WILLIAMS VALVE

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

FORGED GATE, GLOBE AND CHECK VALVES

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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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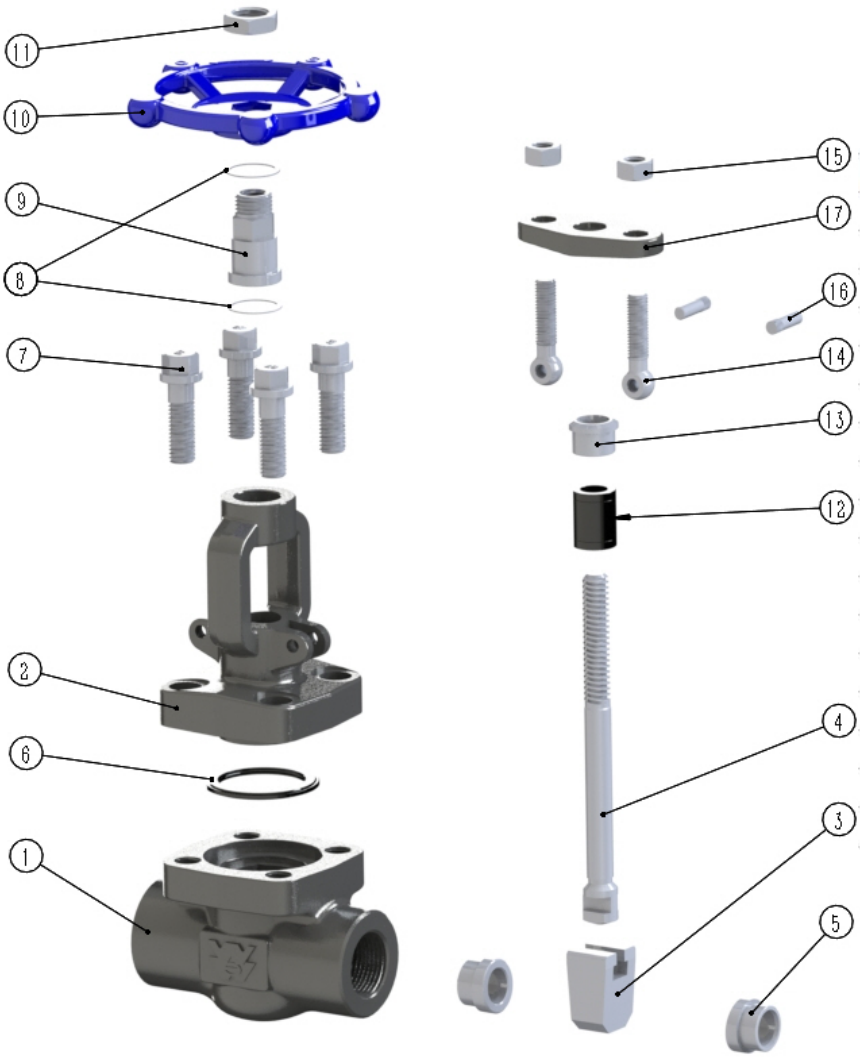
1 FOREWORD

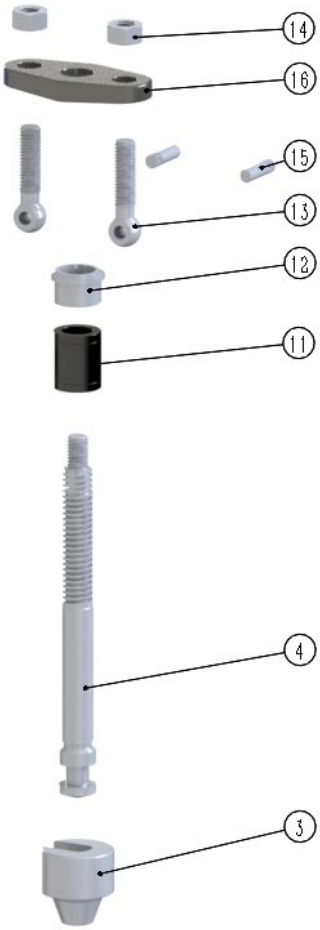
The following instructions are offered as a reference to aid the valve user when installing, maintaining or operating Williams' Forged Gate, Globe and Check valves. This document, consisting of basic information, should be of interest to the layman as well as the experienced valve user; however, it does 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 TYPICAL VALVE COMPONENTS



