WILLIAMS VALVE

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

GATE, GLOBE AND SWING CHECK VALVES

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Revision	Effective Date	Description	Prepared by	Approved by
01	2010	Initial Release	Andrew Pepel	Nick Sherman
02	2020-12	A, Add" Cover and Contents". B, Add "Picture of valve removal process". C, Add "Steps for Disassembly of stem nut". D, Add "Typical GGC explode view". E, Add "Appendix bolting torque requirement".	Mark Han	Simon Copeland
03	2022-11	Editorial Review	Foster Voelker	Simon Copeland
04	2024-01	Update torque Table 1	Eric Chen	Foster Voelker II
05	2024-12	Add Section 3.4.B.5	Eric Chen	Foster Voelker II
06	2025-01	Add Section 4.3 Note regarding seal welding of hinge pin plug	Eric Chen	Foster Voelker II
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SAFETY GUIDELINES

Prior to commencing any valve maintenance or service work, it is essential to ensure that Operations has locked out, isolated, and fully depressurized all relevant piping and equipment to establish a safe working environment.

Maintenance must not proceed until Operations has formally confirmed that it is safe to do so.

All jobsite safety protocols, lockout/tagout procedures, and work permit requirements must be followed without exception. Special attention should be given to double-seated valves, such as ball valves and wedge gate valves, as the body cavity may remain pressurized even after the process lines have been depressurized. Therefore, personnel must exercise caution and verify that all valve cavities are completely depressurized before commencing any service or disassembly work.

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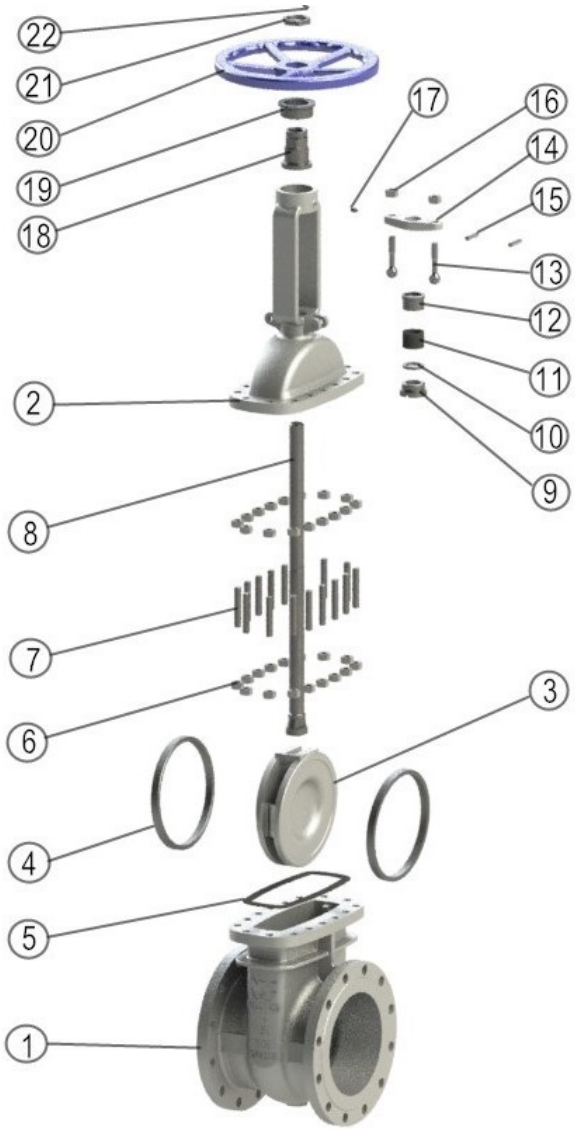
1 FOREWORD

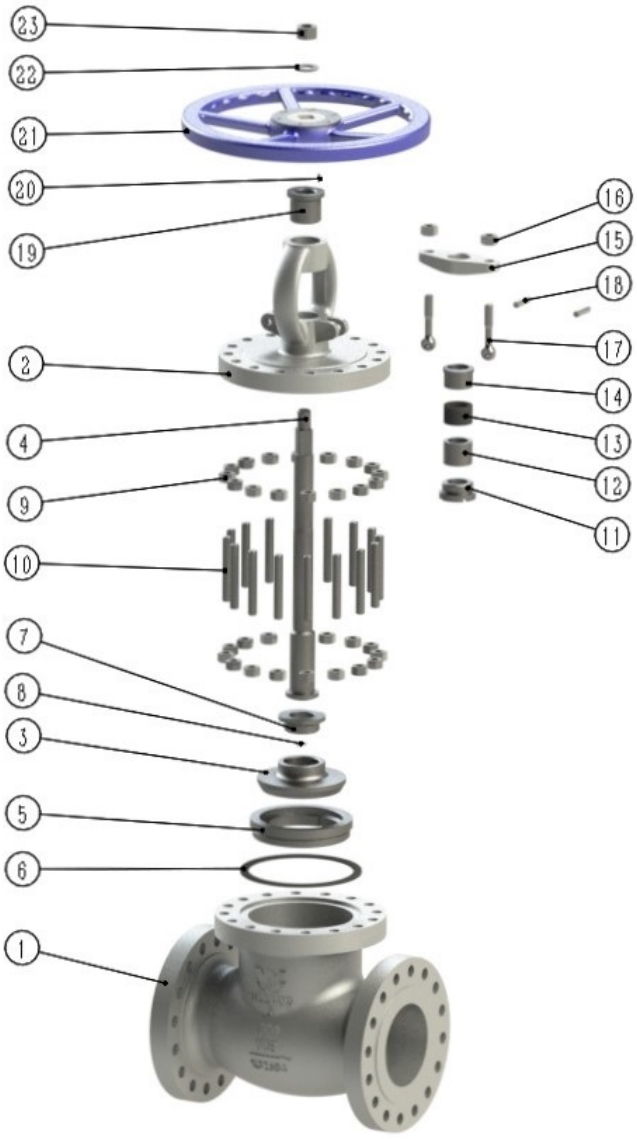
The improper installation, operation, or maintenance of a valve can pose significant risk to personnel and the environment. The following instructions are offered as a reference to aid the valve user when installing, maintaining, or operating Williams' Gate, Globe and Swing Check valves. This document, consisting of basic information, is intended as a reference and does not replace the need for an understanding of the particular application. This document is not intended to be a complete instruction for the inexperienced valve user.

