INSTALLATION AND MAINTENANCE MANUAL FOR PRESSURE SEAL GATE VALVES
I. INTRODUCTION

A. Information about KITZ Corporation of California

KITZ Corporation of California, KCC, designs and manufactures valves for a wide range of applications. Many of our valves are specially designed to meet the unique needs of our customers. This “Installation and Maintenance Manual” describes how to install, operate and maintain the pressure seal valves. An authorized factory representative should be contacted for additional information when it is necessary to rebuild the valve. If you have any questions or need additional information KCC is located in Alameda, CA and can be contacted at (510) 749-3900 between 7am and 5pm Pacific time.

The proper installation and maintenance of the valves supplied by KCC will increase both their life and reliability. KCC provides consulting and maintenance services to support the unique needs of our customers. These services can be provided at your facility or at our authorized service facilities with support from our Alameda Engineering and Manufacturing Plant as required. When possible, KCC should be contacted at least six weeks prior to the date services will be required. This will allow adequate preparation time and ensure the availability of the most qualified staff to provide the needed services.

B. Safety Precautions

KCC has designed this valve to meet the applicable industry codes. At no time should the integrity of the pressure boundary be breached while the valve has the potential to be pressurized. When performing maintenance of any nature on this valve the user should have procedures in place that will ensure the safety of all personnel and equipment in the area. Special care should be exercised when performing any in-line servicing. A written step-wise procedure should be developed for all in-line maintenance. The user should have an experienced valve specialist verify that these procedures adequately address all potential safety issues applicable to their installation.

II. INSTALLATION INSTRUCTIONS

A. Preliminary

KITC ships all valves ready for installation. Do not disassemble the valve prior to installation unless specific instructions are provided by our engineering staff. If your installation procedure for weld in valves includes thermal stress relieving or other heat treatments, those procedures should be provided to our engineering staff prior to valve shipment or installation. Failure to provide KCC with this information may result in damage to the valve internals during installation. This manual provides disassembly instructions that are intended for use when inspecting or refurbishing the valve after it has been in service. If the valves are disassembled for any reason, that procedure should be followed and an adequate supply of spare parts should be available for each valve.

The valves are shipped in the closed position with the port ends covered to prevent damage to the seating surfaces and foreign matter from entering the valve interior. Before installing the valves, examine the lines and the valve ports for any foreign objects. It is generally considered good practice to “Blow” all lines prior to installation of components or equipment that can be damaged by foreign matter.

When possible this should be done prior to the installation of the valve. For welded in valves, the valve closure member should be in the 15 to 25 percent open position during the entire installation procedure. This is intended to prevent damage to the seating surfaces, closure member, and valve stem due to thermal growth.
Make sure that there is no line sag and that the pipe line can support the weight of the valve at the point of installation. Pipe hangers, anchors or other similar devices should be used to support the weight of the pipe and valve. The pipe ends should line up with the valve ends in a manner that will not place additional forces on the valve body or the supporting equipment during installation. When handling the valve assembly make sure that lifting equipment will securely and safely support the valve assembly during the installation process. Please refer to the appropriate valve drawing for installed weights of each valve and actuator combination.

B. Valve Types Covered by This Manual

GATE VALVES – These valves are generally used for full flow and tight shut-off applications where line pressure losses need to be minimized. The valves have bi-directional shut-off capabilities. Therefore valves may be installed in either position convenient to access the valve operator manual override.

C. Valve – welding, bolting, materials

The valves covered by this manual were designed to be mounted with the valve stem in the vertical position above the pipe line. KCC should be consulted if the valve will not be installed with the stem in the vertical direction. The valve ends should be aligned so that the center line of ends are within 0.0626 inches of the center line of the mating pipe.

The valve may be supported by lifting at the yoke during installation. This lifting point or straps under the valve body are the only support and lifting points that should be used during installation. DO NOT lift the valve by the hand-wheel. This valve comes with butt-welded ends and is designed to be welded into the line. The valve body, part #1 is constructed using the material shown in the reference drawing. The user is responsible for selecting and implementing the appropriate welding procedure, pre and post heat treatments (when required), and other materials suitable for their actual process operating conditions. Prior to welding in the line, KCC should be provided with copies of any pre or post heat treatment procedures that will result in valve component temperatures exceeding 1100°F. When heat treating using thermal blankets, only the butt welded sections should be covered by the blankets.

