CRANE

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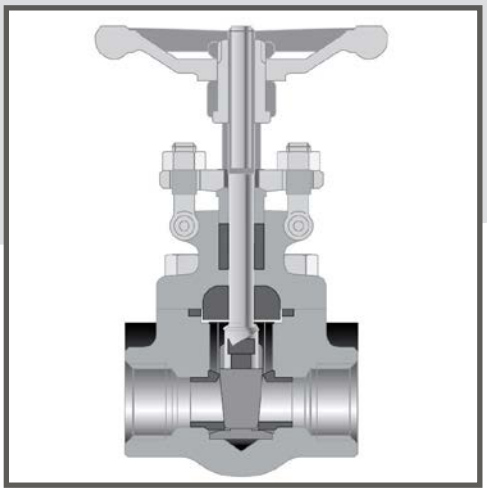
Instructions & Operation Manual



CRANE® Forged Steel

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⚠ CAUTION ⚠

READ INSTRUCTIONS BEFORE INSTALLATION or valve service.
Failure to follow instructions could result in death or serious injury.
If there is any question, contact the factory at 1-800-786-2542.

⚠ WARNING ⚠

Proper installation plays an important role in valves performance. Installation must be performed by qualified technicians only. Customer assumes all responsibility for valve performance on valves installed in the field by non-CRANE® ChemPharma, Tufline personnel. Improper installation will result in damage to the valve.

WARNINGS

- All CRANE®' Valves • are designed and manufactured to be installed in applications where no more than 1g of force in excess of gravity is applied to the valve in any direction. This 1g force can be an effect of Traffic, Wind or Earthquake. CRANE® valves should not be used in applications that exceed 1g.

- All CRANE® valves are designed for operation in clean media. This media should be free of all debris and particulate matter. Debris in the media may cause damage and/or reduced performance to the valve.

- The style, size, pressure class and material selection of all valves are the responsibility of the piping system designer. CRANE® may offer suggestions in this area, however the selection process is solely the responsibility of plant designers. Plant designers should also take into account the specific effects that the process media will have on the valve wall thickness and corresponding service life and ensure that the selected material is compatible with the process media. It is the responsibility of the piping designer to ensure that valves are equipped with any necessary venting and/or draining capabilities.

- Do not exceed 100% of the maximum pressure rating of the valve at any time during its operation. Pressure spikes beyond the valve's pressure rating are solely the responsibility of the user.

- When operating any valve stand clear of any moving parts such as the stem and/or disc assembly.
- All manually operated CRANE® valves are designed to be tightened by hand only. Do not apply excessive input torque via pipe wrenches "cheater bars" or other devices.

- Certain valve applications take place at elevated temperatures. Care should be taken in these instances to ensure that an operator does not touch any portion of the valve other than the handwheel. In severe temperature applications (300°F and above), insulation may be required on the valves to protect operators from the heat.

- Certain processes utilize flammable, caustic and/or otherwise unstable media. Care should be taken in these circumstances to ensure the operator is aware of the specific health and safety risks associated with that medium.
- All CRANE® valves should be operated within the pressure and temperature ranges listed in Table 2 of ASME B16.34. Under no circumstances should the valves be operated at conditions outside these tables.

- Valves other than globes should not be used for throttling applications. Severe damage may occur to other valve styles. When using globe valves for throttling, do not operate the valve continuously at less than 10% open.

- Valves are not suitable to serve as block valves during system hydrostatic pressure tests that exceed 1.1 times the cold working pressure.

- When possible, gate valves should be relieved of maximum seating force when left in the closed position. By relieving this force, it may help prevent damage caused by excessive thermal stem expansion. Care should be taken however to ensure that the valve is not opened, only that the torque/thrust has been removed from the stem.

- All valve packing glands should be tightened in an even manner. Care should be taken to ensure that the packing gland and/or gland flange do not contact the valve stem or stuffing box during tightening.

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General Valve Operation and Maintenance

1.0 THEORY OF OPERATION

Gate Valves. Gate valves are designed to close off or open up the flow in a pipeline. The wedge is designed to completely stop flow and form a tight seal against pressure in either direction. In the open position, the wedge is completely out of the flow stream. Gate valves are not recommended for throttling use.

Globe Valves. Globe valves are designed to close off, open up or throttle the flow in a pipeline. The disc is designed to completely stop flow and form a tight seal with pressure under the disc. In the 10% open position to full open position, globe valves are effective in throttling line pressure.

NOTE: Continuous throttling at less than 10% open may cause excessive vibration, noise, wear and damage to discs and seats.

Check Valves. Swing check valves are designed to open by the system pressure in a line. The normal direction of flow in the line will open the valve, and any attempt by the flow to reverse will close the valve completely. The check valve typically does not require any outside force or signal to operate properly. Check valves allow flow in one direction only.

2.0 DESCRIPTION

This manual covers all CRANE® forged steel valves. These valves are designed within the limits of ASME B16.34 / API 602. This manual is for reference purposes only. Disassembly and maintenance of valves should only be performed by qualified personnel. Consult CRANE® for specific technical support. For Specific information regarding a particular style of valve, please refer to the corresponding detailed Section.

3.0 INSTALLATION

When unpacking, care should be exercised in lifting and handling to avoid damage to valves or injury to personnel. Do not lift any valve by the handwheel or stem.

When installing, ensure that all foreign material is removed from the interior of the valve, including desiccants

NOTE: Do not remove protective end coverings until immediately prior to valve installation.

NOTE: Do not disassemble or modify a CRANE® valve in any way prior to installation. This will void the factory warranty if it occurs.

Certain valve types are designed to function in a single direction (check valves, etc.) All markings should be noted on the valves. Arrows on the valves indicating flow direction should correspond with the system flow direction

4.0 OPERATING INSTRUCTIONS

CRANE® valves are designed for simplicity and ease of operation. To open a gate or globe valve turn the handwheel in a counterclockwise direction; continue turning until interference is felt; at this point, the valve will be fully open. To close the valve, turn the handwheel in a clockwise direction; continue turning until interference is felt; at this point, the valve will be fully closed. Swing, lift, ball, and tilting disc check valves are designed to be operated by line pressure only. When the upstream line is pressurized, flow will open the disc. When the pressure is reduced upstream, or if there is backpressure, the disc will close.

5.0 MAINTENANCE

5.1 Preventative Maintenance and Periodic Inspection
CRANE® recommends that periodic inspections be made of all valves. The frequency of these inspections will vary, depending upon the severity of service and frequency of operation of the valve. As a minimum, all valves should be checked quarterly to ensure proper operation and discourage the damage compounding effects of leakage. The following list details the specific valve types and areas requiring inspection and maintenance.

