WILLIAMS VALVE

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

API-6D SLAB & EXPANDING GATE VALVES

WILLIAMS VALVE
38-52 Review Ave. Long Island City, NY 11101, USA

Revision	Effective Date	Description	Prepared by	Approved by
01	2015	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 "Valve components for Slab &Expanding".	Mark Han	Simon Copeland
03	2025-09	Editorial Review	Eric Chen	Foster Voelker II

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.

.

CONTENTS **Page**

1 FOREWORD

The following instructions are offered as a reference to aid the valve user when installing, maintaining or operating Williams Pipeline Gate valves. This document, consisting of basic information should be of interest to the layman as well as the experienced valve user; however, it does not replace the need for an understanding of the particular application, and is not intended to be a complete instruction for the inexperienced valve user.

2 RECEIVING & HANDLING

A. Upon receipt of the valves, they 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 valve ends by leaving end protectors in place until their removal is necessary. Valves are shipped in the open or closed position, depending on the valve type, to protect seating surfaces. Gate Valves should be left in the closed positions, if possible until completion of installation.

3 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. The handwheel may be shipped separately from the valve. However, actuators (e.g., gearboxes, pneumatic drives, and similar components) must remain installed and are not to be removed.

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

D. For gate valves, inspect the valve to ensure it is fully closed. If the valve is found in the open position, the seating surfaces of the seat and wedge must be cleaned before closing the valve. If the valve is not installed immediately, it should be stored in a safe location protected from rain and dust. Valves must be stored in a well-ventilated, dry area to prevent corrosion and degradation. Outdoor storage is not permitted. Valve end flanges must remain covered during storage. (See Figure 1).

Figure 1

E. Take care to avoid scratching the stem or the sealing surfaces of the end flanges during valve transport.

F. Check and clean the valve if the has been stored over more than six months. Pressure test before using the valve if it has been stored for more than twelve months.

4 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 may present a head hazard if not placed at a proper elevation. Care should be taken to provide adequate headroom below the handwheel and stem when it is in 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.

5 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 proper direction with regard to valve internals. The normal and preferred mounting of Pipeline Gate valves for performance, operation and maintenance is with stem vertical and handwheel above the body. However, other orientations are possible except where specifically stated otherwise. (See Figure 2).

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. Flanged End Valves

   a. Check and align pipe flanges.

   b. Use the proper gasket type and size.

   c. Clean debris, dirt and other 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.
   Note: Bolting together flanges of two different materials may require special instructions.

   e. DO NOT TIGHTEN BOLTS IN A CIRCULAR PATTERN: Bolts must be tightened in a crossover or star pattern to load the bolts evenly.

6. Butt-Weld End Valves

   a. Valve, pipe and weld rod must all be of materials that are mutually compatible.

   b. Make certain valve is in the open position before applying heat.

   c. Welding should be performed by an ASME BPVC qualified welder using the correct welding equipment and following an ASME BPVC Section IX or API 6D Section 7.2 acceptable procedure.

   d. 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.

7. Setup and Safety Considerations

   a. **Caution:** Expanding gate valves used in liquid service must be equipped with a functional thermal relief system. If the relief system incorporates needle valves, they must be in the open position prior to valve operation. Failure to comply may result in a catastrophic malfunction. If it becomes necessary to depressurize the valve body cavity, follow the Thru-Conduit Expanding Gate Valve Body Bleed Procedure. Prior to installation, verify that the valve specifications match those of the intended service and installation location.

b. **Important:** If the valve and actuator are delivered separately, Williams recommends utilizing a qualified technician to mount the actuator to the valve, make all necessary adjustments, fully test and debug the unit before installing the valve in the pipeline.

c. **Caution:** Prior to valve installation, ensure the pipeline is clean. Foreign material, debris, scale, etc. will damage the soft seat inserts of the valve and cause seat leakage during commissioning. Thru-conduit and expanding gate valves are designed for vertical installation. Horizontal orientation is acceptable, provided it conforms to the guidance illustrated below in Figure 2.

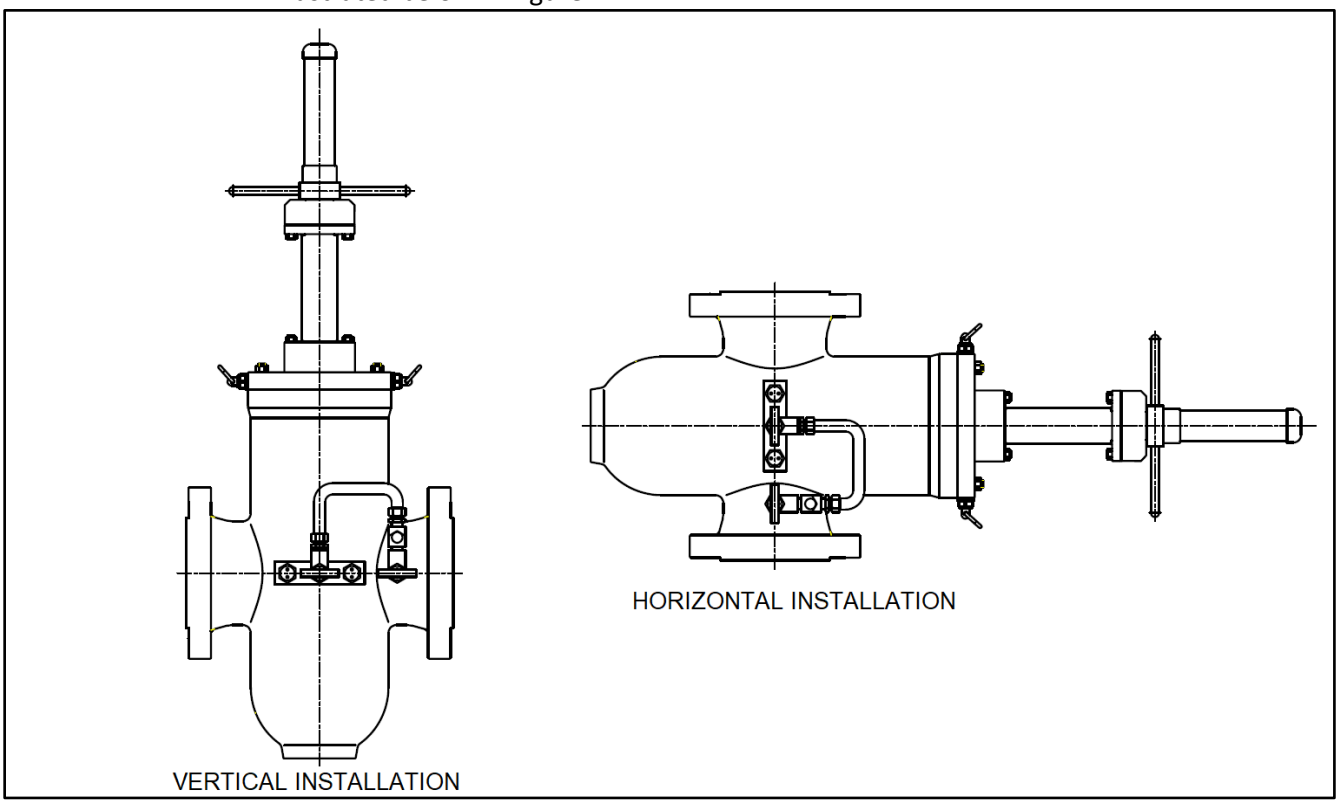


Figure 2

6 POST INSTALLATION

A. After installation of the valve, the line should be flushed or blown out to remove dirt and foreign objects.

B. Operate valve to make sure that nothing is preventing proper operation.

C. Pressure test the joint to prove quality of flange bolting, welding, etc.

D. The valve stem packing should be inspected periodically. If the stem packing shows signs of leakage, tighten the gland nuts to compress the packing, (See Figure 3). 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.