D. Packing Adjustment

The valve packing was adjusted prior to the valve being shipped from KCC. However, it is often necessary to tighten the packing shortly after or during initial operation when the valve is first subject to operating pressure and temperature. When ever possible the valve should be fully stroked after each packing adjustment. There are two packing adjustment nuts, Part #15 on this valve. Both nuts should be adjusted the same number of turns, 0.5 to 2, and then the valve should be stroked. This process should be repeated until all stem leakage is stopped.

III. MAINTENANCE

A. Safety Precautions

When performing maintenance of any nature on this valve the user should have procedures in place that will ensure the safety of all personnel and equipment in the area. At no time should the integrity of the pressure boundary be breached while the valve has the potential to be pressurized. Special care should be exercised when performing any in-line servicing. A written step-wise procedure should be developed for all in-line maintenance procedures.
B. Tools & Equipment

This valve can be disassembled and reassembled using standard tools and following the procedures in this manual. The tools should be in good condition and the proper type does not damage the machined surfaces of the valve parts, bolts, or nuts. Use of “pipe wrench” and “vise-grip” type tools that “bite” into the machined surfaces should be avoided. When a special tool is required for regular maintenance of the valve, the purchaser will be given the option to purchase that tool for shipment with the new valve. If the user is going to rebuild the valve, additional special tools may be required. The tools and skills required to rebuild or refurbish the valve is beyond the scope of this manual. An authorized factory representative should be contacted for additional information when it is necessary to rebuild the valve.

C. Preventive and Routine Maintenance

The procedures in this manual are written for use by experienced valve maintenance personnel. They are intended to be a description of how the valve is designed and constructed. They are not intended to replace operating maintenance, or safety procedures that are of the users responsibility.

The valve should be visually inspected by plant operations staff during the normal plant rounds. Any leakage, excessive or unexplained noise, or other unusual conditions should be immediately reported to plant maintenance staff. The need and schedule of inspections by plant maintenance staff will be dependent on the process operating conditions, the amount of dirt and moisture in the air and the criticality of the valve to the operation of the facility.

The only preventive maintenance that is normally required is the cleaning and lubrication of the stem and stem nut. The valve stem should be kept clean and free of contaminates. This will reduce packing wear when the valve is stroked and reduce the potential for packing leaks. The threads on the valve stem should be kept clean and lubricated. The packing should be adjusted following the procedure in this manual whenever leakage is observed.

If a bevel gear actuator has been supplied with your valve. The manufacturer’s recommendations should be followed unless KCC has provided specific written instructions to the contrary.

D. Packing Adjustment and Replacement

The packing system used on the valve consists of five graphite rings sandwiched between two braided graphite anti extrusion rings. It is adjusted by tightening the packing adjustment nuts, part #15. This forces the gland flange, part #13 to push the gland, part #12 into the bonnet and compresses the packing between the stem and the bore in the bonnet. When the packing is compressed it increases the sealing pressure and the forces required to move the stem. In order to minimize the forces required to move the stem and thus operate the valve, the stem should be fully stroked after each packing adjustment. There are two packing adjustment nuts, part #15 on this valve. Both nuts should be adjusted the same number of turns, 0.5 to 2, and then the valve should be stroked. This process should be repeated until all stem leakage is stopped.

The life of the packing is dependent on several variables related to operating frequency and stem surface conditions. The packing is considered to have exceeded its useful life when the gland bottoms out on the bonnet. Since this is an unsafe condition, replacement should be scheduled prior to this happening. In some cases it is possible to add additional packing rings to extend the service life of a packing set to the next scheduled system outage.
E. Replacing or Adding Packing Rings – *It is recommended that this entire procedure be read before starting the process of adding packing rings.*

Preparing the valve for work – This portion of the procedure is applicable to both the replacement of packing and the addition of packing rings.

- The required materials to perform this process are a packing hook or sharp pointed awl, a flat tool, replacement anti-extrusion ring(s) and the necessary number of packing rings.

- The valve should be put in a safe condition by de-pressurization. KCC does not recommend adding or replacing packing while the valve is pressurized.

F. Removal of the Upper Anti-Extrusion Ring

1. Loosen the packing nuts, part #15, two turns each. If there is no continuous leakage and the nuts turn freely they may be completely removed.

2. If the valve leaks continuously through the packing the valve may not be isolated from the system. If the back seat is leaking, the valve will have to be pressurized and isolated prior to proceeding.