5.2 If the above inspection reveals any indications, the following procedures are recommended:

5.2.1 If the stem packing is leaking, the gland flange should be tightened uniformly until the leakage stops. If the leakages continues or there is no adjustment remaining, additional packing must be installed or the packing must be replaced. It should also be noted the valve should be able to operate freely at all times. If the valve cannot operate due to excessive packing force, the packing has become worn and must be replaced during a system shut down.

5.2.2 If leakage develops at the body bonnet joint, the bonnet studs should be tightened uniformly. This tightening should be done in a star pattern. See section E of this manual.

⚠ CAUTION ⚠

Do not overstress the bolting. If leakage continues, the gasket should be replaced.

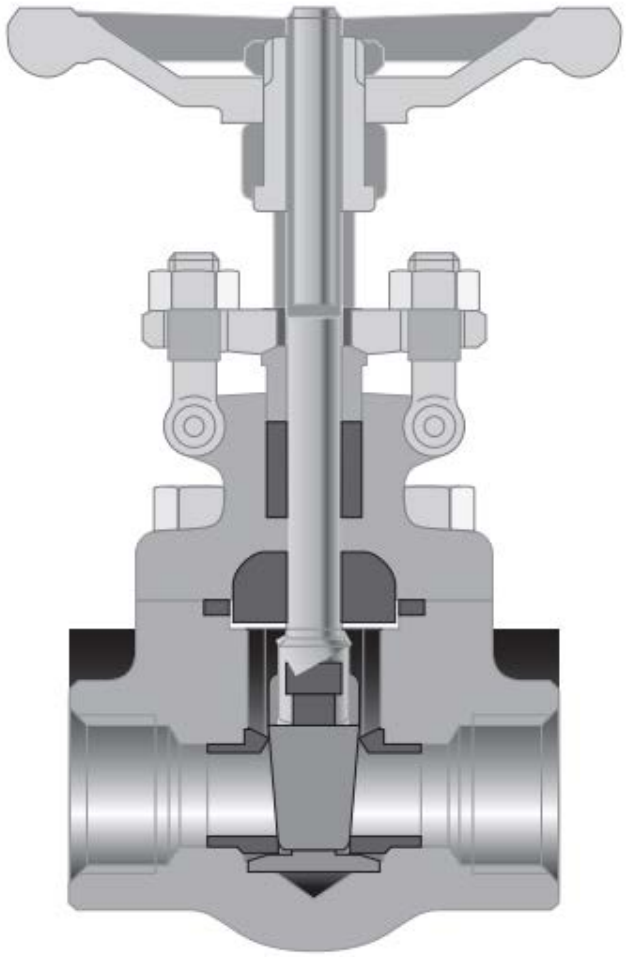
5.2.3 If the seat is leaking, clean the seat ring and check for damage. If material damage has occurred regrinding or welding is possible. Contact the factory.

General Valve Operation and Maintenance

Item to Inspect	Gate	Globe	Check
Check Stem threads for wear	XXX	XXX	
Check for Packing Leaks	XXX	XXX	
Check body/bonnet joint for leaks	XXX	XXX	XXX
If conditions permit, operate valve	XXX	XXX	
Inspect all external connections	XXX	XXX	XXX
Ensure Stem and seal areas are free from debris	XXX	XXX	
Check all lubrication points	XXX	XXX	
Inspect valve for obvious damage	XXX	XXX	XXX

⚠ WARNING ⚠

Do not remove or loosen the packing gland or bonnet bolts while the valve is pressurized.



Section B
Forged Steel Gate Valve

CRANE

Gate Valve

1.0 GENERAL INFORMATION
For General Operations & Maintenance Information regarding this, or any other CRANE® valve please refer to section A of this manual.

2.0 COMPLETE DISASSEMBLY

⚠ CAUTION ⚠

Before disassembling any valve, ensure that all pressure has been removed from the line and from the cavities within the valve. Contact CRANE® before disassembling any valve.

2.1 The following page contains a general disassembly and reassembly procedure. This procedure covers the bulk of the disassembly reassembly process. For specific information regarding packing, gaskets, etc. please refer to the appropriate section.

3.0 MAINTENANCE OF DISASSEMBLED VALVES
3.1 Following the disassembly procedure listed below, examine the body cavity (Item #1) for deposits of foreign material.

3.2 Examine seating surfaces of seat rings and disc / wedge (Item #2), for wear.

3.3 Examine the stem (Item #4), seal area, and threads for excessive wear.

3.4 If excessive wear is evident, worn parts, or if necessary, the entire valve should be reconditioned or replaced.

3.5 CRANE® can offer complete replacement seal kits and spare parts for reconditioning. When ordering, always state the figure number, factory code, serial number and the valve body/trim material.

4.0 LUBRICATION
4.1 Parts requiring lubrication are stem (Item #4), stem nut threads, the entire bonnet gasket (Item #5), and under all nuts. Bonnet Studs and Nuts should be lubricated with anti-seize lubricant.