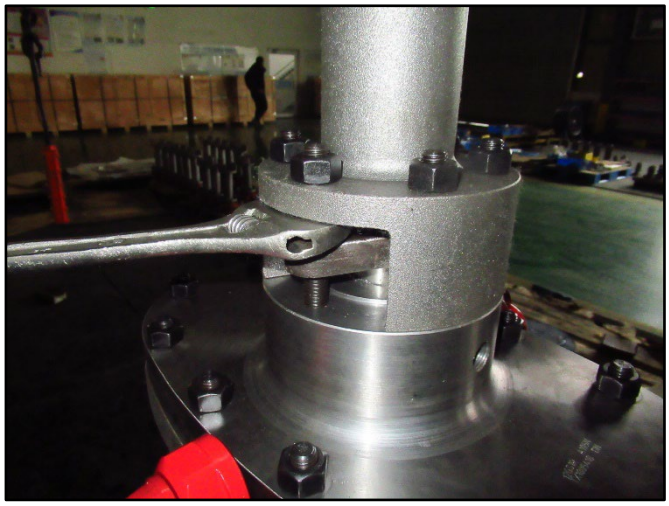


Figure 3

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 compatibility of flushing agent, gasket and packing material.

7 MAINTENANCE

A. Clean and lubricate the Stem.

B. If line conditions permit, cycle the valve to the fully OPEN position.

C. Remove stem protector when applicable.

D. Clean the stem threads to remove any dust, dirt, or foreign particles. Use a wire brush if required.

E. Inspect the threads for wear or damage.

F. Lubricate the threads with lithium based general purpose grease with minimum 150 viscosity.

G. Cycle the Gate OPEN and CLOSED several times to ensure grease distribution over the stem and drive nut.
(See Figure 4 to Figure 7).

Figure 4

Figure 5

Figure 6

Figure 7

H. Return valve to desired operating position. Replace stem protector. (For actuators, please refer to manufacturers recommended lubrication frequency and procedure.)

8 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 provide the information shown on the identification plate affixed to the valve.

A. **Stem Repair:** All valve stems are to be repaired in the following situations:
(1) Straightness.
(2) Damage to head and threads.
(3) Corrosion.
(4) Pitting and taper in the portion that slides through the packing.

B. **Straightness:** Minimum clearance should be assessed by placing a straight edge alongside the full length of the stem and rotating the stem 360°. This allows for visual inspection of any deviation. WEW does not recommend that end users attempt to straighten the stem using a press or machine grinding. If the stem is bent or out of tolerance, contact WEW to request a replacement.

C. **Threads and Stem head:** Thread thickness and surface finish must be sufficient to allow smooth engagement with the stem nut during operation. The stem head must fully and properly engage with the disc or plug to ensure reliable performance.

D. **Stem Sealing Surface Condition:** The portion of the stem that passes through the packing must have a smooth finish and be free of pits or surface imperfections. This can be achieved by polishing or precision turning within predefined tolerances. Additionally, any taper present on the stem in this area should be removed to ensure proper sealing performance.

E. **Valve Repack Tips:** When replacing the packing of a valve, avoid using steel hooks or sharp tools that may scratch the finely finished surfaces of the stem and stuffing box. Utilize soft materials, such as brass tools or hardwood dowels. Thoroughly clean both the stem and stuffing box before installing the new packing, as any residual debris can impair sealing performance. After cleaning, avoid handling the cleaned components or new packing set with bare hands, as skin oils and salts can introduce contaminants that may lead to corrosion.

F. **Stem Packing Removal:** To replace the stem packing when the valve is disassembled, follow this procedure: (See Figure 30 to Figure 38).

- Remove the yoke bolts.
- Turn the handwheel until the gearbox is off the stem.
- Remove packing gland flange.
- Lift the bonnet to remove the packing.
- Reverse the procedure for re-assembly.

G. **Disassembly of stem nut:**

1. Direct handwheel operated valves. (See Figure 8 to Figure 13)

- Remove valve stem protector.
- Remove the handwheel.
- Loosen the valve stem nut bearing box connection bolts and remove the bearing box.
- Remove the valve stem nut and inspect it. If damaged, replace it immediately.
- Reverse the procedure for re-assembly.