3. Remove the packing gland, part #12 and the packing gland flange, part #13.

4. The Anti-extrusion ring, part #11a must be removed before additional packing can be added. This is easily accomplished by using a packing hook or awl and “hooking” this fiber ring. The ring is split at a 45° angle so that it can be removed without removal of the actuator assembly. Extreme care is required so that the stem and bonnet gland surfaces that seal against the packing are not scratched.

If all the packing is to be replaced step 4 is repeated for each packing ring, part #11 and the lower anti-extrusion ring, part #11a. If additional packing rings are being added to make up for wear then proceed to step 4 of the “Packing Replacement” procedure.

G. Packing Replacement

1. Inspect the stem and the bonnet gland surfaces and polish out any scratches. Both surfaces should have an “RMS” finish of 16 or better before the new packing is installed.

2. Replace the lower anti-extrusion ring by carefully pushing it into the packing gland. Note the location of the split in the anti-extrusion ring.

3. Insert the split ring and adapters and push the ring to the bottom of the packing chamber. Check to ensure that the split ring has not reversed the lap joints during this operation.

4. Measure the distance from the top of the existing packing to the top of the bonnet. Subtract the height of the anti-extrusion ring plus 0.25 inches. The remaining height is then divided by 75% of the height of a single packing ring. The whole number is the number of packing rings that will be added.

5. Insert the first new packing ring into the packing chamber with the split 120° clock-wise from the last ring that was added. If new packing is being added to existing packing it should be placed on top of the existing packing.

6. The split pre-compression ring tool is now used to compress the packing rings added in step 5. Insert the split rings and reassemble the packing gland and flange.

7. Replace and alternately tighten the packing nuts in increments of 20 ft/lbs until each nut requires at least 125 ft/lbs of torque to turn. The packing gland should now be uniformly loading the packing rings.

8. If process conditions and safety conditions permit, re-pressurize the valve internals. This step may be delayed until later in this procedure if leakage by the packing is not acceptable.

9. Stroke the valve a minimum of the height of two packing rings; full stroke is preferred.
10. Alternately tighten both nuts no more than two turns at a time until the tightening torque again reaches 125 ft/lbs. Stroke the valve a minimum of the height of two packing rings; full stroke is preferred.
11. Repeat step 10 until the new packing has been compressed 25 to 35%.
12. If additional packing rings are to be added; repeat this process starting with placing the valve and system in a safe condition, step F-1. If the valve has not been re-pressurized, the process should be repeated from step 5 after removing the packing gland, gland flange, and split rings used to compress the packing. If no more packing is being added, proceed to the next step.
13. The anti-extrusion ring should be reinstalled by pushing it down into the packing area. Uniformly move the packing and this ring at least 0.125 inches below the top of the bonnet. If the old anti-extrusion ring is damaged, the spare anti-extrusion ring should be installed.
14. Slide the packing gland and the packing gland flange back into place. Replace and alternately tighten the nuts 20 ft/lbs at a time until each nut requires 125 ft/lbs of torque to turn. The packing gland should now be uniformly loading the packing rings.
15. If process conditions and safety conditions permit, re-pressurize the valve internals. This step may be delayed until later in this procedure if leakage by the packing is not acceptable.
16. Stroke the valve minimum of the height of two packing rings; full stroke is preferred.
17. Tighten both nuts no more than two turns at a time until the tightening torque reaches 125 ft/lb. Stroke the valve a minimum of the height of two packing rings; full stroke is preferred.
18. Repeat step 17.
19. If the valve has been pressurized during the above steps and it is still leaking past the packing, additional tightening of the packing is required. Both nuts should be adjusted the same number of turns, 0.5 to 2, and then the valve should be stroked. This process should be repeated until all stem leakage is stopped.
20. If the valve is going to be pressurized in this step, additional tightening of the packing may be required to stop leakage. Both nuts should be adjusted the same number of turns, 0.5 to 2, and then the valve should be stroked. This process should be repeated until all stem leakage is stopped.

H. Recommended Spare Parts

The need to maintain an inventory of spare parts and the level of that inventory is dependent on several factors. These factors are related to the cost of the spare parts, the storage space and environment required, the “cost” of not having or waiting for the parts, and other factors that are unique to each installation. Many KCC valves are designed for special operating conditions in Section 1-C, the combination of need for, and cost of, spare parts must be carefully evaluated. The specific requirements for applications where facility down times is critical should be discussed with a factory representative.

