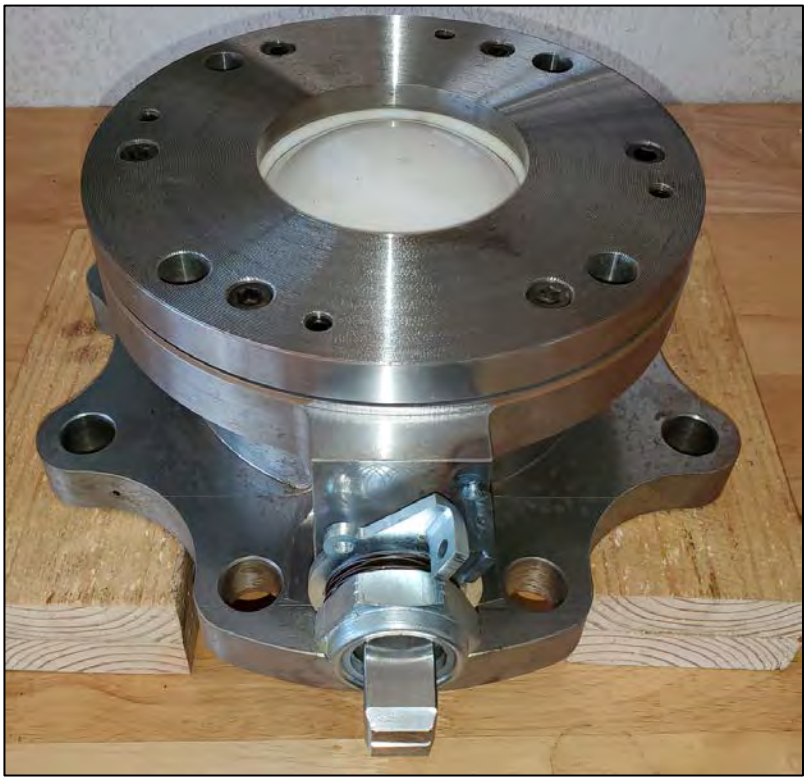
KELSO

Installation, Operation, Inspection and Maintenance Manual



BOTTOM OUTLET VALVE
MODEL: KBOV-P and KBOV-SP SERIES

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1.0 Introduction

Kelso Bottom Outlet Valves offers performance and reliability with today's Best Available Technology.

Our experience delivers a technical superior product which includes features such as; fitment to standard tank car saddles, meets new federal requirements and is designed for both hazardous and non-hazardous service.

1.1 Precautions

The KBOV-P and KBOV-SP Series Bottom Outlet Valve can be used as a safety device in the storage and transportation of a wide variety of fluids, many of which are hazardous materials that could cause serious injury or damage. Only personnel which are properly qualified should install, repair or rebuild the KBOV-P and KBOV-SP Series Bottom Outlet Valve. Only certified parts from Kelso or one of its authorized representatives should be used in the KBOV-P and KBOV-SP Series Bottom Outlet Valve. The KBOV-P and KBOV-SP Series Bottom Outlet Valve may be installed on DOT tank cars that carry hazardous chemicals and may travel under pressure.

Read these instructions prior to performing periodic maintenance and/or repairs.

1.2 Regulations

Kelso valves are used in contact with a variety of products, many of which are hazardous materials. The acceptance and transportation of products are regulated by DOT and AAR in the U.S.A. and in Canada by CTC and Transport Canada. Regulations of other governmental bodies must be complied with. All personnel should be familiar with and follow these regulations. Nothing in these instructions is intended to conflict with or supersede these regulations.

Note: Specifications are subject to change without notice.

1.3 Technical Specifications

1.3.1

Figure 1.3.1. shows the general arrangement of the KBOV-P Series valve and Figure 1.3.2. is a general Bill of Materials for the given arrangement.