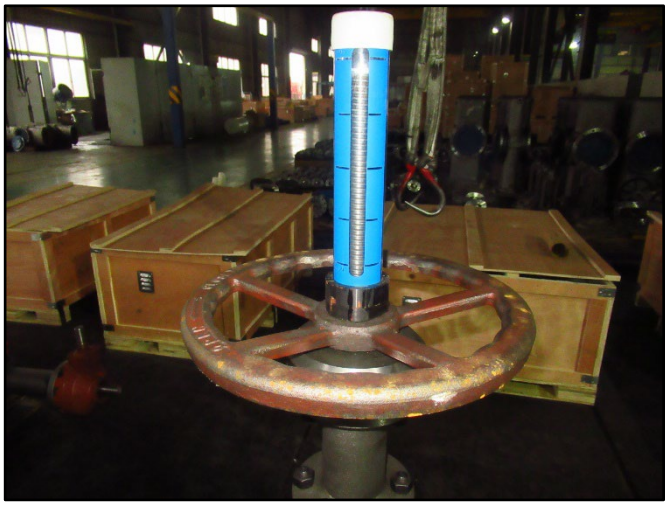


Figure 8

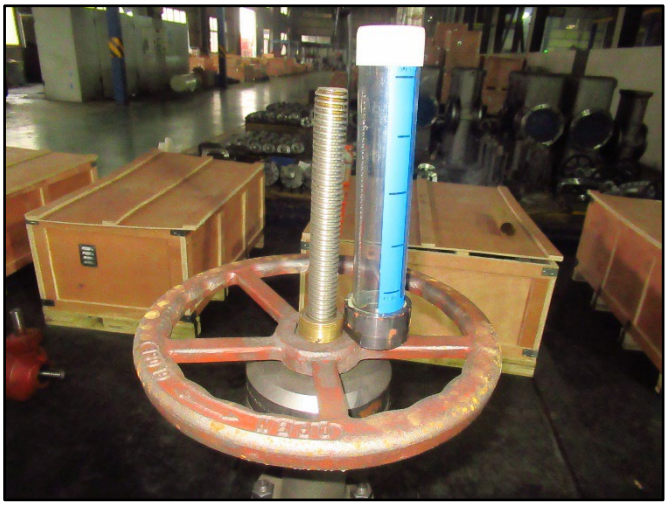


Figure 9

Figure 10

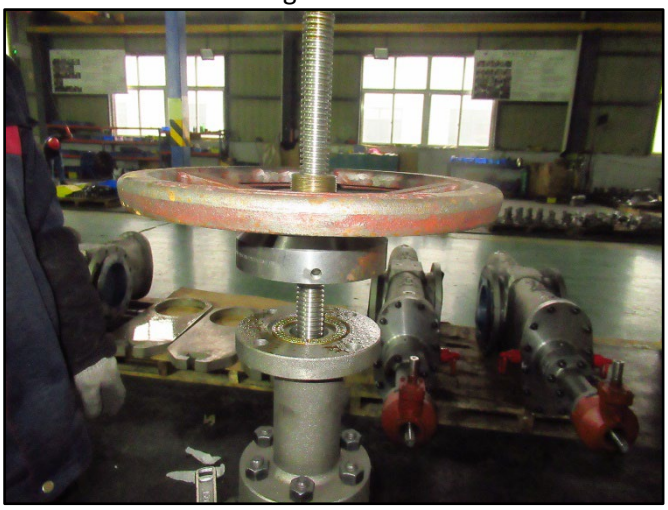


Figure 11

Figure-12

Figure-13

2. Bevel gear operated valves. (See Figure 14 to Figure 21).

- To remove the bevel gear from the valve, unscrew the mounting flange nuts and turn the handwheel in the open direction until the drive nut is 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. Replace if damaged.

Figure 14

Figure 15

Figure 16

Figure 17

Figure 18

Figure 19

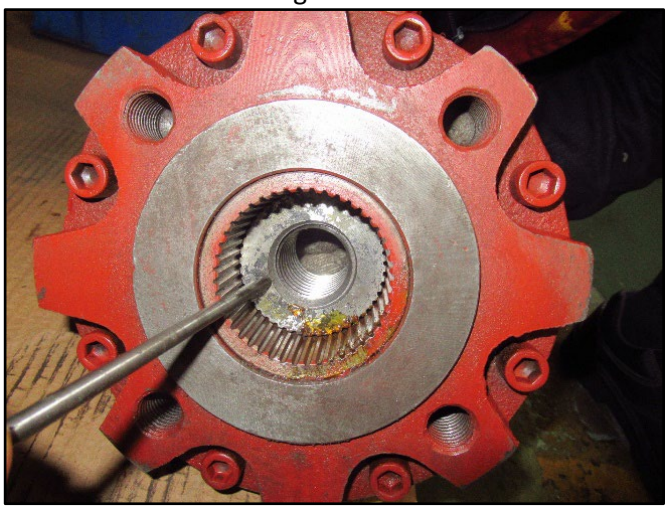


Figure 20

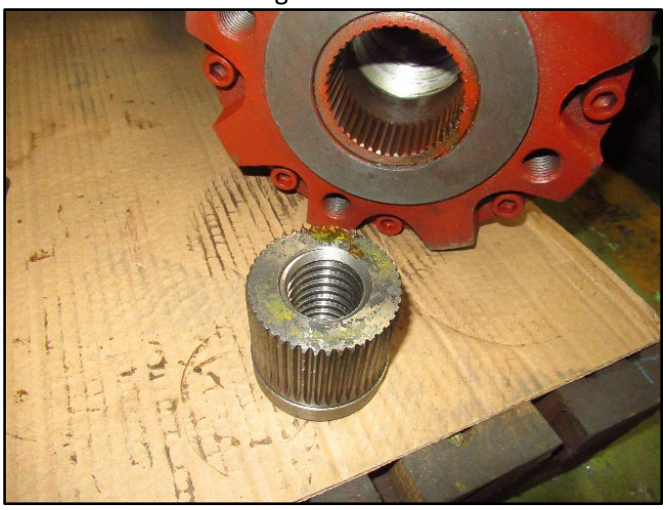


Figure 21

H. Paint Repair

- The intact coating surrounding the damaged area must be lightly abraded, then ground to form a smooth transition layer that facilitates uniform blending of the repair.
- Climatic conditions during the repair process must comply with the environmental parameters defined in the original coating procedure.
- The repair coating shall achieve the specified dry film thickness as outlined in the applicable standard. Air spraying or localized brushing is recommended based on the scope of the repair.
- The drying time for the repaired coating shall be consistent with that of the original application process.
- Installation or packaging is permitted only after the coating has fully cured.
- All additional painting requirements shall adhere to the project-specific painting specifications or the Williams Valve Painting Specification, as applicable.

9 TOOLS & EQUIPMENT

Standard wrenches and tools are generally suitable for servicing Valves. They 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 faces.

F. Hammer and punches to drive out pins.

10 OPERATION

The following section outlines general information on the operation of API 6D gate valves:

A. Open and close valves slowly whenever possible. When the valve is fully open, rotate the handwheel one-quarter turn in the closing direction to avoid leaving the valve jammed in the open position.

B. Never apply excessive leverage to the handwheel in an attempt to stop leakage. Doing so may damage the stem and cause the valve to malfunction.

C. Pipeline gate valves are not intended for throttling service and should not be used for flow regulation.

D. To operate the valve, rotate the handwheel clockwise to close and counter-clockwise to open.

E. When operating slab or expanding gate valves, do not use any external leverage tools. Carefully observe the position indicator during operation. For slab gate valves, once the indicator shows OPEN or CLOSED, rotate the handwheel one-quarter turn in the opposite direction to relieve pressure between the stem and drive nut.

F. For expanding gate valves only, with the valve fully closed, cavity pressure may be relieved through the bonnet vent fitting if necessary.
Safety Precaution: Always wear approved safety gear and face away from the bonnet vent when relieving pressure from the valve.

G. To remove the foreign debris from the valve, first close the valve and relieve cavity pressure. Remove the drain plugs from the bottom of the valve body. Re-install the drain plug when cleaning is complete. (See Figure 22 to FIgure 23).

