.
16. From closures, disassemble seat units, gasket O-Rings and springs.
NOTE: 2" - 4" Class 600 - 1500 B-4C valves have two-piece seats with O-Ring seat seals. Follow instructions in Part IV-A, step 14, except U-Cups are not used.
17. Disassemble trunnion by removing O-Ring and vent plug assembly.
18. Gland plate disassembly. Carefully remove the stem and thrust bearing. Pull out stem bearing ONLY if it needs to be replaced. Remove two stem O-Rings and gland plate O-Ring. Remove vented assembly plug.
NOTE: If valve has not been leaking through stem O-Rings, and stem torque has not been excessive, OMIT THIS STEP. Stem seals are likely to be damaged when being removed or when the stem is being removed unless extreme care is taken.

B. INSPECTION AND CLEANING

1. Wipe metal parts with soft cloth using a petroleum solvent.
2. Wipe O-Rings with a clean dry cloth. Wash in mild soap and rinse thoroughly in clean water.
3. Inspect metal parts for damage or burrs on sealing and moving contact surfaces. Scratches, produced by disassembly on those surfaces contacted by O-Rings, must be removed. Make certain that these surfaces are smooth and free of abrasion damage.
4. Inspect stem bearings and trunnion bearing for excessive wear or damage. Stem bearings will be damaged if upper part of stem was not properly de-burred and cleaned prior to disassembly.
5. Inspect O-Rings and seat units for cuts, extrusions, swelling or imbedded particles.
6. Replace defective parts.
NOTE: Body and seat O-Rings are made to stretch with a certain tension when installed. Any excessive stretching or swelling of O-Rings may cause cutting on reassembly. It is not safe to re-use these parts unless their dimensions are carefully checked against new parts.

C. LUBRICATION

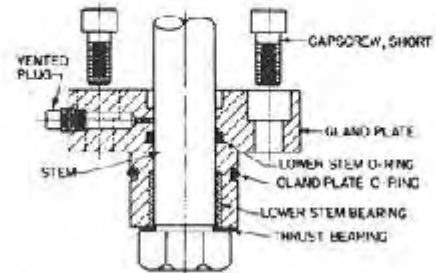
1. For temperatures from -50° to $+225^{\circ}$ F, lubricate all moving

contact metal surfaces with a low temperature, high quality grease. Lubricate O-Rings with heavy grease (Marfak #3 or equal).

2. For temperatures $+10^{\circ}$ F to $+350^{\circ}$ F, lubricate all moving contact metal surfaces and O-Rings with Bracote 622 wide temperature grease or equivalent.

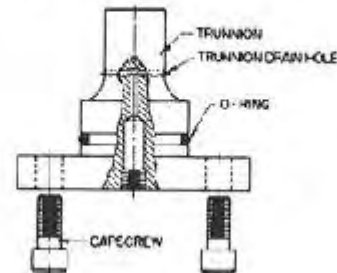
D. REASSEMBLY

1. Place all parts on a clean, solid surface. If flanged, be careful not to damage sealing surface.
2. Gland Plate Preassembly:
 - a. Assemble parts shown in sketch.
 - b. The thrust bearing is installed with the slick side contacting the thrust surface on stem shoulder.
 - c. The stem must be inserted with slow, even pressure to avoid damaging the stem O-Ring.



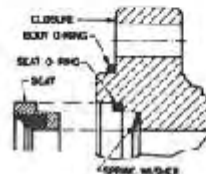
3. Trunnion Preassembly

- a. Install O-Ring as shown.



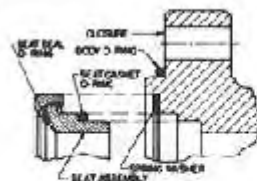
4. Closure/Seat Assembly

- a. Install spring washer (as shown) and body O-Ring on closures.
NOTE: With the nylon seat design, install the spring washer so that it contacts the INNER diameter of the seat ring. With the O-Ring (2 Piece) B-4C seat design, the spring is reversed and contacts the OUTER seat diameter.



B-4B
ONE PIECE NYLON SEAT

2", 3" & 4"
Class 150 & 300

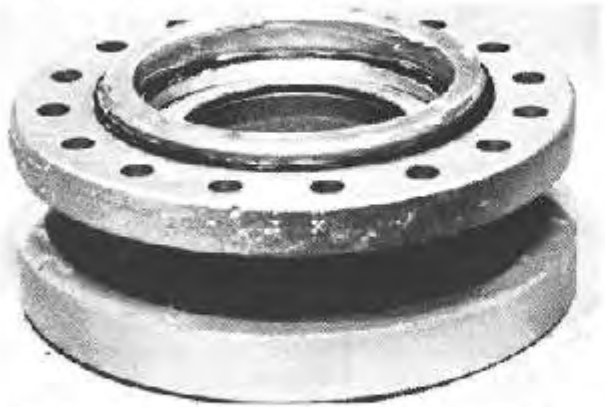


B-4C
TWO PIECE SEAT

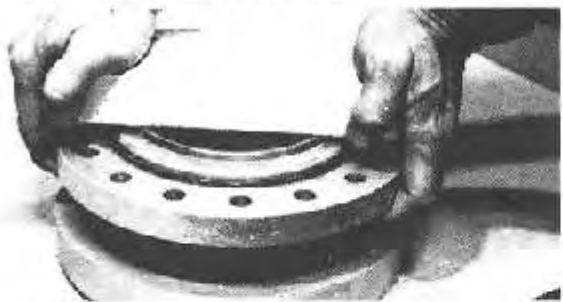
2"-4" CL 600/1500
Refer to PART IV-D, Step 4
For assembly instructions.
U-Cup is not used.