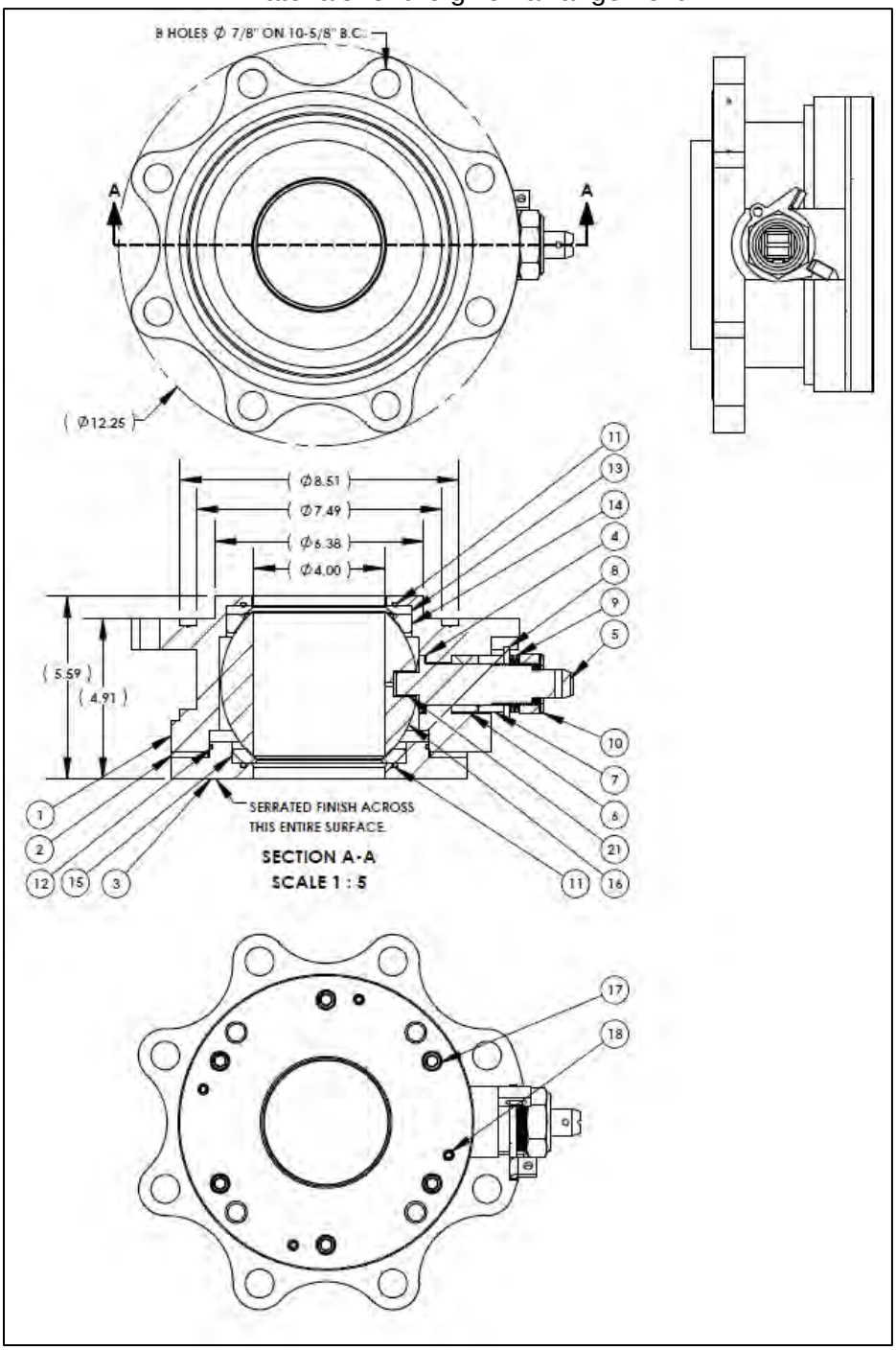


Figure 1.3.1. KBOV-P Series General Arrangement

Item	QTY.	Description
1	1	Body
2	1	Retainer Spacer
3	1	Seat Retainer
4	1	Thrust Washer
5	1	Stem
6	1	Stem Packing (4 Rings)
7	1	Packing Spacer
8	1	Stop Indicator Plate
9	1	Wave Spring
10	1	Stem Lock Nut
11	2	Top Body & Bottom Seat O-Ring
12	1	Bottom O-Ring
13	1	Ceramic Wiper
14	1	Top Seat
15	1	Bottom Seat
16	1	Ceramic Ball
17	6	Seat Retainer Cap Screw
18	4	Seat Retainer Set Screw
19	1	Nameplate (Not Shown)
20	2	Nameplate Rivets (Not Shown)
21	1	Ball/Stem Shim

Figure 1.3.2. KBOV-P Series General Arrangement Bill of Materials

1.3.2 Figure 1.3.3. shows the General Arrangement of the KBOV-SP Series valve with a Steam Jacket that has 2" socket weld connections, and Figure 1.3.4. is a general Bill of Materials for the given arrangement.