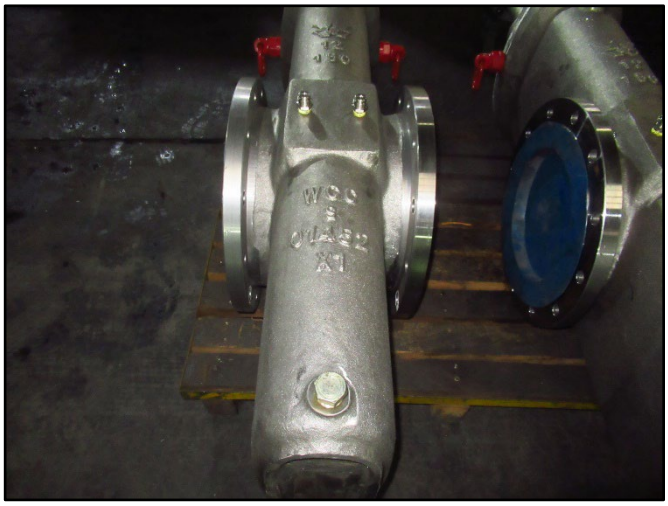


Figure 22

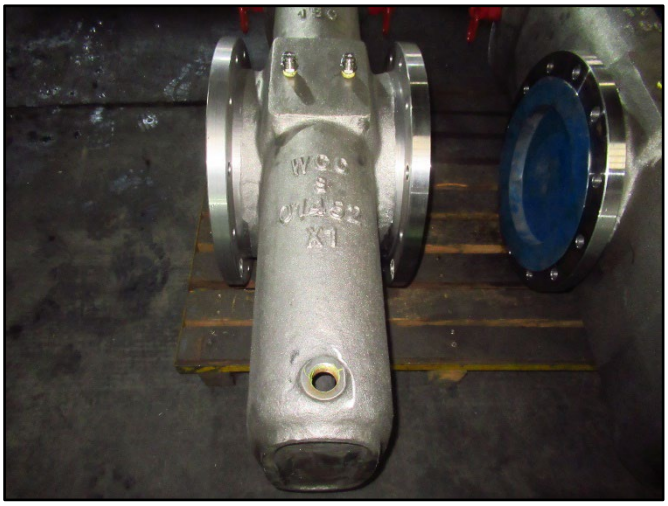


Figure 23

11 SEAT LUBRICATION / SEALANT

A. Two secondary sealant injection ports are located in the middle of the valve body. In the event the seat sealing surfaces are damaged and leaking, a sealant gun can be used to inject the seats with an approved sealant. (See Figure 24)

B. The pressure required to fully inject sealant into the seat/gate surfaces should not exceed 300 psi over the line pressure.

C. Pressure will be required to pump the grease through the gun, hose and extended piping. In cold weather, additional pressure might be required.

D. API 6D Gate valves do not require lubrication to operate. However, lubricating the seats will provide smooth operation. When lubricating the seats and gate surfaces, operate the valve several times OPEN to CLOSED to spread the lubricant evenly on to both surfaces.

E. Return the valve to either the full OPEN or full CLOSED position and inject an additional amount of lubricant to complete the process.

The Secondary Seat Lubricant/Sealant Injection System

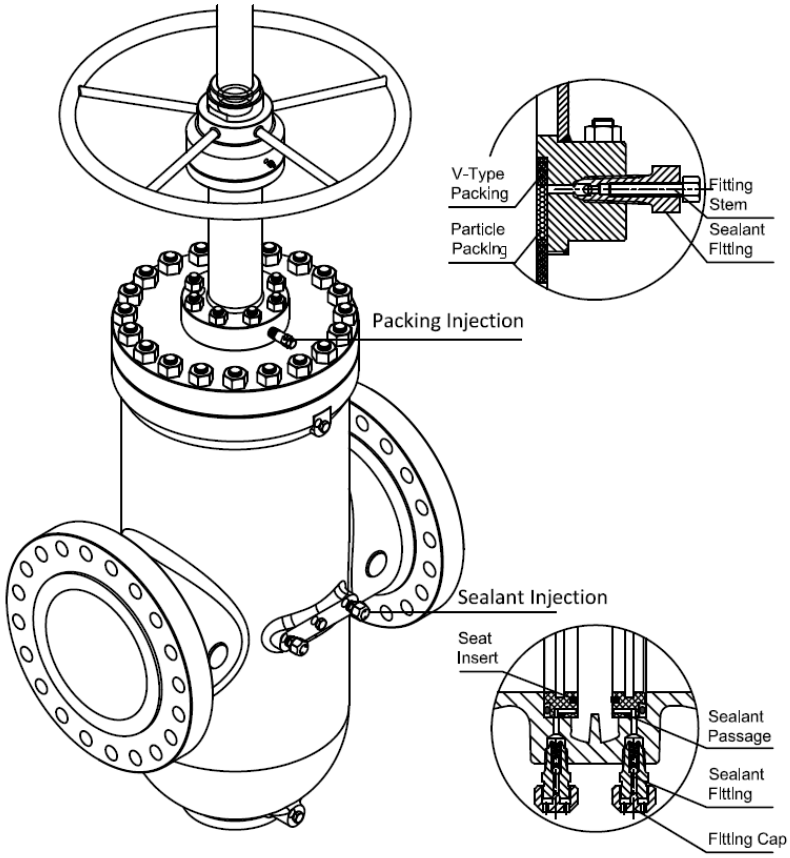


Figure 24

12 PACKING INJECTION PROCEDURE

A. In the event of leakage from the stem packing, close the valve and release the cavity pressure.

B. Remove the stinger from the packing injection fitting. Insert the pressure relieving stinger tool to relieve any stem packing pressure.

C. Once the pressure is fully relieved, remove the plug from the packing relief port opposite the injection fitting.

D. Using an injection fitting gun, inject packing until the fresh packing is seen coming through the relief port.

E. Reinstall the relief port plug. Add additional packing until the pressure in the packing stuffing box stabilizes, then tighten the injection stinger.
(See Figure 25).

Figure 25

13 VALVE INSTALLATION DIRECTION

Install the Gate valve with the Gate segments in the OPEN POSITION. The preferred pressure side of the valve MUST BE INSTALLED TO THE UPSTREAM PIPE as shown below.

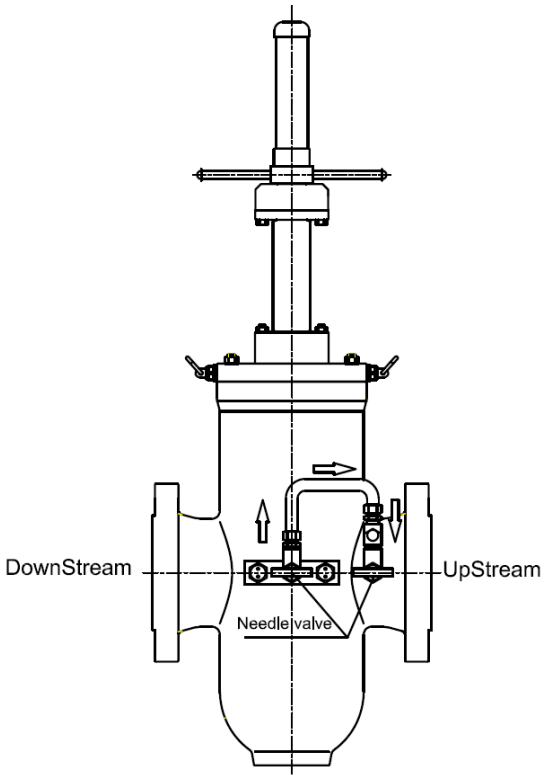


Figure 26

During commissioning and pipeline flushing, the valve must remain in the full-OPEN position to prevent damage to internal parts. Impurities and foreign debris entering the valve body may cause damage to sealing surfaces resulting in malfunction.

14 VALVE BODY BLEED TO UPSTREAM PROCEDURE

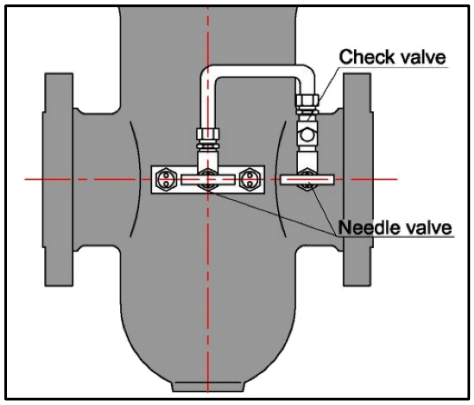
Notice: If customer requires a bypass to relieve pressure from the internal cavity to upstream of the valve while under pressure, please follow this procedure carefully.

