# Table of Contents

1.0. Introduction .............................................................................................................................. 1  
2.0. Receiving, Handling, and Storage ........................................................................................... 1  
  2.1. Receiving and Handling ....................................................................................................... 2  
  2.2. Valve Storage ....................................................................................................................... 2  
3.0. Valve Identification ................................................................................................................. 3  
4.0. Installation................................................................................................................................ 4  
  4.1. Preliminary Considerations.................................................................................................. 4  
  4.2. Valve Connection Type ....................................................................................................... 4  
    4.2.1. Valves Installed by Butt Weld or Socket Weld ............................................................ 5  
    4.2.1.1. Post Weld Heat Treatment (PWHT) ....................................................................... 7  
    4.2.1.2. Furnace Stress Relieving......................................................................................... 8  
    4.2.2. Valves Installed by Threaded Connection .................................................................... 9  
    4.2.3. Valves Installed by Flanged End Connection................................................................... 9  
  4.3. Valve Installation/Positioning ............................................................................................ 10  
    4.3.1. Positioning Check Valves in the Pipe Run ................................................................. 10  
    4.3.2. Positioning Gate and Globe Valves in the Pipe Run .................................................. 11  
    4.3.3. Purging and Testing of Line ....................................................................................... 11  
5.0. Valve Operation ..................................................................................................................... 13  
  5.1. Gate Valve ......................................................................................................................... 14  
  5.2. Globe Valve ....................................................................................................................... 15  
  5.3. Piston Check/Ball Check Valve ......................................................................................... 16  
  5.4. Swing Check Valve............................................................................................................ 17  
6.0. Maintenance ........................................................................................................................... 18  
  6.1. List of Tools for Maintenance and Repair ......................................................................... 18  
  6.2. Preventative Maintenance ................................................................................................. 18  
  6.3. Valve Lubrication .............................................................................................................. 19  
    6.3.1. Points of Lubrication................................................................................................... 20  
    6.3.2. Recommended Lubrication......................................................................................... 22  
  6.4. Stem Packing ..................................................................................................................... 22  
  6.5. Body/Bonnet Disassembly ................................................................................................. 25  
  6.6. Body/Bonnet Assembly ..................................................................................................... 26  
  6.7. Gasket Replacement (Bolted Bonnet Valves Only) ........................................................... 28  
  6.8. Gate Valve Seating Surfaces: Repair and Replacement .................................................... 28  
    6.8.1. In-Body Repair............................................................................................................ 28  
    6.8.2. Seat Removal .............................................................................................................. 29  
    6.8.3. Seat Installation ........................................................................................................... 30  
  6.9. Globe & Check Valve Seating Surfaces: Repair and Replacement ................................... 31  
    6.9.1. Seat Surface Repair .................................................................................................. 31  
    6.9.2. Seat Ring Replacement (Threaded) ............................................................................ 33  
  6.10. Swing Check Valve Seating Surfaces: Repair and Replacement .................................... 33  
  7.0. Spare Parts ............................................................................................................................. 33  
  8.0. Troubleshooting Guide .......................................................................................................... 34
TABLE OF FIGURES

Figure 1 - Weld Set Up ................................................................................................................... 6
Figure 2 - Post Weld Heat Treatment .......................................................................................... 7
Figure 3 - Check Valve Positions ............................................................................................... 11
Figure 4 - Gate and Globe Valve Positioning ............................................................................. 12
Figure 5 - Typical Gate Valve (Bolted Bonnet Design) ............................................................. 14
Figure 6 - Typical Globe Valve (Bolted Bonnet Design) ............................................................ 15
Figure 7 - Typical Piston/Ball Check Valve (Bolted Bonnet Design) .......................................... 16
Figure 8 - Typical Swing Check Valve (Bolted Bonnet Design) ................................................... 17
Figure 9 - Gate and Globe Valve Points of Lubrication ............................................................. 20
Figure 10 - Extraction of Valve Packing .................................................................................... 23
Figure 11 – Typical Packing Ring Configuration ....................................................................... 24
Figure 12 – Bolt Cross-Over Sequence ..................................................................................... 27
Figure 13 - Gate Valve Seat Removal ....................................................................................... 29
Figure 14 - Gate Valve Seat Ring Installation ......................................................................... 30
Figure 15 - Fixture for Globe & Check Valve Seat Surface Repair .......................................... 32

Appendix A - Exploded View Typical Gate Valve (Bolted Bonnet Design) ............................... 36
Appendix B - Exploded View Typical Globe Valve (Bolted Bonnet Design) ............................. 37
Appendix C - Exploded View Typical Piston/Ball Check Valve (Bolted Bonnet Design) .......... 38
Appendix D - Exploded View Typical Swing Check Valve (Bolted Bonnet Design) ................. 39

LIST OF TABLES

Table 1 - Preventive Maintenance Schedule ............................................................................. 19
Table 2 - Recommended Lubricants ........................................................................................... 22
Table 3 - Gland Bolt Torque Settings (Graphite Packing) ......................................................... 24
Table 4 - Recommended Bonnet Bolt Torque Values ................................................................ 27
1.0. Introduction

Choosing the correct valve for a particular operation or service is very important; however, it is not within the scope of this document to provide information regarding valve selection. It is the intent of this manual to provide detailed information directed towards proper installation, operation, and maintenance of Bonney Forge forged steel valves.

The types of valves discussed herein are:

- Gate Valves: Should be used in the fully open or fully closed position.
- Globe Valves: May be used for throttling control as well as on-off service.
- Self-Actuated Check Valves.

With proper care and regular maintenance, users can expect long life and excellent performance from all Bonney Forge valves.

If major repairs become necessary, it is recommended that the valves be returned to the factory for inspection and possible rework.

NOTICE In addition to the installation, operation, and maintenance instructions provided herein, further guidance and information on these topics can be found in MSS SP-92, MSS Valve User Guide, published by the Manufacturer’s Standardization Society (MSS). Information in this manual that was extracted from MSS SP-92 is indicated by a footnote.

2.0. Receiving, Handling, and Storage

Bonney Forge forged steel valves are packaged in a variety of manners:

- Cardboard boxes
- Cardboard boxes and palletized
- Wooden Containers

The packing method depends on factors such as valve size/weight, purchase order quantities, and customer packing requirements. All valves are carefully and securely packaged in a manner to prevent damage during shipment. Gate and globe valves are shipped in the closed position.
2.1. Receiving and Handling

Upon receipt of shipment, verify the integrity of the boxes or containers, examine external package markings, and verify the presence of a packing list.

- Open boxes or remove the container lid using suitable hand tools.
- Check contents for valve type, size, class, material, and quantity against the packing list.
- Inspect the condition of all valves for shipping damage. If the end protectors have been removed for inspection purposes, they must be re-installed to maintain internal cleanliness.

**NOTICE**
If the caps are missing, an inspection of the valve cavity is required. All foreign material must be removed. If cleaning of the valve is required, care must be taken as to the type of solvents used, particularly if the valve is to be connected to the line by welding.