2 VALVE COMPONENTS



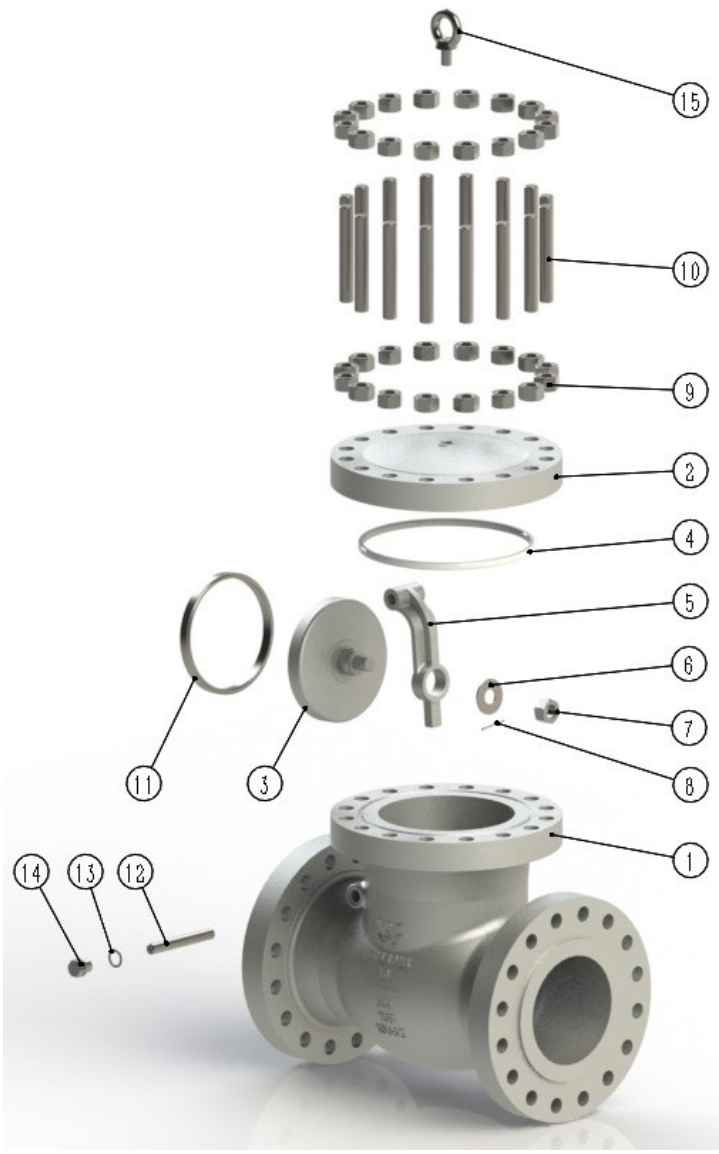
No.	Part Name
1	Body
2	Bonnet
3	Wedge
4	Seat Ring
5	Gasket
6	Nut
7	Stud
8	Stem
9	Back Seat
10	Spacer Ring
11	Packing
12	Gland
13	Eye Bolt
14	Gland Flange
15	Pin
16	Nut
17	Grease Fitting
18	Stem Nut
19	Yoke Cap
20	Handwheel
21	Handwheel Nut
22	Locking Screw

API 600 Gate Valve



No.	Part Name
1	Body
2	Bonnet
3	Disc
4	Stem
5	Seat Ring
6	Gasket
7	Disc Nut
8	Thrust Washer
9	Nut
10	Stud
11	Back Seat
12	Spacer Ring
13	Packing
14	Gland
15	Gland Flange
16	Nut
17	Eye Bolt
18	Pin
19	Stem
20	Locking Screw
21	Handwheel
22	Washer
23	Nut

API 623 Globe Valve



No.	Part Name
1	Body
2	Cover
3	Disc
4	Gasket
5	Hinge
6	Washer
7	Nut
8	Cotter Pin
9	Nut
10	Stud
11	Seat Ring
12	Hinge Pin
13	Washer
14	Plug
15	Lifting Bolt

API 594 Swing Check Valve

3 GENERAL INSTRUCTIONS

3.1 RECEIVING & HANDLING

A. Upon receipt, valves should be inspected for shipping damage. The areas to inspect are the pressure retaining shell, valve ends, and valve operating mechanisms such as handwheel, actuator, stem, etc. Any damage observed during the inspection should be documented in an inspection report. Significant damage should be reported to William E. Williams to determine if repair or replacement of the equipment is necessary.

B. Valves should be stored in a sheltered environment providing adequate protection from weather, dirt, and damage. Materials attached to protect valves during shipment should not be removed until time of installation in the line.

C. Valves should only be handled with equipment that will safely support the valve assembly weight. Slings should never be placed around the handwheel, stem or gland adjustment parts. Protect the valve ends by leaving end protectors in place until removal is necessary. Valves are shipped in the open or closed position, depending on the valve type, to protect seating surfaces, and should be left in these positions, if possible, until completion of installation.

3.2 VALVE TRANSPORTATION / STORAGE

A. Valves should be adequately packaged to ensure protection from atmospheric conditions prior to transportation or storage. If the packaging is damaged, repair it so that the valve can be safely stored and transported. Avoid rotating the handwheel before installation if possible.

B. Actuator and valve may be packaged separately.

C. The paint, the nameplate and the sealing faces of the end flanges shall be protected during transportation. No part of the valve can be dragged on the ground and the valve must be adequately protected from abrasion and impact during transport.

The valve shall be stored at a safe location to protect against rain and dust if it will not be installed immediately. Valves shall be stored in a ventilated and dry warehouse for protection. It is not permitted to store the valve outdoors. Valve end flanges shall be covered as shown in the picture below.

Figure 1

D. Ensure the valve is fully closed. If the valve is opened, the sealing face of the seat and wedge shall be cleaned, the valve closed, and the end protection installed.

E. Take care not to scratch the stem when moving the valve. The packing box and gland flange cannot come into contact with the shelf if the valve is stored on a shelf.

F. Inspect and clean the valve if it has been stored over six months. Pressure test prior to use if the valve has been stored over twelve months.

3.3 PREPARATION FOR INSTALLATION

A. Prior to installing the valve, clean out all dirt and foreign matter from inside the piping system. Wherever possible, the line should be blown out with clean compressed air or flushed out with water to remove all dirt and grit. The valve should be cleaned out in a similar manner.

B. Check for adequate clearance around the valve to ensure that it may be operated properly and that enough free space is available for maintenance of the valve. Valves installed with the handwheel facing down present a head hazard if not placed at a proper elevation. Care should be taken to provide adequate headroom below the handwheel when it is in a fully open position. A clearance of 6 feet, 6 inches above the operating floor is usually sufficient.

C. Valves equipped with actuators require additional clearance to allow for service connections and routine maintenance of the actuator.

3.4 INSTALLATION

A. Precautions:

1. The valve body is a rugged structure but is not intended to be a means of aligning improperly fitted pipe. Care must be taken to ensure that any stresses caused by improper pipe alignment are relieved elsewhere in the piping system. Piping should be supported by hangers placed on either side of the valve and large heavy valves should be independently supported.

B. The following general rules should be followed when installing the valve in the pipeline:

1. Keep pipe ends free of dirt, spatter, and grit.

2. Install the valve with flow in the proper direction with regard to valve internals. The normal and preferred mounting of Gate and Globe valves for performance, operation and maintenance is with the stem vertical and handwheel above the body. However, other orientations are possible except where specifically stated otherwise. Swing or lift check valves installed in horizontal lines must have the valve cover facing up. Swing Checks in vertical lines must have the flow arrow pointing up.

3. Handle the valve only with properly rated equipment that can adequately support its weight, using safe and approved lifting techniques.

4. Install the valve using good piping practices as governed by the applicable code or specification.

5. Swing Check valves are shipped with a wood block to protect the disc from contacting the seat during transport; remove the wood block prior to installation (See Figure 2 and Figure 3). Williams recommends that all check valves be installed at a minimum distance of five pipe diameters from any upstream pumps, elbows, fittings, or equipment, and at least three pipe diameters from any downstream components.