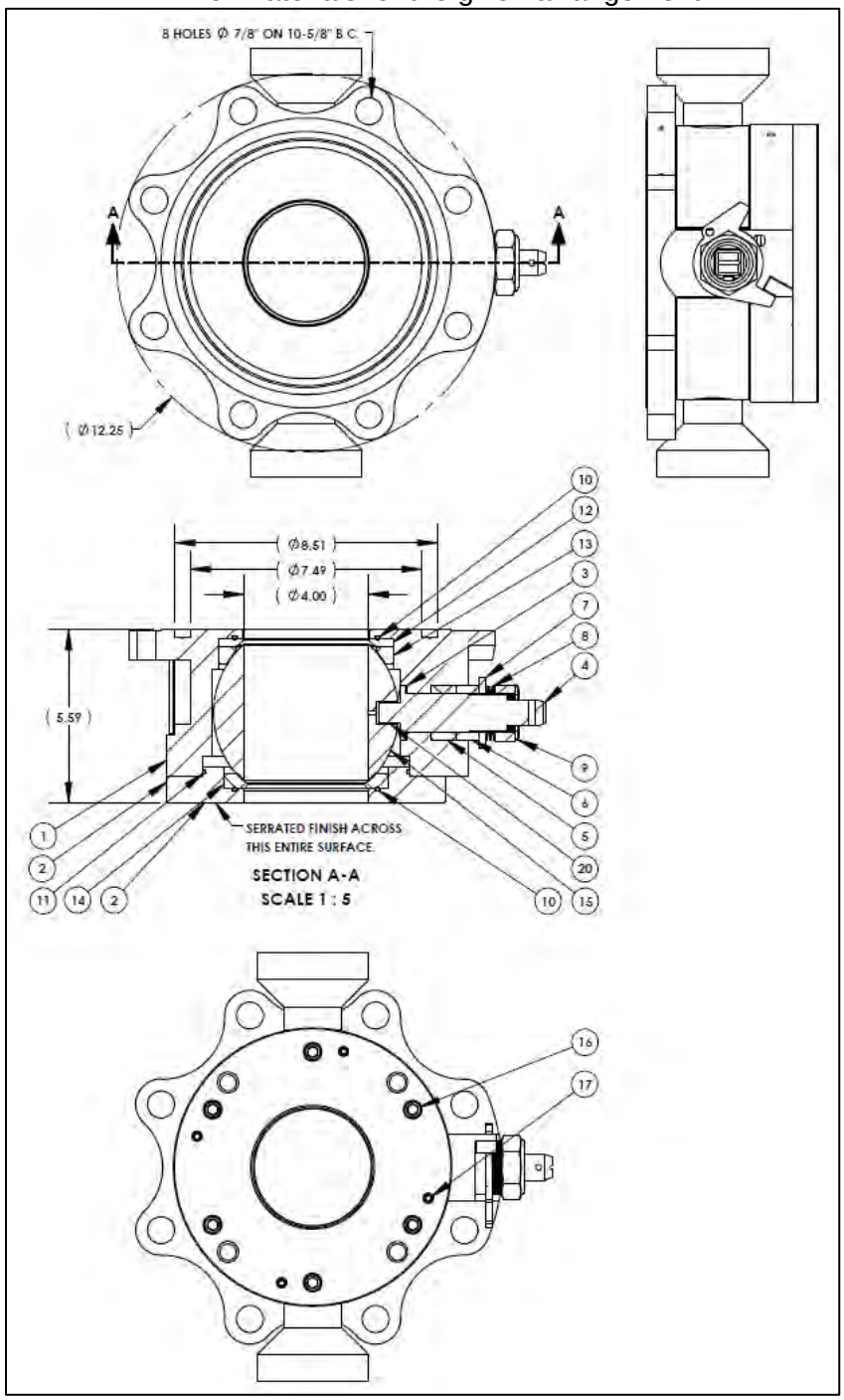


Figure 1.3.3. KBOV-SP Series General Arrangement with Steam Jacket

Item	QTY.	Description
1	1	Body
2	1	Seat Retainer
3	1	Thrust Washer
4	1	Stem
5	1	Stem Packing (4 Rings)
6	1	Packing Spacer
7	1	Stop Indicator Plate
8	1	Wave Spring
9	1	Stem Lock Nut
10	2	Top Body & Bottom Seat O-Ring
11	1	Bottom O-Ring
12	1	Ceramic Wiper
13	1	Top Seat
14	1	Bottom Seat
15	1	Ceramic Ball
16	6	Seat Retainer Cap Screw
17	4	Seat Retainer Set Screw
18	1	Nameplate (Not Shown)
19	2	Nameplate Rivets (Not Shown)
20	1	Ball/Stem Shim

Figure 1.3.4. KBOV-SP Series General Arrangement Bill of Materials

1.4 Required Tools

Open/Boxed End Wrench – 1 3/4”

Sockets – 1 3/4”

Ratchet

Allen Wrench – 3/16” and 5/16”

Torque Wrenches for 5-7 ft./lbs. and 80-100 ft./lbs.

Non-Marring Mallet

Non-Marring Prying Tool

Lint-Free Cloth

Adjustable Wrench

Loctite 242®

Loctite Moly-50® or C5-A® Copper Based Anti-Seize

Wire Brush

2.0 Valve Installation

Only companies and their personnel which are certified by the Association of American Railroads shall perform maintenance and periodic testing of Kelso valves.

2.1 Preliminary Considerations

New valves are tested, adjusted and sealed at Kelso. If a new valve has been left in its original packaging, is undamaged and is not more than six months old, it may be installed on a tank car without retesting or recalibration. Prior to installation, ensure that the valve remains clean and that the gasket sealing surfaces are not damaged in any way, shape or form.

2.2 Installation Procedure

1. Prior to removing any valve or fitting from a tank, ensure that the internal pressure is at atmospheric and that personnel exposure to hazardous chemicals are eliminated.
2. When the securement bolts have been removed from the mounting flange, remove the valve and discard the old flange gasket.

Note: Valve may have steam connections. Use caution and ensure that no steam is present when disconnecting.

3. The flange mating surface should be free from gouges, scrapes and excessive corrosion. If the valve has a flat mating surface, clean the mating surface using a wire brush if scale, rust, adhesive or dirt are evident. Ensure that while removing the old gasket no damage is done to the bottom of the mating flange. Any burrs, radial gouges and debris should be removed.
4. A new valve should be kept in its original shipping container to prevent damage to the valve or its components.
5. The nameplate will verify the test date of the valve. If the last known test date is within six months, the valve can be installed without retesting or requalifying.
6. Place a new gasket on the valve mounting flange. Gasket material should be compatible with the chemical being shipped. Inspect the valve mating flange for defects as described in Paragraph 2.2.3 above.
7. Clean tank car mounting flange and saddle plate (if present) of all product and residue. Clean out threaded holes in the mounting to ensure easy installation.
8. Use lint free cloth and appropriate cleaning solvent to wipe clean the mounting and tongue.

9. Inspect edges of tank car tongue. Any peening over the edges will make it difficult to seat the valve properly. Correct any irregularities according to approved practices.
10. Install the valve in the open position. This is to ensure that the ball surfaces do not get damaged. The valve handle shaft must be oriented so that it points away from tank car.

The valve with outlet cap in place can weigh in excess of 90 lbs. Use mechanical assistance or manpower when lifting and locating valve during installation.

11. Raise the valve until the gasket groove engages the mounting flange. Install 4 bolts 90° apart and tighten gradually, only enough to retain engagement of the valve in to place.
12. Install all remaining bolts. Tighten in a crisscross pattern in 1/3 torque increments to a final torque, prescribed by your engineering dept. In the event that your engineering department does not have a prescribed torque value, use 180-200 ft. /lbs. as a suggestion.
13. Install the handle using the provided instructions.
14. Open and close the valve a few times. Check that the handle fits into both the open and closed positions.
15. Once the valve has been secured to the car, a suitable leak test should be performed to ensure that the flange mating surfaces are pressure tight.

Note: Valve may require steam connection. Ensure that connections are properly connected (per shop procedure).

2.3 Leak Inspection

All newly installed valves must be tested under pressure to confirm that no leaks are present, this includes steam connection.

WARNING: Loose nuts, improper flange seating, damaged and incorrect size gaskets can result in leaks at the valve joints.

2.4 Valve Operation

Operation of all valves must conform to all applicable TC, AAR, DOT and other governmental bodies.

2.4.1. Counterclockwise Operated Valves:
1. To open valve: Rotate handle counterclockwise to 90°.
2. To close valve: Rotate handle clockwise until it stops.

2.4.2. Clockwise Operated Valves:
1. To open valve: Rotate handle clockwise to 90°.
2. To close valve: Rotate handle counterclockwise until it stops.