A. Operate the valve to the CLOSED position.

B. Operate two needle valves to the OPEN position (See Figure 27).

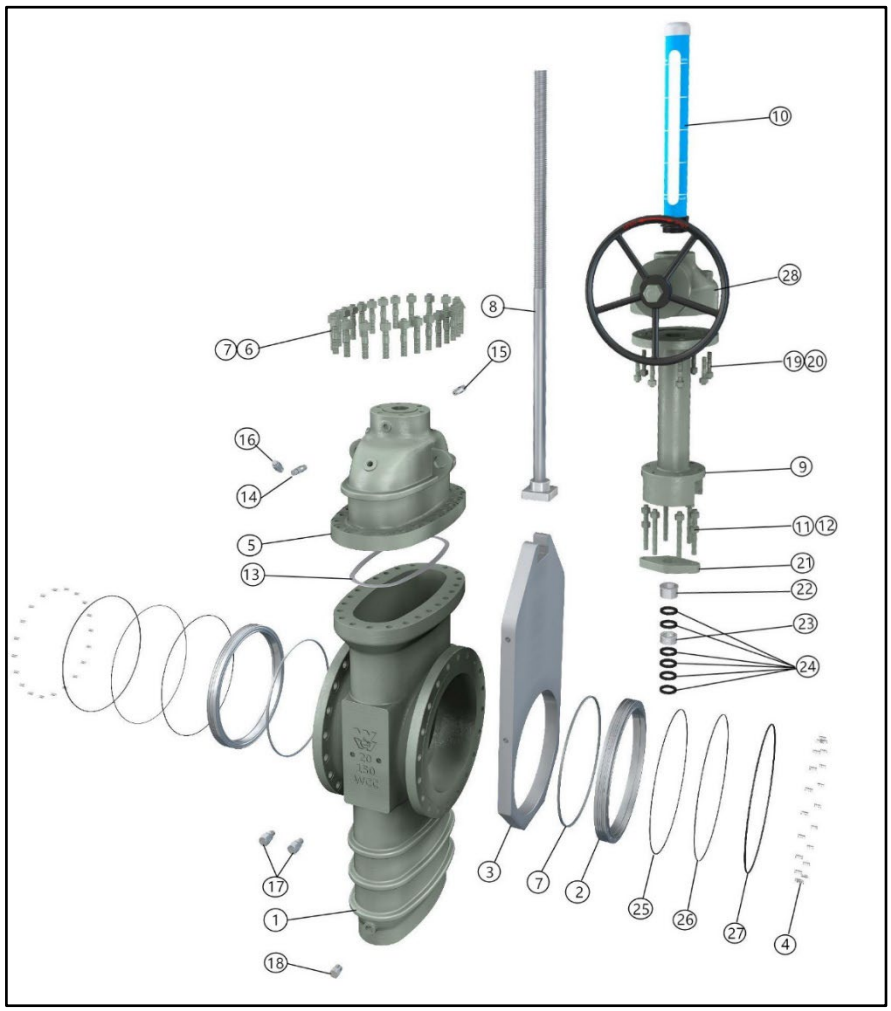
C. Double check the valves again to ensure they are in the proper position.

D. While the internal cavity (body) of the valve is under pressure, the pressure will release upstream from the cavity.



Figur 27

15 VALVE COMPONENTS - SLAB GATE VALVE



ITEM NO.	PARTS NAME
1	BODY
2	SEAT
3	GATE
4	SPRING
5	BONNET
6	BONNET BOLT
7	BONNET NUT
8	STEM
9	WELDING YOKE
10	STEM COVER
11	BOLT
12	NUT
13	GASKET
14	PACKING FITTING
15	PLUG
16	VENT VALVE
17	INJECTION FITTING
18	DRAIN PLUG
19	BOLT
20	NUT
21	GLAND FLANGE
22	GLAND
23	LANTERN RING
24	PACKING
25	O-RING
26	GRAPHITE WIRE ROD
27	O-RING
28	GEAR BOX

Figure-28

16 DISMANTLING AND SERVICING ISTRUCTION FOR SLAB GATE VALVE

A. Rotate the handwheel to fully open the valve.

B. Loosen the yoke joint studs and nuts, then remove the handwheel and stem nut from the valve body, if applicable.

C. Loosen the gland bolts and nuts, then remove the yoke from body. Use caution when removing the yoke as it may cause damage to the stem.

D. Loosen the bonnet and body bolts and nuts, then remove the bonnet from the valve body. Replace the valve packing at this stage. (see Figure 29 thru 38).

E. Ensure the stem can be safely lifted, then carefully extract the stem along with the gate from the valve body.

F. Clean the interior of the body and the seat surfaces thoroughly using a suitable cleaning solution. Inspect seat ring surfaces for scratches or damage. (See Figure 29 to Figure 42).

