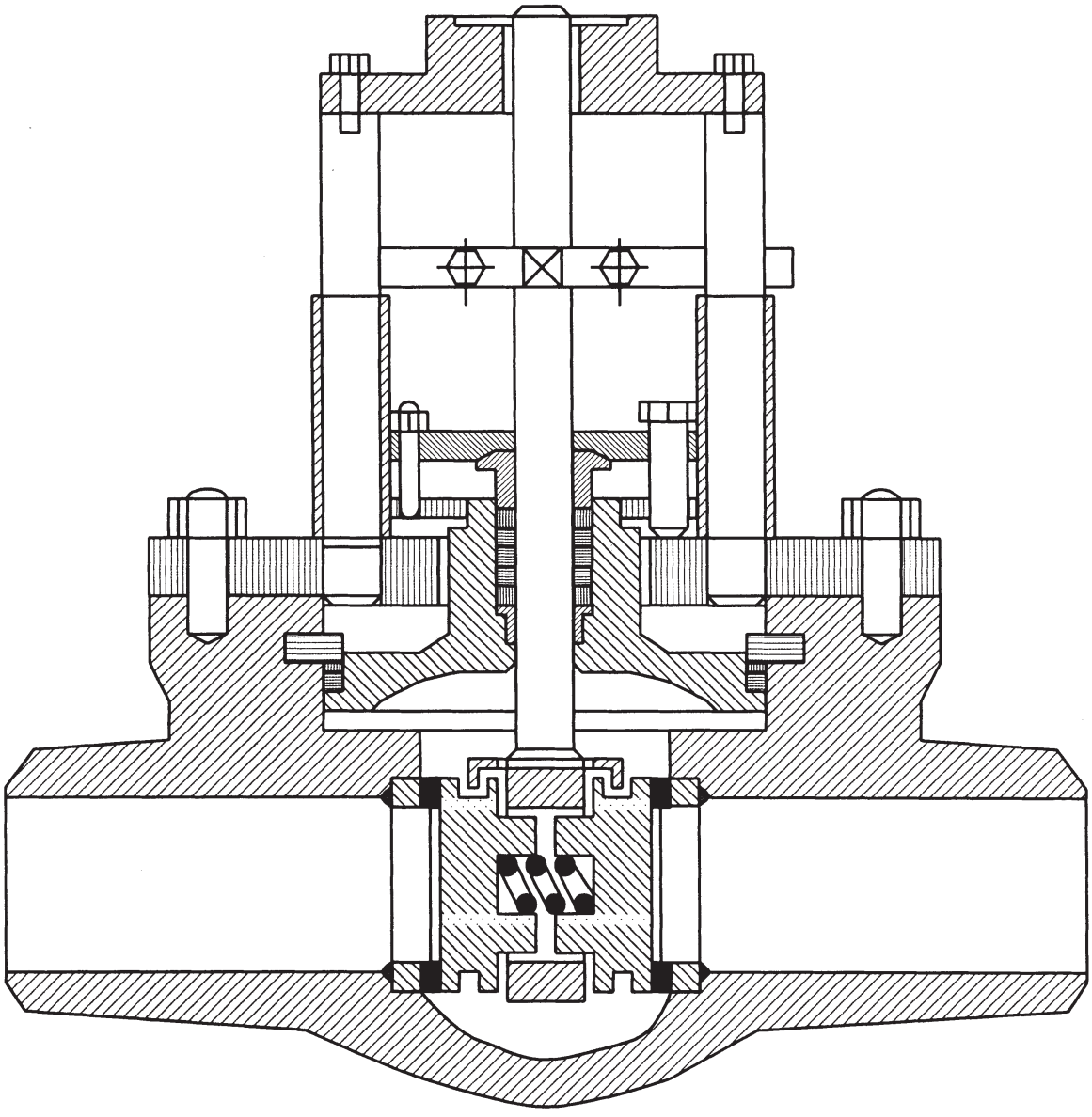
Atwood & Morrill

Parallel Slide Gate Valves

Installation / Operation / Maintenance



Excellent
Engineering
Solutions

WEIR VALVES & CONTROLS

Publication Date 3/17/10

Important: Order Information for Replacement Parts

Weir Valves & Controls USA Inc. manufactures and provides service and replacement parts for the Atwood & Morrill Brand Valves as shown in this catalog.

Maintain this page to allow for the ordering of replacement parts. **Note:** Recommended spare parts are shown on the attachment drawing. When ordering, reference the order number below along with the drawing item number found on the attached drawings.

When inquiring about your specific equipment, please reference our order number _____ so that we may quickly assist you. To order spare parts, provide this number along with the "Type Number" which coincides with the applicable drawing in the last section of this manual. **Note:** Our order number is found on the valve tag located on the valve cover flange. Also supply the valve size, pressure rating and proper part name.

In this instruction manual is an assembly drawing that includes a parts list. An asterisk (*) will denote the recommended spare parts.

Caution Note:

This manual has been prepared for use by experienced, trained individuals who are competent in the installation, operation and maintenance of the equipment. Those personnel who are responsible for the installation, operation and maintenance of this equipment should thoroughly familiarize themselves with the contents of this manual prior to any attempt at installing, operating or maintaining the equipment.

The equipment covered by this manual contains high pressure, high temperature steam and water. There may also be electrical sources or pressurized air supplied with the equipment. It is important that personnel working on or with this equipment understand the hazards involved. This manual contains several "WARNING" and "CAUTION" notes which should be carefully read by the personnel who will work with the equipment. Reading these notes will minimize risk of personal injury and/or equipment damage. In this manual, "WARNING" constitutes a possible personal injury situation and "CAUTION" constitutes possible equipment damage which may render the equipment unsafe for further operation.

In addition, "NOTES" are used throughout the manual to highlight those portions of the text that are important for the safe, efficient installation, operation or maintenance of the equipment.

Table of Contents

1.0 GENERAL INFORMATION

1.1 Valve Description and Application

We design Atwood & Morrill Parallel Slide Gate Valves (PSGV) for high pressure, high temperature applications where tight shutoff and reliable operation are important. The basic Parallel Slide Gate Valve is best suited for isolation service and it should only be operated in the fully open or fully closed position.

NOTE: WE CAN DESIGN PARALLEL SLIDE GATE VALVES FOR THROTTLING SERVICE. MAKE SURE THAT THE VALVE IS SPECIFICALLY DESIGNED FOR THROTTLING SERVICE BEFORE OPERATING THE VALVE IN A MID STROKE POSITION. CONTACT ATWOOD & MORRILL IF UNSURE ABOUT THE ABILITY OF THE VALVE TO BE USED IN THROTTLING SERVICE.