3.0 Disassembly

Prior to any servicing of Kelso Valves, ensure all participating personnel have adequate personal protective equipment.

3.1 Procedure

1. Start by removing the four Seat Retainer Set Screws using a 3/16” hex wrench. *(Figure 3.1)*

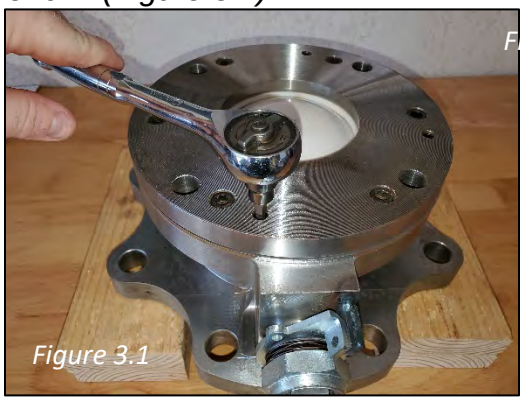


Figure 3.1

2. Then remove the six Seat Retainer Cap Screws using a 5/16” hex wrench. *(Figure 3.2)*

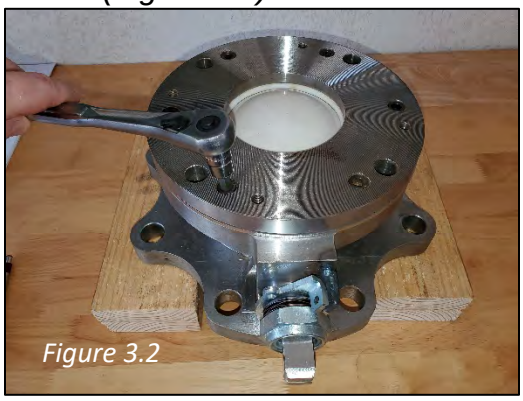


Figure 3.2

3. Lift the Seat Retainer and the Retainer Spacer (KBOV-SP Series valves will not have a Retainer Spacer) from the valve. A non-marring pry tool may be needed between the seat and the body to dislodge. *(Figure 3.3 and 3.4)*

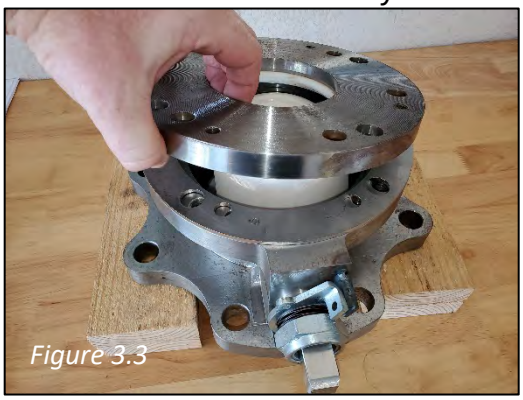


Figure 3.3

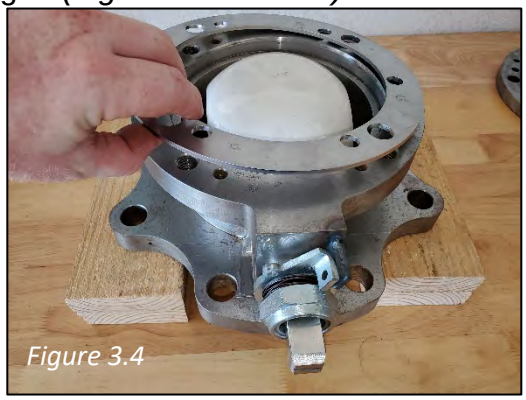


Figure 3.4

Use caution if prying to prevent gouging/scaring of the body and Seat Retainer mating surfaces.

4. Turn the Seat Retainer over and remove Bottom Seat and Bottom Seat O-ring. *(Figure 3.5 and 3.6)*


Figure 3.5


Figure 3.6

5. Then remove the Bottom O-ring from the outside of the Seat Retainer. *(Figure 3.7)*


Figure 3.7

6. Lift the Ball from valve body (the valve must be in the "closed" position to remove the Ball). *(Figure 3.8)*


Figure 3.8

7. After removing the ball from the valve body, remove the Ball/Stem Shim from the notch in the ball. *(Figure 3.9)*


Figure 3.9

Use caution to not nick/gouge the ceramic ball.

8. Use an adjustable wrench to hold the stem from within the valve body and a socket on the nut to remove the Stem Lock Nut. *(Figure 3.10)*


Figure 3.10

9. Once the Stem Lock Nut has been removed, remove the Wave Spring, the Stop Indicator Plate, and the Packing Spacer. *(Figure 3.11 and 3.12)*

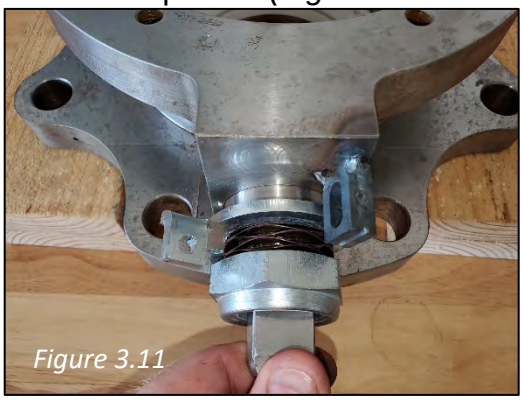


Figure 3.11

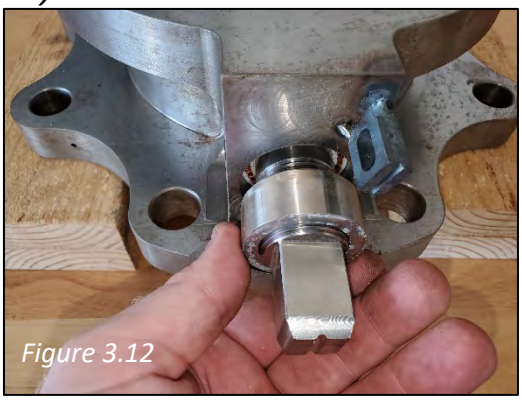


Figure 3.12

10. Push the Stem into the valve body to remove it, then remove the Stem Packing (4 rings) from the stem orifice on the outside of the valve body. *(Figure 3.13 and 3.14)*