5.0 SPECIAL TOOLS AND INSTRUCTIONS
5.1 Recommended bolting torques are shown in section E of this manual.

5.2 No special tools are required for general valve maintenance.

6.0 PREVENTATIVE MAINTENANCE
6.1 Refer to Section A of this manual for General Valve Maintenance Information

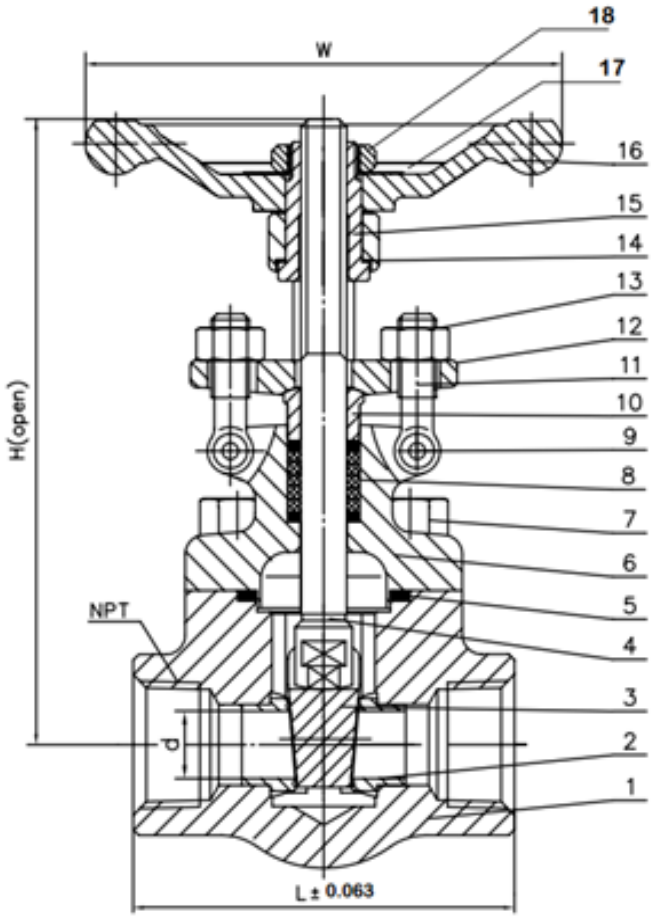
Gate Valve **Disassembly & Reassembly**

Disassembly

- Read the warning notice in Section 2.0 of these instructions.
- Loosen and remove the packing gland eyebolt nuts (#13).
- Loosen and remove the bonnet nuts (#7)
- Using a strap or similar device (when necessary) lift the bonnet assembly (#6) up and away from the valve body (#1).
  Note: Mark the orientation of the disc / wedge to the valve body seats
- Remove the disc / wedge (#3) from the stem (#4).
- While holding the stem (#4), turn the hand wheel (#16), in a clockwise direction to draw out the stem.
- Once the stem has been removed, the gland (#10) and the gland flange (#12) may be removed.
- Remove the packing (#8), using a packing hook or similar tool. Care should be taken to ensure that there is no damage to the stuffing box surface.
- Remove yoke hand wheel nut (#15), and the handwheel (#14).
- Remove the yoke nut (item #15). This may require the removal of set screws or the removal of tack welds, depending on valve configuration.

Reassembly

- Clean all parts thoroughly. Lubricate the seating surfaces with a light oil to discourage galling during reassembly.
- Install a new gasket (#5)
- Install a new packing set (#8). If necessary, install a new gland (#10) and gland flange (#12)
- Install the stem (#4) into the bonnet assembly (#6)
- Reinstall the packing gland eyebolt nuts (#13).
- Replace the disc/wedge (#3) onto stem.
- Install bonnet and wedge assembly into valve body (#1) nothing the previously made marks to indicate the wedge orientation in the body
- Reinstall bonnet bolts (#7)
- Tighten bonnet bolts to the values listed in Section E of this manual



Item	Description	Item	Description
1	Body	10	Gland
2	Seat	11	Eye Bolt
3	Wedge	12	Gland Flange
4	Stem	13	Nut
5	Gasket	14	Gasket
6	Bonnet	15	Yoke Nut
7	Bolt	16	Handwheel
8	Packing	17	Nameplate
9	Pin	18	Handwheel Nut

CRANE

Globe Valve

1.0 GENERAL INFORMATION
For General Operations & Maintenance Information regarding this, or any other CRANE® valve please refer to section A of this manual.

2.0 COMPLETE DISASSEMBLY

⚠ CAUTION ⚠

Before disassembling any valve, ensure that all pressure has been removed from the line and from the cavities within the valve. Contact CRANE® before disassembling any valve.

2.1 The following page contains a general disassembly and reassembly procedure. This procedure covers the bulk of the disassembly reassembly process. For specific information regarding packing, gaskets, etc. please refer to the appropriate section.

3.0 MAINTENANCE OF DISASSEMBLED VALVES
3.1 Following the disassembly procedure listed below, examine the body cavity (Item #1) for deposits of foreign material.

3.2 Examine seating surfaces of the body (Item #1) and disc / wedge (Item #2), for wear.

3.3 Examine the stem (Item #3), seal area, and threads for excessive wear.

3.4 If excessive wear is evident, worn parts, or if necessary, the entire valve should be reconditioned or replaced.

3.5 CRANE® can offer complete replacement seal kits and spare parts for reconditioning. When ordering, always state the figure number, factory code, serial number and the valve body/trim material.

4.0 LUBRICATION
4.1 Parts requiring lubrication are stem (Item #3), stem nut threads, the entire bonnet gasket (Item #4), and under all nuts. Bonnet Studs and Nuts should be lubricated with anti-seize lubricant.

5.0 SPECIAL TOOLS AND INSTRUCTIONS
5.1 Recommended bolting torques are shown in section E of this manual.

5.2 No special tools are required for general valve maintenance.

6.0 PREVENTATIVE MAINTENANCE
6.1 Refer to Section A of this manual for General Valve Maintenance Information.

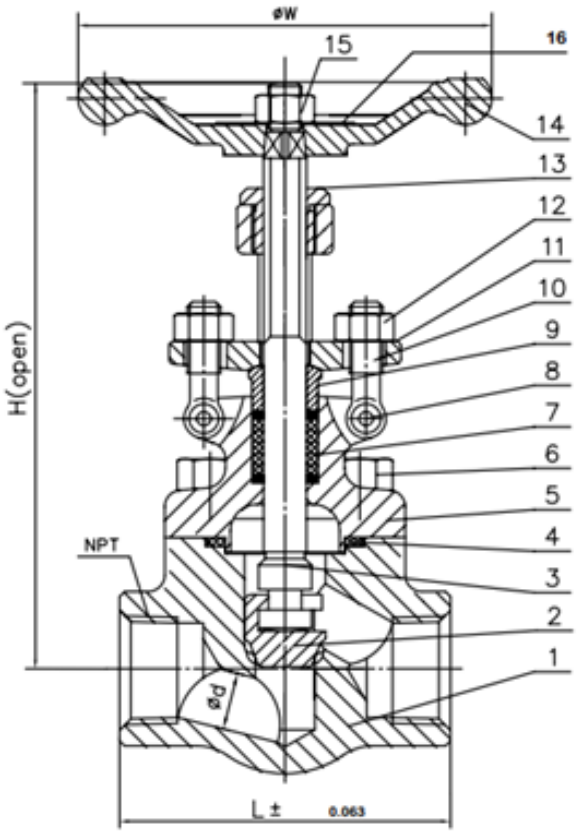
Globe Valve **Disassembly & Reassembly**

Disassembly

- Read the warning notice in Section 2.0 of these instructions.
- Loosen and remove the packing gland eyebolt nuts (#12).
- Loosen and remove the bonnet bolts (#6)
- Using a strap or similar device (when necessary) lift the bonnet assembly (#5) up and away from the valve body (#1).
- Remove the disc / wedge (#2) from the stem (#3).
- While holding the stem (#3), turn the hand wheel (#14), in a clockwise direction to draw out the stem.
- Once the stem has been removed, the gland (#9) and the gland flange (#11) may be removed.
- Remove the packing (#7), using a packing hook or similar tool. Care should be taken to ensure that there is no damage to the stuffing box surface.
- Remove yoke hand wheel nut (#15), and the handwheel (#14).
- Remove the yoke nut (item #13). This may require the removal of set screws or the removal of tack welds, depending on valve configuration.