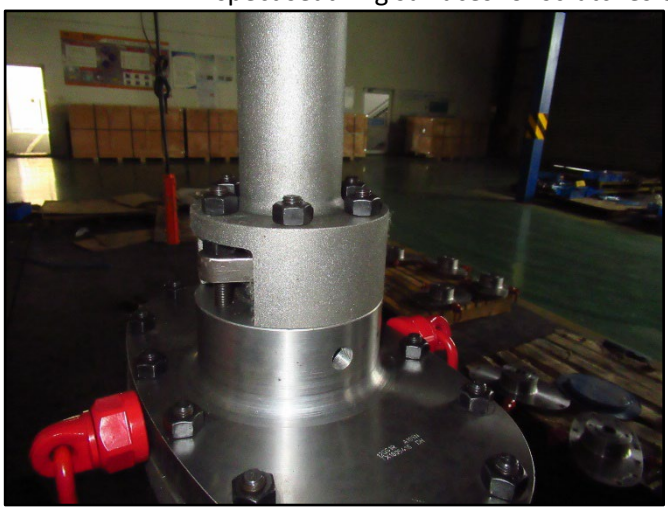


Figure 29

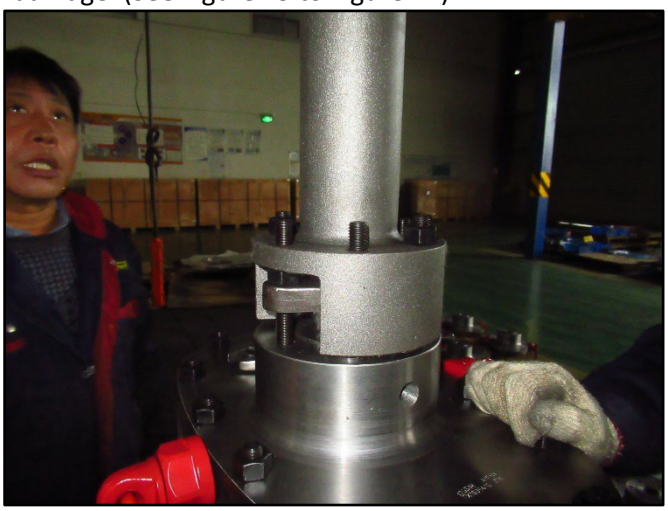


Figure 30

Figure 31

Figure 32

Figure 33

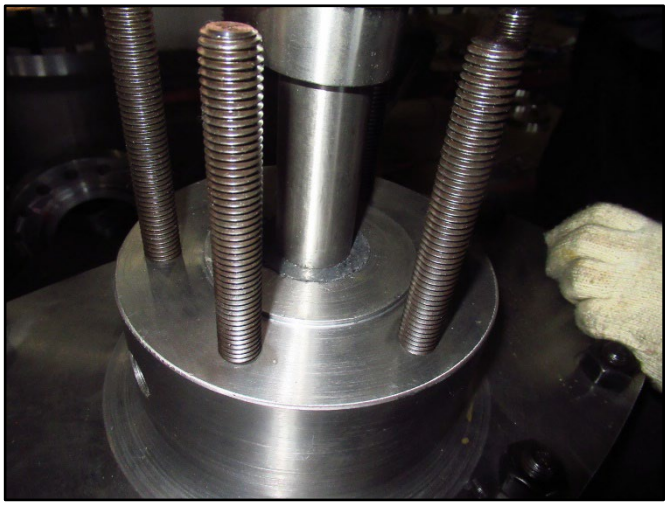


Figure 34

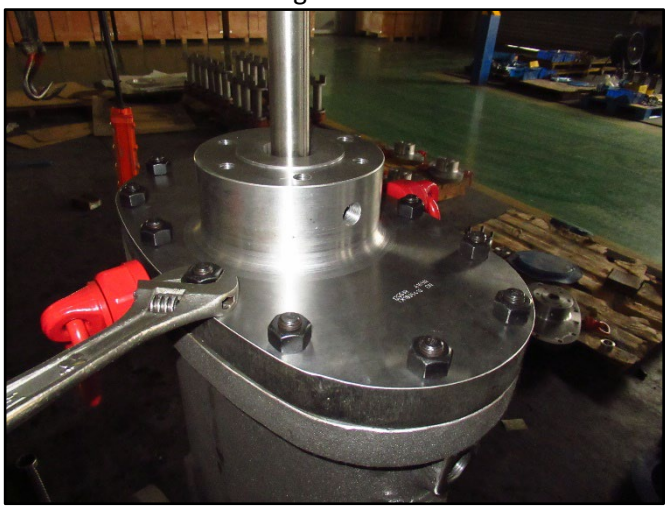


Figure 35

Figure 36

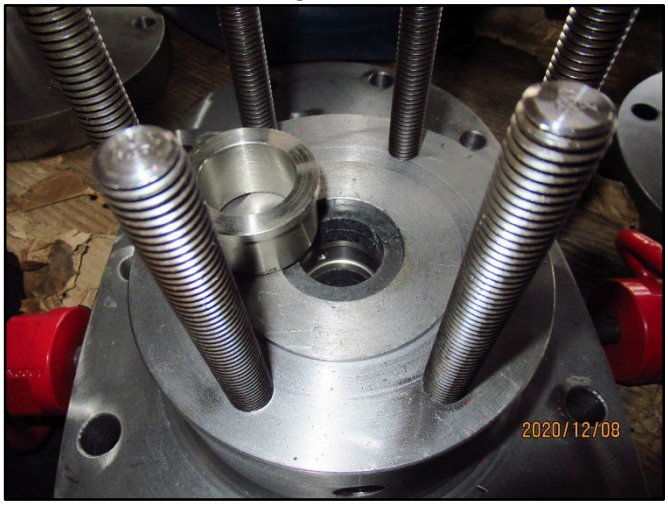


Figure 37

Figure 38

Figure 39

Figure 40

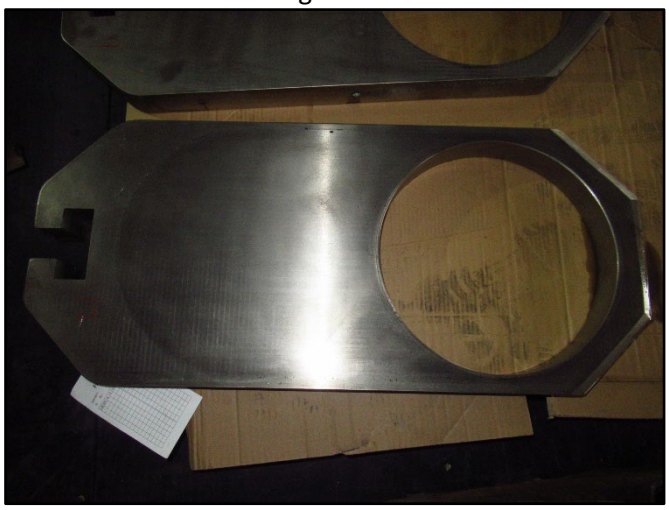


Figure 41

Figure 42

17 VALVE COMPONENTS - EXPANDING GATE VALVE

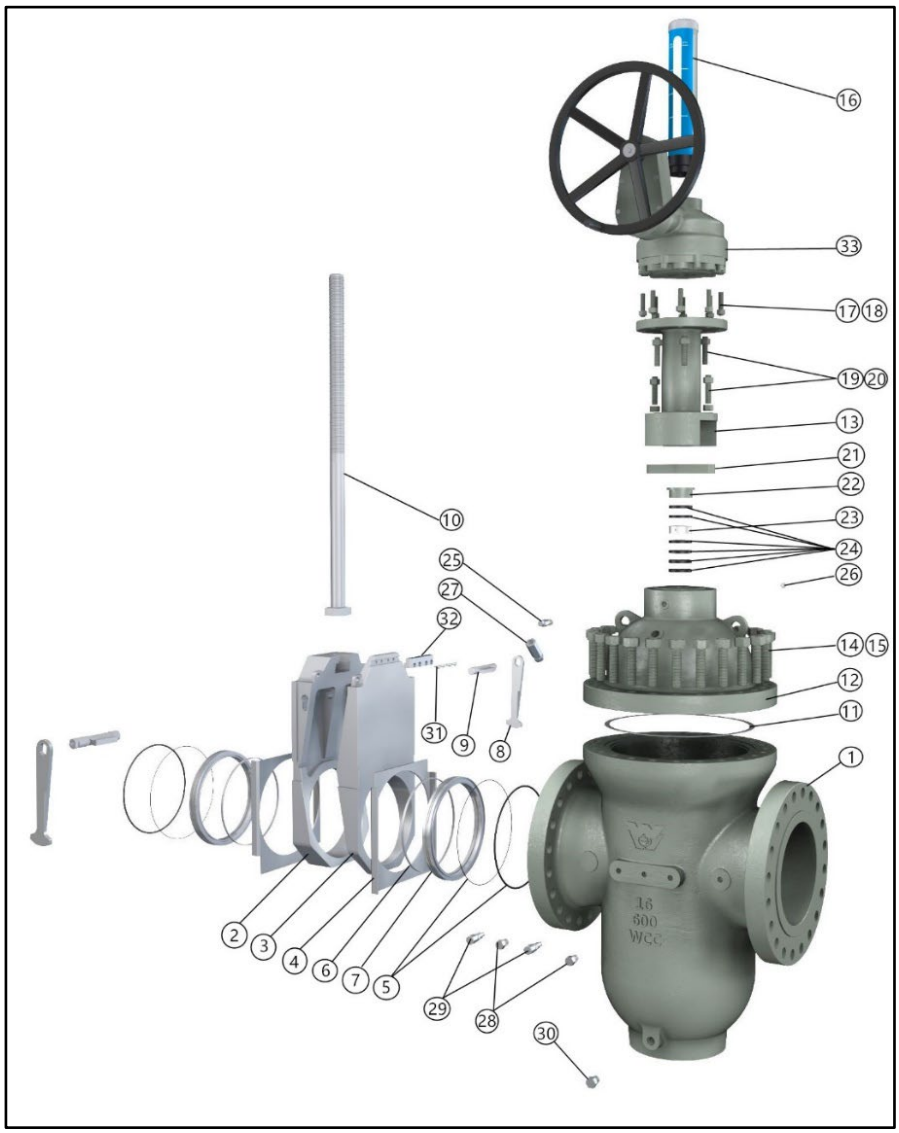


Figure 43

ITEM NO.	PARTS NAME
1	BODY
2	GATE
3	SEGMENT
4	SKIRT PLATE
5	O-Ring
6	SEAT INSERT
7	SEAT RING
8	CENTRALIZER
9	PIN
10	STEM
11	GASKET
12	BONNET
13	YOKE
14	BOLT
15	NUT
16	STEM COVER
17	BOLT
18	NUT
19	BOLT
20	NUT
21	GLAND FLANGE
22	GLAND
23	LANTERN RING
24	PACKING
25	PACKING FITTING
26	PLUG
27	AUTOVENT VALVE
28	PLUG
29	INJECTION FITTING
30	PLUG
31	BOLT
32	STOPPER
33	GEAR BOX

18 DISMANTLING AND SERVICING ISTRUCTION FOR EXPANDING GATE VALVE