NOTE: Some older valves with this seat design use coil springs instead of the spring washer.

- b. Slip well-greased seat O-Ring into closure or over seat depending on seat design (Below).

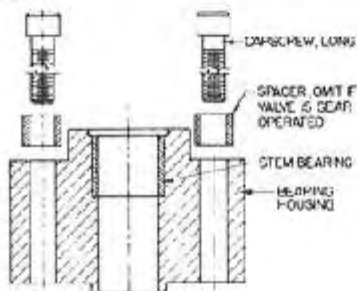


- c. If valve has the O-Ring seat design, position the vent holes in the outer seat ring so that they are centered between any two closure flange stud holes. Clearly mark the position of the vent holes on the O.D. of closure flange.
- d. Carefully press seat assembly into closure counterbore, using even pressure to avoid cocking the seat.

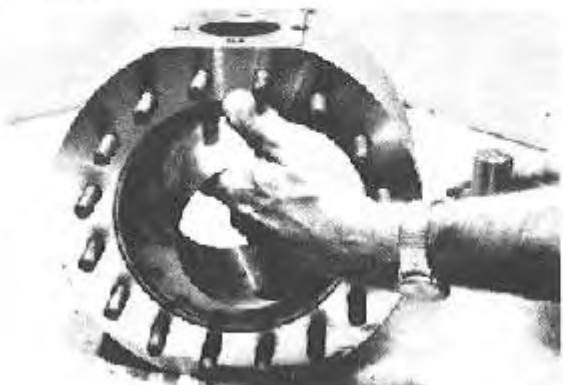


5. Bearing Housing Preassembly

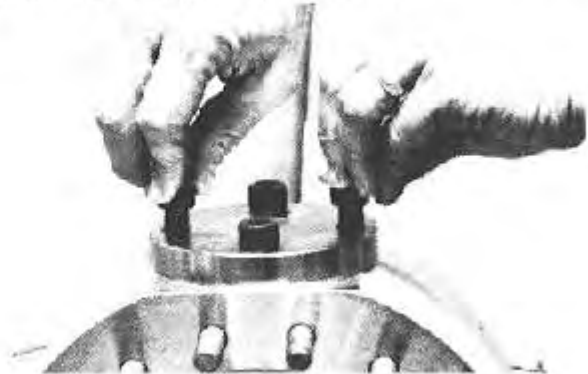
- a. Install new stem bearing if necessary.
NOTE: On gear operated valves, spacers are replaced by adapter plate.



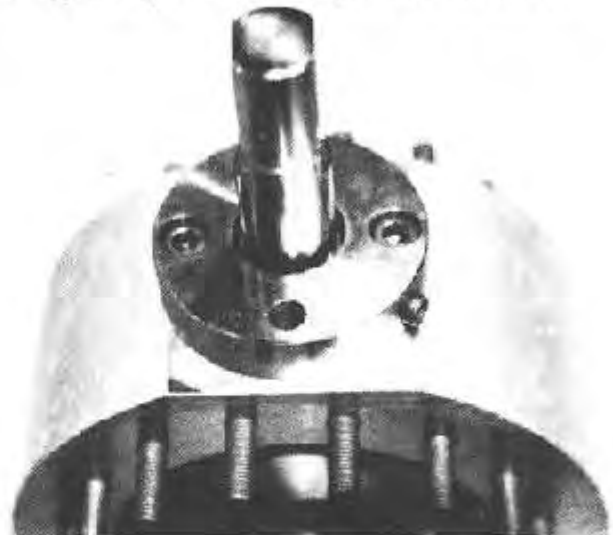
6. Replace body studs, if necessary.
7. Install ball (with trunnion bearing) into body and turn ball to open position.



8. Insert trunnion assembly of Step 3 through the body into the ball, observing witness marks previously made between trunnion and body. THE DRAIN HOLE IN TRUNNION SHOULD BE PERPENDICULAR TO VALVE BORE. Tighten cap screws per torque Table in Part XII.



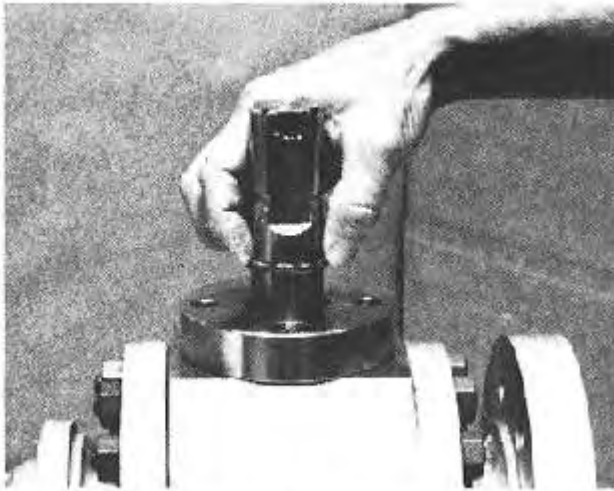
9. Insert gland plate assembly of Step 2.
- a. Position stem so that flats are parallel with valve bore when ball is in open position.
- b. Tighten cap screws per torque Table in Part XII.