Reassembly

- Clean all parts thoroughly. Lubricate the seating surfaces with a light oil to discourage galling during reassembly.
- Install a new gasket (#4)
- Install a new packing set (#7). If necessary, install a new gland (#9) and gland flange (#11)
- Install the stem (#3) into the bonnet assembly (#5)
- Reinstall the packing gland eyebolt nuts (#12).
- Replace the disc/wedge (#2) onto stem.
- Install bonnet and wedge assembly into valve body (#1) nothing the previously made marks to indicate the wedge orientation in the body
- Reinstall bonnet bolts (#6)
- Tighten bonnet bolts to the values listed in Section E of this manual



Item	Description
1	Body
2	Disc
3	Stem
4	Gasket
5	Bonnet
6	Bolt
7	Packing
8	Pin
9	Gland
10	Eye Bolt
11	Gland Flange
12	Nut
13	Yoke Nut
14	Handwheel
15	Handwheel Nut
16	Name Plate

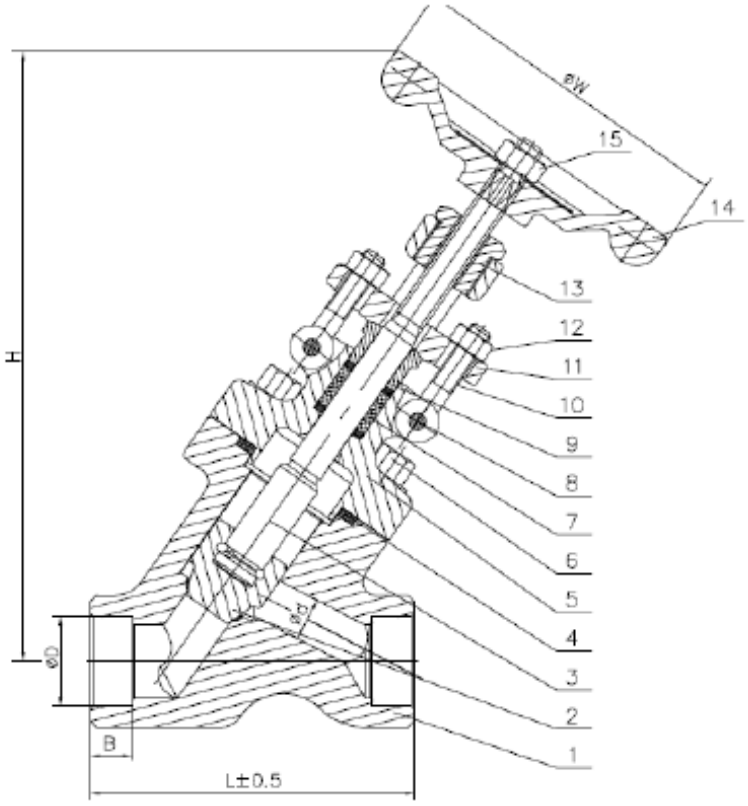
Y Globe Valve **Disassembly & Reassembly**

Disassembly

- Read the warning notice in Section 2.0 of these instructions.
- Loosen and remove the packing gland eyebolt nuts (#12).
- Loosen and remove the bonnet bolts (#6)
- Using a strap or similar device (when necessary) lift the bonnet assembly (#5) up and away from the valve body (#1).
- Remove the disc / wedge (#2) from the stem (#3).
- While holding the stem (#3), turn the hand wheel (#14), in a clockwise direction to draw out the stem.
- Once the stem has been removed, the gland (#9) and the gland flange (#11) may be removed.
- Remove the packing (#7), using a packing hook or similar tool. Care should be taken to ensure that there is no damage to the stuffing box surface.
- Remove yoke hand wheel nut (#15), and the handwheel (#14).
- Remove the yoke nut (item #13). This may require the removal of set screws or the removal of tack welds, depending on valve configuration.

Reassembly

- Clean all parts thoroughly. Lubricate the seating surfaces with a light oil to discourage galling during reassembly.
- Install a new gasket (#4)
- Install a new packing set (#7). If necessary, install a new gland (#9) and gland flange (#11)
- Install the stem (#3) into the bonnet assembly (#5)
- Reinstall the packing gland eyebolt nuts (#12).
- Replace the disc/wedge (#2) onto stem.
- Install bonnet and wedge assembly into valve body (#1) nothing the previously made marks to indicate the wedge orientation in the body
- Reinstall bonnet bolts (#6)
- Tighten bonnet bolts to the values listed in Section E of this manual



Item	Description
1	Body
2	Disc
3	Stem
4	Gasket
5	Bonnet
6	Bolt
7	Packing
8	Pin
9	Gland
10	Eye Bolt
11	Gland Flange
12	Nut
13	Yoke Nut
14	Handwheel
15	Handwheel Nut
16	Name Plate

Swing Check

1.0 GENERAL INFORMATION
For General Operations & Maintenance Information regarding this, or any other CRANE® valve please refer to section A of this manual.

2.0 COMPLETE DISASSEMBLY

⚠ CAUTION ⚠

Before disassembling any valve, ensure that all pressure has been removed from the line and from the cavities within the valve. Contact CRANE® before disassembling any valve.

2.1 The following page contains a general disassembly and reassembly procedure. This procedure covers the bulk of the disassembly reassembly process. For specific information regarding packing, gaskets, etc. please refer to the appropriate section.

3.0 MAINTENANCE OF DISASSEMBLED VALVES
3.1 Following the disassembly procedure listed below, examine the body cavity (Item #1) for deposits of foreign material.

3.2 Examine seating surfaces of the seat ring and disc / wedge , for wear.

3.3 Examine the hinge, and hinge pin for wear.
3.4 If excessive wear is evident, worn parts, or if necessary, the entire valve should be reconditioned or replaced.

3.5 CRANE® can offer complete replacement seal kits and spare parts for reconditioning. When ordering, always state the figure number, factory code, serial number and the valve body/trim material.