Figure 2

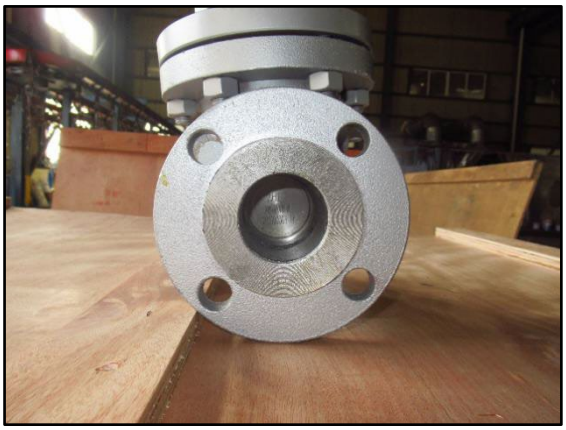


Figure 3

6. Flanged End Valves

   a. Check and align pipe flanges before valve installation.
   b. Use proper gasket type and size.
   c. Clean debris, dirt, and any other foreign particles off the surface of the flanges.
   d. Do NOT ATTEMPT TO FIT TWO FLANGES THAT ARE NOT ALIKE TOGETHER. For example, flat face with flat face or raised face with raised face is the proper procedure.
   e. Do NOT TIGHTEN BOLTS IN A CIRCULAR PATTERN: bolts must be tightened in a crossover or star pattern to load the gasket evenly.

7. Butt-Weld End Valves

   a. Valve, pipe, and weld rod must all be of materials that are mutually compatible.
   b. Welding should be performed by a qualified welder using the correct welding equipment and following all applicable site and industry procedures.
   c. After completion of the weld, it should be stress relieved if required by the welding procedure and subjected to a pressure test to ensure a sound weld.
   d. For additional information, refer to WEW-RP-001 Guidelines for Installation of Weld End Valves.

3.5 POST INSTALLATION

A. After installation of the valve, the line should be flushed or blown out to remove dirt and foreign objects.
B. Verify the tightness of body/bonnet joint and packing gland.
C. Operate valve to make sure that nothing is preventing proper operation.
D. Pressure test the system to prove quality of flange bolting, welding, etc.

Note: Use of caustics or other chemical agents to flush pipe and valve may require the removal of the valve packing and gasket based on the compatibility of the flushing agent, gasket and packing material utilized.

3.6 MAINTENANCE & TROUBLE SHOOTING

While valves typically require minimal attention during normal operation, establishing a program for periodic inspection can help ensure optimal service life and reduce the likelihood of unplanned maintenance.

Items to check on a periodic basis are:

A. Gland bolting should be kept tight to prevent leakage. Avoid over-tightening gland nuts or stuffing box packing. This excessively compresses the packing, which considerably shortens its life and increases operating torque. The gland should only be as tight as is necessary to seal.

B. Observe valve for leakage taking special note of the body/bonnet joint area, the end connections and the pressure retaining shell. If leakage at the body/bonnet joint is evident, check tightness of bolts in a bolted bonnet valve, bonnet or union nut in a threaded or union bonnet valve.

If leakage is at the end connections, check the tightness of the flange bolts in a flanged valve or weld integrity in a welded valve.

After verification of joint integrity, if leakage is still evident, the joint will have to be disassembled and the gasket replaced and/or sealing surfaces repaired.

C. Cleanliness of exposed stems.

D. Lubrication of the valve yoke nut.

Note: Use of a tacky lubricant on exposed threads can pick up abrasive particles from the atmosphere. Dry film lubricants are preferred.

E. Open and close valve to check for possible obstruction to travel.

F. Check tightness of yoke or operator bolting.

3.7 COMMON REPAIRS

The following general instructions are offered to make limited repairs to the valve. For major repairs, contact an authorized *WILLIAM E. WILLIAMS VALVE CORPORATION* representative for special instructions. Always give the information shown on the identification plate affixed to the valve.

A. When holding a valve in a vise to work on it, always put the valve ends against the vise jaws. Never hold the valve with the vise jaws pressing against the valve side as this will cause distortion.

B. Never use pipe wrenches to remove or replace bonnets on small valves, especially bronze. A pipe wrench will pinch or swage the body neck.

C. Re-packing – Isolate and de-pressurize valves prior to attempting to add packing or to repack valve. Although some valves are designed with a backseat to isolate the cavity from the stuffing box, there may be foreign material or damage on the backseat. The backseat is intended to prevent catastrophic leaks and it is highly recommended to repack only when the valve is de-pressurized to ensure personnel safety.

Loosen and remove gland and gland follower, remove all sets of packing from the stuffing box. Clean the stuffing box and inspect stem for signs of damage. Wear or roughness of the stem can make re-packing futile.

Use caution when removing the packing from the stuffing box. Avoid using steel hooks that could scratch or gouge the fine finish of the stuffing box. Wood or brass dowels are acceptable alternatives. (See Figure 4 and Figure 5).

Figure 4

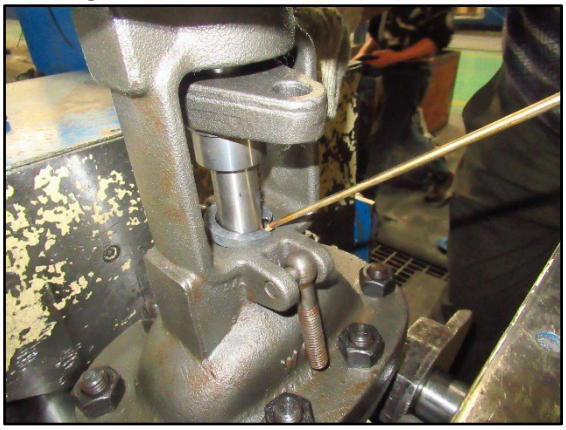


Figure 5

Install new packing and re-assemble gland and gland flange to valve.

Note: Stagger joints of successive packing rings at 90° to 120°, as shown in Figure 3, and insert them into the stuffing box.

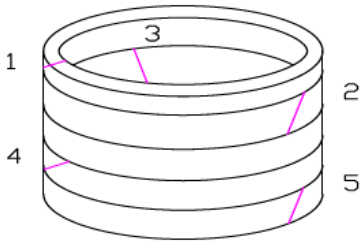


Figure 6

D. Replacing Bonnet Gasket – Isolate and de-pressurize valve prior to attempting to disassemble valve.

On bolted bonnet valves, mark the body and bonnet flanges in order to orientate in the same position when reassembled. (See Figure 7).

Figure 7

Valves having a large or heavy top works will require the use of a hoist or crane to support and lift the top works away from the valve body.

Loosen body/bonnet joint and lift bonnet away from body in a vertical line. On gate valves, the wedge should be marked so that the same wedge and seat sealing surfaces contact when reassembled. (See Figure 8).

Figure 8

Reverse the steps above for reassembly. For bolting, the use of quality anti-seize with a low coefficient of friction is recommended. If the valve was not repacked recently, it should be done prior to placing the valve back into service. Tighten bonnet bolting using a star pattern. See Figure 9 for the tightening sequence.