Care shall also be taken in the proper handling of valves to prevent damage. Valves should never be thrown or dropped. Lifting the valve by the stem is not advisable and, for larger valves, lifting the valve by the handwheel is not recommended.

2.2. Valve Storage

All Bonney Forge carbon steel and alloy steel forged valves are shipped from the factory with a phosphate coating on un-machined surfaces and with a rust preventative sprayed on machined surfaces. In addition, plastic end protectors are installed on both end connections for protection from damage and to prevent entrance of foreign materials into the valve.

Valves received in the above condition and in their original shipping containers may be stored for up to one year with no additional protection; provided they are stored indoors, above floor level, and in a low humidity atmosphere.

**NOTICE**
If the valves are removed from their original shipping containers, they should be placed above floor level on suitable storage shelves.

If valves are to be stored indoors for a longer period of time in a high (80% or greater) humidity atmosphere, it is suggested that each item be periodically inspected, inside and out, for rust and/or corrosion.

The valves should be cycled open and closed, during which time each valve stem should be inspected for corrosion. Any external rust and/or corrosion should be removed by cleaning the affected area with a wire brush followed by the application of a suitable rust preventative.
3.0. Valve Identification

Each Bonney Forge valve is identified with a nameplate, which is placed over the handwheel and secured with the handwheel nut on gate and globe valves, and riveted to the cover on check valves.

Below are (2) examples of Bonney Forge nameplates, the nameplates differ depending on where the valve was manufactured.

1. NACE marking indicating the valve is in compliance with NACE MR0103, & MR0175.
2. Applicable Design Codes.
3. Bonney Forge Valve Figure Number
4. Shell Material (e.g. Body, Bonnet)
5. Stem Material
6. Closure Member Material (In case of hard face overlay, “HF” will be marked.)
7. Seat Material (In case of hard face overlay, “HF” will be marked.)
8. Rated Pressure Class
9. Valve Type
10. Nominal Pipe Size
11. Maximum Working Pressure (PSI) at Reference Ambient Temperature per ASME B16.34
12. Reference Ambient Temperature per ASME B16.34
13. CE Marking which complies with the requirements of European Pressure Equipment Directive 97/23/EC.
4.0. Installation

4.1. Preliminary Considerations

Bonney Forge Valves are tested and shipped ready for installation. Prior to installation, consideration shall be given to the following:

- Only experienced, trained personnel should install, operate, and perform maintenance on all valves.
- Observe all State and Local Codes as well as National Standards and Safety Procedures that pertain to the installation of all valves.
- Always use tools to the intent for which they were designed, to prevent damage to the valve, and to prevent injury or death to the user.
- Examine valve nameplate and tags to ensure the correct valve is being installed.
- Remove all end protectors.
- Inspect the inside of the valve for cleanliness through the valve end ports. Remove any debris or foreign material.
- Consult flow arrows marked on valve body for proper installation.
- Check the tightness of packaging gland bolts, and tighten if necessary.

4.2. Valve Connection Type

Depending on valve end configuration, three (3) basic installation procedures are used:

**Welded Connection:**
- Socket Weld - In accordance with ASME B16.11\(^1\)
- Butt Weld - In accordance with ASME B16.25\(^1\)

**Screwed Connection:**
- Threaded - In accordance with ASME B1.20.1 (Female NPT)\(^1\)

**Flanged Connection:**
- Flanged - In accordance with ASME B16.5\(^1\)

Bonney Forge valves are manufactured from forged bodies and bonnets of carbon, alloy and stainless steel material. The material properties have excellent welding properties, which allow the valves to be welded directly in the pipe run. Valves with threaded ends can also be seal welded if needed.

---

\(^1\) Standard used unless otherwise specified.
4.2.1. Valves Installed by Butt Weld or Socket Weld

These items require proper welding to insure a pressure tight seal and to retain their ability to withstand stress. The valve, pipe, and weld rod must be of compatible materials and the welding shall be performed by a certified welder using qualified welding procedures. The welds must be inspected as required by all applicable specifications.

**NOTICE** Prior to welding, inspect the end surfaces to be welded for required dimensions, defects, and cleanliness and correct any condition that might interfere with assembly or satisfactory welding. Additionally, ensure the valve end and pipe end are properly aligned.

When welding socket end valves, be sure to leave 1/16" gap between the end of the pipe and bottom of the valve socket. This will allow for expansion of the material as it is welded. Since the valve body is compact, having a short end-to-end dimension, any extended welding time could cause excessive heat build-up on the valve seat area. This excessive heat build-up could cause damage; such as loosening of gate valve seat rings, surface distortion, etc. To avoid this problem, we suggest allowing the part to cool after each pass of the weld, to alternate welding passes from one valve to the next, and if possible to envelope the valve with wet cloth to decrease heat build-up.

It is recommended that the valve being welded **not** be located between the hot lead and the ground strap of the welding equipment. Failure to do so can cause arcing across the disc/seat and the stem/stem bushing areas, resulting in permanent damage or failure of the valve to operate. In addition, do **not** use yoke, handwheel, or stem for welding ground. See Figure 1 for details.

Prior to welding, gate and globe valves should be tightened down to the closed position then opened approximately 1/16 of a turn after the handwheel slack is run out. This will allow for material expansion as well as help hold the valve seats in place (on gate valves) while welding. The gate valve design is such that the valve seat rings are pressed in and swedged in place. Our experience shows there is a 10% to 15% risk of the seats becoming loose due to excessive heat or welding while the valve is in the open position, which may also result in valve seat leakage.

---

1 Paragraph extracted from MSS SP-92, with permission of the publisher, the Manufacturers Standardization Society.
NOTE: Arcing can occur across close tolerance areas of this valve due to incorrect procedure.

Ground Strap

INCORRECT

CORRECT

NOTE: No field path through this valve; correct procedure

Ground Strap

Figure 1 - Weld Set Up
4.2.1.1. Post Weld Heat Treatment (PWHT)

The recommended method of PWHT is via local ceramic resistance heaters, individually monitored with thermocouples. Thermocouples are attached to the weld or welds. Properly sized ceramic heaters are wrapped around the weld area, extending approximately 1/4” past the weld on the valve side. Do not wrap the valve body with a heating element. See Figure 2 for details. Wrap flexible insulation around valve ends, extending approximately 1/2” past the valve on the valves side. It is not recommended to wrap the entire valve body with insulation. Prior to heat input close the valve completely, then open the valve approximately 1/16 of a turn after the handwheel slack is run out. This very slight opening will allow the trim components to expand during the thermal cycle.