The Atwood & Morrill Parallel Slide Gate Valve has two independent parallel discs kept in contact with the body seats by a spring or set of springs between the discs (See Figure 1). Because the valve discs are always in contact with the body seats, foreign materials on the seats are cleaned away when the valve is stroked. The valve does not depend on the spring force to seat. The system pressure acting on the downstream disc provides the sealing force. Because Atwood & Morrill Parallel Slide Gate Valves do not use any wedging action to seat, the valve cannot be thermally bound in the closed position.

Atwood & Morrill Parallel Slide Gate Valves use wide flat seats designed to reduce seat bearing stresses. Even with minor damage to the seat faces the Parallel Slide Gate Valve design will still provide tight shut off and long life.

We supply Parallel Slide Gate Valves with a variety of cover joints depending on the application. Lower pressure applications (Class 600 and lower) use a cover joint that is bolted construction with a flat gasket. In higher pressure applications Atwood & Morrill generally uses a pressure sealed bonnet construction. The standard pressure seal construction uses a molded graphite seal ring. Some pressure seal applications use a metal seal ring. The exact details of the cover joint design are shown on the valve assembly drawing provided with the order.

Weir Valves & Controls supplies Atwood & Morrill Parallel Slide Gate Valves with a variety of operators. The valve assembly drawing provided with the valve will show the correct operator. We supply the original equipment manufacturer's Instructions for the storage, installation, operation, and maintenance of the operator separately.

1.2 Valve Operation

The Parallel Slide Gate Valve seat is kept tight by the pressure acting on the back of the outlet disc. The valve seats are designed to provide a tight seal without using a wedge action. Parallel Slide Gate Valves are position seated. The valve is fully closed when the stem guide anti rotation device is approximately 1/16" from hitting the external stops on the Yoke Rods (see Figure 2). Additional tightening of the operator will not increase the seat tightness.

CAUTION: THE PARALLEL SLIDE GATE VALVE IS POSITION SEATED. THE VALVE IS FULLY OPEN OR CLOSED WHEN THE STEM GUIDE/ ANTI ROTATION DEVICE IS APPROXIMATELY 1/16 INCH FROM CONTACTING THE STOPS ON THE YOKE RODS. FORCING THE VALVE PAST THE STOPS WILL CAUSE DEGRADED PERFORMANCE AND CAN POTENTIALLY DAMAGE THE VALVE INTERNALS.

The valve stroke is limited in the open direction by a stem backseat that contacts the valve cover when the valve is fully open. While the stem backseat can reduce packing leakage, WV&C does not recommend using the backseat to isolate the packing chamber for online replacement of the valve stem packing.

WARNING: DO NOT ATTEMPT TO REPLACE THE VALVE STEM PACKING WITH THE STEM BACK SEAT ISOLATING THE PACKING CHAMBER FROM THE INTERNAL SYSTEM PRESSURE. ATTEMPTING TO REPLACE THE VALVE STEM PACKING WHILE THE VALVE STILL HAS PRESSURE INTERNALLY CAN RESULT IN PERSONAL INJURY OR DEATH.

1.3 Pressure Lock Between Seats and Bonnet Over Pressurization (see Figure 3 for reference)

Atwood & Morrill Parallel Slide Gate Valves, like all double seated valves, can seal simultaneously against both seats. When the center cavity is full of liquid and subsequently heated or cooled to the freezing point, a dangerous rise in the internal cavity pressure can occur. This can lead to equipment damage or pressure boundary failure.

Both ASME/ANSI B16.34 (Valves Flanged, Threaded and Welded End), paragraph 2.3.3, and ASME/ANSI B31.1 (Power Piping Code) paragraph 107.18 recognize this situation and require the PURCHASER to provide a means in design, installation, or operation to assure that the pressure inside the valve will not exceed the rated pressure for the temperature attained.

To help our customers meet the requirements of the code, WV&C can provide a method to equalize the pressure between the center cavity and the connecting pipe line. WV&C has several methods available to equalize the pressure. The easiest way to meet the requirements of the code is to establish operating procedures that require the valves in the open position whenever a change in operating temperature is expected.

If having the valve in the open position during start-up and shut down is not practical, you must have some arrangement to equalize the pressure in the center cavity. The simplest method that we can design into the valves is drilling the upstream disc (see Figure 4). The drilled upstream disc will prevent over pressurization, but the valve will no longer be capable of bidirectional sealing. Great care must be taken to ensure the valve is installed in the pipeline correctly.

Another method that we can incorporate into the design is an equalizing pipe (intergate relief line). We connect the center cavity to the upstream side of the body with an external pipe. This method also renders the valve unidirectional unless it is fitted with an isolation valve. (See Figure 5).

NOTE: VALVES THAT ARE UNIDIRECTIONAL WILL HAVE A FLOW ARROW ON THE BODY. MAKE SURE THAT THE VALVE IS INSTALLED WITH THE FLOW ARROW POINTING IN THE DIRECTION OF FLOW. FAILURE TO INSTALL THE VALVE CORRECTLY WILL CAUSE OPERATIONAL PROBLEMS WITH ISOLATION OF THE VALVE.

1.4 Operation of Intergate Relief Line Stop Valves
(see Figures 6 and 7 for reference)

When the external intergate relief pipe is fitted with an isolation valve, the isolation valve should only be closed when isolating the upstream side of the valve from a downstream pressure source is necessary. When isolating the upstream side is necessary, first shut the main valve, and then shut the intergate relief line stop valve.

When upstream isolation is no longer required, open the intergate relief line stop valve first and then open the main valve.

WARNING: FAILURE TO OPERATE THE INTERGATE RELIEF LINE STOP VALVE AS DESCRIBED ABOVE MAY RESULT IN EQUIPMENT DAMAGE OR PRESSURE BOUNDARY FAILURE.

2.0 STORAGE AND INSTALLATION

2.1 Short Term Storage

When storing the valves for less than six months, the following instructions will apply.

The valves should be stored in their original packaging and in the orientation that they were placed for shipment until just before installation. If the packaging is damaged, notify WV&C immediately for instructions.

Storage facilities should be atmospherically controlled, heated and well ventilated. We recommend indoor storage. The storage area should limit the possibility of damage due to corrosion, contamination, or physical mishandling.