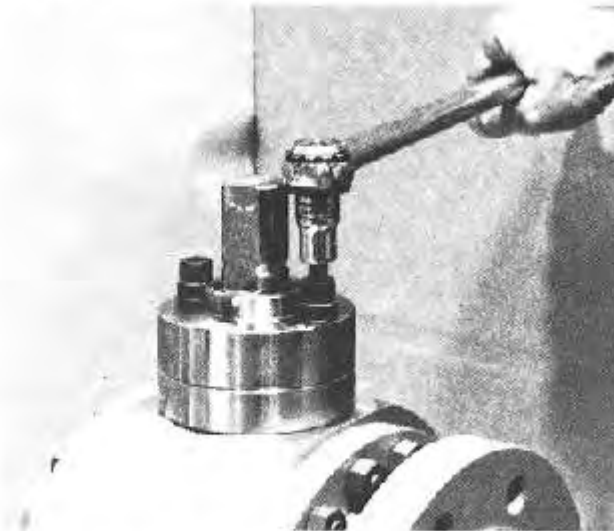
10. Install closure/seat assembly of Step 4 on body.
- a. Make certain Body O-Ring gland is clean and free of burrs.
- b. If valve has the nylon seat design, align witness marks previously made on body closures. Line flange holes must straddle vertical centerline.
- c. If valve has the O-Ring seat design, observe the marks made on the closure flange O.D. when seat was installed. These marks show the location of the seat vent holes. Position the closure on body so that these marks are at 90° to the stem axis.
- d. Tighten nuts per torque Table in Part XII.



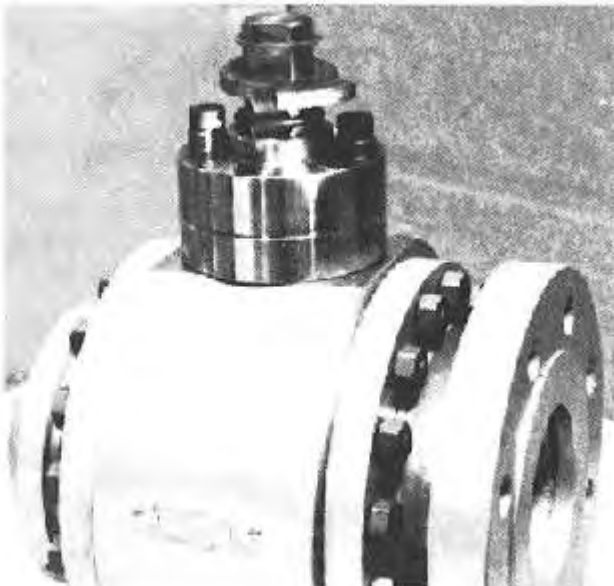
11. Install upper stem O-Ring into gland plate counterbore.



12. Replace bearing housing assembly of Step 5. Tighten cap screws per torque Table in PART XII if valve is wrench operated.



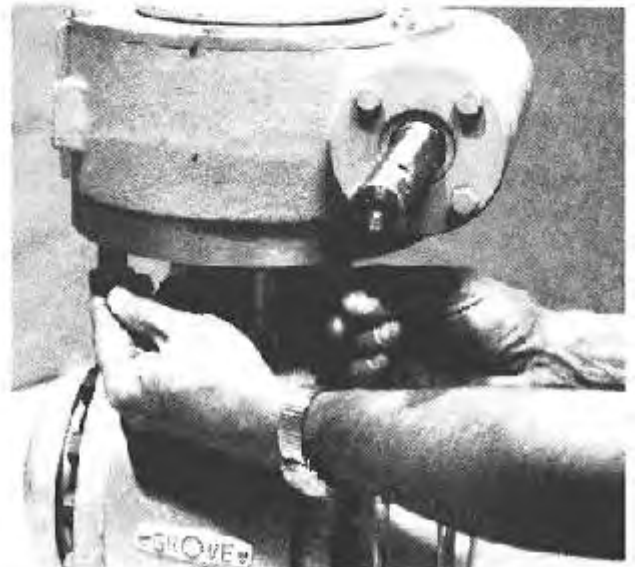
13. If valve is wrench operated:
a. Replace weather seal, stop collar and retaining ring.
b. Replace wrench.



14. If valve is gear operated:
a. Install adapter plate on top of bearing housing so that witness marks line up.
b. Tighten bearing housing cap screws per torque table in Part XII.



- c. Replace weather seal, stop collar and retaining ring.
d. Install stem adapter, if used, over stem and replace key. With valve in fully open position, key will be on valve bore center line.
e. Replace fiber gasket on adapter plate.
f. Replace operator so that operator drive sleeve engages key in stem adapter and witness marks line up.