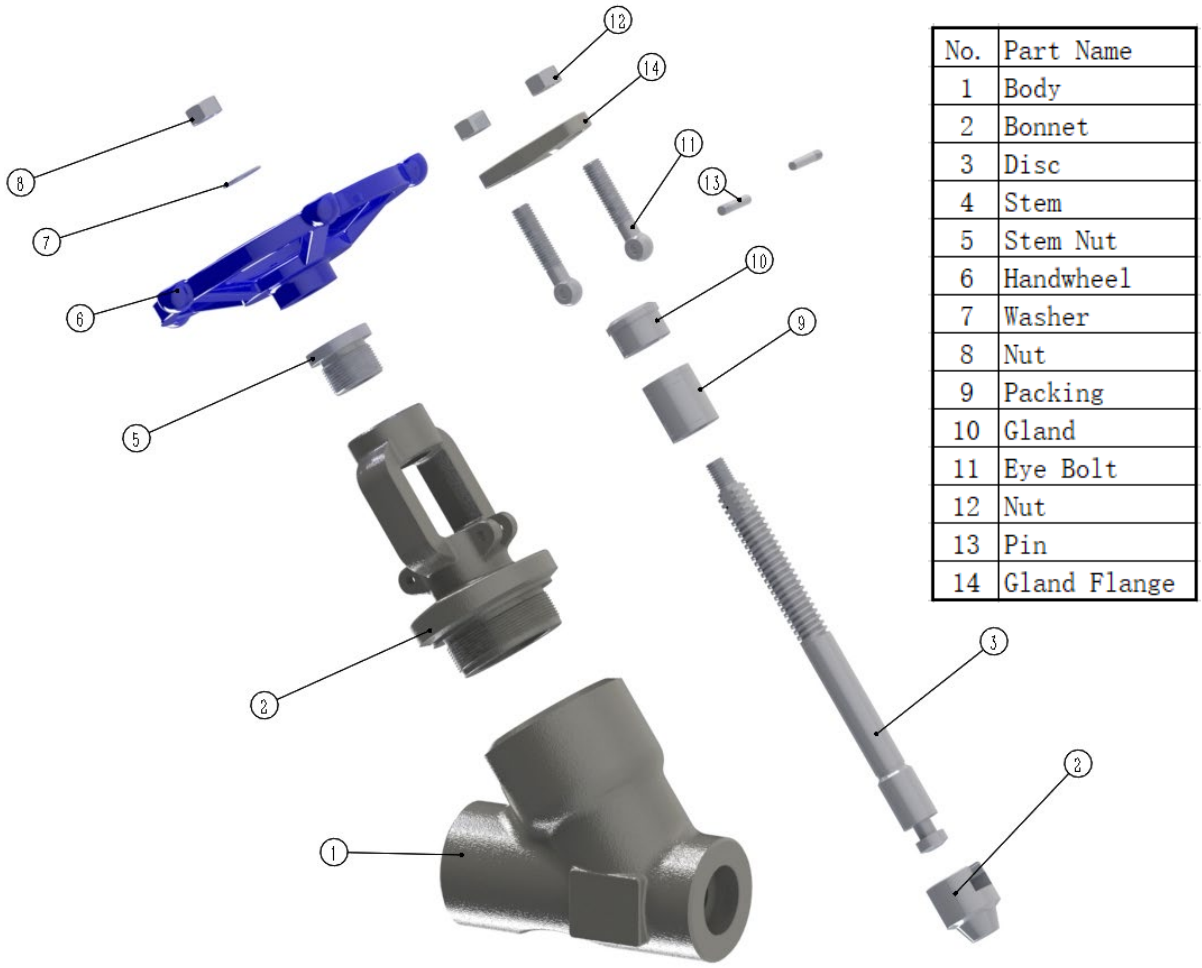
No.	Part Name
1	Body
2	Bonnet
3	Gate
4	Stem
5	Seat Ring
6	Gasket
7	Bolt
8	Thrust Washer
9	Stem Nut
10	Handwheel
11	Handwheel Nut
12	Packing
13	Gland
14	Eye Bolt
15	Nut
16	Pin
17	Gland Flange