We ship our valves in a clean, dry condition, free of grease, slag or other foreign matter. We seal all openings to prevent the entry of any foreign matter into the valve during shipment. Desiccant packs are secured to the protective end caps. If you plan to store the valves for more than three months, you should replace the desiccant quarterly. After you have replaced the desiccant, make sure to resecure the protective end caps.

When valves are supplied with electric motor operators, the operator manufacturer’s storage recommendations must be followed. The limit switch compartment must have desiccant installed. When the limit switch compartment is fitted with internal space heaters, you should connect them to a power source and keep them energized throughout the storage period. All plastic seals should remain in place until just before installation.

When valves are supplied with air or hydraulic actuators follow the manufacturer’s recommendations for storage of the actuators and power units.

2.2 Extended Storage

When valves will be stored for longer than six months, the valve stem packing should be removed and the stuffing box should be lightly coated with silicon grease. The stuffing box should then be sealed. Before installation, stuffing boxes must be cleaned and suitable new packing installed.

When valves are supplied with electric motor operators, the operator manufacturer’s storage recommendations must be followed. The limit switch compartment must have desiccant installed. When the limit switch compartment is fitted with internal space heaters, you should connect them to a power source and keep them energized throughout the storage period. All plastic seals should remain in place until just before installation

When valves are supplied with air or hydraulic actuators follow the manufacture’s recommendations for storage of the actuators and power units.

2.3 General Installation Notes and Precautions

The interior surfaces of the valve that are accessible when the valve is in the closed position have been coated with a preservative. These surfaces, and the seating surfaces, must be cleaned using a site approved solvent. When removing the preservative from the internal surfaces, care must be taken not to damage the valve seating surfaces. Do not use wire brushes to remove any preservative from the seat faces. When all the interior surfaces have been cleaned of the preservative, wipe the surfaces with a site approved solvent using clean lint-free cloths and allow the surfaces to air dry. The coating applied to the weld end preparations does not have to be removed before installation. Just before positioning the valve for fit-up, reinspect the internals for cleanliness and verify correct orientation.

Some valves are unidirectional. Check the valve for a flow arrow. Be sure the valve is being installed in the correct orientation in the pipeline.

Make sure that the power supply of the actuator is adequate. For air operated valves make sure the air supply pressure is correct and the volume of air that can be delivered is adequate to operate the valve within any specified time limits. For electric motor operated valves confirm that the power source is correct for the particular operator.

CAUTION: SOME THREE PHASE MOTOR OPERATORS ARE PHASE ROTATION SENSITIVE. READ AND FOLLOW THE MOTOR OPERATOR INSTALLATION PROCEDURES. FAILURE TO FOLLOW THE INSTALLATION PROCEDURES MAY CAUSE EQUIPMENT DAMAGE OR IMPROPER OPERATION.

2.4 Installation Welding Precautions

While the actual welding and inspection procedures for the attachment welds are the owner's responsibility, WV&C requires that the procedures address the following items:

1. The valve discs must be in the closed position during all phases of installation preheating, welding and postweld heat treatment of the weld.
2. The maximum temperature of the valve seat area must not exceed the values listed in Table 2.4.1 during all phases of installation welding including pre and post weld heat treatment. Monitor the temperature of the valve body exterior at the area of the seat to assure compliance with this requirement.

Table 2.4.1 Maximum Seat Area Temperature During Installation Welding

Body Base Material	Maximum Temperature (°F)	Maximum Temperature (°C)
Carbon Steel, A216 WCB, A105	800	425
Low Alloy Steel (1¼Cr.,½ Mo.) A217 WC6, A182 F11	1100	590
Low Alloy Steel (2¼Cr., 1 Mo.) A217 WC9, A182 F22	1100	590
High Chrome C12A	1100	590

Consult the Valve assembly drawing for body material. If the body material type is not listed in Table 2.4.1, call WV&C for specific guidance.

3. Apply heat to the valve body seat area, uniformly. Heating and cooling rates MUST NOT exceed 200°F (90°C) per hour per inch of material thickness.

Note: Be careful when installing valves in vertical pipelines. Weld debris that fall onto the seating surfaces can cause damage to the seat faces.

2.5 Pre Start-up Operational Testing

After the valve has been properly installed in the pipeline, the following pre operational testing should be done.

2.5.1 Field Hydrostatic Testing

During field hydrostatic testing of the pipe connection welds, do not exceed the valve pressure rating. If the valve is being used as the test boundary, make sure that the valve is opened and the pipeline is drained after the test. Check the valve periodically for external leaks.

It is possible that the valve stem packing will leak during hydrostatic testing. If the valve stem packing is leaking during hydrostatic testing, tightening the valve stem packing gland bolting can generally stop the leak. Care should be taken when tightening the gland bolting. Make sure the gland is pulled down evenly and that the packing or gland does not retard the free movement of the valve stem.

NOTE: When any adjustments are made to the gland, the valve must be cycled two or three times to verify smooth and non-binding operation.

CAUTION: DO NOT USE THE VALVE AS A HYDROSTATIC TEST BOUNDARY WHEN THE OPPOSITE END OF THE VALVE IS ISOLATING A LIVE STEAM SOURCE. THE DIFFERENTIAL TEMPERATURE ACROSS THE VALVE WILL INDUCE HIGH STRESS LEVELS IN THE VALVE SEAT HARD SURFACING, AND MAY CAUSE FAILURE OF THE SEATING SURFACES.

2.5.2 Pressure Seal Ring Precautions

In valves fitted with pressure sealed bonnets, the pressure seal can relax in the time between final shop testing and initial site hydrostatic testing. Before hydrostatic testing, WV&C recommends that the cover jacking screws be checked to make sure they are still tight and the seal ring is firmly in position. A small leakage amount through the seal with little pressure on the valve is not cause for concern. Higher pressure application will generally seal the cover tightly. The greater the valve internal pressure, the tighter the seal ring will become.

Note: Do not tighten cover jacking screws with line hydrostatic test pressure applied. If tightening of the jacking screws is needed to stop the leakage reduce the pressure applied to the system operating pressure and then tighten the jacking screws. Tightening the cover jacking bolts with hydrostatic pressure applied will make future disassembly very difficult.

2.5.3 Chemical Cleaning

Before chemical cleaning, saturate the valve stem packing with water to prevent absorption of chemicals into the packing. After chemical cleaning is complete, the valve stem packing should be removed and replaced.

2.5.4 Steam Blows

Do not use the valve in pipeline steam blows. Debris suspended in the high velocity steam flow could seriously damage the valve seating surfaces. If bypassing the valve during steam blows is impractical, specialized steam blow down protective equipment must be used to protect the valve seats. Contact the WV&C Service Department for availability of the equipment.