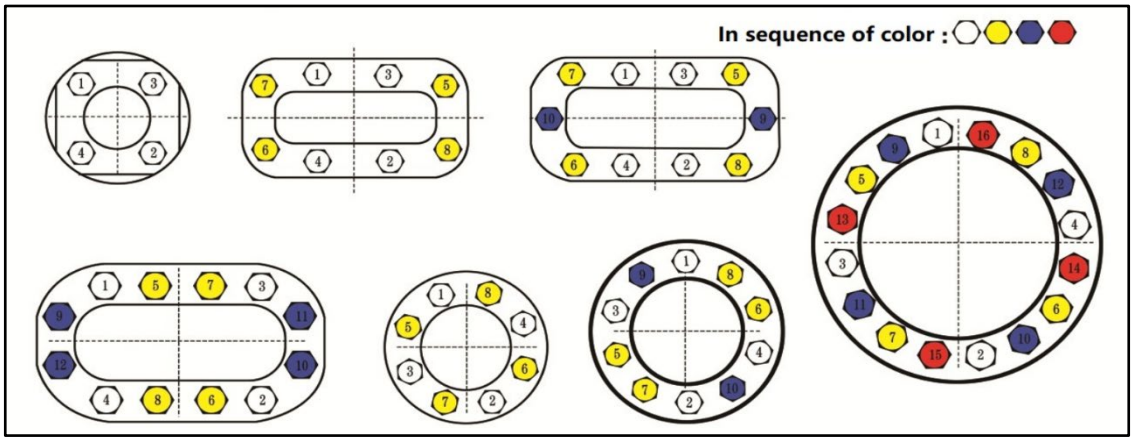


Figure 9

*Table 1 in appendix for body/bonnet stud torque.
Prior to re-pressurizing the valve, recheck the tightness of the body/bonnet joint.

E. Paint Repair - During coating repair, the intact area surrounding the damage must first be lightly abraded and then ground to form a smooth transition layer, ensuring uniform blending between the existing and repaired surfaces. Throughout the repair process, climatic conditions must be controlled in accordance with the parameters established in the original coating procedure. The repaired area shall achieve the specified dry film thickness as defined by the relevant standard, with air spraying or localized brushing recommended depending on the size and nature of the repair. Drying time for the repaired coating must align with the requirements for standard paint application, and no installation or packaging shall proceed until the coating is fully cured. All additional painting requirements must conform to the project-specific painting specifications or, where applicable, the Williams Valve Painting Specification.

3.8 TOOLS & EQUIPMENT

Standard wrenches and tools are generally suitable for servicing valves. Common tools are:

A. Hoist to lift large or heavy items.

B. One set of box-end, open-end, or socket wrenches..

C. One set Allen-type hex key wrenches.

D. Standard packing tool or blunt hook to remove packing rings.

E. Combination oilstone, coarse and fine grit, to polish wedge and seat ring sealing surfaces.

F. Hammer and punches to drive out pins.

3.9 OPERATION

The following is general information on the operation of valves:

A. Open and close valves slowly whenever possible. When the valve has been fully opened, rotate the handwheel one-quarter turn in closed position so as not to leave the valve jammed open.

B. Never put excessive leverage on handwheel to stop leakage as this may damage the stem and could ruin the valve.

C. When a cool valve is suddenly opened to let hot media, such as steam pass through, the valve may leak slightly for a short time through the stem packing. Do not tighten the packing gland or nut when this happens, since it will only shorten the life of the packing. Allow the valve components to heat up and expand. The leak will generally stop within ten minutes.

D. A Gate valve should not be used for throttling purposes.

E. A Globe valve should not be throttled less than 25% open.

F. A Swing Check valve should not be used in a vertical pipeline handling liquid at high heads, because severe water hammer may result from reversal of flow, or in applications where flow cycles are short or intermittent.

G. Williams recommends that all check valves be installed at a minimum distance of five pipe diameters from any upstream pumps, elbows, fittings, or equipment, and at least three pipe diameters from any downstream components.

4 VALVE SPECIFIC STORAGE, INSTALLATION AND MAINTENANCE PROCEDURES

4.1 GATE VALVE - O.S. & Y

A. Periodic Inspections

The valve stem packing should be inspected quarterly. If the stem packing shows signs of leakage, simply tighten the adjusting nuts to compress the packing. Do not over-tighten the adjusting nuts as this will make operation of the valve more difficult. If after tightening the adjusting nuts to their fullest extent, the leakage does not stop, it is then necessary to replace the stem packing. It is not recommended that additional packing rings be added to the stuffing box as this may cause damage to the stem sealing system. Please contact Williams Valve or its distributor for new stem packing sets.
Table 2 in appendix for tightening torque of eye bolts for Gate valves.

1. The lubrication of the yoke nut should be inspected quarterly. A high-pressure grease gun should be used for valves supplied with ball type grease fittings. Injection method for handwheel operated valve: rotate handwheel CCW (the same as opening direction) at least 4 turns and then use grease gun to inject through grease fitting until grease is spilled between bushing and upper section of stem nut; close valve with handwheel in CW direction. The grease will cover the thread surfaces as the stem nut rotates, providing sufficient lubrication. The valve stem threads should be consistently coated in lubricant. Refer to Figure 10 thru Figure 11.

Figure 10

Figure 11

* Figure 10-Valve stem threads coating of lubricant.
* Figure 11- Grease the stem nut through the grease fitting.

2. Bonnet bolt tension should be checked periodically when valves are used in high temperature applications where creep may occur. Although leaks through ring joints are rare, erosion or corrosion could cause rings to fail. In these cases, a new ring gasket is required.
   CAUTION: Any maintenance that includes any disassembly of the valve must be carried out with the valve depressurized and isolated.

B. Extraordinary Maintenance or Replacement of Damaged Parts

If the stem locks or "freezes", cause can generally be attributed to worn packing, a dry yoke nut or dry stem threads. In either of these cases, the following service is required:

1. Unscrew gland nuts, remove the gland flange and bushing to expose the stem packing and lantern ring. Replace stem packing if it is damaged.
   Refer to Figure 16 thru Figure 19.

2. Check lubrication of yoke nut. If it is dry, remove the yoke nut and determine if there is evidence of seizure marks. If so, replace it with a new yoke nut. Also check the nut and stem threads.
   For disassembly of yoke nut, please refer to section E.
   Reverse the procedure for re-assembly.

C. Disassembly of Stem Packing

1. Partially unscrew the eyebolt nuts to reduce the compression load on the stuffing box. Remove the stem packing and then replace with new set(s) of packing. Finally, tighten nuts sufficiently while allowing the stem to operate smoothly. For the Disassembly of Stem Packing procedure, please refer to Figure 16 thru Figure 19.
   Reverse the procedure for re-assembly.

2. To replace the stem when the valve is completely disassembled for general maintenance follow this procedure:
   Refer to Figure 12 thru Figure 19.

- Open the valve halfway and remove bonnet bolts and nuts.
- Lift up the bonnet to remove the wedge.
- With the bonnet removed, unscrew the gland bolts and lift up the gland flange exposing the stem packing.
- Remove the stem through the stuffing box.
- Remove the stem packing.