Gate Valve



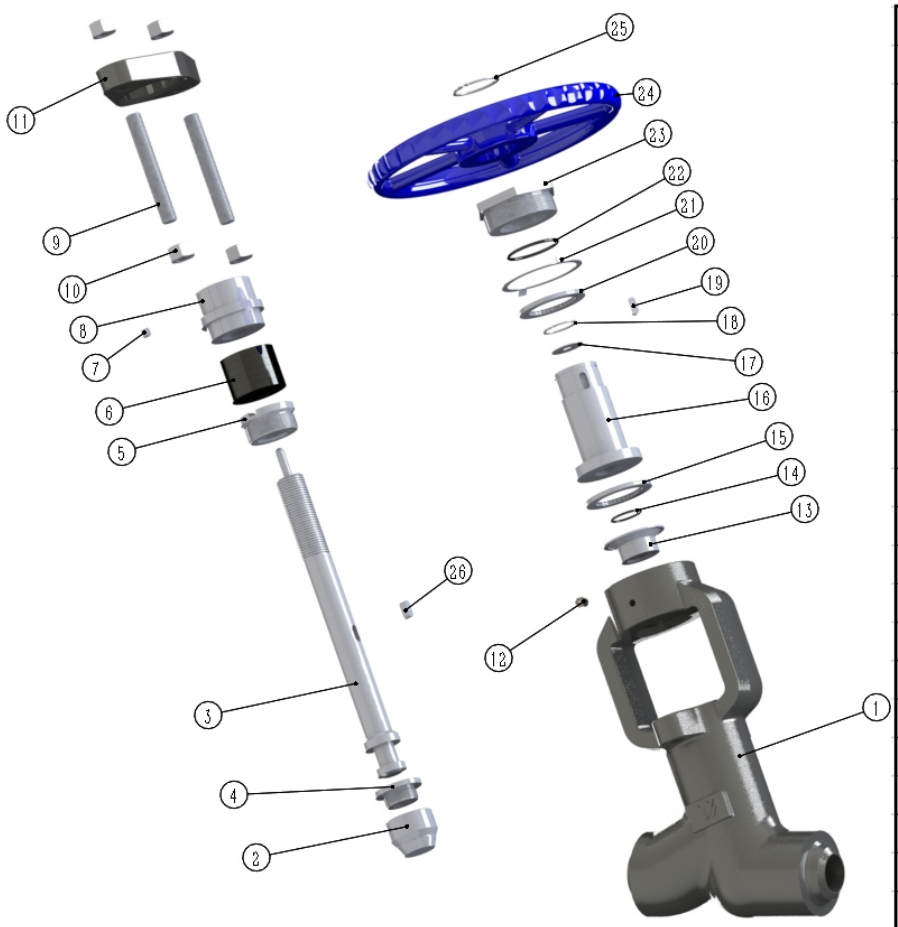
No.	Part Name
1	Body
2	Bonnet
3	Disc
4	Stem
5	Gasket
6	Bolt
7	Stem Nut
8	Handwheel
9	Washer
10	Nut
11	Packing
12	Gland
13	Eye Bolt
14	Nut
15	Pin
16	Gland Flange