2.5.5 Valve Operator Stroke Testing

Before start-up, stroke the valve with both the normal power source and the manual override if so equipped. Make sure that the operation is smooth throughout the stroke from open to close to open.

2.5.6 Motor Operator Limit Switch Adjustment

When Parallel Slide Gate Valves are fitted with motor operators, the operators are supplied with limit switches used to control the valve stroke. The limit switches are set at the factory for the correct stroke. No adjustment to the switches is required, unless the switch settings are tampered with. If adjustment of the switches is necessary, the following procedure should be followed.

1. The Parallel Slide Gate Valve is designed to provide a tight shut-off by having the disc seats and the body seats directly in line. When setting the valve stroke, it is important that the disc and body seat are in alignment. The stroke of Parallel Slide Gate Valves is limited by position and not by torque.

CAUTION: DO NOT REWIRE THE MOTOR OPERATOR TORQUE SWITCH. THE PARALLEL SLIDE GATE VALVE IS POSITION SEATED. THE MOTOR OPERATOR IS SET TO LIMIT STROKE WITH THE TRAVEL LIMIT SWITCHES. THE TORQUE SWITCH IS ONLY USED AS A BACKUP IF THE LIMIT SWITCHES FAIL.

SETTING THE PARALLEL SLIDE GATE VALVE MOTOR OPERATOR TO STOP ON THE TORQUE SWITCH MAY RESULT IN SERIOUS DAMAGE TO THE VALVE INTERNALS AND/OR DEGRADE VALVE PERFORMANCE.

2. To set the limit switch for the fully closed position, use the manual override to stroke the valve by turning the valve hand wheel clockwise until the anti rotation bars are 1/16" from the fully closed stop position. Set the limit switch at this position according to the motor operator manufacturer's procedures.
3. Assure that the operator's torque setting is not in the minimum position. The setting should be in the mid-range position. Any adjustments made should be carried out according to the motor operator manufacturer's procedures.
4. To set the limit switch for the fully opened position, use the manual override to stroke the valve. Turn the valve handwheel counterclockwise until the stem's backseat contacts the cover's backseat, inside the valve. When the backseats are in contact, the handwheel will be difficult to turn. Now, turn the handwheel clockwise closing the valve until the stem has moved 1/16" closed. Set the limit switch at this position following the motor operator manufacturer's procedures.
5. Now operate the valve using the motor operator. Stroke the valve from fully closed and fully open to ensure that the operator is positioning the disc properly by observing the position of the anti rotation bars. Also make sure the motor operator is stopping because the limit switches have tripped, and not by torque stall. The stem should completely stop before hitting the backseat or external stop.

CAUTION: SOME THREE PHASE MOTOR OPERATORS ARE PHASE ROTATION SENSITIVE, READ AND FOLLOW THE MOTOR OPERATOR INSTALLATION PROCEDURES. FAILURE TO FOLLOW THE INSTALLATION PROCEDURES MAY CAUSE EQUIPMENT DAMAGE OR IMPROPER OPERATION.

3.0 MAINTENANCE

3.1 Mechanical Maintenance Safety Precautions

The foundation of safety in an industrial environment is knowledge about the hazards involved with the job to be done. All personnel who work on this equipment must understand the instructions, drawings and/or procedures for the equipment on which he or she is working.

The following safety guides should be considered each time maintenance is about to be done on mechanical equipment.

1. Always read and understand the maintenance instructions for the equipment before starting maintenance. Have a copy of the instructions at the work site for reference.
2. Always ensure that the work area is clean, free from obstruction and properly lighted.
3. Always know the valve service! Is the valve in a safe condition before any maintenance work? Does the pipeline contain hazardous materials, fluids or vapors?
4. Always coordinate maintenance with the Operations Department. Ensure that ALL the devices used to isolate a component are tagged and locked out.
5. Beware of valves that can be remotely actuated and valves with stored energy actuators (ie. air or spring). If these components are being worked on, ensure that all means of actuating the valve are tagged and locked out and carefully control the release of any stored energy.
6. Always ensure the line is depressurized and cooled before breaching the pressure boundary. As a guide, the line is depressurized when:
   A. The local pressure gauge reads zero.
   B. The drain has been clear for at least five minutes.
7. Always use the correct tool. This includes all hand tools, power tools and scaffolding.
8. Always know how much weight is being lifted. Inspect ALL lifting equipment (shackles, slings, falls, eyes, etc.) and ensure that all components are adequate for the lift.
9. Always observe all safety procedures in force at the site.
10. Always replace worn or damaged parts with the original equipment manufacturer's replacement parts and install them following the manufacturer's instructions and recommendations. DO NOT attempt to manufacture parts from unauthorized materials.
11. Always observe the initial pressurization if maintenance involves breaching of the pressure boundary. Be ready to isolate the components quickly if a problem occurs.
12. ALWAYS STOP IF IN DOUBT. Recheck documentation and secure a second opinion. Be sure you understand what has to be done and what to expect before proceeding. Practice the STAR Principle, Stop, Think, Act and Review.
13. Never do any maintenance on energized or pressurized equipment.
14. Never defer maintenance once a problem is identified. Continued operation may further damage the equipment or endanger personnel.

3.2 Preventive and General Maintenance

The only maintenance required for the valve during operation are periodic inspections. These inspections should include checking for leaks at the stuffing box and cover sealing areas. Also, inspect the valve stem and guide surfaces of the yoke rods and the stem guide anti rotation device for cleanliness. Paint, dirt, rust scale or other foreign matter on these surfaces can greatly hamper the operation of the valve. Clean the surfaces whenever possible.

WV&C recommends that the valve packing be inspected yearly or during the routine plant maintenance outages and replaced accordingly.

Seal or packing replacement, inspection or repair of the valve internals can be accomplished without removal of the main valve body from the line.

Check the condition of the valve before disassembly. Thoroughly inspect the valve stem and all other exposed moving parts. Foreign material such as dirt, rust or scale can greatly hamper the smooth operation of the valve.

Clean the surfaces wherever possible. Inspect the joints, connections and stuffing boxes where persistent leakage may occur.

After surface cleaning and inspection or repair of the valve externals, begin valve disassembly. Clean all parts with a wire brush (except seating surfaces) and wash them with an approved cleaning solvent. Wipe the surfaces with a lint-free cloth or allow the parts to air dry.

Inspect each part carefully for damage. Rework the parts or replace them from stock, as inspections show.

At reassembly, always use new sealing parts such as gaskets and stem packing.