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17

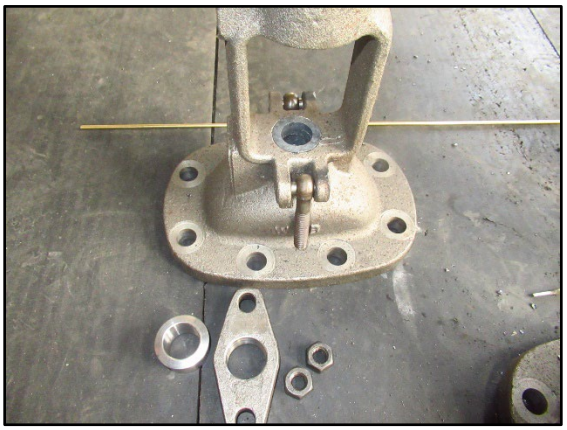


Figure 18

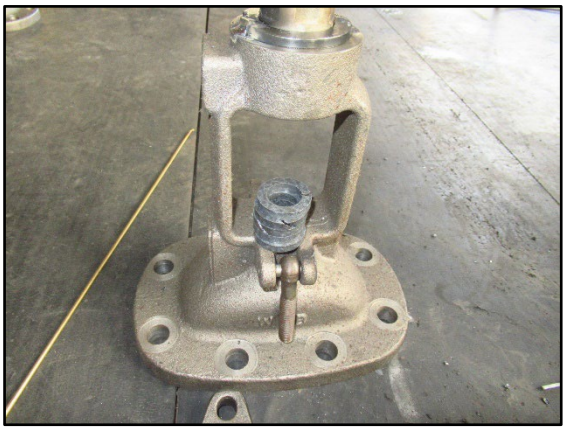


Figure 19

D. The procedure to re-assemble the valve is as follows:

Refer to Figure 12 to Figure 19, reverse the steps for re-assembly.
Re-insert the stem through the stuffing box taking special care to reassemble the parts in sequence. Insert the remaining packing rings into the stuffing box and compress using the gland and gland flange. Then, reassemble nuts and tighten. Note, the stem must slide freely through the stuffing box without applying excessive force. Finally, install the bonnet gasket making sure it is not damaged. Williams recommends the use of new gaskets during re-assembly.

Raise the bonnet, making sure the stem is in a half open position, then connect disc to stem. Lower bonnet on to the valve body making sure that the disc fits exactly into body guides and the bonnet gasket is properly seated. Align holes and tighten bonnet nuts utilizing proper torque control procedures. Hydrostatically test the valve to assure that there is no leakage.

E. Disassembly of yoke nut

When necessary, use the following procedure for disassembling and replacing yoke nut:
Refer to Figure 20 thru Figure 25.

1. Direct hand-operated valves (handwheel).
   - Remove set screw.
   - Unscrew handwheel nut.
   - Remove handwheel.
   - Unscrew yoke nut retaining nut, removing spot welds, if necessary.

   Reverse the procedure for re-assembly.

Figure 20

Figure 21

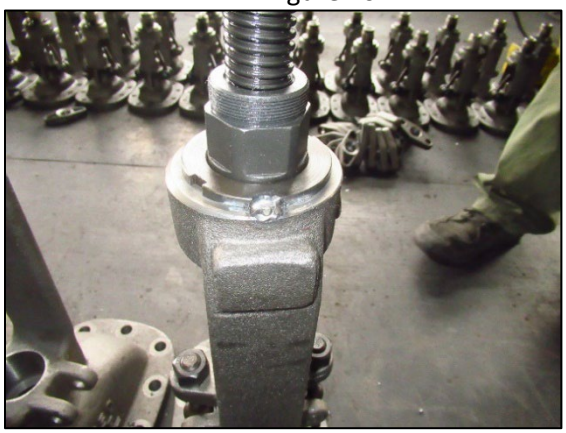


Figure 22

Figure 23

Figure 24

Figure 25

2. Bevel gear operated valves
   Refer to Figure 26 thru Figure 31.
   - To remove the bevel gear from the valve, unscrew nuts and turn the handwheel in the open direction indicated by the arrow until the drive nuts are disengaged from the stem.
   - To check the condition of the drive nut or bearing, unscrew the retainer ring and remove the drive nut and bearing. If damaged, a new drive nut or bearing is necessary.

Figure 26

Figure 27

Figure 28

Figure 29

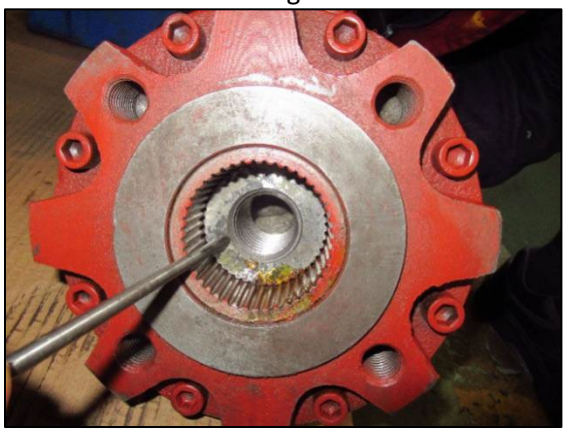


Figure 30

Figure 3

F. Wedge and Seats

Refer to Figure 32 thru Figure 35.

Leakage through seats and wedges is not always easy to spot when valves are in service. However, when leaks are identified, immediate action is necessary. Any delay can permanently damage seat or wedge seal surfaces.

To repair or replace wedges or seats, the valve must be removed from the line and the following procedure should be applied:

- Ensure that the valve is in the partially open position.
- Ensure the valve is not under pressure before unscrewing bonnet nuts.
- Remove the bonnet.
- Lift up the bonnet until the wedge is disconnected from the guides.
- Release the wedge from the stem.

If seat surfaces show signs of seizing, pitting, grooves or other defects not deeper than 0.8 mm (1/32”) it is possible to repair seating surfaces to original conditions by relapping the surface with fine grain abrasive paste.

Defects having a depth exceeding 0.8 mm (1/32”) cannot be repaired by lapping. In this case the seats must be replaced.

It is recommended that the face of the disc be blued to check for contact of seating surface after final lapping. For re-assembly of valves use the procedure outlined under Section D.

Figure 32

Figure 33

Figure 34

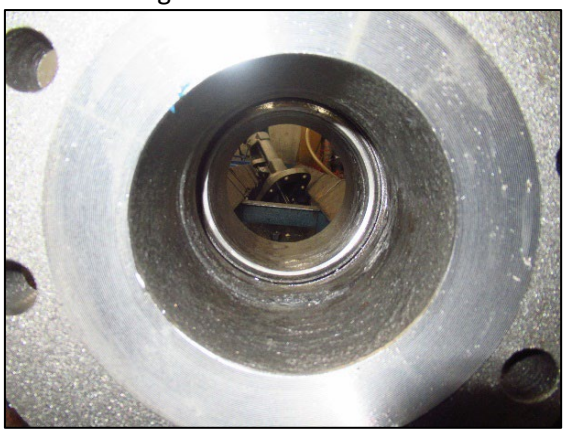


Figure 35

4.2 GLOBE VALVE - O.S. & Y

A. Periodic Inspections

1. The valve stem packing should be inspected quarterly. If the stem packing shows signs of leakage, simply tighten the adjusting nuts to compress the packing. Do not over-tighten the adjusting nuts as this will make operation of the valve more difficult. If after tightening the adjusting nuts to their fullest extent, the leakage does not stop, it is then necessary to replace the stem packing. It is not recommended that additional packing rings be added to the stuffing box as this may cause damage to the stem sealing system. Please contact Williams Valve or its distributors for new stem packing sets. For packing replacement see parts B and C.
   Table 3 in appendix for tighten torque of eye bolt for Globe valve.

2. The lubrication of the yoke nut should be inspected quarterly. A high-pressure grease gun should be used for valves supplied with ball type grease fittings. The valve stem threads should also be given a coating of lubricant.

3. Bonnet bolt tension should be checked periodically when valves are used in high temperature applications where creep may occur. Although leaks through ring joints are rare, erosion or corrosion could cause rings to fail. In these cases, a new ring gasket is required.

B. Extraordinary Maintenance or Replacement of Damaged Parts

Stem: If the stem locks or freezes the cause can generally be attributed to worn packing, a dry yoke nut or dry stem threads. In either of these cases, the following service is required:

1. Unscrew gland nuts, remove gland flange and bushing to expose stem packing and lantern ring. Replace stem packing if it is damaged.
   Remove the stem packing please refer to Figure 36 thru Figure 39.
   Reverse the procedure for re-assembly.