This manual identifies the spare parts that should be on-site during normal operation of the valve and when performing regular maintenance. For sites where there are five or more KCC valves of the same design and size it may be cost effective to increase the level of others. The factory should be consulted for a list of the spare parts required to rebuild or refurbish a valve. The following spare parts are recommended and should be ordered with the original purchase of the valve.

- Packing Set - part #11
- Pressure Seal - part #6
It may be cost effective for critical processes to stock the spare parts listed below.

- Valve Disc/Wedge - part #3
- Valve Stem - part #5

IV. DISASSEMBLY PROCEDURE

A. Safety Precautions

When performing maintenance of any nature on this valve the user should have procedures in place that will ensure the safety of all personnel and equipment in the area. At no time should the integrity of the pressure boundary be breached while the valve has the potential to be pressurized. Special care should be exercised when performing any in-line servicing. A written step-wise procedure should be developed for all in-line servicing, or other maintenance procedures.

The complexity and danger associated with the disassembly of a valve will be dependent on many factors and the coverage of all these factors is beyond the scope of this manual. The factors discussed here that may effect the safety of personnel and equipment are intended to be the starting point for the development of the required safety related maintenance procedures, not a check list.

Isolation of valve from process conditions- The valve must be either removed from the system or adequately isolated prior to the start of any physical disassembly procedures. If the valve has been used on fluid systems with components that may be harmful to humans or damaging to equipment, the valve should be drained and cleaned prior to disassembly.

Corrosion of parts- The degree of corrosion and thus the difficulty of disassembly will be directly related to the level of corrosion of the valve parts. This can increase the force required to disassemble components and result in the failure of tools and parts. Prior to using the lifting lugs on the valve (if furnished) they should be inspected to ensure that the connection to the body is not corroded.

Lifting of parts- The equipment used to lift or remove valve components should be capable of safely carrying the weight of all components it will be required to lift or in any way support.

Removal clearances- When the valve is disassembled in-line or in an area where space is limited, the valve drawing should be reviewed to ensure that there will be adequate space to remove all components. A hazardous condition is often created when a component gets “stuck” in the middle.

B. Kitz Support

Services to support the disassembly of these valves can be provided by KCC engineering staff at your facilities, or done at one of our authorized service facilities. We are also able to provide additional consulting services to support your unique needs. These services can be provided at your facilities or at our authorized service facilities with support from our Alameda Engineering and Manufacturing Plant as required.

If you have any questions or need additional information, KCC is located in Alameda, California and can be contacted at (510) 749-3900 between 7:00 am and 5:00 pm Pacific Time.)
C. In-Line Servicing

Many of the valves designed and built by KCC have been designed to be serviced without removal from the system. There are many advantages to this feature with a few significant limitations. Each application should be reviewed to determine the expected work prior to deciding to disassemble the valve in-line.

Limitations

The primary limitation is the ability to do precision machining on the parts that cannot be removed from the line. Other limitations can result from space constraints, environmental effects such as rain and cold, limited access to body interior, and work rules.

Advantages

The primary advantages are the reduction in cost and complexity for welded valves. Other advantages can result from reduced lifting and equipment handling requirements, reduced actuator power and signal reconnections, and reinstallation cost.

D. Removal From the Line for Servicing

The operating environment, the repairs required, or other constraints may require that the valve be removed from the line for servicing. In these cases the procedure(s) to be used should be reviewed by qualified plant staff to ensure that all necessary factors have been considered.

Limitations

The major disadvantage of removing the valve from the system is the cost of cutting out a welded in valve, and then having to re-weld and possibly heat-treat the valve upon reinstallation. Another limitation may be the ability to apply process conditions to the valve. However, most maintenance shops have facilities to pressurize the valve. Other major considerations include supporting the valve during removal of the stem/bonnet/disc assembly, clean up of hazardous fluids, and the potential for fire hazards. The valve stem should be supported in the vertical position when it is disassembled and this may be a problem with some valves. Extra care must be taken to prevent the valve body from moving when the stem/bonnet/disc assembly is being removed.

Advantages

The primary advantage is the ability to control the work environment and use a wider variety of tools and equipment to service the valve components. When the valve is removed from the line, a more complete inspection can be performed on the body internals. Safety constraints and work rules may be more relaxed, or the valve can be sent out for repairs.

E. Tools & Equipment

The following tools are required for the disassembly of the valve and removal of the actuator.

1. Socket wrenches, box and open-end wrenches of the appropriate sizes.
2. Screw drivers, pliers and soft mallet.
3. Lifting equipment capable of handling the heaviest component to be lifted.
F. Yoke Removal

a. Loosen and remove the yoke clamp nuts, part #20 which holds the yoke in place.
b. The yoke can now be lifted from the valve body.