A. Rotate the handwheel to the fully open the valve.

B. Loosen the yoke joint studs and nuts, then remove the handwheel and stem nut from the valve body, if applicable.

C. Loosen the gland bolts and nuts, then remove the yoke from body. Use caution when removing the Yoke as it may cause damage to the stem.

D. Loosen the bonnet and body bolts and nuts, then remove the bonnet from the valve body. Be careful to not damage the packing ring.

E. Ensure that the stem can be safely lifted, then remove the stem together with the expanding gate from the valve body.
Caution: When the expanding gate is lifted to approximately one-third of its travel, secure the two gate segments using bolts to prevent the expansion plate from separating and falling. (Refer to Figure 44.)

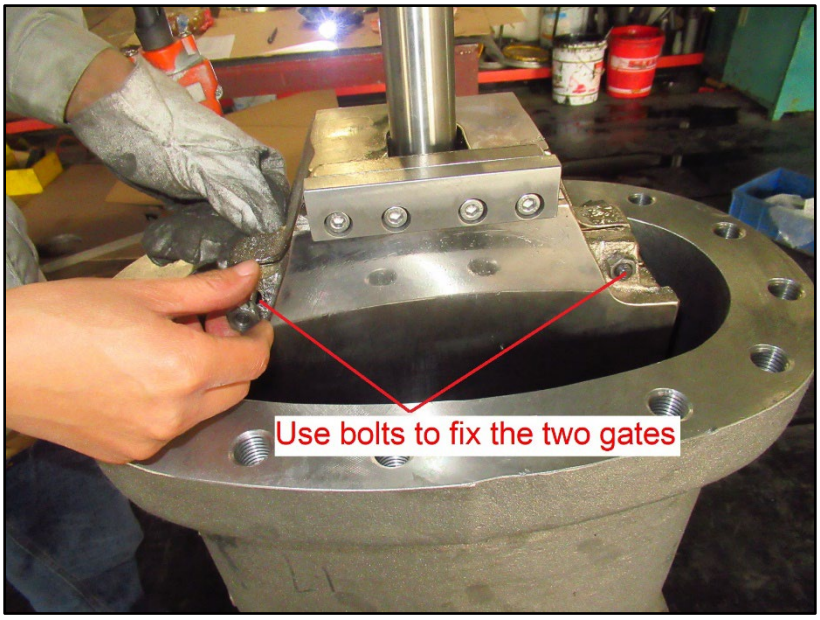


Figure 44

F. Clean body interior and seat surface thoroughly with suitable cleaning liquid and check for any scratches on seat ring surfaces.
(See Figure 45 to Figure 58).