Globe Valve



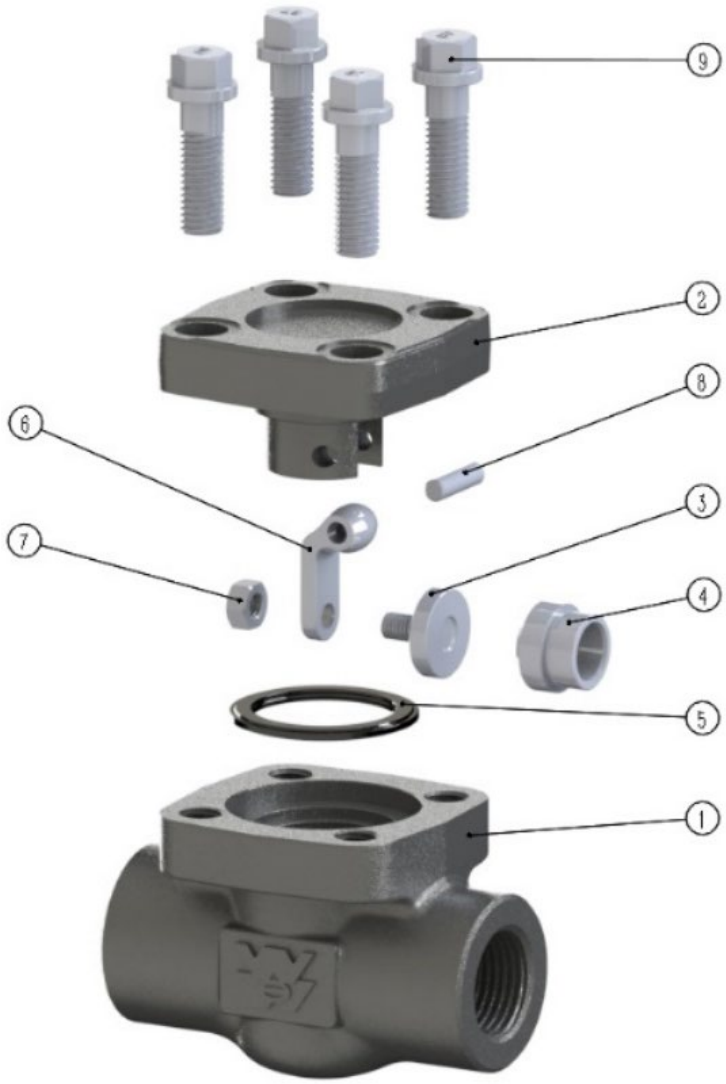
No.	Part Name
1	Body
2	Bonnet
3	Disc
4	Stem
5	Stem Nut
6	Handwheel
7	Washer
8	Nut
9	Packing
10	Gland
11	Eye Bolt
12	Nut
13	Pin
14	Gland Flange