3.3 Valve Disassembly

NOTE: Before disassembling the valve, be sure to have as a minimum a new seal ring packing set and disc locking plate on hand.

CAUTION: DO NOT ATTEMPT ANY MAINTENANCE OR REPAIR OF THE VALVE UNLESS ALL PERSONNEL WHO WORK ON THIS EQUIPMENT HAVE COMPLETELY READ AND UNDERSTOOD THESE INSTRUCTIONS. FAILURE TO FOLLOW THE INSTRUCTIONS LISTED HERE MAY CAUSE EQUIPMENT DAMAGE.

3.3.1 Manual Gear or Electric Motor Actuator Removal

WARNING: BEFORE ATTEMPTING TO REMOVE ELECTRIC MOTOR OPERATORS MAKE SURE THE ELECTRICAL SUPPLY TO THE ACTUATOR IS PROPERLY ISOLATED. MAKE SURE THAT THE BREAKERS ARE OPENED YOU HAVE REMOVED THE FUSES AND THE EQUIPMENT IS PROPERLY TAGGED OUT ACCORDING TO THE SITE APPROVED TAG OUT PROCEDURE. FAILURE TO ISOLATE THE POWER SUPPLY BEFORE ATTEMPTING TO WORK ON ELECTRIC MOTOR ACTUATORS CAN CAUSE PERSONAL INJURY AND/OR EQUIPMENT DAMAGE.

1. Verify that the valve is isolated and depressurized. To release any pressure locked between the two discs, stroke the valve to the fully opened position and return it to the fully closed position.
2. Attach a suitable hoist to the operator to support its weight during the disassembly process.
3. Remove the bolting that holds the operator on the adaptor plate or bridge.
4. Rotate the handwheel clockwise (as in closing the valve). Take up on the hoist as the operator travels up the stem. Be careful not to damage the stem threads as the operator separates from the stem.

WARNING: USE CAUTION AS THE OPERATOR SEPARATES FROM THE STEM AS IT MAY SWING ESPECIALLY IF THE LIFTING POINT IS NOT DIRECTLY IN LINE WITH THE STEM CENTERLINE. IF THE OPERATOR IS ALLOWED TO SWING, IT MAY DAMAGE THE STEM NUT THREADS OR INJURE PERSONNEL.

5. The operator can be removed to a suitable work area if further disassembly is required.
6. Remove the hex nuts, hex head capscrews, lockwashers and the stem guide anti rotation device from the stem.
7. If the yoke rods screw directly into the body and not into a bottom plate, the top plate can now be removed. Remove the capscrews or nuts holding the top plate to the yoke rods and remove the top plate. If the yoke rods screw into a bottom plate, remove the nuts that secure the plate to the valve body and remove the top plate, yoke rods, and bottom plate in one assembly.
8. Remove the gland plate's hex nuts, gland plate and gland.

NOTE: If the cover flange jacking bolts pass through the gland plate, the jacking bolts can be removed at this point.

9. The packing can now be removed using a suitable packing removal device such as a packing puller, or hydraulic packing remover. Use caution not to score the stem during the removal process.

3.3.2 Removal of Air or Hydraulic Operators

WARNING: BEFORE ATTEMPTING TO UNCOUPLE AIR OR HYDRAULIC OPERATORS FROM THE VALVE MAKE SURE YOU UNDERSTAND HOW THE ACTUATOR WORKS, AND THAT THE ACTUATOR IS IN A SAFE CONDITION. SOME AIR OPERATORS ARE SPRING LOADED TO FAIL THE VALVE IN AN OPEN OR CLOSED POSITION. BEFORE YOU REMOVE THE ACTUATOR MAKE SURE THAT YOU HAVE RELEASED ANY SPRING TENSION, AND THAT YOU PROPERLY REMOVE THE POWER SUPPLY FROM SERVICE ACCORDING TO THE SITE APPROVED TAG OUT PROCEDURE. ATTEMPTING TO REMOVE AN AIR OR HYDRAULIC ACTUATOR WITH THE POWER SUPPLY STILL IN SERVICE CAN CAUSE PERSONAL INJURY AND/OR EQUIPMENT DAMAGE.

1. Verify that the valve is isolated and depressurized. To release any pressure locked between the two discs, stroke the valve to the fully opened position and return it to the fully closed position. After stroking the valve remove the coupling.

Note: Air or Hydraulic operators are connected to the valve stem by a variety of coupling devices. Usually we thread the valve stem and actuator push rods into the coupling. In Some split style couplings the push rod and valve stem are keyed into the coupling. When the coupling is a split style, the coupling can be removed by removing the bolting that holds the two halves together. When the coupling is solid, the actuator push rod must be unthreaded from the coupling.

2. Attach a suitable hoist to the operator to support its weight during the disassembly process.
3. Remove the bolting that holds the operator on the adaptor plate or bridge.
4. The operator can be removed to a suitable work area if further disassembly is required.

5. Remove the hex nuts, hex head capscrews, lockwashers and the stem guide anti rotation device from the stem.
6. If the yoke rods screw directly into the body and not into a bottom plate, the top plate can now be removed. Remove the capscrews or nuts holding the top plate to the yoke rods and remove the top plate. If the yoke rods screw into a bottom plate, remove the nuts that secure the plate to the valve body and remove the top plate, yoke rods, and bottom plate in one assembly.
7. Remove the gland plate's hex nuts, gland plate and gland.

NOTE: If the cover flange jacking bolts pass through the gland plate, the jacking bolts can be removed at this point.

8. The packing can now be removed using a suitable packing removal device such as a packing puller or hydraulic packing remover. Use caution not to score the stem during the removal process.

3.3.3 Valve Cover Area

Because there are several different designs of upper structures and various methods to secure the pressure seal cover, separate disassembly instructions for each style are given. While the basic ideas and function of the parts remain the same in all the designs, distinct differences prevent one set of steps to cover all of the valve types. Examine the outside of a particular valve, to determine which design combination is present. The following is a brief summary of each:

I. YOKE RODS

The yoke rods are used to support the valve's operator. The key difference is how the yoke rods are secured to the valve body. The two methods are:

A. Yoke rods are screwed directly into the body casting.
B. Yoke rods are screwed into a bottom plate that is secured to the body casting.

II. PRESSURE SEAL COVER DIFFERENCES

The noticeable external differences are the way that the cover is pulled into place. Jacking studs, screws or bolts are used to raise the cover to its proper sealing position. The locations of the two jacking devices are:

A. Long studs are screwed directly into the cover and pass through a bottom or locking plate placed over the body cover bore opening.
B. A cover flange is screwed on the cover, around the stuffing box. Capscrews, bolts or setscrews are threaded into the flange so the bolting contacts a bottom plate. By screwing downward against the plate, the flange rises, lifting the cover into its proper position.