Following PWHT, inspect the valve for smooth operation by cycling open and closed. If possible, perform a seat closure pressure test prior to service operation.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>THERMOCOUPLE</td>
</tr>
<tr>
<td>2</td>
<td>VALVE</td>
</tr>
<tr>
<td>3</td>
<td>FIBER INSULATION</td>
</tr>
<tr>
<td>4</td>
<td>CERAMIC HEATERS</td>
</tr>
</tbody>
</table>

**Figure 2 - Post Weld Heat Treatment**

**NOTICE** Bonney Forge does not make any recommendations in regards to the actual PWHT details of temperature and time. This work is not within the scope of the Bonney Forge Corporation. Bonney Forge recommends that all applicable "Piping Code" requirements be considered.
For alloy steel valves or when welding specification or service conditions require field PWHT, the valve may be ordered with pipe nipples already welded and heat treated in the factory before valve assembly. The specified PWHT can then be performed in line without affecting the valve.

Even though PWHT by furnace stress relieving is not recommended by Bonney Forge, sometimes it is inherently necessary to subject the complete valve or body assembly to the furnace heat treatment process. Bonney Forge finds this to be an acceptable practice. Please follow all other applicable sections of our recommended practice and note that the valve nameplate should be removed prior to heat treating.

### 4.2.1.2. Furnace Stress Relieving

Valves manufactured from carbon and alloy steel materials, such as ASTM A105, can be subject to graphitization and surface scaling. These conditions could be detrimental to the valve. Should any such internal surface scale break loose, it may become lodged in or cause damage to the seating areas of the valve, which could result in valve leakage. If valves are disassembled for the PWHT, it will be necessary for this scale to be removed, particularly from gasket surface areas prior to re-assembly. The potential for this problem can be reduced if the heat treatment is performed in a controlled atmosphere furnace and/or the machined surfaces are protected with a weld anti-splatter guard compound such as “Protecto Metal #2” by the G.W. Smith Co. In addition, if the bolted bonnet valves are disassembled for the PWHT, Bonney Forge recommends that the bonnet gasket be replaced with a new gasket upon re-assembly. This is due to the fact that a controlled compression spiral wound gasket is used and it may not reseat properly when re-compressed a second time.

The valve name plates are painted aluminum and the marking information shown on the plate will be lost if the plate is subjected to the PWHT temperatures. Please remove the plate before subjecting the valve to heat treating.

If the wedge is removed from the gate valves during PWHT, it is important that the original wedge be placed in the same valve, in its original position, upon re-assembly. This will help ensure a leak tight seat during system pressure testing. See Section 6.5. and 6.6. for disassembly and assembly instructions.

It is also recommended that after PWHT, all valves be subjected to a hydrostatic shell pressure test to assure that the valve's pressure integrity is maintained and that no gasket or stem packing leaks have developed due to the heat treatment.
4.2.2. Valves Installed by Threaded Connection

Inspect all threads on both the valve and the mating pipe for correct thread form (no thread damage) and cleanliness (no chips or grit present) before assembly. Use a pipe thread compound during assembly, always applying the threading compound to pipe threads, never to valve threads.

Excess compound on pipe threads will be pushed out of the valve allowing easy removal, whereas excess compound on the valve threads will be pushed into the valve where it will be difficult to remove.

When installing threaded end valves, do **not** turn the valve by applying force to the bonnet, yoke, or handwheel. Proper pipe spanners or wrenches should be used, one engaging the valve and the other engaging the corresponding pipe.

Every attempt should be made to avoid possible damage to the valves and/or piping as a result of applying excessive wrenching forces during assembly. Additionally, substantial wrenching forces should not be applied until the threads are properly engaged.

**NOTICE** Open end wrenches should not be used on the valve. The valve may not be provided with hexagon or octagon ends and the end dimensions may not always correspond to wrench openings. For this reason, pipe spanners, Stillson type or similar wrenches of proper size, should be used.

4.2.3. Valves Installed by Flanged End Connection

Make sure the flanges are properly aligned (parallel) so that forcing the flanges together, which may damage the valve and/or pipe, is not necessary. Inspect the mating flange faces for radial grooves, dents, or any other condition that may cause leakage and correct any existing condition before assembling the flanges. Also, inspect the gaskets for defects or damage.

Tighten the flange bolts in a crossover pattern as follows:

a) Slightly torque all bolts using a crossover bolt sequence. Bolts should be tightened evenly to prevent misalignment of the flanges and uneven gasket loading. Only one gasket shall be used between the contact faces of the flanged joint.

b) Repeat Step (a) using additional torque until all bolts are tightened properly. This may require additional crossover sequences since as one stud is torqued it will loosen the adjacent studs.

---

1 Sentence extracted from MSS SP-92, with permission of the publisher, the Manufacturers Standardization Society.
If while tightening the bolts, the torque applied to each bolt has been increasing with each turn, then is found to remain unchanged or increase less with each turn, the bolt is yielding. The bolts should be scraped and replaced as they will no longer be able to hold the proper torque needed to maintain a preload¹.

Consult the appropriate Code (see Section 4.2) for the proper matching of flanges, bolting, and gaskets.

4.3. Valve Installation/Positioning

Positioning the valve in the pipe run is very important. Prior to actual installation, check for clearance around the valve to assure adequate room for proper operation/maintenance. Once proper positioning and clearance has been assured, the system should be cleansed of all foreign matter. Whenever possible, blow out the pipe line with clean compressed air or flush it out with water to remove grit and dirt. At this time, attention shall be given to the preliminary considerations outlined in Section 4.1.

4.3.1. Positioning Check Valves in the Pipe Run

These valves must be fitted in horizontal pipe runs with the cover facing vertically upward. Variance to either side of the vertical axis must not exceed five (5) degrees. Swing-check valves and spring-loaded check valve designs allow for additional positioning, such as vertical pipe runs with upward flow.

Check valves must not be installed in a vertical down flow pipe run or in a horizontal pipe run with the cover in the vertical down position. Always install valves in the direction indicated by the flow arrow stamped on the body. See Figure 3 for details.

Positioning check valves close to upstream flow disturbances (e.g. pipe fittings, discharge of pumps, etc.) can lead to valve cycling (i.e. trim chatter). This may cause rapid wear of seats and trim which can ultimately lead to valve malfunction. Therefore, it is recommended that sufficient distance (that which provides steady flow) be provided between the flow disturbance and the check valve.

A check valve should not be used as a primary means of isolation for any application due to its inherent incapability of providing as tight of seal (no through leakage) as gate or globe valves.

¹ Sentence extracted from MSS SP-92, with permission of the publisher, the Manufacturers Standardization Society.
4.3.2. Positioning Gate and Globe Valves in the Pipe Run

Gate and globe valves should be installed with the stem in a vertical up position on horizontal lines. Other acceptable stem positions are at an angle between the vertical and horizontal axis which still allows for complete drainage. If installed with the stem below the horizontal axis, complete drainage is not possible and solids may accumulate in the valve bonnet, which will greatly affect the valve operation and service life. These items may also be installed in vertical lines. See Figure 4 for details.

**NOTICE** Unless marked with a flow arrow, gate valves can be installed in line with disregard to flow direction. Globe valves should be installed so that the arrow stamped on the body points in the direction of the fluid flow.