Y Type Welded Bonnet Globe Valve



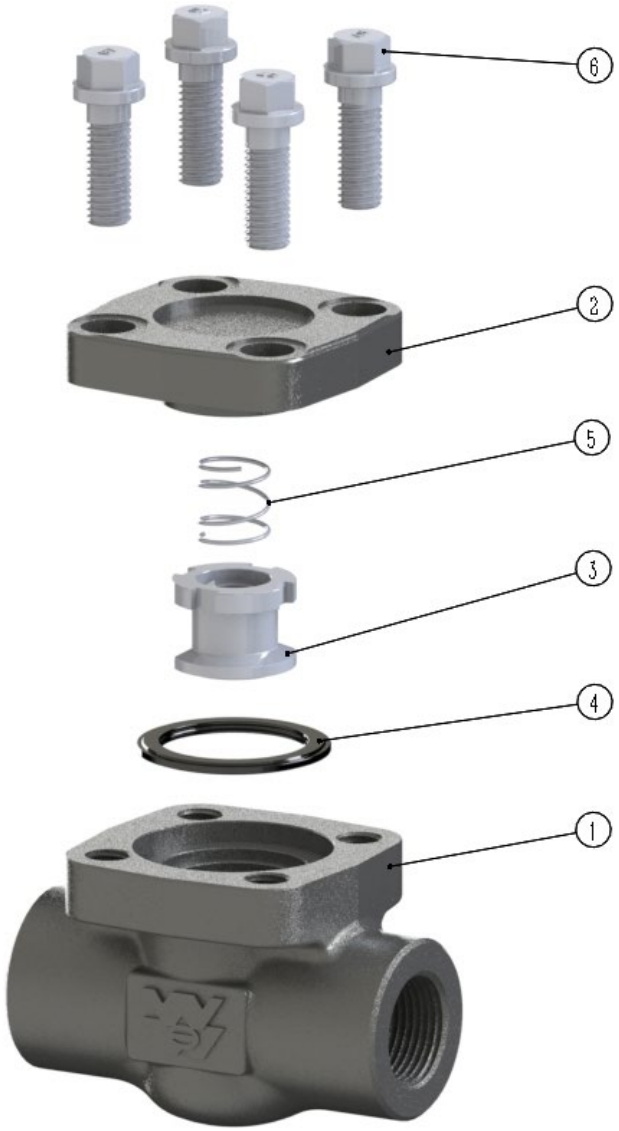
Y-Type Bonnetless Globe Valve

No.	Part Name
1	Body
2	Disc
3	Stem
4	Disc Cover
5	Back Seat
6	Packing
7	Key
8	Gland
9	Stud
10	Nut
11	Gland Flange
12	Grease Fitting
13	Stem Protector
14	O-Ring
15	Bearing
16	Stem Nut
17	Dust Cover
18	Stop Collar
19	Key
20	Bearing
21	Lock Washer
22	O-Ring
23	Yoke Nut
24	Handwheel
25	Stop Collar
26	Key



No.	Part Name
1	Body
2	Cover
3	Disc
4	Seat Ring
5	Gasket
6	Hinge
7	Nut
8	Hinge Pin
9	Bolt

Swing Check Valve



No.	Part Name
1	Body
2	Cover
3	Disc
4	Gasket
5	Spring
6	Bolt

Lift Check Valve

3 GENERAL INSTRUCTIONS

3.1 RECEIVING & HANDLING

A. Upon receipt of 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. Serious damage should be reported to William E. Williams to determine if repair or replacement of the equipment is necessary.

B. If valves show no sign of shipping damage, they should be stored in a sheltered area to protect them from weather, dirt and damage. Materials attached to protect valves during shipment should not be removed until time of installation in the line.

C. 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, and should be left in these positions, if possible, until completion of installation.

3.2 VALVE TRANSPORTATION / STORAGE

A. Check the packaging of valve before transportation according to standard. 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. Check and clean the valve if it has been stored over six months, and pressure test before using the valve 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 fully open position.

C. Valves with actuators will require additional clearance around them for making service connections and maintenance to 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.

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 Gate and Globe 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. 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. 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. Handle the valve only with equipment that will adequately support it, using a safe and proper technique.

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

6. Flanged End Valves

    a. Check and align pipe flanges before valve installation.
    b. Use proper type and size gaskets.
    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. Plain face with plain face or raised face with raised face is the proper procedure.
    e. Do NOT TIGHTEN BOLTS IN ROTATION: they must be tightened in a crossover or star pattern to load the bolts evenly.

7. Butt-Weld End and SW 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 an acceptable procedure.
    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. Check for tightness of body/bonnet joint and adjustment of packing gland.
C. Operate valve to make sure that nothing is preventing its proper operation.
D. Pressure test the joint to prove quality of flange bolting, welding, etc.
E. The valve shall be fully open or fully closed under normal working condition. It's not recommended to partially open the valve to regulate the fluid flow.

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.

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. Glands 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 the weld in a welded valve.

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

C. Lubrication and 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 since 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 valve is designed for re-packing under pressure, there may be foreign material on the backseat, so it is good practice to repack only when valve is de-pressurized.

Loosen and remove packing retainer, remove all sets of packing from stuffing box. Clean out 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.

Install new packing and re-assemble packing retainer to valve.
Note: Stagger joints of successive packing at 120°and insert them into the stuffing box. As shown below figure.

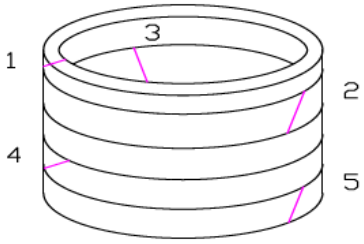


Figure 1

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 so they may be mated in the same position when reassembled.

Reassemble in reverse order of above instructions. For bonnet bolt, if the bolt is stainless steel, need use molybdenum disulphide grease, for other material normally don't need use any lubricant or anti seize compound. If valve has not been repacked recently, it should be done prior to placing valve back into service. Tighten Bonnet Bolting using a star pattern. See Figure 2 for the sequence of stud tighten.