Figure 3.13

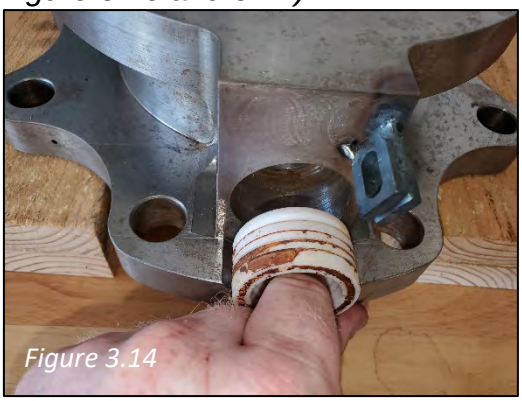


Figure 3.14

11. Detach the Thrust Washer from the stem or from within the valve body at the stem orifice. *(Figure 3.15)*


Figure 3.15

12. Remove the Top Seat and then the Ceramic Wiper from the Body. *(Figure 3.16 and 3.17)*

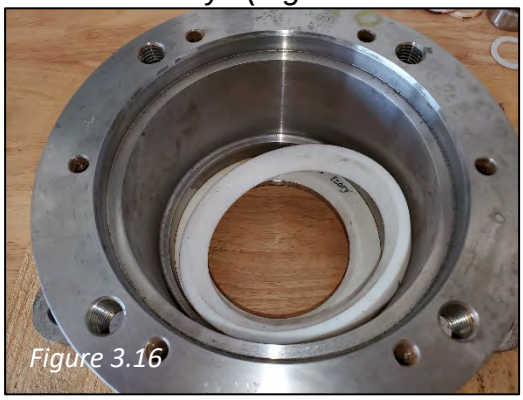


Figure 3.16


Figure 3.17

13. Remove the Top Body O-ring. *(Figure 3.18)*

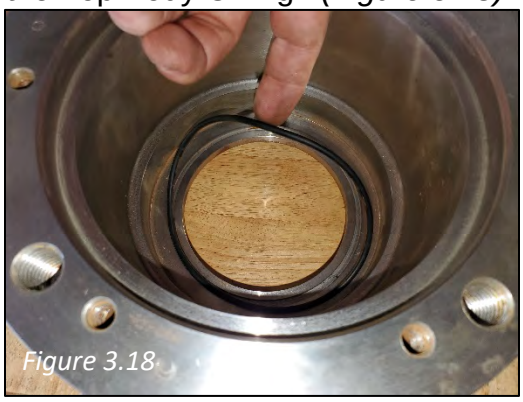


Figure 3.18

4.0 Inspection

The valve and some components can be visually inspected without removal from the car. However, a proper inspection should be made whenever the valve is rebuilt or when suspect operation warrants.

4.1 Cleaning

All components, except for the wiper, seat, ball, and seals (O-rings), of the Kelso valve may be cleaned using:

1. Wire brushes and/or clean towel/cloth. If valve is fabricated from stainless steel and contains stainless steel parts, wire brushes that have been used on carbon or low alloy steel should not be used on this part.
2. Low pressure water, glass bead, sand or soda blasting provided the blast media is not angular in form or leaves iron content on stainless parts.
3. A chemical/surfactant application, in conjunction with manufactures prescribed instructions, to achieve a desired result. It is suggested the chemical/surfactant be of neutral pH to ensure the integrity of the metal composition.
4. Regardless of cleaning method, it is suggested that the parts be double rinsed and dried (with sanitary towel) prior to reinstallation and immediately after any chemical/surfactant application.

Disposal should be managed in accordance with all applicable state and federal regulations.

4.2 Components

1. Remove all foreign debris, if it exists, from all of the parts.
2. Inspect valve body and ball sealing surfaces for corrosion, cracks and scratches. No defects allowed. *(Figure 4.1 & 4.2)*

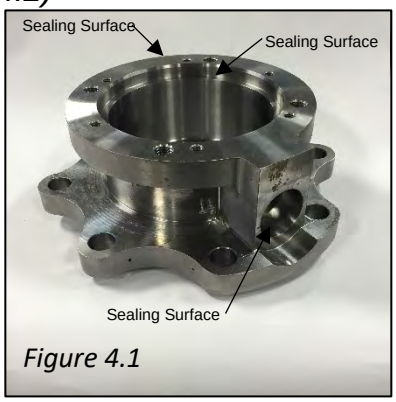


Figure 4.1

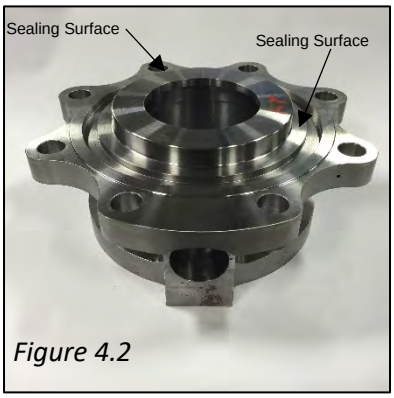


Figure 4.2

3. Inspect body stem orifice using a light. It must be free of scratches, gouges or corrosion. *(Figure 4.3)*

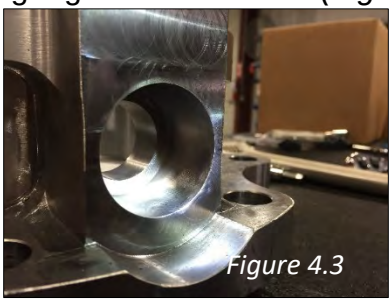


Figure 4.3

4. Ball must be clean. Use a solvent to remove any debris and residue. An ultrasonic bath can be an option.
5. Inspect the ball for any dents, scratches or gouges. A good technique is to use your finger nail. If your finger nail "catches" an abrasion, this will be a cause for rejection as it could allow leakage or affect the ball sealing. *(Figure 4.4)*


Figure 4.4

Do not attempt to repair valve balls. Attempts to remove imperfection can result in diameter changes. Which can result in deficient sealing. Replace ball if imperfections are noticed.