4.0 LUBRICATION

4.1 Bonnet Studs and Nuts should be lubricated with anti-seize lubricant.

5.0 SPECIAL TOOLS AND INSTRUCTIONS

5.1 Recommended bolting torques are shown in section E of this manual.

5.2 No special tools are required for general valve maintenance.

6.0 PREVENTATIVE MAINTENANCE
6.1 Refer to Section A of this manual for General Valve Maintenance Information.

Swing Check **Disassembly & Reassembly**

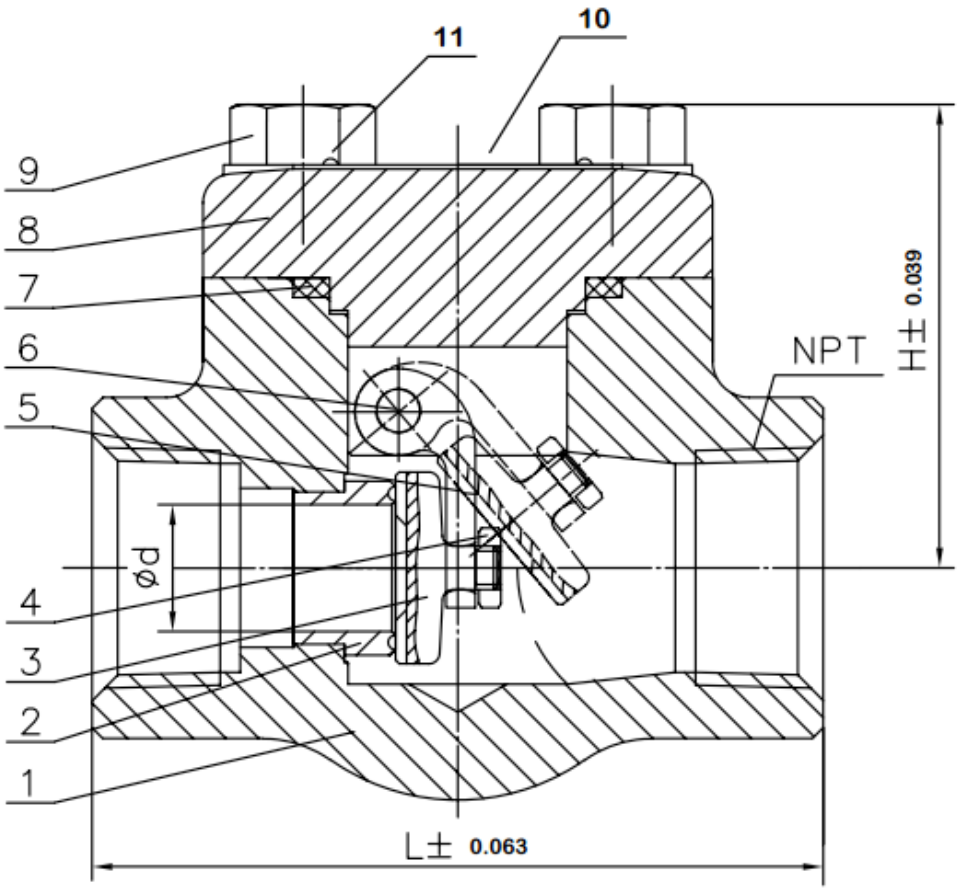
Disassembly

- Read the warning notice in Section 2.0 of these instructions.
- Loosen and remove the bonnet bolts (#9)
- Remove and discard Gasket (#7)
- Remove disc nut (#4). Care should be taken to ensure that the disc is not damaged upon removal.
- Remove hinge and disc assembly from valve. Note the position and quantity of any shims or spacers when used.
- If necessary, remove the hinge pin (#6) from the hinge.

Reassembly

- Clean all parts thoroughly.
- Reinstall hinge / disc assembly in reverse order.
- Care should be taken to reinstall / apploy any lock devices on the disc to disc nut connection.
- Install a new gasket (#7)
- Tighten bonnet bolts to the values listed in section E of this manual.

Item	Description
1	Body
2	Seat
3	Disc
4	Nut
5	Arm
6	Pin
7	Gasket
8	Bonnet
9	Bolt
10	Nameplate
11	Rivet



Bolt Torque Data

GENERAL INFORMATION
For General Valve Operation & Maintenance information, please refer to section A of this manual.
This section details the specific torque values recommended by CRANE® for bolting used in all CRANE® products.

Standard Procedures
Always use new bolting materials
Verify that the new materials are compatible with the process system as well as any temperature or pressure requirements. Note that bolting materials can have minor identification changes which may have substaintial impact on performance, ie. B7M vs. B7.

Whenever allowed by system and process parameters, use the appropriate lubrication to ensure even tightening of the bolting materials. For higher temperature applications, the use of an Anti-Seize compound may be necessary to promote future disassembly.

ASSEMBLY AND MAINTENANCE OF FLANGE JOINTS
When a flanged joint is assembled, each of the component parts in subject to tensile or compressive stresses of varying magnitude. In the great majority of cases, it is adequate to tighten the bolts sufficiently to withstand the test pressure without leakage.

The maximum allowable stress values for bolting given in the various codes such as ASME Boiler and Pressure Vessel Code and the ASME Code for Pressure Piping are design values to be used in determining the minimum amount of bolting required. A distinction must be recognized between the design value and the bolt stress that might actually exist or that might be needed for conditions other than the design pressure. The initial tightening of the bolts is a pre-stressing operation, and the amount of bolt stress developed must be within proper limits to insure, on the one hand, that it is adequate to provide against all conditions that tend to produce a leaking joint and, on the other hand, that it is not so excessive that yielding of the bolts and/or flanges can produce relaxation that also can result in leakage.

The first important consideration is the need for a joint to be tight in the hydrostatic test. An initial bolt stress of some magnitude greater than the design value therefore must be provided. If it is not, further bolt strain develops during the test which tends to part the joint and thereby, to decompress the gasket enough to allow leakage. It is evident that an initial bolt stress higher that the design value may, and in some cases must, be developed in the tightening operation. This practice is permissible, as pointed out in Appendix S, Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, provided it includes necessary and appropriate provision to insure against excessive flange distortion and gross crushing of the gasket.

Investigation of field-erected flange joints has indicated that the probable bolt stress developed manually, when using standard wrenches on alloy steel bolts is:

$$S=45{,}000/\sqrt{d}$$

Where S is the bolt stress and d is the nominal diameter of the bolt.

Experience indicates that these stresses are satisfactory for ASME B16.5 flanges and will comply with the requirements as set forth in the preceding paragraphs. It can be seen that smaller bolts will have excessive stress unless judgment is used in pulling up on them. On the other hand, it will be impossible to develop the desired stress in very large bolts by ordinary hand wrenching. Impact wrenches may prove serviceable, but if not, resort may be had to such methods as preheating the bolt or using hydraulically-powered bolt tensioners. With some of these methods, control of the bolt stress is possible by means inherent in the procedure, especially if effective thread lubricants are employed, but in all cases, the bolt stress can be regulated within reasonable tolerances by measuring the bolt elongation with suitable extensometer equipment.

Generally, simple wrenching without verification of the actual bolt stress meets all practical needs, and measured control of stress is employed only when there is some special or important reason for doing so.
It is possible for the bolt stress to decrease after initial tightening, because of slow creep or relaxation of the gasket, particularly in the case of the "softer" gasket materials. This may be the cause of leakage in the hydrostatic test, in which case it may suffice merely to retighten the bolts. A decrease in bolt stress can also occur in service at elevated temperatures as a result of creep in the bolt and/or flange gasket material, with consequent relaxation.

When this results in leakage under service conditions, it is common practice to retighten the bolts, and sometimes a single such operation, or perhaps several repeated at long intervals, is sufficient to correct the condition.