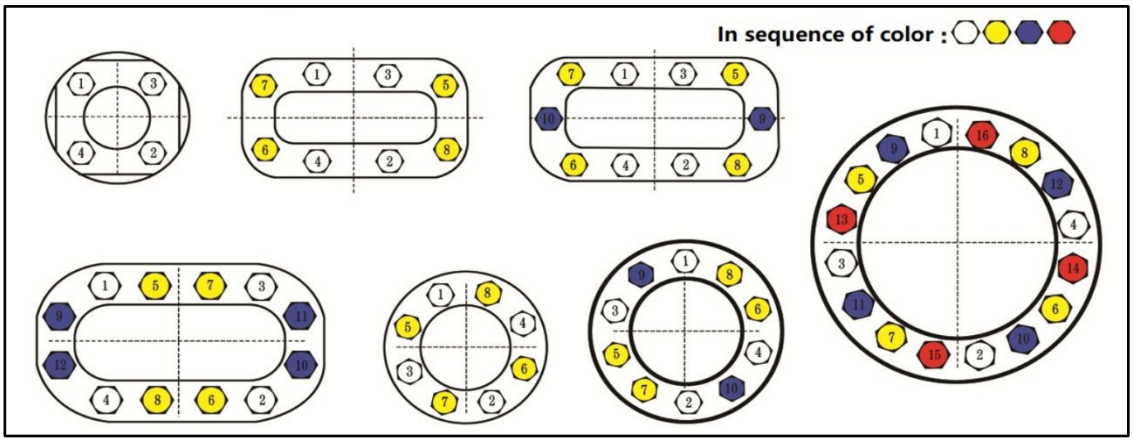


Figure 2

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

3.8 TOOLS & EQUIPMENT

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

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

B. One set Allen-type hex key wrenches.

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

D. Combination oilstone, coarse and fine grit, to polish wedge and seat ring faces.

E. 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.

4 APPENDIX - BOLTING TORQUE REQUIEMENT

4.1 Annex Table 1 Bonnet Bolt Torque (N.m):

Table 1- Wm. E. Williams Valve Forged GGC Valve Bonnet Bolt Torque

Class	Valve Type	Size	Bonnet bolt dimensions (MM)	Bonnet bolt torque (N.M)				
				B7	L7/B16	B7M/L7M	B8	B8M
800LB	Gate	1/2"	M10X31	35.1	35.3	26.8	33.6	31.9
800LB	Gate	3/4"	M10X31	35.1	35.3	26.8	33.6	31.9
800LB	Gate	1"	M12X33	61.2	61.6	46.7	58.6	55.6
800LB	Gate	1-1/4"	M14X38	97.8	98.4	74.7	93.7	88.9
800LB	Gate	1-1/2"	M14X38	97.8	98.4	74.7	93.7	88.9
800LB	Gate	2"	M16X43	151.6	152.7	115.8	145.3	137.9
800LB	Globe	1/2"	M10X31	35.1	35.3	26.8	33.6	31.9
800LB	Globe	3/4"	M10X31	35.1	35.3	26.8	33.6	31.9
800LB	Globe	1"	M12X33	61.2	61.6	46.7	58.6	55.6
800LB	Globe	1-1/4"	M14X38	97.8	98.4	74.7	93.7	88.9
800LB	Globe	1-1/2"	M14X38	97.8	98.4	74.7	93.7	88.9
800LB	Globe	2"	M16X43	151.6	152.7	115.8	145.3	137.9
800LB	Piston check	1/2"	M10X31	35.1	35.3	26.8	33.6	31.9
800LB	Piston check	3/4"	M10X31	35.1	35.3	26.8	33.6	31.9
800LB	Piston check	1"	M12X33	61.2	61.6	46.7	58.6	55.6
800LB	Piston check	1-1/4"	M14X38	97.8	98.4	74.7	93.7	88.9
800LB	Piston check	1-1/2"	M14X38	97.8	98.4	74.7	93.7	88.9
800LB	Piston check	2"	M16X43	151.6	152.7	115.8	145.3	137.9
800LB	Swing check	1/2"	M10X31	35.1	35.3	26.8	33.6	31.9
800LB	Swing check	3/4"	M10X31	35.1	35.3	26.8	33.6	31.9
800LB	Swing check	1"	M12X33	61.2	61.6	46.7	58.6	55.6