6. Inspect all threads and threaded holes for galling, excessive wear and damage. Replace if necessary.
7. Inspect the stem for scratches and gouges on stem shaft. No imperfections allowed. *(Figure 4.5)*


Figure 4.5

8. The threads on the stem should pass a thread ring go gage. A die (1-1/4-12 UMF-2A), can be used to re-chase threads. However, if threads exhibit stripping or irreparable damage, replace stem.
9. Inspect the wiper ring for any breaks, cracks, gouges. Replace if any defects are noticed.
10. If any damage, as mentioned above, is detected on any of these parts, it will condemn that part and that part will need to be replaced.

5.0 Assembly

Bottom Outlet Valves with Steam Jacket fitting, should be leak tested prior to assembly, see Section 6.1.

5.1 Procedure

1. With the body placed on a flat surface and properly secured, preferably on test stand, with bottom facing up, install the Top Body O-ring into the machined groove. Make certain that the groove is free from debris/residue to allow for proper O-ring sealing. *(Figure 5.1)*

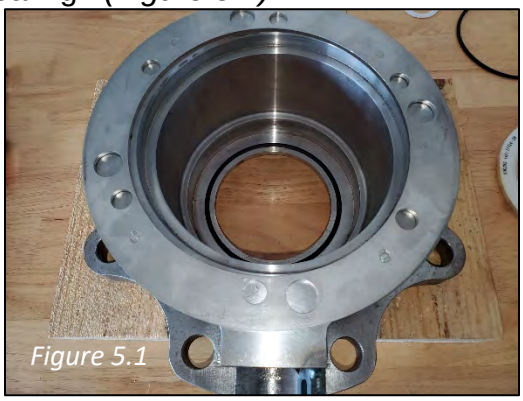


Figure 5.1

2. Place the Ceramic Wiper into the body, flat side down, and press firmly into place. *(Figure 5.2)*

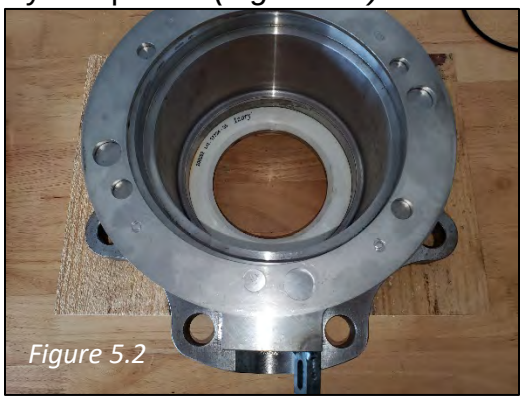


Figure 5.2

3. Insert the Top Seat, flat side down, and press firmly into place. *(Figure 5.3)*


Figure 5.3

4. Place the Thrust Washer on Stem and insert the Stem through the stem orifice, from the inside of the valve body. *(Figure 5.4)*

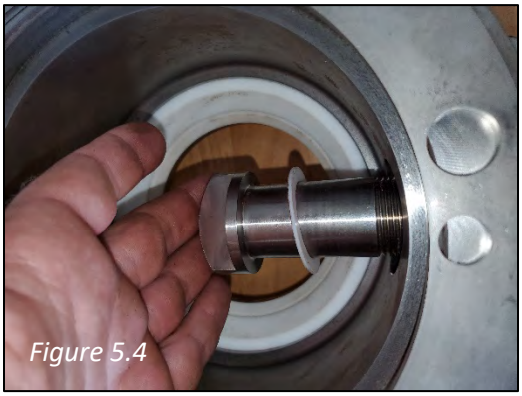


Figure 5.4

5. Next stack the Stem Packing (4) rings. Start with the packing ring with a flat bottom and a “V” groove on the opposite face. Add the (2) rings with the “V” groove on one face and a peak on the opposite face. Finish with the packing ring with a peak and flat top on the opposite face. See pictures below for clarification. *(Figure 5.10 - 5.13)*


Figure 5.5


Figure 5.6


Figure 5.7

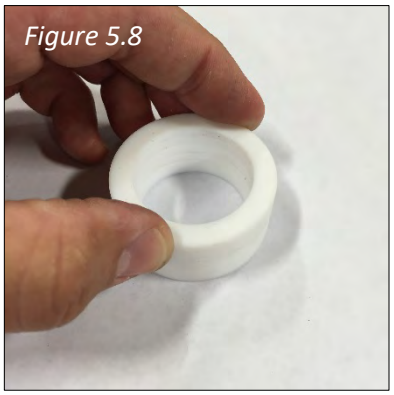


Figure 5.8

6. Insert the Stem Packing, with the peaks towards the outside of the body, and Packing Spacer onto the stem, pressing both into the stem orifice. *(Figure 5.14 - 5.16)*


Figure 5.9

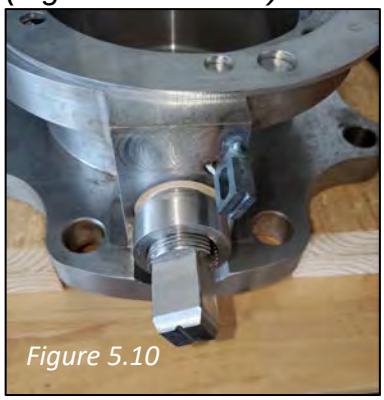


Figure 5.10

7. Place the Stop Indicator Plate (if a bent tab is present it will face away from the body; or, the small hole in the plate will be opposite of the tab on the body) onto the stem. Align the notch on the plate and the machined groove of the stem, pushing onto the stem, against the Packing Spacer. *(Figure 5.11)*