G. Bonnet, Stem, Wedge Removal

The bonnet, part #2, the stem, part #5, and the wedge, part #3, assembly should be removed as a unit if possible. This will reduce the potential for damage to the stem surfaces that seal against the packing. If it is necessary to remove the bonnet and leave the stem in the valve, the procedure for removing the packing should be used prior to starting this procedure.

1. Loosen the cap screws, part #10, that are used to pre-load the bonnet. Using a mallet and a block of wood, tap around the perimeter of the bonnet retaining plate, part #9, until the bond between the bonnet and the pressure seat ring is released.
2. Move the bonnet into the body so that the bonnet retaining ring, part #8 can be removed.
3. Push the bonnet into the body until the large diameter is clear of the bonnet retaining ring. The bonnet retaining ring is actually four pieces and is removed one piece at a time.
4. Remove the spacer ring, part #7.
   The next three steps have been found to be effective when breaking the bond between the pressure seal ring and the body. If that bond has already been broken then the stem can be used to pull the entire bonnet, stem and disc assembly out of the body; go to step #8.
5. Replace the bonnet retaining plate, part #9.
6. Hand tighten the cap screws, part #10, until the bonnet is held tightly in place. The cap screw should be tightened so that the entire pressure seal ring is uniformly loaded. Care must be taken so that the bonnet is not wedged or cocked in the body.
7. Tighten the cap screws 0.5 turns at a time, 180º apart, until all cap screws have been tightened. Repeat this process until the bond between the pressure seal and the body is broken.
8. The stem can now be used to lift the entire bonnet, stem, disc assembly out of the body. The lifting equipment should be setup so that it can support the stem, bonnet, disc assembly during removal. Extreme care should be exercised when removing this assembly. The weight of the components to be lifted can be as much as 30% of the total valve weight. The method of attachment to the stem for lifting must be capable of supporting this load. The section on “Disassembly of bonnet, stem, wedge assembly” that follows should also be reviewed.
9. The back-seat guide bushing located in the lower portion of the bonnet must be machined out if it is damaged. In this case, KCC should be contacted for specific instructions.
10. Remove the bonnet retaining plate, bonnet, stem, and wedge.
11. The spacer ring and the pressure seal may now be removed from the bonnet.

H. Inspections

The stem, packing gland bore, and wedge faces should be inspected for scratches and corrosion. Damaged parts must be refurbished or replaced. KCC should be consulted for information on specific parts. The pressure seal ring should be checked for deformation, cracks or scratches and corrosion. KCC recommends replacement if there is any visible damage to this ring. The sealing surfaces in the valve body should also be inspected for damage. These surfaces include the two seat surfaces and the pressure seal surface.
V. REASSEMBLY PROCEDURE

A. Safety Precautions

Adequate safety procedures should be in place to ensure the safety of all personnel during the assemble process. The valve should be assembled and tested before being put back in service. The safety concerns raised in this manual are intended only to point out generic concerns that should be the starting point for safe working practices when working on KCC valves.

Isolation of valve from process conditions - The valve must be adequately isolated from the process prior to the start of any assembly procedures. If the valve has been cleaned with components that may be harmful to humans or damaging to equipment, the valve should be flushed prior to re-assembly.

Lifting of parts - The equipment used to lift or remove valve components should be capable of safely carrying the weight of all components it will be required to lift or in any way support.

Re-assembly clearances - When the valve is re-assembled in-line or in an area where space is limited, the valve drawing should be reviewed to ensure that there will be adequate space to install all components, a hazardous condition is often created when a component gets “stuck” in the middle.

B. Kitz Support

Services to support the re-assembly of these valves can be provided by KCC engineering staff at your facilities, or done at one of our authorized service facilities. We are also able to provide additional consulting services to support your unique needs. These services can be provided at your facilities with support from our Alameda Engineering and Manufacturing Plant as required.

If you have any questions or need additional information, KCC is located in Alameda, California and can be contacted at (510) 749-3900, between 7:00 am and 5:00 pm Pacific Time.

C. Maintenance Shop & In-line Servicing

Once the valve parts have been restored to design specification, the valve may be re-assembled in the shop or in the line. If the valve has been removed from the line for servicing it is generally advisable to do the re-assembly in the shop. However, since these valves are designed to be welded into the system it is not likely they will be removed for servicing.