4.3.3. Purging and Testing of Line

Once the valve is in line, open the valve and flush or blow out the line again to remove any dirt or foreign objects which may have collected during installation. Check for tightness of bonnet/body bolts and for proper packing gland adjustment. Operate the valve to ensure proper operation, and pressure test the valve to verify the integrity of all joints.

**Figure 3 - Check Valve Positions**
Figure 4 - Gate and Globe Valve Positioning
5.0. Valve Operation

All Bonney Forge gate and globe valves have “open” and “closed” marked on the handwheels along with directional arrow. Gate and globe valves may be opened by turning the handwheel counterclockwise and closed by turning clockwise. The handwheels are designed such that reasonable effort exerted by the operators is sufficient to operate the valve. Whenever possible, open and close the valve slowly. This is particularly important in piping systems containing liquids where rapid valve closure (alone or in combination with other factors) could lead to the possibility of an undesirable pressure surge (“water hammer”) in the piping system.

**NOTICE** After the valve has been opened fully, rotate the handwheel 1/4 turn toward the closed position so the valve will not remain in the full back seated position. Allowing the stem to remain in the full back seated position may mask an unsatisfactory condition of the stem packing.

Never use excessive leverage on the handwheel to stop leakage since this force can damage the stem and cause additional damage from any foreign materials which may be trapped between the seats.

Cold valves located on steam or hot fluid lines may leak slightly through the stem packing for a short time during startup. Do not immediately tighten the packing gland or nuts, but allow the valve to heat up to its operating temperature. The leakage will generally stop within a few minutes. If leakage persists, consult the maintenance section of this manual. Sections 5.1 through 5.4 will help in the understanding of basic operation of common valves.

---

1 Sentence extracted from MSS SP-92, with permission of the publisher, the Manufacturers Standardization Society.
5.1. Gate Valve

A typical outside screw and yoke (OS&Y) gate valve of bolted bonnet design is shown in Figure 5; an exploded view is shown in Appendix A. Flow through the gate valve is stopped by forcing the wedge (14) between the two seats (15). These seats (15) are pressed into the valve body (16) and are of a removable design. The end of the stem (10) fits into the slots on top of the wedge (14) which allows sufficient wedge movement for effective seating with the seat rings (15). The wedge (14) is guided through its entire travel by guides in the body (16). The stuffing box is located in the bonnet (12) and filled with packing rings (9). The packing (9) is compressed in the stuffing box and around the stem (10) by the packing gland (8) and the gland flange (7) which are forced down against the packing (9) by two adjustable gland studs (6) and stud nuts (5). The valve stem (10) threads are engaged with the yoke sleeve (4) and the yoke sleeve (4) is held in place with the handwheel nut (1). The valve is opened by a counterclockwise rotation of the handwheel (3).

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HANDWHEEL NUT</td>
</tr>
<tr>
<td>2</td>
<td>NAME PLATE</td>
</tr>
<tr>
<td>3</td>
<td>HANDWHEEL</td>
</tr>
<tr>
<td>4</td>
<td>YOKE SLEEVE</td>
</tr>
<tr>
<td>5</td>
<td>GLAND NUT</td>
</tr>
<tr>
<td>6</td>
<td>GLAND BOLT STUDS</td>
</tr>
<tr>
<td>7</td>
<td>GLAND FLANGE</td>
</tr>
<tr>
<td>8</td>
<td>PACKING GLAND</td>
</tr>
<tr>
<td>9</td>
<td>PACKING</td>
</tr>
<tr>
<td>10</td>
<td>STEM</td>
</tr>
<tr>
<td>11</td>
<td>BOLTS</td>
</tr>
<tr>
<td>12</td>
<td>BONNET</td>
</tr>
<tr>
<td>13</td>
<td>GASKET</td>
</tr>
<tr>
<td>14</td>
<td>WEDGE</td>
</tr>
<tr>
<td>15</td>
<td>SEAT</td>
</tr>
<tr>
<td>16</td>
<td>BODY</td>
</tr>
</tbody>
</table>

Figure 5 - Typical Gate Valve (Bolted Bonnet Design)
5.2. Globe Valve

A typical outside screw and yoke (OS&Y) globe valve of bolted bonnet design is shown in Figure 6; an exploded view is shown in Appendix B. The design of the globe valve is very similar to that of a gate valve and its operating characteristics are basically the same. The main difference being that, rather than a wedge, the globe valve employs a disc (17) as a means of controlling the flow. The disc (17) is connected to the stem (7) by means of a disc connecting ring (16). Another difference is that globe valves generally contain an integral seat (18) (renewable seats are also an option).

Because of the body's labyrinth design, the globe valve causes a larger pressure drop than a gate valve. It is, however, an excellent device for regulation of flow in the moderate to full flow range.

**NOTICE** Globe valves should be installed only in the direction of flow indicated by the arrow stamped on the body.

![Figure 6 - Typical Globe Valve (Bolted Bonnet Design)](image-url)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HANDWHEEL NUT</td>
</tr>
<tr>
<td>2</td>
<td>WASHER</td>
</tr>
<tr>
<td>3</td>
<td>NAMEPLATE</td>
</tr>
<tr>
<td>4</td>
<td>HANDWHEEL</td>
</tr>
<tr>
<td>5</td>
<td>YOKE NUT</td>
</tr>
<tr>
<td>6</td>
<td>YOKE SLEEVE</td>
</tr>
<tr>
<td>7</td>
<td>STEM</td>
</tr>
<tr>
<td>8</td>
<td>GLAND NUT</td>
</tr>
<tr>
<td>9</td>
<td>GLAND FLANGE</td>
</tr>
<tr>
<td>10</td>
<td>GLAND BOLT STUD</td>
</tr>
<tr>
<td>11</td>
<td>PACKING GLAND</td>
</tr>
<tr>
<td>12</td>
<td>PACKING</td>
</tr>
<tr>
<td>13</td>
<td>BONNET</td>
</tr>
<tr>
<td>14</td>
<td>BOLTS</td>
</tr>
<tr>
<td>15</td>
<td>GASKET</td>
</tr>
<tr>
<td>16</td>
<td>WIRE CONNECTION</td>
</tr>
<tr>
<td>17</td>
<td>DISC</td>
</tr>
<tr>
<td>18</td>
<td>INTEGRAL SEAT</td>
</tr>
<tr>
<td>19</td>
<td>BODY</td>
</tr>
</tbody>
</table>
5.3. Piston Check/Ball Check Valve

A typical bolted bonnet piston check and ball check valve are shown in Figure 7; an exploded view is shown in Appendix C. The bodies (8) of the piston check valve and the ball check valve are of the same labyrinth design as that of the globe valve. The barrier to flow is a free moving piston (6) that is guided by the body (8) or a free moving ball (10) that is guided by the bonnet (4). The piston check and ball check valve also have an integral seat (7) (renewable seats also an option), against which either the piston (6) or the ball (10) seat to provide stoppage of flow. The piston (6) or ball (10) drop into the seat (7) by gravity during no-flow conditions and open by fluid pressure on the upstream side (from underneath the piston (6) or ball (10)). Reversal of fluid flow forces the piston (6) or ball (10) back into the seat (7) which stops the flow.