Figure 45

Figure 46

Figure 47

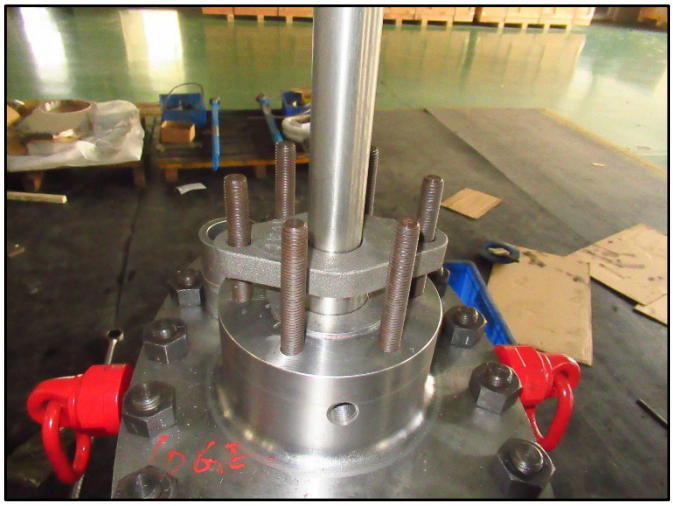


Figure 48

Figure 49

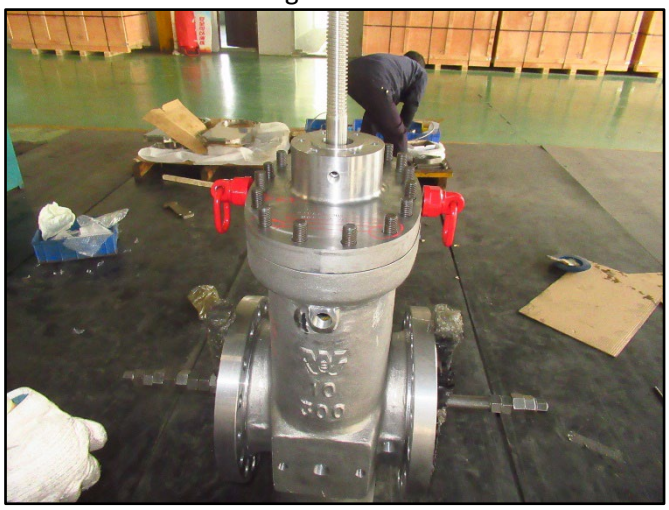


Figure 50

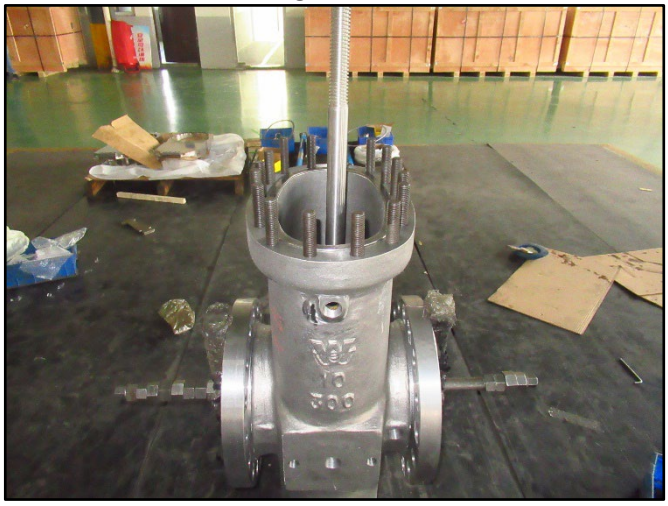


Figure 51

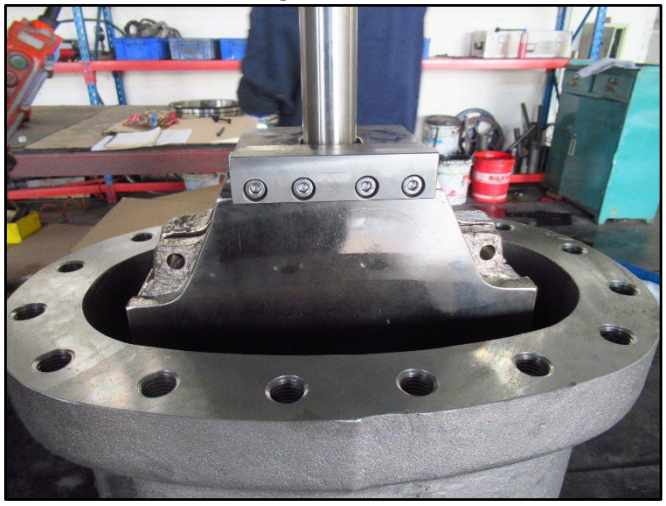


Figure 52

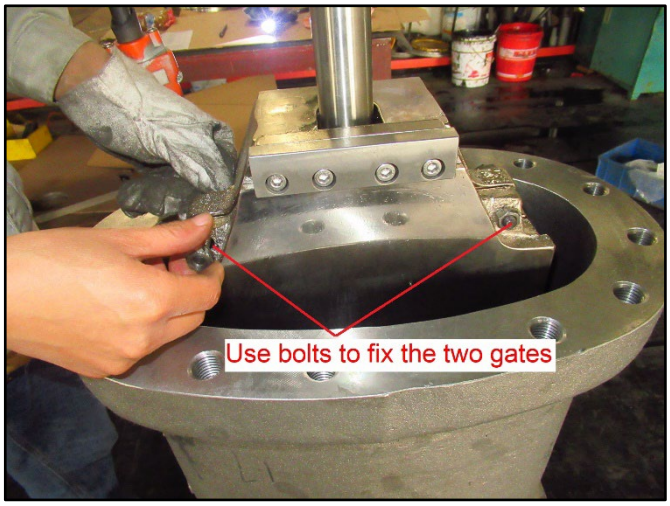


Figure 53

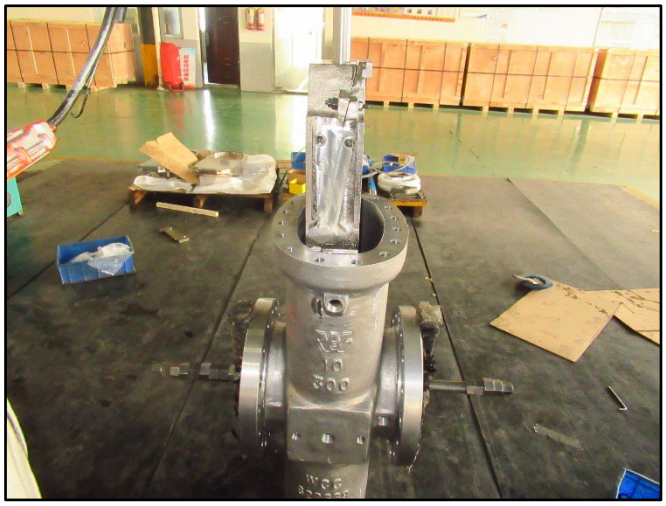


Figure 54

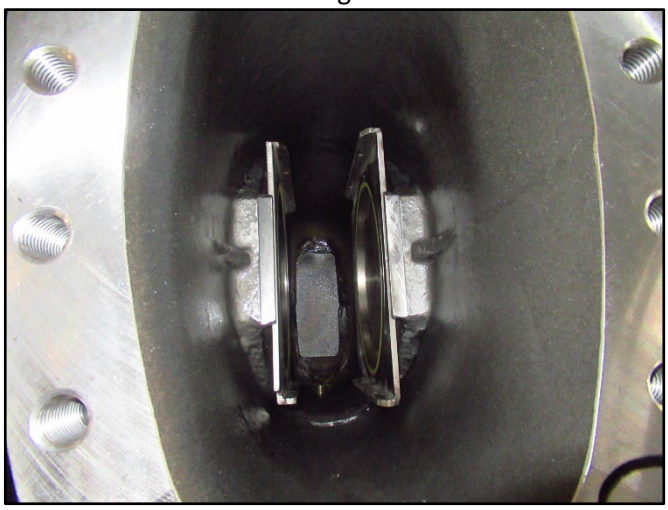


Figure 55

Figure 56

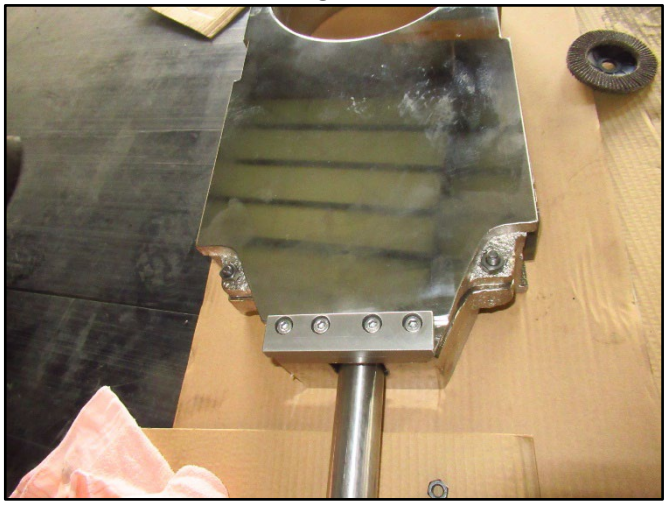


Figure 57

Figure 58