800LB	Swing check	1-1/4"	M14X38	97.8	98.4	74.7	93.7	88.9
800LB	Swing check	1-1/2"	M14X38	97.8	98.4	74.7	93.7	88.9
800LB	Swing check	2"	M16X43	151.6	152.7	115.8	145.3	137.9
1500LB	Gate	1/2"	M12X33	61.2	61.6	46.7	58.6	55.6
1500LB	Gate	3/4"	M12X33	61.2	61.6	46.7	58.6	55.6
1500LB	Gate	1"	M14X38	97.8	98.4	74.7	93.7	88.9
1500LB	Gate	1-1/4"	M14X38	97.8	98.4	74.7	93.7	88.9
1500LB	Gate	1-1/2"	M16X43	151.6	152.7	115.8	145.3	137.9
1500LB	Gate	2"	M18X58	209.5	211.0	160.1	200.8	190.6
1500LB	Globe	1/2"	M12X33	61.2	61.6	46.7	58.6	55.6
1500LB	Globe	3/4"	M12X33	61.2	61.6	46.7	58.6	55.6
1500LB	Globe	1"	M14X38	97.8	98.4	74.7	93.7	88.9
1500LB	Globe	1-1/4"	M14X38	97.8	98.4	74.7	93.7	88.9
1500LB	Globe	1-1/2"	M16X43	151.6	152.7	115.8	145.3	137.9
1500LB	Globe	2"	M18X58	209.5	211.0	160.1	200.8	190.6
1500LB	Piston check	1/2"	M12X33	61.2	61.6	46.7	58.6	55.6
1500LB	Piston check	3/4"	M12X33	61.2	61.6	46.7	58.6	55.6
1500LB	Piston check	1"	M14X38	97.8	98.4	74.7	93.7	88.9
1500LB	Piston check	1-1/4"	M14X38	97.8	98.4	74.7	93.7	88.9
1500LB	Piston check	1-1/2"	M16X43	151.6	152.7	115.8	145.3	137.9
1500LB	Piston check	2"	M18X58	209.5	211.0	160.1	200.8	190.6
1500LB	Swing check	1/2"	M12X33	61.2	61.6	46.7	58.6	55.6
1500LB	Swing check	3/4"	M12X33	61.2	61.6	46.7	58.6	55.6
1500LB	Swing check	1"	M14X38	97.8	98.4	74.7	93.7	88.9
1500LB	Swing check	1-1/4"	M14X38	97.8	98.4	74.7	93.7	88.9
1500LB	Swing check	1-1/2"	M16X43	151.6	152.7	115.8	145.3	137.9
1500LB	Swing check	2"	M18X58	209.5	211.0	160.1	200.8	190.6

- The torque value for CL800 is also applicable for CL150 to CL600;

4.2 Annex Table 2 Eye Bolt Torque (N.m):

Table 2-Wm. E. Williams Valve Forged GGC Valve Eye Bolt Torque

Valve Type	Size	Class	Eye Bolt Size	Torque (N.M)
Gate	1/2"	800	M8X32	40
Gate	3/4"	800	M8X32	40
Gate	1"	800	M10X38	60
Gate	1-1/4"	800	M10X43	65
Gate	1-1/2"	800	M12X45	70
Gate	2"	800	M12X47	82
Globe	1/2"	800	M8X32	30
Globe	3/4"	800	M8X32	30
Globe	1"	800	M10X38	38
Globe	1-1/4"	800	M10X43	45
Globe	1-1/2"	800	M12X45	54
Globe	2"	800	M12X47	82
Gate	1/2"	1500	M10X38	45
Gate	3/4"	1500	M10X38	50
Gate	1"	1500	M10X43	65
Gate	1-1/4"	1500	M12X45	80
Gate	1-1/2"	1500	M12X47	97
Gate	2"	1500	M12X55	153
Globe	1/2"	1500	M10X38	35
Globe	3/4"	1500	M10X38	42
Globe	1"	1500	M10X43	68
Globe	1-1/4"	1500	M12X45	85
Globe	1-1/2"	1500	M12X47	105
Globe	2"	1500	M12X55	147

- The torque value for CL800 is also applicable for CL150 to CL600;