- g. Replace operator mounting cap screws and tighten evenly all around hand-tight.
h. Check alignment of operator by cycling from fully open to fully closed position. If valve operates freely, wrench-tighten cap screws evenly.

E. TESTING FOR LEAKAGE.

1. Close valve fully.
2. Admit 50 PSI air or nitrogen to body cavity through trunnion vent port. Lock off body pressure.
3. If pressure holds steady, all seals are tight.
4. If body pressure falls steadily, apply soap solution to ball/seat circumference, closure flange to body interface and to vented plug in gland plate. Release pressure, disassemble and repair area of leakage.
5. Vent air pressure from body.
6. Install vent plug assembly in trunnion.

PART XI - Accessory Installation

A. MOUNTING GEAR OPERATORS AND SETTING OPERATOR STOPS.

1. Before mounting the operator on the valve, grease the valve stem. Check the key to see that it is the proper length and fits the key slot without excessive play. Lower the operator over the stem and bolt down to the valve adapter plate. Tighten bolts securely.

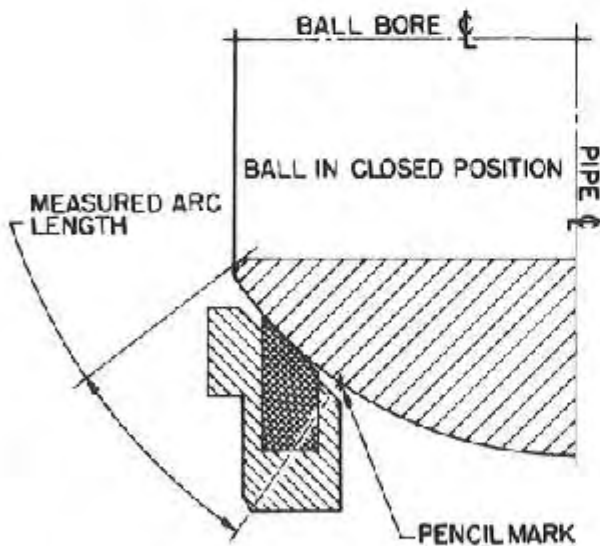
NOTE: If operator fits tight over the valve stem, DO NOT force down by taking up on the bolts. This will lock-up the ball and cause excessive torque. Check for scratches or burrs and polish to provide smooth sliding surfaces.

2. The valve internal stop is designed to serve as an indicator of the ball open and closed positions. This stop permits slightly more than 90° travel in order that the stops in the operator can be set to serve as the actual stopping means. After the operator has been properly installed on the valve, the operator stops can be set as follows:

Off-Stream (Valve removed from line)

- a. Back-off locknuts and stop screws on both sides of the operator.
- b. Turn handwheel clockwise until ball is about half closed.
- c. From the table, find the arc length for the size of the valve, and measure off this distance from ball bore lip along horizontal center line. Make a pencil mark on the ball at this point. (Refer to sketch).

Horizontal Plane Thru Valve Bore Centerline

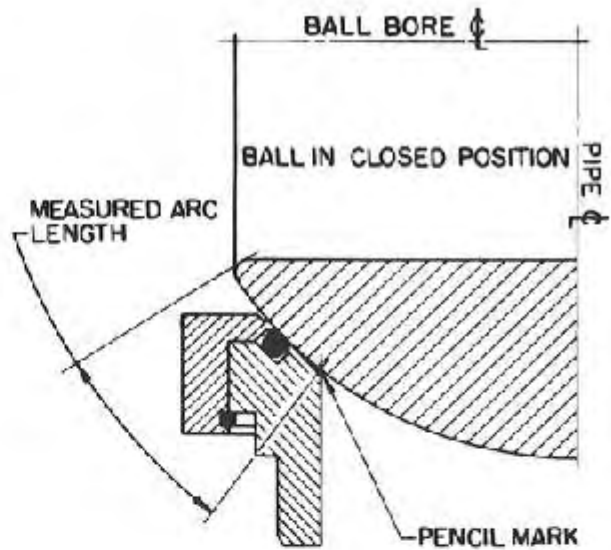


One Piece (Nylon) Seats

VALVE SIZE	MEASURED ARC LENGTH (Inches)
1-1/2"	17/32 ± 1/16
2"	9/16 ± 1/16
3"	23/32 ± 1/16
4"	55/64 ± 1/16

- d. Continue to turn valve towards the closed position until the pencil mark is flush with the I.D. of the seat ring.
- e. Turn the operator "close" stop screw until it can go no further. Tighten the locknut.

- f. Turn operator handwheel counter-clockwise until bore of the ball lines up visually with bore of seat ring.
- g. Advance "open" operator stop screw until it can go no further and tighten the locknut.