The piston and ball check valves are designed for horizontal service; however, these valves can be equipped with an internal spring (9) which allows the valve to be used in vertical up service, as shown in Figure 3.

**NOTICE**  Check valves can be installed only in the direction of flow indicated by the arrow stamped on the body.

---

**Figure 7 - Typical Piston/Ball Check Valve (Bolted Bonnet Design)**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RIVET</td>
</tr>
<tr>
<td>2</td>
<td>NAMEPLATE</td>
</tr>
<tr>
<td>3</td>
<td>BOLTS</td>
</tr>
<tr>
<td>4</td>
<td>BONNET</td>
</tr>
<tr>
<td>5</td>
<td>GASKET</td>
</tr>
<tr>
<td>6</td>
<td>PISTON</td>
</tr>
<tr>
<td>7</td>
<td>INTEGRAL SEAT</td>
</tr>
<tr>
<td>8</td>
<td>BODY</td>
</tr>
<tr>
<td>9</td>
<td>SPRING*</td>
</tr>
<tr>
<td>10</td>
<td>BALL</td>
</tr>
</tbody>
</table>

* THE SPRING WILL BE SUPPLIED ON REQUEST
5.4. Swing Check Valve

A typical bolted bonnet swing check valve is shown in Figure 8; an exploded view is shown in Appendix D. The swing check valve is a straight-through flow check valve equipped with a disc (7) which rests against the seat (9) under no-flow conditions. The seat (9) is pressed into the valve body (11) and is of the removable design. A hinge (5) supports the disc (7) from a hinge pin (8) which is set in the valve bonnet (6). The supporting hinge (5) allows the disc (7) to swing freely away from the seat (9) because of the flow pressure being exerted upon the disc's upstream side. A reversal of fluid flow exerts pressure on the downstream side of the disc (7) forcing it against the seat (9) and stopping the flow.

**NOTICE** Swing check valves are designed for horizontal flow but may also be used for vertical flow in the upward direction. See Figure 3 for details.

**ITEM** | **DESCRIPTION**
---|---
1 | RIVET
2 | NAMEPLATE
3 | B/B BOLTS
4 | B/B GASKET
5 | HINGE
6 | BONNET
7 | DISC
8 | HINGE PIN
9 | SEAT
10 | DISC NUT
11 | BODY

Figure 8 - Typical Swing Check Valve (Bolted Bonnet Design)
6.0. Maintenance

Bonney Forge valves are made from selected materials to give long and trouble free service when properly installed in the correct applications. Proper care and maintenance in the field can contribute to extended performance of the valve.

The general maintenance operation on Bonney Forge valves usually consists of lubrication of the yoke sleeve and stem threads and adjustment of the packing gland. Should other repairs be required, Sections 6.2. through 6.10. are provided to be used as a guide in the repairs.

6.1. List of Tools for Maintenance and Repair

Standard wrenches and tools are suitable for servicing the valves as follows:

- Set of open end, box end, crescent, and socket wrenches, and torque wrench to adjust/remove: bonnet bolts, gland bolt nuts, and handwheel nuts.
- Standard packing tools or blunt hooks to remove stem packing.
- Combination oilstone and lapping compounds, coarse and fine grit, to lap and polish.
- Emory cloth, coarse and fine grit, for removing scratches and polishing gasket surface area.
- Pipe and spanner wrenches for installation.
- Hammers, blunt chisels, tapered drift pins for seat removal and replacement.

Other devices and fixtures as stated throughout the instruction manual.

6.2. Preventative Maintenance

Maintenance programs vary greatly from application to application, dependent on factors such as operational frequency, service conditions, external environment, etc. The end user should establish a routine maintenance program to extend the life of the valve and minimize downtime for repair. Table 1 suggests actions to include in a preventive maintenance program. These actions and performance frequencies are to be used as a guide only in establishing an individual maintenance program.
6.3. Valve Lubrication

The valve stem and yoke sleeve should be lubricated periodically based on cycle and service conditions, but not less than that shown in Table 1. Maintaining the stem and yoke sleeve adequately lubricated helps to ensure smooth valve operation and helps prevent premature component wear, particularly the yoke sleeve flange. Additionally, exposed stem threads should be kept clean.

**NOTICE** When the valve is installed in dirty environments, the use of dry lubricants is recommended, because tacky lubricants on exposed stem threads can attract abrasive particles.

Bonney Forge recommends using a quality high temperature lubricant on all gate and globe valves. See Section 6.3.2 for recommended lubricants and their manufacture.

---

**Table 1 - Preventive Maintenance Schedule**

<table>
<thead>
<tr>
<th>INSPECTION</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect exterior of valve for cleanliness and signs of corrosion or leakage</td>
<td>Monthly</td>
</tr>
<tr>
<td>Inspect stem packing for signs of leakage</td>
<td>Monthly</td>
</tr>
<tr>
<td>Inspect body/bonnet flange connection for signs of gasket leakage</td>
<td>Monthly</td>
</tr>
<tr>
<td>Perform a complete valve cycle (open-close or close-open)</td>
<td>Every 6 Months</td>
</tr>
<tr>
<td>Lubricate valve stem threads. Examine stem threads for cleanliness</td>
<td>Every 6 Months or as Needed</td>
</tr>
<tr>
<td>Lubricate valve yoke sleeve</td>
<td>Based on cycle and service conditions; Not less than once per year or 100 cycles maximum</td>
</tr>
</tbody>
</table>
6.3.1. Points of Lubrication

Figure 9 - Gate and Globe Valve Points of Lubrication
Gate Valves, O.S.&Y Design (Figure 9)

Bonney Forge gate valves have two (2) points of lubrication, the stem/yoke sleeve threads and the yoke sleeve flange/yoke bearing ring area. Lubricate these areas as follows:

- Open the valve to half stroke.
- Brush lubricant onto the stem as it protrudes through the handwheel, and on the stem under the yoke.
- Run the valve through a complete “open-close” cycle, the stem/yoke sleeve are now lubricated.
- Next, open the valve slightly (about 1/8 turn, the handwheel will have some slop as the yoke sleeve is not engaged with the stem), this will cause the yoke sleeve to drop slightly creating a small clearance between the yoke sleeve and the yoke.
- Liberally brush lubricant into the small opening.
- Close the valve. This will distribute lubricant to the bearing ring interface of the yoke sleeve and yoke.

Globe Valves, O.S.&Y Design (Figure 9)

Bonney Forge globe valves have one point of lubrication, the stem/yoke sleeve threads. Lubricate as follows:

- For Bonney Forge globe valves with a grease fitting, lubricate through the fitting.
- For Bonney Forge globe valves without a grease fitting, open the valve to half stroke.
- Brush lubricant on the stem threads above and below the yoke nut.
- Run a complete “open-close” cycle, the stem/yoke are now lubricated.
6.3.2. Recommended Lubrication

Bonney Forge valves are supplied with the stem threads and yoke sleeve lubricated with AGIP MU EP 2 type lubricant or equivalent. Table 2 lists some lubricants which are equivalent to the AGIP product. Bonney Forge recommends using one of these lubricants or one with equivalent properties/characteristics for stem thread and yoke sleeve lubrication.