2. Check lubrication of yoke nut. If it is dry, remove the yoke nut and determine if there is evidence of seizure marks. If so, replace it with a new yoke nut. Also check the nut and stem threads.
   Disassembly of yoke nut procedure please refer to section E.
   Reverse the procedure for re-assembly.

C. Disassembly of Stem Packing

1. Remove the stem packing and then replace with new set(s) of packing. Reassemble plug and gland flange. Finally, tighten nuts sufficiently while allowing the stem to operate smoothly.

2. To replace the stem when the valve is completely disassembled for general maintenance follow this procedure.
   Refer to Figure 36 thru Figure 41.
   - Open the valve and remove the bonnet bolts and nuts.

- With the bonnet removed, unscrew the gland bolts and lift up the gland flange exposing the stem packing.
- Remove handwheel, then turn stem to release it from yoke nut and remove from stuffing box.
- Remove the stem packing.
- Check condition of back-seat bushing for seizure marks. If apparent, order replacement parts.

Figure 36

Figure 37

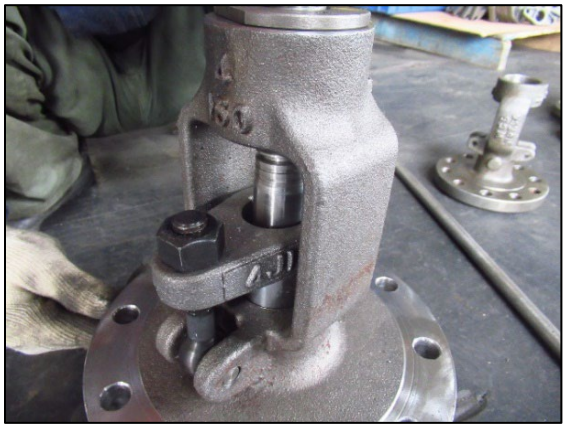


Figure 38

Figure 39

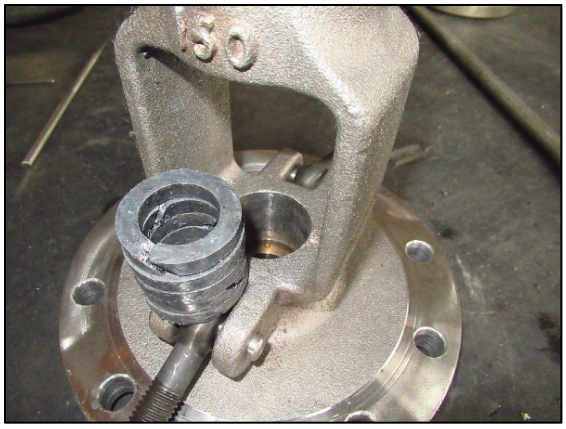


Figure 40

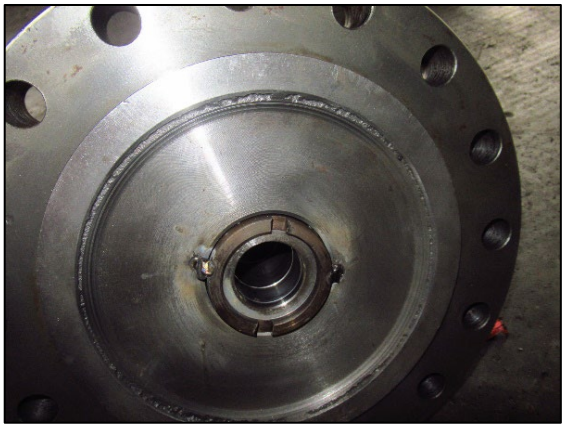


Figure 41

D. The procedure to re-assembling the valve is as follows:

Refer to Figure 36 to Figure 41 reverse their order for re-assembly.

Re-insert the stem through the stuffing box, taking special care to reassemble the parts in sequence. Insert the remaining packing rings into the stuffing box and compress using the gland ring and flange. Then, reassemble nuts and tighten. Note, the stem nut must slide freely through the stuffing box without applying excessive force. Finally, install the bonnet gasket making sure it is not damaged. Williams recommends the use of new gaskets during re-assembly.

Raise the bonnet assembly, making sure the stem is in the fully open position. Lower bonnet on to the valve body making sure that the disc fits exactly into body guides and the bonnet gasket is properly seated. Align holes and tighten bonnet nuts utilizing proper torque control procedures.. Hydrostatically test the valve to assure that there is no leakage.

E. Disassembly of yoke nut

When necessary use the following procedure for disassembling and replacing yoke nut. Refer to Figure 42 to Figure 47.

1. Direct hand-operated valves (handwheel)
   - Remove set screw (if valve have set screw of handwheel nut).
   - Unscrew handwheel nut.
   - Remove handwheel.
   - Unscrew yoke nut retaining nut, removing spot welds if necessary.
   - Reverse the procedure for re-assembly.