Two-Piece O-Ring Seats (4" Class 600/1500)

VALVE SIZE	MEASURED ARC LENGTH (Inches)
2"	9/16 ± 1/16
3"	23/32 ± 1/16
4"	55/64 ± 1/16

On-stream (Valve in pipeline and under pressure)

- a. Back-off locknuts and stop screws on both sides of the operator.
- b. Turn handwheel in a clockwise direction as far as it will go. This places valve in maximum closed position as permitted by the stop collar of the valve.
- c. Vent body cavity pressure thru special vent valve. If CONTINUOUS drainage occurs, slowly turn handwheel counter-clockwise until drainage just stops.
- d. From this handwheel position, COUNT THE NUMBER OF HANDWHEEL TURNS in counter-clockwise direction required to initiate flow from vent port. Do not overshoot.
- e. Turn handwheel CLOCKWISE one half the counted number of turns determined in "d" above.
- f. Turn the operator stop screw until it will go no further. Tighten the locknut.
- g. Tighten the vent plug assembly. Close vent valve.
- h. From the handwheel position in Step "f", turn the handwheel COUNTER-CLOCKWISE the number of turns for 90° rotation indicated in the table for the operator involved.
- j. Advance the other operator stop screw until it will go no further. Tighten the locknut.

NOTE: For valves isolated from line pressure, the above stop setting procedure may be accomplished by using 50 psi air or nitrogen pressure introduced into body cavity of closed valve thru vent port in trunnion. For setting stops on other gear or power operators, refer to the manufacturer's instructions.

PART XII - Miscellaneous - A. Bolting Torques

Body Stud Torque (B-4B & B-4C)

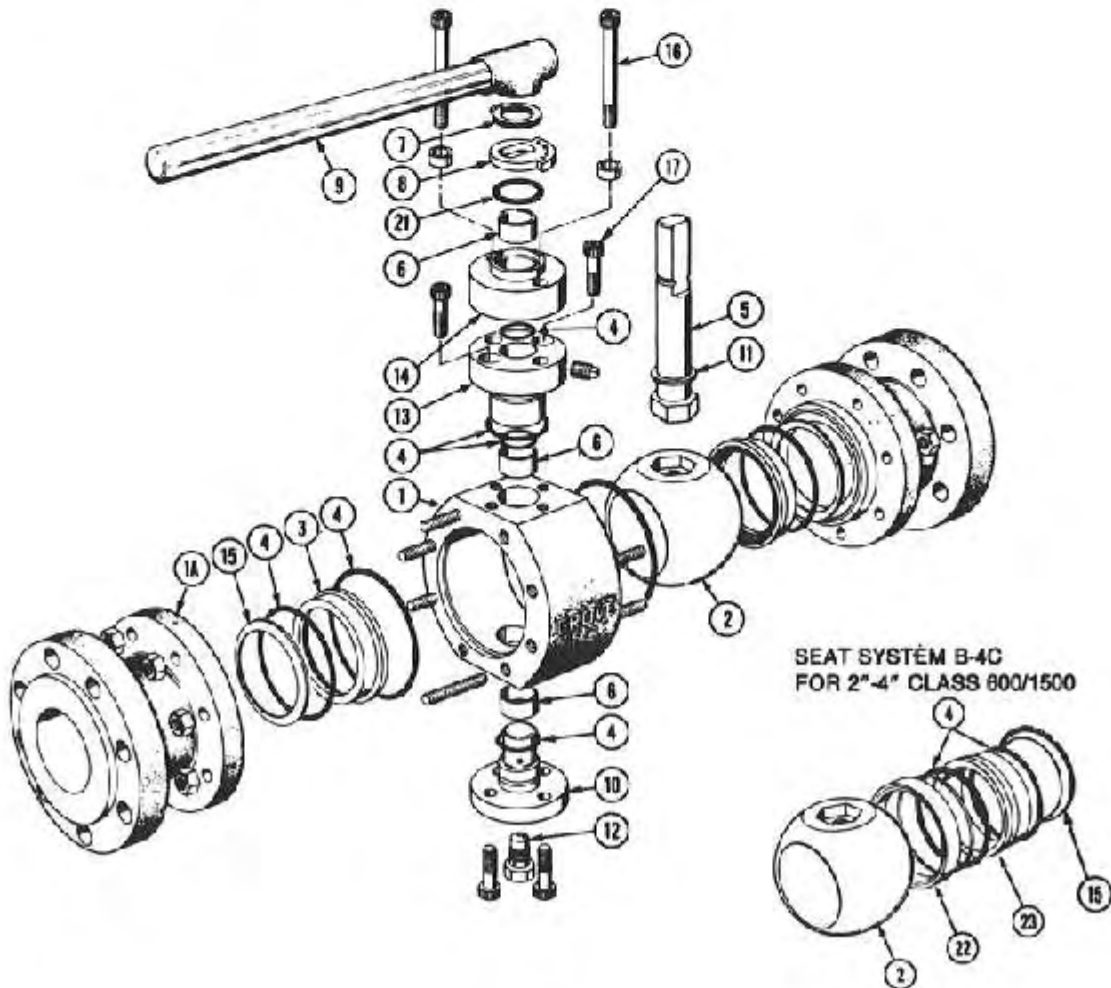
STUD SIZE	Torque* (ft.-lb.) Lubed (Moly)
1/2 - 13 UNC	55
5/8 - 11 UNC	105
3/4 - 10 UNC	180
7/8 - 9 UNC	300