<table>
<thead>
<tr>
<th>LUBRICANT</th>
<th>MANUFACTURER</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGIP MU EP 2</td>
<td>AGIP</td>
</tr>
<tr>
<td>Mobilux EP 2</td>
<td>Mobil</td>
</tr>
<tr>
<td>Spheerol EPL 2</td>
<td>Castrol</td>
</tr>
<tr>
<td>Ronex MP</td>
<td>Exxon</td>
</tr>
<tr>
<td>Alvania EP 2</td>
<td>Shell</td>
</tr>
</tbody>
</table>

Table 2 - Recommended Lubricants

6.4. Stem Packing

Leakage through the stuffing box does not always indicate a defective valve, but may simply indicate stem packing leakage. Re-tightening of the gland nuts may stop the leakage. Gland nuts should be tightened uniformly and only to the extent needed to stop the leakage. Table 3 can be used as a guide for tightening of the gland nuts.

If the gland has run out of travel or excessive tightening does not stop the leakage, isolate and depressurize the valve for repacking. The valve need not be taken out of line for simple repacking.

⚠️ Excessive tightening of the gland flange may cause difficult operation of the valve and possible damage to the stem.

⚠️ Repacking of the valve is not recommended while the valve is in service because any leakage could cause serious injury to maintenance personnel.
Consult the packing manufacturer's installation instructions, if provided. Otherwise, the following steps may be utilized for the replacement of the valve packing.

a) To extract packing, remove the gland nuts and studs.

b) Lift the gland flange and gland out of the stuffing box.

c) Remove old packing, using an extractor tool of the correct size (see Figure 10). Any remains of old packing must be removed from the stuffing box and stem. Care shall be taken to avoid scratching the stem or stuffing box surfaces.

d) Clean the stem and stuffing box and examine it for damages.

e) Install new packing rings, one at a time, with the diagonal cut in each ring 90 degrees away from the cut in the ring previously installed (see Figure 11).

f) Each ring should be firmly compressed into position before the next ring is added. Rings should fit snugly into the stuffing box; the ends of a packing ring must not overlap or gap when fitted into the stuffing box.

g) Install the gland and the gland flange, and secure with the gland nuts. Tighten the nuts uniformly and only to the extent needed to prevent leakage. Table 3 can be used as a guide.

h) Actuate the valve through a minimum of three (3) complete cycles ending with the valve in the closed position. Retighten the gland nuts as needed.

![Figure 10 - Extraction of Valve Packing](image-url)
**Figure 11 – Typical Packing Ring Configuration**

**Table 3 - Gland Bolt Torque Settings (Graphite Packing)**

<table>
<thead>
<tr>
<th>VALVE SIZE</th>
<th>CLASS (lbs.)</th>
<th>TORQUE (in.-lbs.)</th>
<th>TORQUE (N-m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8”</td>
<td>150 - 800</td>
<td>35 - 53</td>
<td>4 - 6</td>
</tr>
<tr>
<td></td>
<td>1500 - 2500</td>
<td>106 - 124</td>
<td>12 - 14</td>
</tr>
<tr>
<td>1/2”</td>
<td>150 - 800</td>
<td>44 - 71</td>
<td>5 - 8</td>
</tr>
<tr>
<td></td>
<td>1500 - 2500</td>
<td>106 - 124</td>
<td>12 - 14</td>
</tr>
<tr>
<td>3/4”</td>
<td>150 - 800</td>
<td>53 - 71</td>
<td>6 - 8</td>
</tr>
<tr>
<td></td>
<td>1500 - 2500</td>
<td>142 - 159</td>
<td>16 - 18</td>
</tr>
<tr>
<td>1”</td>
<td>150 - 800</td>
<td>71 - 88</td>
<td>8 - 10</td>
</tr>
<tr>
<td></td>
<td>1500 - 2500</td>
<td>177 - 195</td>
<td>20 - 22</td>
</tr>
<tr>
<td>1-1/4”</td>
<td>150 - 800</td>
<td>88 - 124</td>
<td>10 - 14</td>
</tr>
<tr>
<td></td>
<td>1500 - 2500</td>
<td>177 - 195</td>
<td>20 - 22</td>
</tr>
<tr>
<td>1-1/2”</td>
<td>150 - 800</td>
<td>106 - 142</td>
<td>12 - 16</td>
</tr>
<tr>
<td></td>
<td>1500 - 2500</td>
<td>195 - 212</td>
<td>22 - 24</td>
</tr>
<tr>
<td>2”</td>
<td>150 - 800</td>
<td>106 - 142</td>
<td>12 - 16</td>
</tr>
<tr>
<td></td>
<td>1500 - 2500</td>
<td>195 - 230</td>
<td>22 - 26</td>
</tr>
</tbody>
</table>
6.5. Body/Bonnet Disassembly

Complete body/bonnet disassembly procedures are listed below and should be used when performing the maintenance described in Sections 6.7 through 6.10.

It is recommended that disassembly be limited only to the extent required to provide corrective work.

a) Isolate and depressurize the system.

b) Operate the valve to its full open position.

c) Match mark the body and bonnet flanges to maintain their relation.

d) For bolted bonnet type valves:

1) Remove the body-to-bonnet bolts in a crossover pattern to prevent cocking of the bonnet which could cause the remaining bolts to jam. See Figure 12

2) Lift up the entire bonnet assembly, taking care not to damage the wedge or disc.

   i) For gate valves, match mark the wedge and body to maintain their relation upon reassembly. It is important to match mark the wedge so that the same wedge and seat face are in contact upon reassembly.

e) For welded bonnet type valves:

1) The weld may be removed using portable grinders or other similar equipment, or by flame cutting, such as using a common oxyacetylene torch.

2) Weld cut-off shall be limited as much as possible, to only the weld seam, so as to allow for re-welding and future disassembly.

3) Remove bonnet assembly, taking care not to damage the wedge or disc.

   i) For gate valves, match mark the wedge and body to maintain their relation upon reassembly. It is important to match mark the wedge so that the same wedge and seat face are in contact upon reassembly.

NOTICE The majority of Bonney Forge welded bonnet valves use a double sealing joint design. This joint design consists of an internal threaded connection and an external seal weld. After the seal weld is removed, the bonnet is disassembled by unthreading it in a counterclockwise direction from the valve body.
6.6. Body/Bonnet Assembly

Complete body/bonnet assembly procedures are listed below and should be used when performing the maintenance described in Sections 6.7 through 6.10.

a) Inspect the bonnet bolting to ensure that it is not damaged. Any damaged bolting should be immediately replaced.

b) Make sure both the body and bonnet gasket faces are smooth and clean. For bolted bonnet valves, insert a new gasket onto the body gasket seating surface.

c) Place the entire bonnet assembly onto the valve body, taking care not to damage the wedge or disc. Attention shall be given to the location marks on the body, body flanges, and the wedge.