(Abstracted in part from Appendix S, Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.)

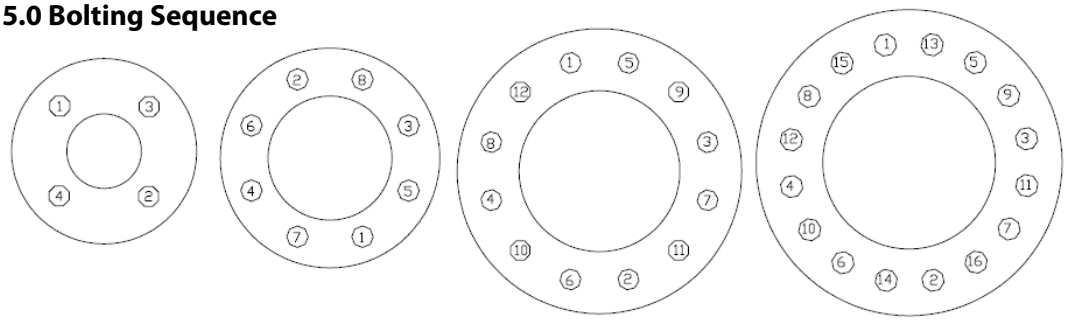
Torque Values

TORQUE VALUES

All values are listed in foot-pounds. A range is supplised. All bolting torqued are based upon the use of a well lubricated bolting.

ASTM A193, Gr B7, B8, B8m and K-500 bolting									
Bolt Diameter (inches)	No. of Threads (per inch)	Minor Diameter (inches)	Area Tensile Stress (sq. inches)	30,000 psi		45,000 psi		60,000 psi	
				Torque (ft/lbs)	Tension (lbs)	Torque (ft/lbs)	Tension (lbs)	Torque (ft/lbs)	Tension (lbs)
1/4	20	.1887	.0318	4	954	6	1431	8	1908
5/16	18	.2443	.0524	8	1572	12	2439	16	3144
3/8	16	.2983	.0775	12	2325	18	3488	24	4650
7/16	14	.3499	.1063	20	3189	30	4784	40	6378
1/2	13	.4056	.1419	30	4257	45	6386	60	8514
9/16	12	.4603	.182	45	5460	68	8190	90	10920
5/8	11	.5135	.226	60	6780	90	10170	120	13560
3/4	10	.6273	.334	110	10020	165	15030	220	20040
7/8	9	.7387	.462	170	13860	255	20790	340	27720
1	8	.8466	.606	260	18180	390	27270	520	36360
1 1/8	8	.9716	.790	375	23700	565	35550	750	47400
1 1/4	8	1.0966	1.000	525	30000	790	45000	1050	60000
1 3/8	8	1.2216	1.233	715	36990	1,075	55485	1425	73980
1 1/2	8	1.3466	1.492	925	44760	1,395	67140	1850	89520
1 5/8	8	1.4716	1.78	1,200	53400	1,800	80100	2400	106800
1 3/4	8	1.5966	2.08	1,500	62400	2,250	93600	3000	124800
1 7/8	8	1.7216	2.41	1,850	72300	2,775	108450	3700	144600
2	8	1.8466	2.77	2,260	83100	3,390	124650	4525	166200
2 1/4	8	2.0966	3.56	3,260	106800	4,890	160200	6525	213600
2 1/2	8	2.3466	4.44	4,500	133200	6,750	199800	9000	266400
2 3/4	8	2.5966	5.43	6,025	162900	9,040	244350	12050	325800
3	8	2.8466	6.51	7,875	195300	11,815	292950	15750	390600

5.0 Bolting Sequence



Long Term Storage of Valves

1.0 GENERAL INFORMATION
For General Operation & Maintenance Information regarding for valves, please refer to Section A of this manual.

2.0 Storage
The following recommendations are for preparing valves and their accessories for long term storage. They are necessary to maintain the valves in proper condition prior to installation into the pipeline. By following these procedures, abrasive and corrosive substances can be prevented from affecting valve performance.

It is the purchaser's responsibility to take the necessary precautions for the protection of valves in storage.

2.1 As shipped condition
Valves are packaged with a moisture resistant closure on the valve ends. Where size permits, plastic plugs or caps are used. On larger size valves, wood covers are sealed with tape and securely attached with metal bands. On valves with pipe flanges the wooden covers are secured with bolts. All other openings are covered with plastic caps or plugs. Parts packaged separately are secured in packaging from the factory to prevent damage during handling and storage. These parts are to be stored off the ground in an area protected from the weather.

2.2 Recommended storage facilities
The following are a list of storage types in order of most preferred to least preferred:

Enclosed weather tight building with a concrete floor.
Enclosed building with a dirt floor. Valves must be on pallets.

Open air, valves on pallets on a concrete floor covered with a tarpaulin (This is not recommended for more than six months)

Open air, valves on pallets on a dirt floor and covered with a tarpaulin (This is not recommended for more than six months)

2.3 Inspection
Periodic inspections should be performed on all stored valves and parts. The frequency of these inspections should be determined by the type of storage facilities and weather conditions. A minimum, all parts and valves should be inspected every 4 to 6 months. Inspect for dirt, moisture or any other type of contamination. If any is found the valve is to be thoroughly cleaned and dried. Repeat the above listed packaging procedure to ensure the valve is weather tight. Slight external rusting may occur on valves stored outside. This will have little or no effect on their performance. If units are stored for more than 6 months we recommend that gate and globe valves be cycled open to close every 6 months to keep the packing from adhering to the stem and to help lubricate the stem and yoke. Heavy internal rust however, may be harmful and must be corrected.

2.4 Preparation for installation into the pipeline
Inspect valves as per the above instructions and remove any contamination, assuring that the valve is clean and dry. Re-torque all bolting to factory specifications to compensate for possible bolt relaxation, which may occur during long storage. Ensure that all foreign material has been removed from the valve.

VALVE INSTALLATION

1.0 GENERAL INFORMATION
For general valve information, please refer to Section A of this manual.

2.0 Introduction
By exercising proper care in the installation of CRANE® valves, the probability of trouble-free service will be enhanced. It is important to recognize that in the transport, handling and storage of a valve between the time of manufacture and the time of installation, there are numerous possibilities for accident or error, which may affect valve performance.

All valves should be handled/installed in such a manner as to comply with all applicable state, local and federal safety regulations including, but not limited to OSHA regulations. Personal Protective Equipment (PPE) should also be used in compliance with all regulations.

3.0 INSPECTION AND HANDLING
Before installation of the valve, it is important to determine that the valve is in satisfactory condition. It may be helpful to observe the following points, in order to avoid subsequent valve problems:

3.1 Carefully unpack valve and note any special warning tags or identification plates attached to the valve; take appropriate action.