III. TYPE IDENTIFICATION

After examining the valve, determine its type. The valve design type will also be listed on the assembly drawing.

Table 3.3.3.1 Valve Design Types

TYPE NO.	THE VALVE HAS:
1 See Figure 8	Valve is a pressure seal design AND Yoke rods screwed into the body AND Cover flange screwed onto the cover.
2 See Figure 9	Valve is a pressure seal design AND Yoke rods screwed into the body AND No cover flange. Studs and nuts coming through a bottom or locking plate.
3 See Figure 10	Valve is a pressure seal design AND Yoke rods screwed into a bottom plate AND Cover flange is screwed to the cover AND Jacking bolts pass through the gland
4 See Figure 11	The valve is a pressure sealed design AND Yoke rods screwed into a bottom plate AND There is no cover flange AND Studs and nuts coming through a bottom or locking plate.

3.3.4 Type 1 Cover Disassembly Instructions

(See Figure 8 for reference)

1. Loosen the jacking screws so they no longer touch the bottom plate.
2. Unscrew the cover flange from the cover.
3. Lift the bottom or locking plate off the body and over the stem.
4. Clean the cover area thoroughly. Then tap the cover down with a block of wood or soft metal drift. If the cover does not move down smoothly, it is probably tilted. Measure the distance from the top of the cover to the body flange face all around the circumference. If the measurement is not equal all around, tap the side where the dimension is smallest until the cover is moving smoothly.
5. Once the cover has moved down to the shoulder, the valve is ready for complete disassembly. Go to step 3.3.8

3.3.5 Type 2 Cover Disassembly Instructions

(See Figure 9 for reference)

1. Remove the jacking hex nuts.
2. Lift the bottom or locking plate off the body and over the stem.
3. Clean the cover area thoroughly. Then tap the cover down with a block of wood or soft metal drift. If the cover does not move smoothly, it is probably not square to the valve cover flange face. Measure the distance from the top of the cover to the body flange face all around the circumference. If the measurement is not equal all around, tap the side where the dimension is smallest until the cover is moving smoothly.
4. Once the cover has moved down to the shoulder, the valve is ready for complete disassembly. Go to step 3.3.8.

3.3.6 Type 3 Cover Disassembly Instructions
(See Figure 10 for reference)

1. The jacking screws should have been removed when the gland plate was removed. If not, remove the jacking screws, gland nuts and gland plate.
2. Unscrew the cover flange from the cover.
3. Remove the hex nuts holding the bottom plate to the body.
4. Clean the cover area thoroughly. Then tap the cover down with a block of wood or soft metal drift. If the cover does not move down smoothly it is probably tilted. Measure the distance from the top of the cover to the body flange face all around the circumference. If the measurement is not equal all around, tap the side where the dimension is smallest until the cover is moving smoothly.
5. Once the cover has moved down to the shoulder, the valve is ready for complete disassembly. Go to step 3.3.8.

3.3.7 Type 4 Cover Disassembly Instructions
(See Figure 11 for reference)

1. Loosen the jacking screws so they no longer touch the bottom plate.
2. Unscrew the cover flange from the cover.
3. Remove the hex nuts holding the bottom plate to the body.
4. Clean the cover area thoroughly. Then tap the cover down with a block of wood or soft metal drift. If the cover does not move down smoothly it is probably tilted. Measure the distance from the top of the cover to the body flange face all around the circumference. If the measurement is not equal all around, tap the side where the dimension is smallest until the cover is moving smoothly.
5. Once the cover has moved down to the shoulder, the valve is ready for complete disassembly. Go to step 3.3.8.

3.3.8 Cover Stem and Disc Pack Removal

1. Once the cover is completely lowered on the shoulder of the valve bore, remove the master segment of the load key. The master segment is the one with parallel sides.

Note: The load key segments have a groove on the upper inside edge to help in the removal of the segments.

2. Remove the remaining load key segments.
3. Remove the backing ring.
4. After the backing ring has been removed, again thoroughly clean the cover area of any foreign matter.

NOTE: The seal ring material can be either metal or graphite. If it is graphite, go directly to step no. 12. If the seal ring is metal, continue.

5. Install four or eight all thread steel rods into the seal ring. The smaller valves have four 1/4"-20 tapped holes and the larger valves have eight 3/8"-16 tapped holes.
6. Applying a thin film of light machine oil into the valve bore can be useful.
7. Fashion a strong back to match-up with the eight threaded rods and sit flush on the top of the valve body.
8. Install eight steel hex nuts with washers. Tighten nuts evenly using the diametrically opposed method.
9. As the seal ring is pulled up, check that it is being drawn up evenly. This is done by measuring the distance from the top of the seal ring to the flange face in four places. The dimension will be the same at all four places if the seal is being drawn up evenly.
10. In larger vavles that use eight pull up rods you can remove the ring using only four of the rods once the ring is moving easily.
11. Once the seal ring is free, it can be lifted from the valve body.
12. The cover, or the cover and stem / disc pack assembly can now be hoisted from the valve body. If you remove the cover by itself, you must use caution that it does not bind or damage the stem.
13. If you removed only the cover in step 12, attach a suitable hoist to the valve stem in preparation for removal.
14. Hoist the valve stem and disc pack assembly up and out of the body seats.
15. Take the stem and disc pack assembly to a suitable work area to complete the disassembly of the disc pack.
16. Place the disc pack in a vise with soft jaws and hold the discs together. Bend the tabs on the locking plate out of the way and remove the hex head shoulder screws.

Note: be careful not to damage the seat faces with the jaws of the vise

17. Remove the disc retainer and loosen the vise until the spring or springs are at their free height.
18. The two discs can now be removed from the carrier ring.

3.4 Post Disassembly Inspection

Once the valve is completely disassembled, a thorough inspection of the internals should be done. When disassembly is complete, several areas should be examined in detail.

3.4.1 Body Internal Inspection
(See Figure 14 for reference)

Pay particular attention to the seat and pressure seal areas when the valve body is inspected.

Inspect both seating surfaces looking for signs of wear, scoring, or cutting. When wear cutting or scoring is discovered, the body seat will need to be lapped to restore the proper seat finish. Measure the distance between the seats at four places using an ID Mic or vernier. The seats should be parallel within .002". If the seats are not parallel, they will need to be reworked by lapping to restore parallelism before reassembly.