**NOTICE** To prevent the disc or wedge from being driven into the seat(s) during tightening of the bonnet bolts, make sure the valve is a few turns open.

d) For bolted bonnet type valves:
   1) Install the bonnet bolts, initially tightening by hand to ensure threads are properly engaged.
   2) Slightly torque all bolts uniformly using a crossover sequence to prevent uneven gasket loading, bolt damage, and to facilitate smoother assembly. See Figure 12.
   3) Repeat Step (2) using additional torque until the body and bonnet flanges come into contact and the bonnet bolt torques are in accordance with Table 4.

e) For welded bonnet type valves:
   1) Thread the bonnet into the valve body in a clockwise direction.
   2) Cycle the valve open-closed a few times to ensure proper operation.
   3) Re-weld the body-bonnet joint according to the required code weld procedures.
   4) For weld-joints that require PWHT, the packing shall be replaced subsequent to PWHT. See Section 6.4 for guidance on packing replacement.

f) Test the valve as required, and place the valve back into service.
<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Inch</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3/8</td>
<td>M10</td>
</tr>
<tr>
<td></td>
<td>1/2</td>
<td>M12</td>
</tr>
<tr>
<td></td>
<td>9/16</td>
<td>M14</td>
</tr>
<tr>
<td></td>
<td>5/8</td>
<td>M16</td>
</tr>
<tr>
<td></td>
<td>3/4</td>
<td>M20</td>
</tr>
<tr>
<td></td>
<td>7/8</td>
<td>M22</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>M24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Torque Range (ft-lb)&lt;sup&gt;(1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>B8 Class 1</td>
</tr>
<tr>
<td>B7M, B8 Class 2, B8M, L7M, B348 Gr.2, F44</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Torque Range (N-m)&lt;sup&gt;(1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>B8 Class 1</td>
</tr>
<tr>
<td>B7M, B8 Class 2, B8M, L7M, B348 Gr.2, F44</td>
</tr>
</tbody>
</table>

Notes: (1) Torque values given in chart are for un-lubricated bolting.

Table 4 - Recommended Bonnet Bolt Torque Values

Tighten/Loosen Bolts in Numerical Order

Figure 12 – Bolt Cross-Over Sequence
6.7. Gasket Replacement (Bolted Bonnet Valves Only)

a) Examine the gasket seating surface of the body and the bonnet for evidence of wear, damage, or deterioration. Discard the old gasket.

b) Replace or repair all damaged parts, then clean seating surfaces to remove all rust, gasket residue, and other debris.

c) Polish gasket seating surfaces using a fine emery cloth.

d) Remove any radial scratches or other damage, taking care that the emery cloth does not remain in the valve.

**NOTICE** A radial scratch across the seating surface may allow for a leak path. To ensure a proper seal, the gasket seating surface should have a finish between 63 and 125 µin Ra.

e) Clean the surface to remove all polishing residue.

f) Install a new gasket and re-assemble the valve according to Section 6.6. Gasket sealing compound should not be used when installing the new gasket.

6.8. Gate Valve Seating Surfaces: Repair and Replacement

The valve and seat ring design and method of seat ring installation are such that the valve must be removed from the line when seat ring replacement is necessary. Therefore, Bonney Forge recommends that the valve be replaced or returned to the factory for seat ring replacement. However, Sections 6.8.2 and 6.8.3 are provided to aid in any attempts of seat replacement in the field.

6.8.1. In-Body Repair

Seat rings for gate valves in sizes 1" and larger, if not too badly damaged, may be repaired in the body. Smaller size valves can be repaired, but with great difficulty; therefore, Bonney Forge recommends the installation of new seats.

The seats can be lapped in the body, using a flat lapping plate 1/4" thick with the outside diameter 1/16" larger than that of the seat, having a 1/4" high boss on one side, and 1/32" smaller in diameter than the inside diameter of the seat. The plate must have a square hole in the center for attachment to a square tool. Make a square tool of suitable size and length, with one end to fit a brace and the other end attached to the plate. Valve seats can then be hand lapped by using grinding compound.

**NOTICE** Wedges can be lapped on any surface plate, but care should be taken to maintain the correct wedge angle.
6.8.2. Seat Removal

Subsequent to body/bonnet disassembly per Section 6.5., the seats may be removed as follows:

a) Using a blunt chisel and hammer, strike the seat ring at location #1 (Shown in Figure 13).

b) Insert the chisel through the end of the valve, and strike the seat ring at location #2 (Shown in Figure 13). This will drive the seat ring out of the socket.

c) Remove the seat ring through the bonnet opening in the valve.

Figure 13 - Gate Valve Seat Removal
6.8.3. Seat Installation

The drift pin method used to expand the seats into place is shown in Figure 14.

**NOTICE** Before placing the seats in the valve body, be sure that all surfaces on body and seats are clean and free of all burrs, scale, and foreign matter.

- **a)** Place the seats in the body through the bonnet opening, with the top of the narrow part (indicated by a reference mark on outer surface of seat ring) is in the center and in line with the run of the valve. They should have just sufficient clearance to turn freely in the body.

**NOTICE** A small amount of grease may be applied to the seat to aid in holding the seat in place.

- **b)** Place the wedge in the body, using a false or dummy stem.

- **c)** Line up the seats with the wedge by using a rocking motion of the stem. Be sure the seats and wedge are in perfect alignment and the stem is in center of bonnet opening.

- **d)** Tap the stem lightly to force the wedge into seating position. It is ready for a trial impression. This is accomplished by using a lead mallet and driving the wedge in sufficiently tight to form a light impression of the seats on the wedge.
e) Remove the wedge, and if a uniform impression is obtained all around on both sides of the wedge, the valve is ready for final assembly.

f) In the event that a uniform impression is not obtained, adjust the seats as necessary and repeat Step (e) to obtain another impression. Do not move seats after uniform trial impression is made.

g) Assemble valve complete with the packing, then close valve, forcing wedge into closed position. Valve is now ready for expanding of the seat skirt.

h) When using a drift pin as illustrated in Figure 14, place valve on solid foundation, lubricate the point of contact with the drift pin to prevent galling of seat skirts, and drive the drift pin in until the seat skirt is fully expanded and tight against the body.

i) Reverse valve and expand the other seat being careful not to over expand.

j) Loosen wedge to verify proper valve operation and, if the seats are properly expanded, the valve is ready for testing.

6.9. Globe & Check Valve Seating Surfaces: Repair and Replacement

These valves are available with either threaded-in seat rings or an integral seat, both of which may be repaired (threaded in seats shall be replaced) while the valve is in line.

6.9.1. Seat Surface Repair

When surface damage is minor, the seats may be repaired by using a lapping operation.