Figure 42

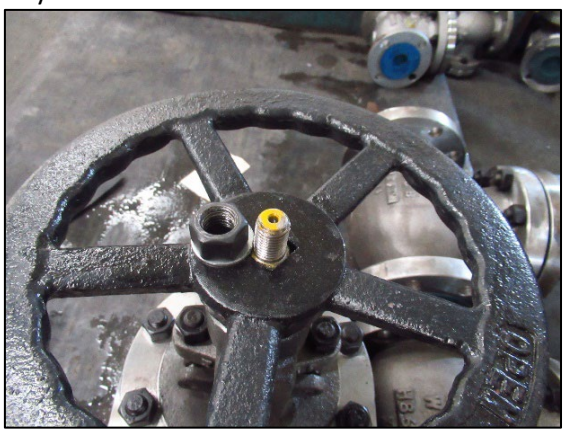


Figure 43

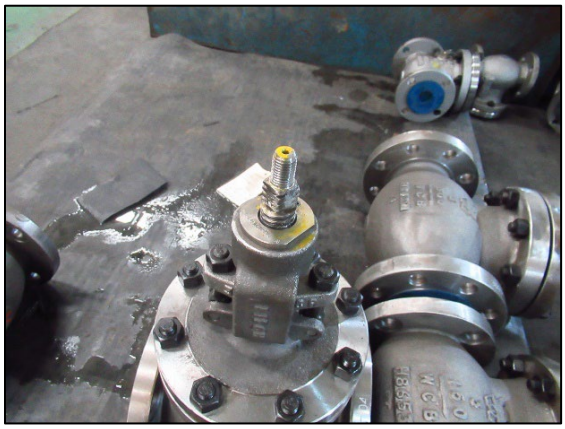


Figure 44

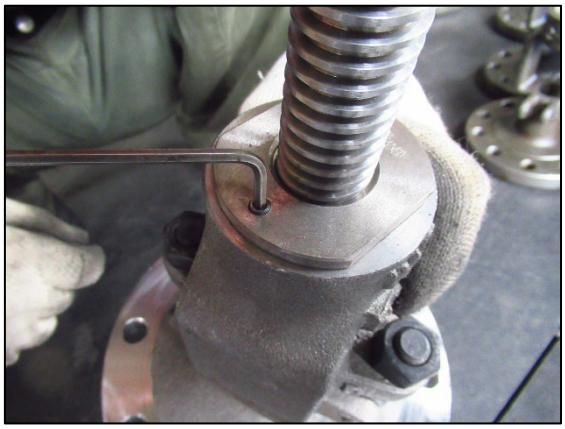


Figure 45

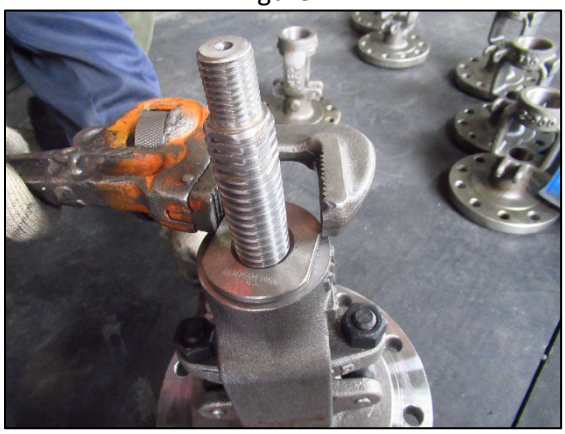


Figure 46

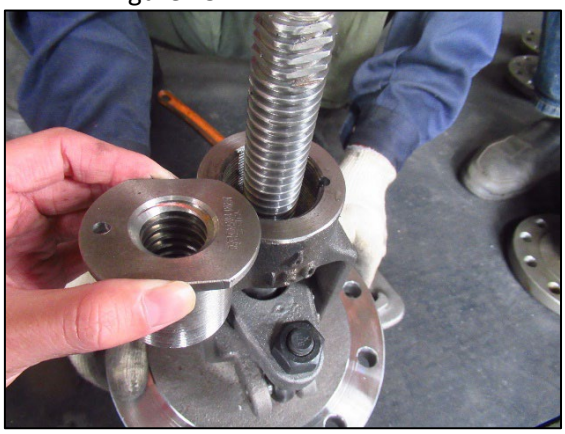


Figure 47

2. Bevel gear operated valves.

   Refer to the Gate valve section E clause 2. (Figure 26 thru Figure 31.)

F. Disc and Seats

Leakage through disc and seats is not always easy to spot when valves are in service. However, when leaks are identified, immediate action is necessary. Any delays can permanently damage seat or disc seal surfaces.

To repair or replace the disc or seats, the valve must be removed from the line, then use the following procedure.

- Make sure that the valve is not under pressure before unscrewing bonnet nuts.
- Remove bonnet, being careful not to damage the gasket.
- Remove bonnet when disc is in full open position.
- Lift up bonnet.

Refer to Figure 48 to Figure 51.

Figure 48

Figure 49

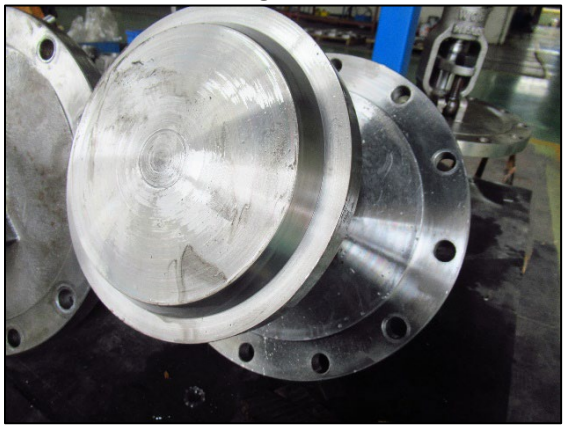


Figure 50

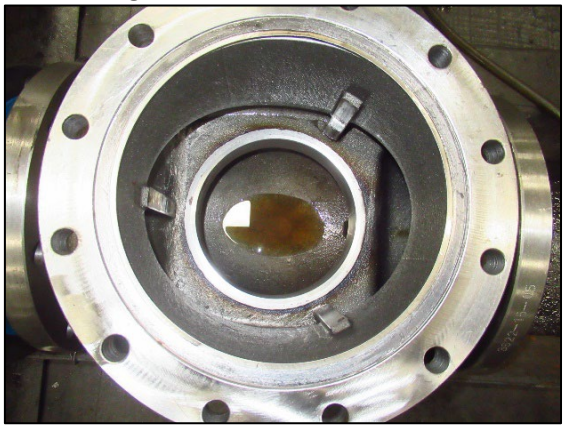


Figure 51

If seat surfaces show signs of seizing, pitting, grooves or other defects not deeper than 0.8 mm (1/32") it is possible to repair seating surfaces to its original conditions by relapping the surface with line grain abrasive paste, creating a perfect tightness once again. Defects having a depth exceeding 0.8 mm (1/32") cannot be repaired by lapping. In this case, parts must be replaced.

It is recommended that the face of the disc be blued to check for contact of seating surface after final lapping. For re-assembly of valves, use the procedure outlined under Section D.

4.3 SWING CHECK VALVES

No periodic maintenance is necessary. If gasket leaks are detected, correct using the following procedure.

Refer to Figure 54 thru Figure 65.

1. Disassemble all cover bolts and nuts.

2. For check valves with lifting lug, lift up the cover from this point, for small size valve without lifting lug, lift the cover manually.

Figure 52

Figure 53

3. Check that the hinge, nut, and pin are in good condition and firmly connected. Replace damaged parts as necessary.

   Note: As of January 2018, API 594 requires that plugs retaining the hinge pin be fully welded. This design necessitates cutting the weld for disassembly.

4. Lift and remove the disc-hinge assembly. Movement should be free and not hindered by any malfunction of the hinge pin. Where disc travel is not sufficiently smooth, remove plugs or blind flanges and then remove hinge pin. Check surface for seizure marks. If marks are deeper than 0.8 mm (1/32”); re-machine hinge pin and re-assemble. If defect depth is greater than 0.8 mm (1/32”) a new hinge pin is necessary. When reassembling hinge pin, it is recommended that the disc be removed by loosening the nut.

5. When leakage is due to deterioration of seal surfaces caused by corrosion or foreign substances, it must be determined whether the disc or seat seal are the cause.
   i. Deterioration of disc surfaces.
      Disassemble disc by removing nut and washer. Repair surface by grinding and lapping using fine grain abrasive paste.

   ii. Deterioration of seat seal surfaces.
      When seal surfaces are damaged and defects are confined to a small area but are not deeper than 0.8 mm (1/32”), the seal surface can be repaired. The recommended method is to use a cast iron strap with an outside diameter matching the valve’s raceway. Then using a fine grain abrasive paste between the strap and raceway, it is rotated on the seat to restore original tightness. When defects are deeper than 0.8 mm (1/32”) and found on the entire seal surface, a new seat is required. To replace the new seat, If the seat ring is a welded seat, please contact Williams to repair or need replace the valve. If the seat is thread connected type use preferably a pneumatic tool with a shape to match the dimensions of the valve seat. It is recommended that an anti-seizing compound be used when installing the replacement seat to make threading it into the body easier.