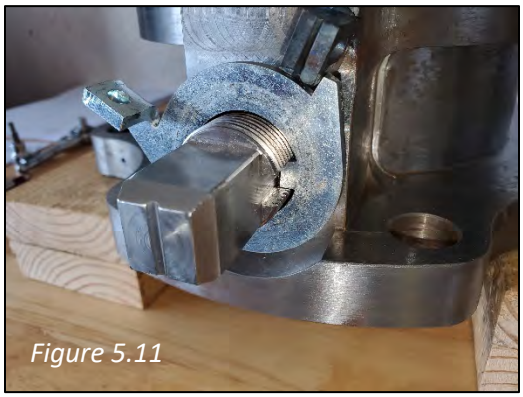


Figure 5.11

8. Now apply the wave spring. Apply thread locker to the stem and then install the Stem Lock Nut. Use an adjustable wrench on the portion of the stem protruding into the body of the valve to hold stem while tightening, Torque to 80-100 ft./lbs. *(Figure 5.12 & 5.13)*

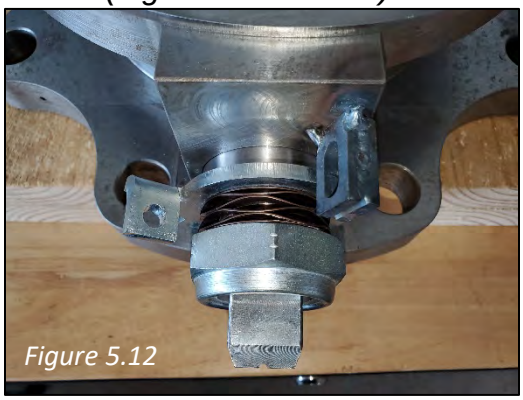


Figure 5.12


Figure 5.13

9. Place the Ball/Stem shim into the Ball notch. *(Figure 5.14)*


Figure 5.14

10. Align the notch in the ball with the stem. Place the Ball into the valve body. *(Figure 5.15)*


Figure 5.15

11. With the Seat Retainer on a flat surface, facing up. Install the Bottom O-ring into the machined groove on the outside of the Seat Retainer. Now install the Bottom Seat O-ring into the machined groove on the inside of the Seat Retainer. Make certain that the groove is free from debris/residue to allow for proper O-ring sealing. *(Figure 5.16)*


Figure 5.16

12. Insert the Bottom Seat into the Seat Retainer, flat side down, and press firmly into place. *(Figure 5.17)*

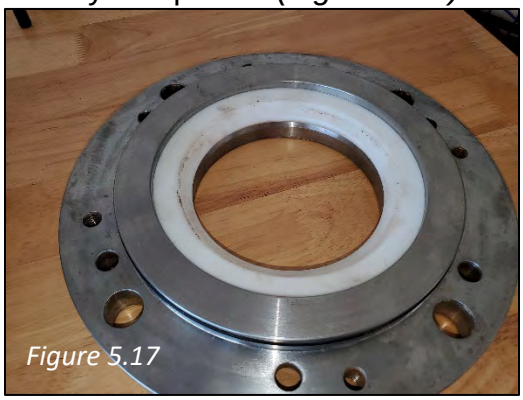


Figure 5.17

13. For KBOV-P Series valves, place the Retainer Plate Spacer on the valve body and align all of the corresponding holes *(Figure 5.18)*. for KBOV-SP Series valves, a Retainer Place Spacer will not be used. The “-P” and “-SP” will be indicated on the valve nameplate.


Figure 5.18

14. Place the Seat Retainer on the valve body. Align the counter bored holes and tapped holes of the Seat Retainer to the corresponding hole on the body. Attach the Seat Retainer with Socket Head Cap Screws, installing and tightening the screws in a star pattern, and Torque the screws to 5-7 ft./lbs. *(Figure 5.19 and 5.20)*


Figure 5.19


Figure 5.20

15. Apply thread locker to the Retainer Plate Set Screws then insert Set Screws into Seat Retainer. Tighten to 5-7 ft./lbs in a star pattern. *(Figures 5.21 and 5.22)*


ure 5.21

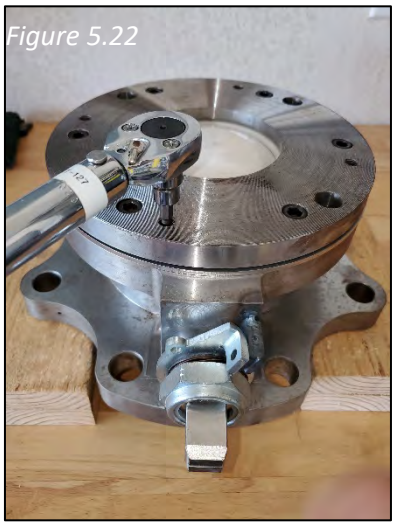


Figure 5.22

Note: After the Bottom Outlet is assembled, the valve should be held for 12 hours prior to testing. This allows for seating of the ball and the seals providing consistent opening and closing pressures.

6.0 Pressure Testing and Valve Completion

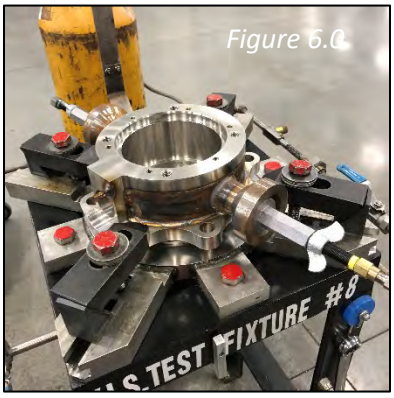
Because of ball valves simplicity, testing is only required to check the valve for leaks.