Capscrew Torque (B-4B & B-4C)

CAPSCREW SIZE	TORQUE (ft. - lbs.)	
	Min	Max
5/16 - 18	10	15
7/16 - 14	27	40
1/2 - 13	40	60

PART NAME	
1. Body	12. Vent Plug Assembly
1A. Closure	13. Gland Plate
2. Ball	14. Bearing Housing
3. Seat Unit	15. Spring Washer
4. "O-Rings	16. Capscrew (Bearing Housing)
5. Stem	17. Capscrew (Gland Plate)
6. Bearings	18. Stud
7. Stop retaining Ring	19. Nut
8. Stop Collar	20. Capscrew (Trunnion)
9. Wrench	21. Weather Seal
10. Trunnion	22. Outer Seat Ring
11. Thrust Washer	23. Inner Seat Ring

Isometric - Typical B-4B & B-4C

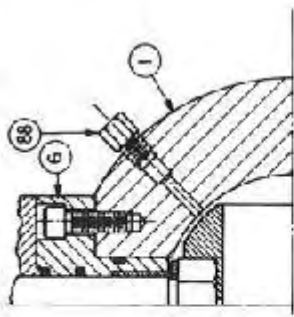


ITEM	PART NAME	MATERIAL
1	BODY	STEEL
2	SPRING WASHER	SPRING STEEL
3	SPRING WASHER	STEEL
4	SPRING WASHER	STEEL
5	THRUST BEARING	STEEL & TEFLON**
6	GLAND PLATE	STEEL
7	STEM BEARING (LOWER)	STEEL & TEFLON**
8	STEM O-RING	GROVEX®
9	GLAND PLATE O-RING	GROVEX®
10	CAPSCREW (BEARING HOUSING)	ALLOY STEEL
11	BEARING HOUSING	STEEL
12	RETAINING RING	STEEL
13	STEM	STEEL
14	STOP COLLAR	STEEL
15	BEARING HOUSING	STEEL
16	STEM BEARING (UPPER)	STEEL & TEFLON**
17	VENTED PLUG	STEEL
18	INDU O-RING	GROVEX®
19	STEM	STEEL
20	STEM	STEEL
21	INDU O-RING	GROVEX®
22	STEM	STEEL
23	STEM	STEEL
24	CLOSURE	STEEL
25	NUT	STEEL
26	DALL (WITH BEARING)	STEEL
27	TURNBON	STEEL
28	TURNBON	STEEL
29	VENT PLUG ASSY	STEEL
30	TURNBON O-RING	GROVEX®
31	TURNBON BEARING	STEEL & TEFLON**
32	SEAT O-RING	GROVEX®
33	WRENCH	STEEL
34	CAPSCREW (TURNBON)	ALLOY STEEL
35	CAPSCREW (GLAND PLATE)	ALLOY STEEL
36	SPACER	STEEL
37	O-RING (WEATHER SEAL)	GROVEX®

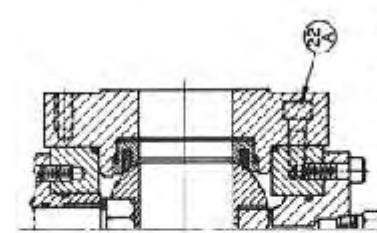
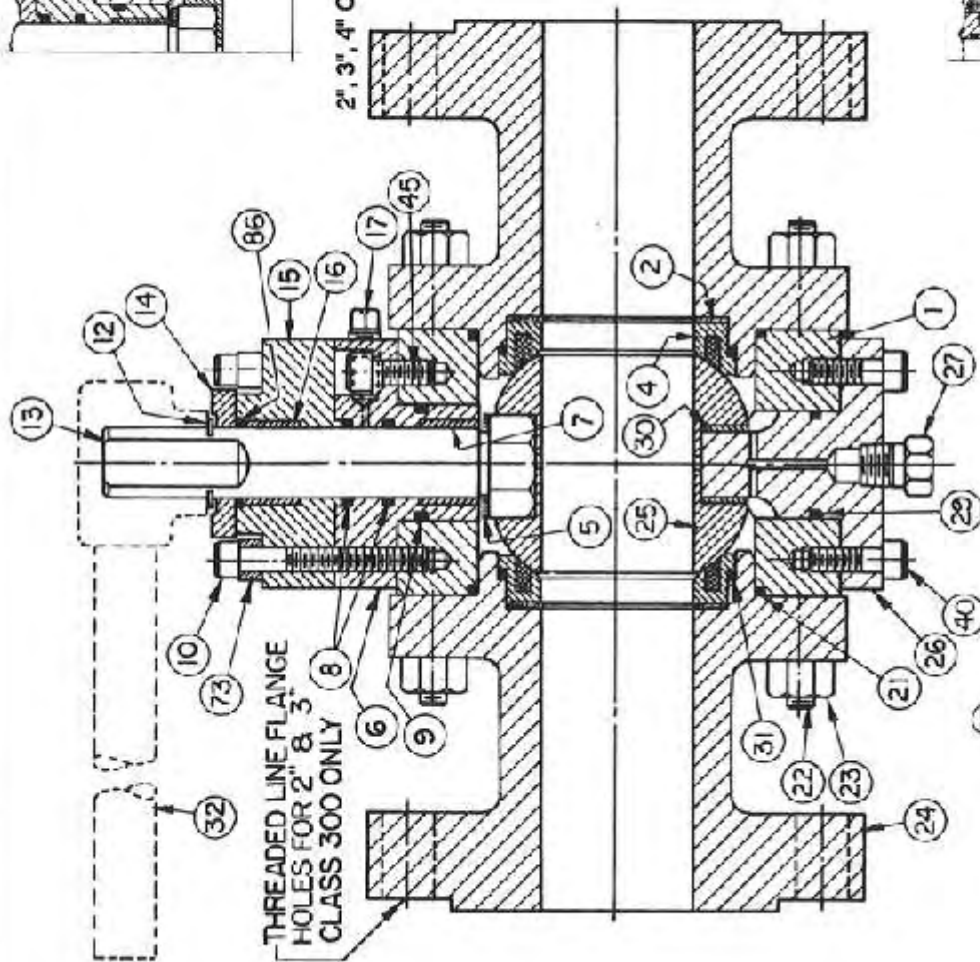
FOLLOWING PARTS USED ONLY WITH O-RING SEAT IN 4-INCH CLASS 600-1500