Figure 54

Figure 55

Figure 56

Figure 57

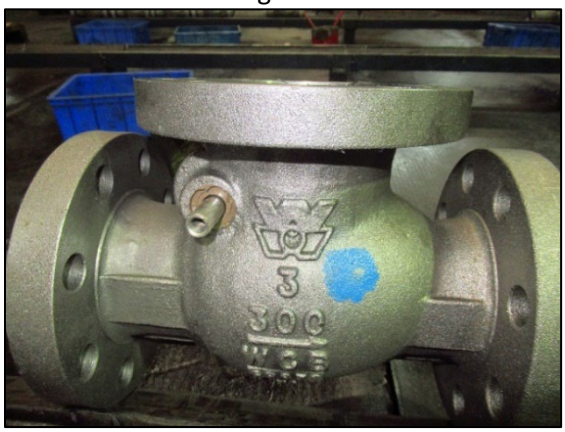


Figure 58

Figure 59

Figure 60

Figure 61

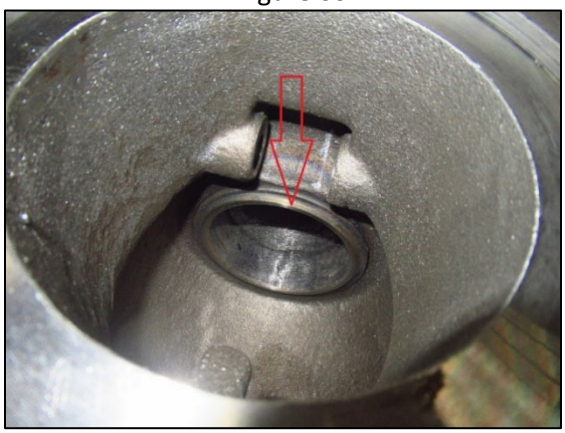


Figure 62

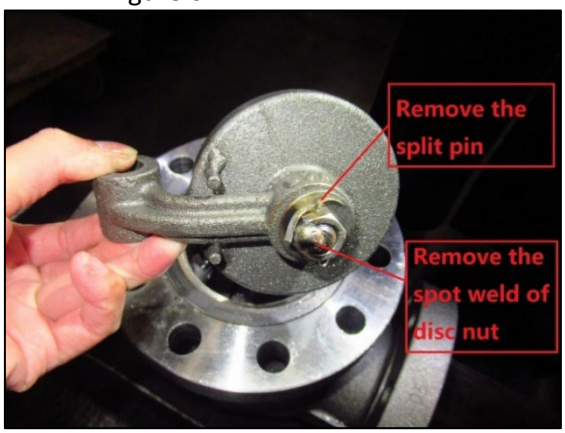


Figure 63

Figure 64

Figure 65

CAUTION: Always be sure that the valve is de-pressurized and isolated prior to performing any maintenance work.

5 APPENDIX BOLTING TORQUE REQUIEMENT

5.1 Annex Table 1 Body Flange Stud Torque (N.m):

Thread Specification	Max Torque (N.m)			
	Materials (B 8, B8M, B8C, B8A, B8MA)	Materials (B 8-2, B8M-2, B8C-2)	Materials (B 7, L7, B16)	Materials (B7M, L7M)
3/8-16UNC	25	50	50	50
7/16-14UNC	40	80	80	80
1/2-13UNC	60	110	110	110
9/16-12UNC	80	165	165	165
5/8-11UNC	90	260	260	225
3/4-10UNC	165	450	410	380
7/8-9UNC	260	600	650	600
1-8UN	380	950	1050	950
1-1/8-8UN	500	1100	1200	1100
1-1/4-8UN	750	1600	1750	1600
1-3/8-8UN	1100	1700	1900	1700
1-1/2-8UN	1400	2200	2350	2200
1-5/8-8UN	1800	-	3700	3350
1-3/4-8UN	2200	-	5000	4500
1-7/8-8UN	2600	-	6200	5600
2-8UN	3600	-	7400	6700
2-1/4-8UN	4500	-	10000	9000
2-1/2-8UN	6300	-	15000	13500
2-3/4-8UN	9500	-	20000	18000
3-8UN	12000	-	26500	24000
3-1/2-8UN	18000	-	43000	39000
Notes:1, Allowable torque ranges from 90% to 110% of bolt yield. Do not exceed specified value. 2, Tighten to 60% of specified value and increase in 10% increments until seal is achieved.				

Table 1

5.2 Eye Bolting Torque (N.m):

5.2.1 Annex Table 2 Gate Valve Eye Bolting Torque Data

Size	Torque	Size	Torque	Size	Torque
150LB		300LB		600LB	
2"	11~15	2"	11~15	2"	15~19
2-1/2"	11~15	2-1/2"	11~15	2-1/2"	17~21
3"	14~18	3"	14~18	3	18~24
4"	15~19	4"	15~19	4"	27~33
5"	21~27	5"	21~27	5"	38~48
6"	21~27	6"	22~28	6"	53~65

8"	22~28	8"	31~39	8"	54~68
10"	31~39	10"	42~52	10"	61~75
12"	42~52	12"	44~54	12"	94~116
14"	44~54	14"	47~59	14"	165~203
16"	47~59	16"	48~60	16"	165~203
18"	48~60	18"	75~93	18"	177~217
20"	75~93	20"	92~114	20"	189~231
22"	79~97	22"	99~123	22"	242~296
24"	99~123	24"	141~173	24"	242~296
26"	141~173	26"	151~185	26"	287~351
28"	141~173	28"	151~185	28	456~558
30"	151~185	30"	204~250	30"	476~582
32"	151~185	32"	229~281	32"	604~740
34"	183~225	34"	334~410	34"	651~797
36"	193~237	36"	334~410	36"	680~832
38"	204~250	38"	365~447	40"	680~832
40"	229~281	40"	365~447	42"	722~884
42"	334~410	42"	380~466	-	-
46"	334~410	48"	522~638	-	-
48"	365~447	-	-	-	-
54"	380~466	-	-	-	-
60"	522~638	-	-	-	-
64"	522~638	-	-	-	-
66"	522~638	-	-	-	-
900LB		**1500LB**		**2500LB**	
2"	22~28	2"	26~32	2"	36~46
2-1/2"	32~40	2-1/2"	37~47	3"	56~70
3"	40~50	3"	49~61	4"	62~76
4"	42~52	4"	54~68	6"	117~145
5"	63~77	6"1500	99~121	8"	265~325
6"	65~81	8"	216~264	10"	413~505
8"	88~108	10"	248~304	12"	892~1092
10"	185~227	12"	263~323	14"	1055~1291
12"	198~244	14"	381~467	20"	1385~1693
14"	207~253	16"	381~467	-	-
16"	212~260	18"	781~955	-	-
18"	290~356	24"	978~1196	-	-
20"	343~421	-	-	-	-
24"	502~614	-	-	-	-
30"	825~1009	-	-	-	-

Table 2

5.2.2 Annex Table 3 Globe Valve Eye Bolting Torque Data

150LB		300LB		600LB	
Size	**Torque**	**Size**	**Torque**	**Size**	**Torque**
2"	11~15	2"	11~15	2"	17~21
2-1/2"	14~18	2-1/2"	14~18	2-1/2"	18~24
3"	15~19	3"	15~19	3"	27~33
4"	21~27	4"	21~27	4"	38~48
6"	22~28	6"	42~52	6"	94~116
8"	31~39	8"	48~60	8"	177~217
10"	42~52	10"	132~162	10"	287~351
12"	47~59	12"	151~185	12"	301~369
14"	75~93	14"	183~225	-	-
20"	151~185	16"	241~295	-	-
-	-	20"	365~447	-	-

900LB		1500LB	
Size	**Torque**	**Size**	**Torque**
2"	22~28	2"	39~49
2-1/2"	46~58	2-1/2"	54~68
3"	46~58	3"	99~121
4"	71~87	4"	138~170
6"	198~244	6"	263~323
-	-	2"	422~516

Table 3