Test stand must have an appropriate mounting for valve. Test gauges must meet requirements of AAR D 4.5.

If your company has its own process and procedure for assembly and testing, follow it; otherwise this procedure offers only the essential steps and guidelines.

6.1 Procedure – Steam Jacket

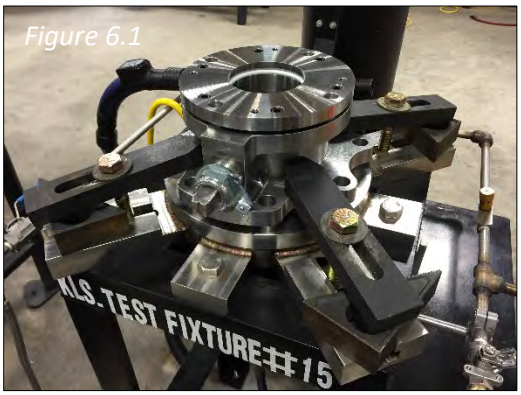
1. Secure valve to test stand and apply test plugs to Steam Jacket Fittings. Kelso follows test procedure KTOP018 for Bubble Leak Testing. *(Figure 6.0)*



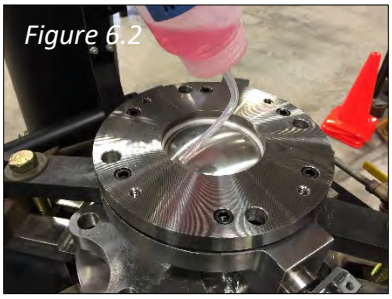
2. Bubble Leak Test Steam Jacket to 100-120 psi.
3. The absence of bubble formation and a stable gauge reading indicates an acceptable test.

6.2 Procedure – Body, Stem, Seals and Ball

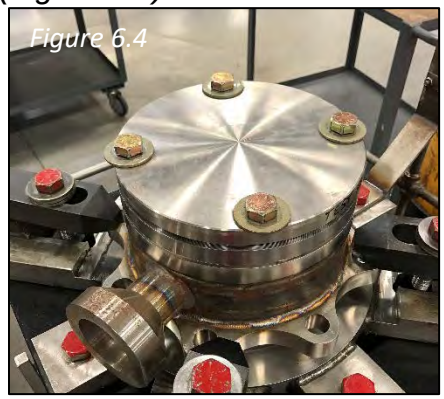
1. Secure valve to pressure test stand. Kelso follows test procedure KTOP018 for Bubble Leak Testing. *(Figure 6.1)*



2. Using a handle device or wrench; open and close the valve three times.
3. Close valve and pressurize, use leak indicator fluid to cover sealing areas (Bottom seat retainer to seat and body, ball and seat, stem to valve, body to test stand and Test flange to bottom seat). *(Figure 6.2 & 6.3)* No leaks are allowed. Depressurize valve.
    a. If valve fails, investigate O-ring, ball, seal conditions and torque on retainer flange to resolve problem.



4. Open valve. Install blind flange test plate with test gasket using 4 bolts. *(Figure 6.4)*



5. Pressurize valve. Use leak indicator fluid around sealing surfaces and stem. No leaks are allowed. Depressurize valve. Remove from test plate.
    a. If valve test fails; investigate flange sealing surfaces and gasket to remedy situation.
6. Record data. Rinse and wipe valve completely. Dry with air gun.

7.0 Maintenance

Under normal operating conditions, the KBOV-P and KBOV-SP Series Bottom Outlet Valve should not require maintenance until a periodic retest is required by code or there are signs of leakage through the valve (not leakage between the tank and valve mounting flanges). DOT and AAR have set forth a retest interval between tests.

These instructions only describe maintenance to a valve which has been removed from the tank car and located in a suitable environment for retest. Kelso recommends all maintenance only be performed on valves which have been removed from the tank.

7.1 Testing Valves in Storage

Valves that are factory set, sealed, have been left in their original shipping containers, are undamaged and are no more than six (6) months old: may be installed without being retested.

7.2 Valve Repair

Repair work on valves involving machining, grinding or other alterations/modifications can be performed only by the valve manufacturer, by the car owner or user with the valve manufacturer's permission. The flat gasket face on the valve body mounting surface or the gasket tongue may be machined to remove nicks and burrs.

8.0 Special Guidelines

Evaluation of the valves critical components metal surfaces is the responsibility of the repair facility conducting the work the components are cleaned and inspected.

Test Stand and Pressure Gauge Requirements:
It is recommended that the test stand mounting must be equivalent to the AAR M1002 figures in Appendix E for the valve being tested. The pressure gauge must meet the requirements of AAR M1002 Appendix D 4.5 “Test Gauge Standards” and must be date-tagged accordingly.

9.0 Warranty Information

See the Warranty Terms and Conditions.

10.0 Revisions

10.1 Revision 1 11/30/2016
- 10.1.1 Stem Lock Nut Torque Value
- 10.1.2 Loctite on Stem Lock Nut
- 10.1.3 Torque Seat Retainer SHC
- 10.1.4 Stem Packing 5 to 4

10.2 Revision 2 1/10/2017
- 10.2.1 Installation order of Set Screws
- 10.2.2 Torque value of Set screws
- 10.2.3 Additional information for testing.

10.3 Revision 3 3/2/2017
- 10.3.1 Installation of Retainer Plate Weldment
- 10.3.2 Order of Set Screw installation
- 10.3.3 Steam Jacket notes
- 10.3.4 Additional testing of Steam Jacket and Blind Flange.

10.4 Revision 4 9/4/2019
- 10.4.1 Updated Figures to Match Current Designs
- 10.4.2 Torque Value of Plate Set Screw
- 10.4.3 Updated Testing Procedure

10.5 Revision 5 11/19/2019
- 10.5.1 Updated Verbiage and Figures to Include KBOV-SP Series Valve Arrangement
- 10.5.2 Added General Arrangement and BOM for KBOV-SP Series Valve