38	SEAT SPRING	SPRING STEEL
39	INNER SEAT RING	STEEL
40	OUTER SEAT RING	STEEL
41	SEAT LOCK RING	C.R.F. 3
42	P.M. SEAT RING	C.R.F. 3
43	SEAL O-RING	GROVEX®
44	RELIEF VALVE (BODY)	STEEL

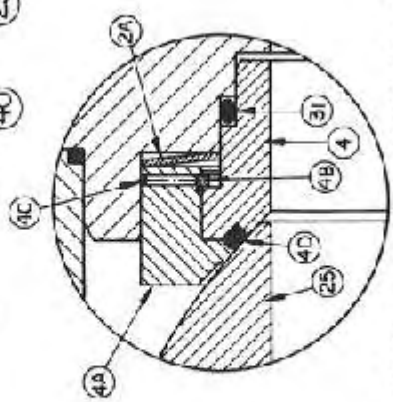
* RECOMMENDED FOR SPARE PARTS (SPARE PARTS, KITS, A, B, & C)
 † A GROVE TRADENAME COVERING A VARIETY OF ELASTOMERIC MATERIALS
 ** TRADEMARK OF E.I. DUPONT CO.



END VIEW
 2", 3", 4" CLASS 600/1500 ONLY B-4C



2", 3" & 4" CLASS 150 B-4B R.F. FLANGE
 PLATE FLANGES WITH TAPPED HOLES
 FOR FLANGE BOLTING



SEAT DETAIL FOR 2"-4" CLASS 600/1500 B-4C

6029 HOLLIS STREET GROVE VALVE & REGULATOR CO. OAKLAND, CALIF.	
MODEL	DESCRIPTION
B-4B & B-4C BALL VALVE	TYPICAL CONSTRUCTION WRENCH OPERATED 2" - 4" CL. 150-1500

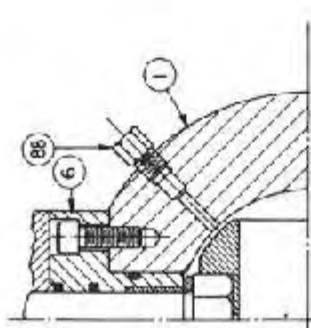
ITEM	PART NAME	MATERIAL
B1	1 BODY	STEEL
B1	2 SPRING WASHER	SPRING STEEL
A1	4 SEAT UNIT	STL & SYNTHETIC MATL.
A1	5 THRUST WASHER	STEEL & TEFLON**
A1	6 GLAND PLATE	STEEL
A1	7 STEEL BEARING (LOWER)	STEEL & TEFLON**
A1	8 STEEL O-RING	GRUNEX®
A1	9 GLAND PLATE (DRIVING)	GRUNEX®
A1	10 CAPSCREW (BEARING HOUSING)	ALLOY STEEL
A1	12 RETAINING RING	STEEL
A1	13 STEM	STEEL
A1	14 STOP COLLAR	STEEL
A1	15 BEARING HOUSING	STEEL
A1	16 STOP WASHER (UPPER)	STEEL & TEFLON**
A1	17 VENTED PLUG	STEEL
A1	21 BODY O-RING	GRUNEX®
A1	22 STUD	ALLOY STEEL
A1	23A CAPSCREW (PLATE CLOSURE)	ALLOY STEEL
A1	23B NUT	ALLOY STEEL
A1	24 CLOSURE	STEEL
A1	25 BALL	STEEL
A1	26 TRUNION	STEEL
A1	27 VENT PLUG ASSY	ALLOY STEEL
A1	28 TRUNION O-RING	GRUNEX®
A1	29 TRUNION BEARING	STEEL & TEFLON**
A1	31 SEAT O-RING	GRUNEX®
A1	44 CAPSCREW (PLATE ADAPTER)	ALLOY STEEL
A1	45 ADAPTER PLATE	STEEL
A1	51 SHAFT ADAPTER	STEEL
A1	62 KEY	STEEL
A1	63 GASKET	FRFR
A1	64 OPERATOR	STEEL & IRON
A1	66 CAPSCREW (OPER. MT.)	STEEL
A1	66 O-RING (WEATHER SEAL)	GRUNEX®