Inspect the seal welds that hold the body seat rings in place. The seal welds should be continuous and show no signs of leaks. Any

defects found in the seat ring seal welds should be repaired before lapping and reassembly. Repairs to the seat seal weld should be carried out using a site approved TIG welding procedure appropriate for the body base material.

Inspect the pressure seal area in the body neck. Depending on the seal type used in the construction, scoring across the seal area may affect the performance of the seal. If the valve uses a metal pressure seal, any scoring found should be removed to ensure that the seal will remain pressure tight after reassembly. Removal of the scoring must be done carefully to ensure that the bore remains circular. Even with excellent repair technique it is likely that any repair process will oversize the bore. WV&C does produce oversize pressure seal rings for cases where the seal area bore has been oversized by repair. Another option available is to modify the valve components to accept a graphite pressure seal. This option is available through WV&C's Service Department, and it can often be the quickest and least risky way to approach a scored pressure seal area. When the valve uses a graphite pressure seal, light scoring up to .030" deep can be left in the seal area and the seal will still work.

3.4.2 Inspection of the Stem Assembly

(See Figure 13 for reference)

Inspect the stem assembly for scoring. Pay particular attention to the stem threads condition, the anti rotation device attachment area, the packing area, and the stem back seat.

The stem threads should be inspected for damage. Rolled over metal on the threads will cause difficultly in reassembly and operation. The threads should be reworked with a thread file. If the damage is severe, the stem should be replaced, and the cause of the damage should be investigated.

Check the area where the anti rotation device attaches. The milled edges should be square, with no signs of rolled over material. Damage in this area shows the valve stroke was improperly adjusted, or that the valve was manually operated beyond the stops. Remedial action should be taken to ensure that the valve stroke is adjusted correctly, and that the operators understand the valve is position seated.

The packing area should have no scoring. Any scoring found should be removed by polishing.

The stem back seat should show no signs of steam cutting or scoring. Any defects noted on the stem back seat should be removed by lapping.

3.4.3 Valve Cover Inspection

(See Figure 12 for reference)

Inspect the valve cover for signs of wear or leakage. Pay particular attention to the packing, back seat, and seal surfaces.

Inspect the packing area for signs of pitting. Light pitting can be polished out with emery cloth. Heavy pitting should be investigated to determine the cause.

The back seat should not show signs of scoring or leakage. The back seat should be lapped to the stem, if damaged.

The pressure seal area should be free from scoring, pitting, or evidence of leakage. If the seal area shows any damage, it must be repaired before reassembly. Repair techniques for the cover pressure seal area are identical to those for the body pressure seal area.

3.4.4 Disc Inspection

Inspect the disc seat faces for scoring and wear. If the seat faces are damaged, they must be reworked before reassembly. Light scoring can be removed by lapping. Heavy damage may need machining and lapping to restore the seat finish. The seat overlay must be a minimum of .060" thick after lapping to ensure that the required hardness is retained by the seating surfaces.

3.5 Disc and Body Seat Lapping

(see Figures 15, 16 and 17 for reference)

NOTE: Commercial lapping equipment is available or the following may be done.

1. Before any lapping is done on the discs or body seat rings, measurements must be recorded in Table 3.5.1.
2. Using an ID micrometer or vernier, record the distance between the two body seat rings in four positions 90° apart.
3. Using an appropriate lapping arbor, apply number 180 grit cloth to the arbor face using double stick tape to secure the grit cloth. The grit cloth and tape should be approximately 1" long and spaced at least 1" between each piece.
4. Clean the seat area using acetone or other approved solvent cleaner. Wipe seat with a lint-free cloth or allow it to air dry.
5. Cover the seat area with a thin, even coat of Spray-on 603 layout blue or equal and allow to dry.
6. Install the lapping arbor with unused, clean grit cloth and rotate once or twice. Verify the lapping arbor is flush and equal pressure is applied diametrically.
7. Remove the lapping arbor and inspect the seat area. Areas where the blue is not removed are still low and require more lapping.
8. If the blue has not been completely wiped clean from the entire seat area, additional lapping is required. Clean the grit cloth with air and/or a soft brush. Install the lapping arbor and rotate. The grit cloth should be inspected after 250-500 revolutions. Clean or replace the grit cloth as required. We recommend all pieces of grit cloth and tape be replaced to assure uniform thickness after a lapping period. An air motor or commercial lapping equipment may simplify the lapping process.
9. To check the seating, repeat steps 5-8. Caution must be observed that the seats are only lapped enough to obtain proper seating and that excessive hard surfacing is not removed. The seat will be true when all the blue is removed. The seat area must have a √32 RMS or smoother finish. If this finish cannot be obtained using the number 180 grit cloth, finish the lapping process using number 240, 320 or 400 grit.
10. Upon completion of lapping a particular seat, again measure and record the measurements noted in Steps 2 & 3. Subtract the difference to find out the actual amount of hard surfacing removed from a particular seat. Once the opposite seat is lapped flat, the measurement should be taken again, to find out how much material was removed from the body seats.

Body Seat Dimensions Table 3.5.1

Position	Before Lapping (D1)*	After lapping inlet seat (D2)*	Material removed from Inlet seat (D2-D1=r1)	After lapping outlet seat (D3)*	Material removed from outlet seat (D3-D2=r2)	Total material removed (r3)
1						
2						
3						
4						

NOTE: DIMENSIONS AT ALL FOUR POINTS MUST BE WITHIN .002".

11. The clearance between the disc retainer and the two corresponding grooves of the discs is critical to the proper valve operation. The grooves of both discs may require machining if excessive lapping is required or if new discs are installed (see Figure 17).
12. When any machining operation is done on the disc, check that the seat surfaces have not been disturbed. Perform Steps five through eight to verify that the seating areas have not been affected.

3.6 Backseat Lapping

1. The backseat can be lapped by positioning the cover upside down.
2. Attach a sling and hoist to the bottom of the carrier ring. Hoist the stem assembly into position and insert into the cover.
3. Install a spring between the sling and hoist to take the weight off the stem and carrier ring.
4. Apply a thin, even film of fine lapping compound (340 grit) to the stem backseat and lap the seat by rotating the stem in an oscillating motion. Extreme caution must be observed that excessive down pressure is not used and that the seat area metal does not pick up or gall.
5. The seats can be checked by cleaning the seats thoroughly using acetone or site approved cleaning solvent. Apply a thin film of Dykem Hi-Spot Blue DX-100 or equal to the stem backseat area. Insert the stem into cover and apply pressure (do not rotate). Remove the stem and inspect the blue transfer. The seat will be true when a complete circle of blue transfer is obtained.