3.2 Check the valve for any markings indicating flow direction. If flow direction is indicated, appropriate care should be exercised to install the valve in the proper flow orientation. Check valves and non-return valves are uni-directional and must be installed in the proper orientation.

3.3 Inspect the valve interior through the end ports to determine that it is clean and free from foreign matter and/or harmful corrosion. Remove any special packing materials (blocks to prevent disc movement) or packages of desiccant. The wedge/discs of weld end gate/globe valves should be lightly closed during welding of the valves into the pipeline.
3.4 Check the pipeline to ensure that it is properly aligned and supported. Expansion joints or bends should be installed in the pipeline to compensate for expansion and contraction.

3.5 Do not pick up the valve by the handwheel.

3.6 Immediately prior to valve installation the interior of the piping should be checked for cleanliness and freedom from foreign materials.

4.0 INSTALLATION
All valves should be installed in such a manner as to prevent exposure to excessive vibration and process flow turbulence. Check valves specifically are subject to increased turbulence and wear due to their position in a piping system. At a minimum, bolted bonnet check valves should have 10 pipe diameters of straight pipe immediately upstream of the valve and they should not be placed close to pumps, valves or other fittings.

4.1 Threaded Valves
For tight sealing, threaded pipe joints depend on a good fit between the male and female pipe threads, and, usually, the presence of a special soft or viscous material between the assembled threads. For best assurance of a leak-free system the following points should be observed:

4.1.1 Check the threads on both the valve and the mating pipe for form and cleanliness. Inspect for obvious dents, deformation of the thread or out-of-round areas. Ensure that no chips or grit are present.

4.1.2 Note internal length of threads in valve ends, and proximity of valve internal seat or wall. Observe any need for care regarding how far pipe is threaded into valve. If there appears to be a possibility of a problem, carefully check the pipe end thread, to make sure there is no extended straight portion beyond the standard tapered sections.

4.1.3 Use care to align threads at point of assembly. Tapered pipe threads are inherently loose fit at entry; substantial wrenching force should not be applied until it is apparent that threads are properly engaged.
4.1.4 Apply appropriate tape or thread compound to the external pipe threads (except when dry seal threading is specified).

4.1.5 Assemble joint wrench-tight. Wrench on valve should be on the valve end into which the pipe is being threaded.

⚠ CAUTION ⚠

Because there is no clear limit on the torque that may be developed in a tapered thread joint, it is possible to damage valves by applying excessive twisting forces through the body.

4.1.6 Repeat the process at second valve end. Again apply wrench at end of valve to which pipe is being assembled.

Installation

5.0 TESTING AND ADJUSTMENT

5.1 When a valve has been properly inspected and installed, it is reasonable to assume it will be in good condition and ready to operate. Nevertheless, it is at this time that the valve is at the end point of its more vulnerable phase. Operability can be proven only by test.

5.2 At this point valves having adjustable stem seals should be checked to determine that packing has been properly installed and gland bolting has its initial adjustment. Additional adjustment should be determined according to need as valve operability is checked and as system pressure is introduced.

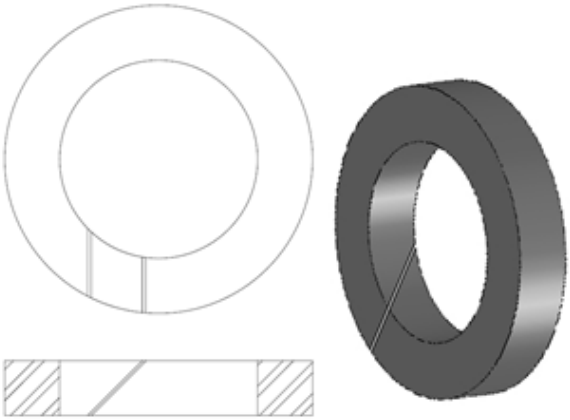
5.3 A first observation can be made by actuating the valve through an open-close, or close-open cycle. If no obvious problems are observed, an actual test at pressure may be applied while tightness and operability are checked.

5.4 It is a fairly common practice after the installation of piping systems to clean the systems by blowing with gas or steam or flushing with a liquid to remove debris and/ or internal protective films and coatings. It should be recognized that valve cavities may form a natural trap in a piping system and material not dissolved in or carried out by the flushing fluid may settle in such cavities and adversely affect valve operation. Also, abrasive material carried by a high velocity fluid stream may cause serious damage to seating surfaces. Again, great care should be taken to ensure that the valve is free of all debris prior to operation.

5.5 Upon installation, new valve lubrication should be applied to all lubrication points.

Section H:

Packing & Gasket Maintenance and Valve Lubrication.



VALVE INSTALLATION

1.0 GENERAL INFORMATION

For general valve information, please refer to Section A of this manual.

2.0 Introduction

By exercising proper care in the installation of CRANE® valves, the probability of trouble-free service will be enhanced. It is important to recognize that in the transport, handling and storage of a valve between the time of manufacture and the time of installation, there are numerous possibilities for accident or error, which may affect valve performance.

All valves should be handled/installed in such a manner as to comply with all applicable state, local and federal safety regulations including, but not limited to OSHA regulations. Personal Protective Equipment (PPE) should also be used in compliance with all regulations.

3.0 INSPECTION AND HANDLING

Before installation of the valve, it is important to determine that the valve is in satisfactory condition. It may be helpful to observe the following points, in order to avoid subsequent valve problems:

3.1 Carefully unpack valve and note any special warning. **1.0 GENERAL INFORMATION**

For general valve information, please refer to Section A of this manual.

2.0 PACKING MAINTENANCE

2.1 Inspection of the valve stem / bonnet seal should be an essential part of routine monthly valve maintenance inspections.

2.2 If inspection indicates the seal is leaking, the bolts holding the gland flange should be tightened uniformly (one quarter of a turn at a time) until leakage stops.

⚠ CAUTION ⚠

Extreme care should be taken when working on or around any pressurized equipment. Tightening of bolting beyond this point results in over compression of the packing against the stem, thereby producing excessive wear and loss of packing material. If difficulty is experienced in achieving satisfactory sealing without producing excessive stem friction, it may be desirable to increase or to replace the packing material.

2.3 If gland travel is fully taken up and leakage does not stop, a careful examination of the stem should be undertaken. Operation of a valve on a regular basis will minimize corrosion between the stem and packing material. Any deterioration of the stem surface which is in contact with the stem seal or packing (such as dents, scratches, pitting or general corrosion) must be recognized as a probable cause of leakage problems. The valve stem should be examined to determine if it has become bent or misaligned. If any of the above conditions exist, the stem must be refinished or replaced. If the stem is undamaged and the valve continues to leak, addition to or replacement of the packing is necessary.