- Globe valves require a guide fixture to maintain alignment during the lapping operation. The guide fixture can be made to fit into the gasket area of the body as shown in Figure 15.
- The section of the fixture extending into the body is to be made 1/64” smaller than the body bore.
- A hole in the center of the fixture is required for the stem; this hole should be 1/64” larger than the shank of the valve stem or outside diameter of the spacer (see Figure 15).

**NOTICE** The globe valve stem/disc assembly may be used in the lapping operation. However, due to its loose disc design, it is necessary to prevent the disc from rotating on the stem. This can be accomplished by preparing a fixture as shown in Figure 15. The valve handwheel can then be reattached to the stem and used as a convenient handle when re-lapping the seats.

**WARNING** Applying too much pressure to the seat ring may damage the seat and/or valve.
The lapping operation can be performed as follows:

a) Place a small quantity of lapping compound between the seat and disc surface.

b) With the lapping compound in place, between the mating surfaces, the disc should be reciprocally rotated: the strokes should be light, and the disc should be lifted frequently and turned to a new position, circularly around the valve body, so the lapping will take place over a new area.

c) Continue lapping until all defects are removed; apply a final finish with a fine lapping compound.

NOTICE  It is recommended that the face of the disc be ‘blued’ to check for proper contact with the seating surface after final lapping.

The disc of the globe valve may also require refinishing. When defects are found on the stem/disc assembly seating surface, it is convenient to refinish the stem/disc assembly using a lathe.

a) Place the stem/disc assembly onto the lathe spindle and place the chuck around the disc, without taking the assembly apart.

b) Hold the disc using a four jaw chuck so that the large outside diameter and seating surface run true.

c) Grind the seating surface using a tool grinder. Machine only deep enough to clean the surface.

d) Polish the seating surface with a fine emery cloth.
**NOTICE** Check valves do not require lapping fixtures as the bore of the valve body serves as a guide. On ball check valves the rolling action of the ball retains seating surfaces in good condition until ball size or ball guide is worn and replacement parts are needed.

### 6.9.2. Seat Ring Replacement (Threaded)

Valves having renewable (threaded-in) seats may have the seat ring replaced while the valve is in the line. The inside area of the seat ring has a hexagonal shape, into which a hexagonal shape tool may be inserted. The seat ring may then be removed by un-threading the seat in a counterclockwise direction. The seat threads in the valve body should be carefully inspected to make sure they are in useable condition.

**NOTICE** When installing new seats, the seats should be screwed tightly into the valve body, then unscrewed and examined to make sure they are making continuous contact, for a tight seal.

### 6.10. Swing Check Valve Seating Surfaces: Repair and Replacement

The seating surfaces of swing check valves can be repaired as described for gate valves in Section 6.8. The disc can be lapped on any surface plate. Upon valve re-assembly, ensure the hinge and disc assembly is properly oriented to the seat.

**NOTICE** The valve and seat ring design and the method of seat ring installation are such that the valve must be removed from the line when seat ring replacement is necessary. Therefore, it is recommended that the valve be replaced or returned to the factory for seat ring replacement.

### 7.0. Spare Parts

Spare parts generally consist of stuffing box packing and body/bonnet gaskets for all Bonney Forge forged steel valves. Packing and gaskets are usually readily available from Bonney Forge inventory, for standard valves. In the event that packing and gaskets are not available, or the customer desires to purchase a different type of packing or gasket, Bonney Forge can provide the necessary dimensional information.

When ordering spare parts, please have the following information available (found on valve nameplate): size, figure number, item number, and material. When possible, the original purchase order and purchase date can help identify the parts, especially those used on special order valves.
## 8.0. Troubleshooting Guide

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
</table>
| Leakage through stem packing     | 1. Gland nuts are loose  
2. Packing is dried or worn  
3. Improper packing installation  
4. Insufficient packing in stuffing box  
5. Stem is damaged | 1. Tighten gland nuts per Section 6.4.  
2. Replace packing per Section 6.4.  
3. Replace packing per Section 6.4.  
4. Add packing per Section 6.4.  
5. Repair or replace stem or replace valve. |
| Leakage through body/bonnet flange | 1. Bonnet bolts are loose  
2. Gasket is damaged | 1. Tighten bolts per Section 6.6 and Table 4.  
2. Replace gasket per Section 6.7. |
| Seat Leakage                     | 1. Valve is not fully closed  
2. Dirt or debris between sealing surfaces.  
2. Open valve to flush or clean sealing surfaces.  
3. If possible, repair sealing surface per Section 6.8, 6.9, or 6.10. |
| Difficult to operate             | 1. Over-tightened packing  
2. Stem threads lack lubrication  
3. Dirt or debris on stem threads  
4. Stem or stem threads are bent | 1. Loosen gland nuts per Section 6.4.  
2. Lubricate stem threads per Section 6.3.  
3. Remove dirt or debris from threads; lubricate as needed  
4. Repair or replace stem or valve as required. |
This page is intentionally left blank
Appendix A - Exploded View Typical Gate Valve (Bolted Bonnet Design)
Appendix B - Exploded View Typical Globe Valve (Bolted Bonnet Design)
### Appendix C - Exploded View Typical Piston/Ball Check Valve (Bolted Bonnet Design)

<table>
<thead>
<tr>
<th>NO</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RIVET</td>
</tr>
<tr>
<td>2</td>
<td>NAME PLATE</td>
</tr>
<tr>
<td>3</td>
<td>BOLTS</td>
</tr>
<tr>
<td>4</td>
<td>BONNET</td>
</tr>
<tr>
<td>5</td>
<td>GASKET</td>
</tr>
<tr>
<td>6</td>
<td>PISTON</td>
</tr>
<tr>
<td>7</td>
<td>INTEGRAL SEAT</td>
</tr>
<tr>
<td>8</td>
<td>BODY</td>
</tr>
<tr>
<td>9</td>
<td>SPRING</td>
</tr>
<tr>
<td>10</td>
<td>BALL</td>
</tr>
</tbody>
</table>

![Diagram of Piston/Ball Check Valve](image_url)
Appendix D - Exploded View Typical Swing Check Valve (Bolted Bonnet Design)
Bonney Forge has made every attempt to ensure that the information contained in this Installation, Operation, and Maintenance manual is correct. This manual is provided for informative purposes and to provide general guidance in regards to installation, operation, and maintenance of Bonney Forge forged steel valves. Therefore, the material contained herein does not constitute a guarantee of satisfactory results by reliance thereon, nor shall it be construed as a product warranty or guarantee. It is ultimately the purchaser’s/user’s responsibility for the proper installation, operation, and maintenance of Bonney Forge valves.

Bonney Forge reserves the right to change designs, materials, or specifications without notice. Questions regarding these provisions, or regarding material contained in this manual, shall be directed to Bonney Forge at the following address:

Bonney Forge  
Mount Union Plant  
14496 Croghan Pike  
Mount Union, PA 17066-0330  
Phone: 814-542-2545  
Toll Free: 1-800-345-7546