D. Tools & Equipment

The following tools are required for the re-assembly of the valve and replacement of the actuator.

1. Socket wrenches, box, and open-end wrenches of the appropriate sizes.
2. Screw drivers, pliers, and soft mallet.
3. Lifting equipment capable of handling the heaviest component to be lifted.
E. Cleaning and Lubrication

Prior to re-assembly all components should be cleaned with a suitable solvent to remove dirt, grease and other material. The valve actuator, stem nut, thrust bearings, and stem should be lubricated with high temperature grease (Mobil #28) after they are cleaned. The stem should be assembled on the valve prior to applying lubrication.

F. Stem/Wedge Assembly

Place the stem in the vertical position and slide the wedge into the stem T-Head.

G. Bonnet, Stem, Wedge Assembly

1. The bonnet will be lowered down the stem toward the wedge. Extra care should be taken so that the stem threads do not scratch any of the machined surfaces that either guide the stem or seal the packing.
2. The pressure seal ring and spacer ring should be placed on the outside diameter of the bonnet from the top.
3. The bonnet, stem, wedge assembly must now be supported so that it can be lowered into the body.
4. The guiding surfaces on the side of the wedge should be aligned so that they can slide down the guides in the valve body. Slide the wedge into the body until it is in contact with these guides.
5. Slide the bonnet down the stem until it is also in contact with the machined sealing surface bore in the valve body. The entire assembly can now be lowered until the valve wedge rests on the valve seats.
6. The bonnet retaining ring can be up to (4) pieces. Prior to installing this ring, the pressure seal ring and the spacer ring must be below the groove in the body of the bonnet retaining ring. The retaining ring pieces are placed into the groove clear of the outside diameter of the bonnet that will hold them in place.
7. The bonnet, stem, wedge assembly is now pulled up until the bonnet rests on the bonnet retaining ring.
8. Place the bonnet retaining plate on the bonnet and thread on the cap screws. This will keep the bonnet from dropping.
9. The valve may be repacked at this time, refer to the section on “Packing Replacement” in this manual.

H. Re-establishing the Pressure Seal

The valve should be isolated from the system so that the pressure used to re-establish the pressure seal will not damage other equipment. The pressure source should be capable of supplying fluid in the liquid state at 1.5 times the maximum operating pressure of the valve. A higher pressure may be used as long as it does not exceed the hydrostatic test pressure rating of the valve.

1. Tighten the cap screws in the bonnet retaining plate to uniformly pre-load the pressure seal. The cap screws should be tightened in 10 ft/lb increments around the entire diameter to a torque shown on Attachment A.
2. Open the valve fully so that the stem backseats in the bonnet. This will reduce the potential for leakage through the packing.
3. Pressurize the valve to the required pressure and isolate from the pressure source. The valve should hold pressure for three minutes.
4. Re-tighten the cap screws to 100 ft/lbs of torque around the entire diameter and de-pressurize the valve.
I. Yoke Replacement

1. Lower the yoke into position on the valve body.
2. The yoke clamp ring, part #19 secures the yoke to the valve body. Affix the two piece yoke clamp ring body-yoke assembly by bolting it together with the studs and nuts, part #20 and #21.

CAUTION:

We recommend that the valve be inspected for packing leakage after the valve is back in service and subject to working pressure and temperatures. At this time we also recommend that the bonnet draw bolts be checked for tightness; this will insure that the bonnet does not drop and compromise the pressure seal integrity.
## ATTACHMENT A

Bonnet/Draw Bolt Torque Values

<table>
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<tr>
<th>STUD SIZE</th>
<th>BOLTING MATERIAL</th>
<th>B7, B16, 630, A-574</th>
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<tr>
<td></td>
<td>FT LB</td>
<td>Nm</td>
<td>FT LB</td>
</tr>
<tr>
<td>3/8” - 16UNC</td>
<td>20</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>7/16” - 14UNC</td>
<td>30</td>
<td>41</td>
<td>30</td>
</tr>
<tr>
<td>1/2” - 13UNC</td>
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<td>45</td>
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<td>9/16” - 12UNC</td>
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<td>95</td>
<td>62</td>
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<tr>
<td>5/8” - 11UNC</td>
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</tr>
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<td>3/4” - 10UNC</td>
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<td>7/8” - 9UNC</td>
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<td>1 1/2” - 8UN</td>
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Note:

1. Torque tolerance ± 10%
2. For temperatures above 750°F (400°C) uses 75% of the values.