FOLLOWING PARTS USED ONLY WITH O-RING SEAT IN-INC. | CLASS 600 - 1500

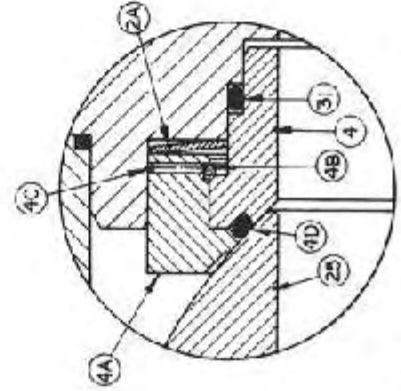
B1	2A SEAT SPRING	SPRING STEEL
B1	4 INNER SEAT RING	STEEL
B1	4A OUTER SEAT RING	STEEL
B1	4B SEAT LOCK RING	C.N.I.S.
B1	4C P.M. SEAT RING	C.N.I.S.
A1	10 SEAL O-RING	GRUNEX®
A1	80 "RELIEF" VALVE (ODDY)	STEEL

- ** NOT USED WITH GV-2 OPERATOR ON 4" VALVES
- ‡ RECOMMENDED FOR SPARE PARTS (SPARE PARTS, KITS, A, B, & C)
- ⊕ A GROVE TRADENAME COVERING A VARIETY OF ELASTOMERIC MATERIALS
- ** TRADEMARK OF E.I. DUPONT CO.

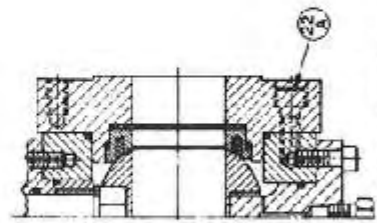
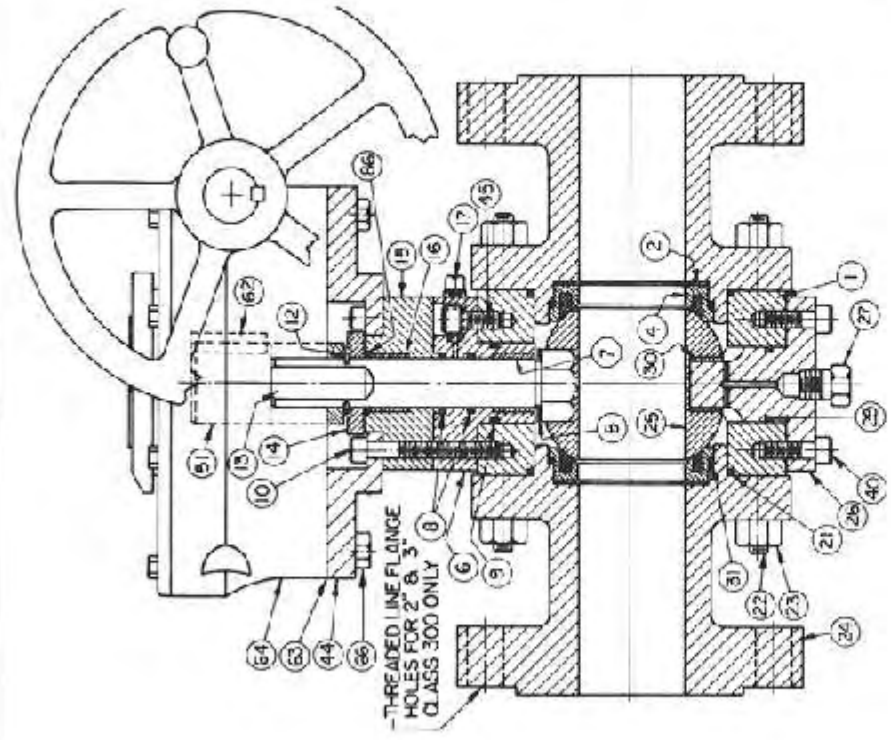
6628 HOLLIS STREET		GROVE VALVE & REGULATOR CO.		OAKLAND, CALIF.	
MODEL	B-4B & B-4C	DESCRIPTION	TYPICAL CONSTRUCTION GEAR OPERATED BALL VALVE		



END VIEW
2, 3, 4" CLASS 600 TO 1500 ONLY
B-4C



SEAT DETAIL FOR 2, 3, 4" CLASS 600/1500 B-4C



2, 3, & 4" CLASS 150 R.F. FLANGE B-4B
PLATE FLANGES WITH TAPPED HOLES
FOR FLANGE BOLTING



**COOPER CAMERON
VALVES**



**COOPER CAMERON
VALVES**

3250 Briarpark Drive, Suite 300
Houston, Texas 77042
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