2.4 Replacement packing should be dry and free of all types of contamination prior to installation in the stuffing box. The new packing should also be compatible with both the valve stem material and the material in the piping system, at operating temperatures and pressures.

⚠ CAUTION ⚠

It is extremely dangerous to remove the bolting, gland flange and gland to replace the packing with pressure in the pipeline. Always depressurize the valve/pipeline before dismantling the stuffing box. Although specific procedures may vary with specific valve and packing designs, the following rules always must be considered.

3.0 Packing installation and instructions

3.1 Remove / drain system pressure from the valve.

3.2 Loosen and remove nuts holding gland flange in place. At this time, the gland flange and the gland will be free to move up the stem and the stem packing is exposed (refer to appropriate valve Section for identification of parts).

3.3 Remove old packing. Use caution to ensure that tools used to remove packing do not scratch either the stem shaft or the inside of the stuffing box. Clean shaft and box thoroughly.

3.4 Replace original packing with packing indicated on the applicable spare parts listing. (In most cases, the packing will be a die-formed graphite/ braided carbon set). Use all new packing. Never install used rings.
3.4.1 To open split ring joints, twist the open ends in opposite directions, the packing ring should resemble an "S". Install each new packing ring separately, tamping each one before installing the next. Ensure that rings are not cocked and that air is not entrapped between adjacent rings.

3.4.2 The joints of split packing rings should be staggered 90 degrees to 120 degrees from the joints of adjacent rings.

3.4.3 If the valve has a lantern ring, make sure it is replaced in its original position.

3.4.4 The gland may be used to set the packing in the bottom of the stuffing box.

3.5 Replace the gland and gland flange and hand tighten the gland nuts. Then tighten the gland nuts to approximately 40 ft. lbs, this is an approximation, and will vary depending upon the valve size and pressure rating.

Actual packing adjustment is more of a skill than a exact science.

3.6 Manually open and close valve several times to ensure all parts are working smoothly under pressure and to help"set" the packing.

3.7 After several days, inspect valve for leakage. Slight adjustment may be required.

3.8 The following suggestions apply if Chevron type Teflon packing is used:

3.8.1 Ensure that sections of the lips of the rings are not turned over.

3.8.2 Ensure that the packing rings are facing in the direction of the medium being sealed - whether it is liquid or gas.

4.0 GASKET MAINTENANCE
NOTE: The following information refers primarily to valves that have been repaired/reconditioned previously. It is always a sound practice to inspect and maintain all sealing areas. Inspection of the valve body/bonnet joint should be a part of routine maintenance inspection after installation and start-up. Flanged valves should have the flange ends inspected at the same time. In addition to improper gasket installation procedure, thermal changes, pressure changes, vibrations etc also may cause leakage. If re-torqueing of the bolting does not stop the leakage, the flanged joint should be unbolted and the gasket carefully examined.

Gasket Maintenance

Possible Remedies	
Gasket Corroded	Select a replacement material with improved corrosion resistance.
Gasket extruded excessively	Select replacement material with better cold flow properties,, select replacement material with better load carrying capacity – i.e., more dense
Gasket grossly crushed	Select replacement material with better load carrying capacity, provide means to prevent crushing the gasket by use of a stop ring or redesign of flanges.
Gasket mechanically damaged due to overhang of raised face or flange bore	Review gasket dimensions to insure gaskets are proper size. Make certain gaskets are properly centered in joint
No apparent gasket compression visible	Select softer gasket material. Select thicker gasket material. Reduce gasket area to allow higher unit sealing load. Inspect flange dimensions.
Gasket substantially thinner on O.D. than I.D.	Indicative of excessive "flange rotation" or bending. Alter gasket dimensions to move gasket reaction closer to bolts to minimize bending movement. Provide stiffness to flange by means of back-up rings select softer gasket material to lower required seating stresses. Reduce gasket area to lower seating stresses.
Gasket unevenly compressed around circumference.	Improper bolt-up procedure followed. Make certain proper sequential bolt up procedures are followed.
Gasket thickness varies periodically	Indicative of "flange bridging" between bolts or warped flanges. Provide additional bolts if possible to obtain better load distribution. If flanges are warped, re-machine, or use softer gasket material.

CRANE

Gasket Installation Procedures

5.0 GASKET INSTALLATION PROCEDURES

Regardless of the type of gasket being used or the materials of construction, certain basic procedures must be followed during assembly to ensure proper operation.

5.1 Inspect the gasket seating surfaces. Look for tool marks, cracks, scratches or pitting by corrosion and make sure that the gasket seating surface is proper for the type of gasket being used. Radial tool marks on a gasket seating surface are virtually impossible to seal regardless of the type gasket being used, therefore every attempt must be made to minimize them.

5.2 Inspect the gasket. Make sure the material is as specified, look for any possible defects or damage in the gasket.

5.3 Inspect and clean each stud or bolt, each nut, each washer, and the facing on the flanges against which the nuts will rotate. Look for severe galling, pitting, etc. If any of the above mentioned items are damaged beyond repair, replace the damaged item.

5.4 Lubricate all thread contact areas and nut facings. The importance of proper lubrication cannot be over-stressed. No joint should be made up without the proper lubricant being applied to the threaded surfaces and to the nut facings. When flanges will be subjected to high temperatures, the use of an anti-seize compound should be considered to facilitate subsequent disassembly.

5.5 With raised face and flat face installation, loosely install the stud bolts on the lower half of the flange. Insert the gasket between the flange facing to allow the bolts to center the gasket on the assembly. Install the balance of the bolts and nuts and bring all to a hand-tight or snug condition.

5.6 If the gasket is being installed in a recess or a groove, center the gasket midway into the recess or the groove. If the joint is vertical it may be necessary to use some cup grease or a few dabs of gasket cement or some other adhesive compatible with the process fluids, to keep the gasket in position until the flanges are tightened.

5.7 Torque the bolts up to a maximum of thirty percent of the final torque value required following the sequence recommended. See Section E for bolting sequence and torques. Number bolts so that torqueing requirements can be followed. With any gasket material, it is extremely important to follow a proper bolting sequence. If this sequence is not followed, the flanges can be cocked. Then, regardless of the amount of subsequent torqueing, they cannot be brought back parallel. This problem, of course, is maximized on metallic gaskets more so than on non-metallic.

5.8 Repeat step 5.7, increasing the torque to approximately 50 to 60 percent of the final torque required.

5.9 Continue with a star pattern of re-torqueing all studs or bolts to the desired amount until no further rotation of the nuts can be achieved. This may require several re-torquings since as one stud is torqued it will relieve the stress on the adjacent stud until such time as equilibrium is achieved.

5.10 On high-pressure, high-temperature applications, it is recommended that the flanges be re-torqued to the required stress after 24 hours at operating pressures and temperatures to compensate for any relaxation or creep that may have occurred.

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