3.7 Reassembly

Make sure that all of the parts are cleaned and available. Account for ALL REPLACEMENT PARTS NEEDED TO COMPLETE THE JOB.

3.7.1 Internals Reassembly

1. Install the spring and the two discs into the carrier ring.
2. Put the two discs, spring and carrier ring into the vise, squeeze the discs together, and install the disc retainer, new locking plate, and shoulder screws.
3. Tighten the shoulder screws into the disc retainer. Bend the ends of the locking plate against a flat of each shoulder screw. Be sure the disc retainer has freedom of movement without being constrained by the shoulder screws or the locking tabs. Before removing the disc pack assembly from the vise making two additional temporary retainers may be helpful (see Figure 18) and place them 90 degrees apart from the normal disc retainer. These temporary retainers will be used to help get the disc pack started into the body seats.

NOTE: If one disc has a hole for over pressurization protection, refer to the assembly drawing for proper orientation.

4. Lower the stem and disc assembly into the valve body. Remove the temporary retainers after the disc seats are started into the body seats.
5. Lower the disc pack so the disc seats are in 100% contact with the body seats. With the disc pack in this position, the seat retainer should be free to move under the shoulder screws. The inside edges of the disc retainer should not contact the disc groves. If the disc retainer is not free to move when the disc pack is in this position, then the discs may not be free to contact the body seats.

Note: The disc retainer is designed to keep both discs parallel when the valve is in the fully opened position. In the fully closed position, the disc retainer should not prevent the two discs from reaching the two body seats.

6. Using a suitable overhead hoist, lower the cover over the stem and into the valve body, down to the body bore's shoulder.
7. Install the new seal ring into the body bore. Again be sure that the cover seal area is absolutely clean.
8. Install the backing ring on top of the seal ring.
9. Install the segmented load keys into the groove in the body cover bore. The master load key, the only one with parallel ends, is the last key to be installed. It is helpful to lift the stem and cover up at this time to make sure that the cover fits through the load key.

Note: The load keys have a groove on one side for assistance with removal. Make sure the groove is facing out. Also make sure that the key segments are fully seated in the body or the cover will not be able to pass through the load key and proper sealing will not occur.

3.7.2 Type 1 Cover Reassembly

1. Place the bottom or locking plate over the stem and into the body bore.
2. Screw the cover flange on the cover until the two top surfaces are even. This will protect the threads from damage and dirt.
3. Screw the jacking screws through the cover flange until they touch the bottom plate.
4. Tighten the jacking screws down in equal increments to raise the cover. As the cover rises, be sure the top edge of the cover does not catch a load key.
5. Continue to tighten the jacking screws until the cover is firmly seated in place. Refer to section 5.0 for final torque value on the jacking screws.

Note: When the valve is initially pressurized, there may be a small amount of leakage through the cover's sealing area. This is normal and as the pressure increases, this leakage will most likely diminish and disappear. We recommend that you re tighten the cover bolting after line pressure is established.

3.7.3 Type 2 Cover Reassembly

1. Place the bottom or locking plate over the stem, line up the cover studs and the holes in the bottom or jacking plate and lower it into the body bore.
2. Install the hex nuts on the cover studs and screw them down hand tight to the bottom or jacking plate.
3. Tighten the hex nuts down in equal increments to raise the cover. As the cover rises, be sure the top edge of the cover does not catch a load key.
4. Continue to tighten the jacking screws until the cover is firmly seated in place. Refer to section 5.0 for final torque value on the jacking screws.

Note: When the valve is initially pressurized, there may be a small amount of leakage through the cover's sealing area. This is normal and as the pressure increases, this leakage will most likely diminish and disappear. We recommend that you re tighten the cover bolting after line pressure is established.

3.7.4 Type 3 Cover Reassembly

1. Lower the bottom or locking plate, yoke rods and top plate as an assembly over the stem and secure the assembly to the body using the mounting hex nuts.
2. Remove the top plate hex nuts and top plate from the yoke rods.
3. Place the cover flange over the stem and screw it onto the cover. Screw it down so the top of the cover flange lines up with the top of the cover.
4. Repack the stuffing box at this time. Refer to the packing instructions section
5. Place each of the jacking screws through the gland plate and screw them into the cover flange until they touch the bottom plate.
6. Tighten the jacking screws down in equal increments to raise the cover. As the cover rises, be sure the top edge of the cover does not catch a load key.
7. Continue to tighten the jacking screws until the cover is firmly seated in place. Refer to section 5.0 for final torque value on the jacking screws.
8. Install the top plate on the yoke rods and secure it in place with the hex nuts.

Note: When the valve is initially pressurized, there may be a small amount of leakage through the cover's sealing area. This is normal and as the pressure increases, this leakage will most likely diminish and disappear. We recommend that you re tighten the cover bolting after line pressure is established.

3.7.5 Type 4 Cover Reassembly

1. If the cover bushing was removed, place it over the stem and into the stuffing box.
2. Place the gland over the stem and down to the cover. Do not allow it to enter the stuffing box at this time.
3. Lower the bottom / jacking plate, yoke rods and top plate as an assembly over the stem until it is in place on the body.
4. Secure the assembly to the body using the mounting hex nuts. Refer to section 5.0 for final torque value.
5. Install the hex nuts on the cover studs and screw them down hand tight to the bottom plate.
6. Tighten the hex nuts down in equal increments to raise the cover. As the cover rises, be sure the top edge of the cover does not catch a load key.
7. Continue to tighten the jacking screws until the cover is firmly seated in place. Refer to section 5.0 for final torque value on the jacking screws.

Note: When the valve is initially pressurized, there may be a small amount of leakage through the cover's sealing area. This is normal and as the pressure increases, this leakage will most likely diminish and disappear. We recommend that you re tighten the cover bolting after line pressure is established.

3.7.6 Packing the Stuffing Box and Upper Structure Reassembly

Note: This procedure describes a five-ring packing set with wiper rings on each end and three packing rings in the middle. Please refer to the valve's arrangement drawing for the exact complement of rings, and the fitting of any spacers that may be specified.

1. Install one wiper ring around the stem and into the stuffing box. Push the ring down evenly to the cover bushing.
2. Install the packing, one ring at a time, pushing each down to each previously installed ring. If the rings of packing are split, stagger the splits at least 90° apart. Continue adding rings until there is only enough room for one wiper ring and part of the gland.
3. Add the wiper ring and the gland over the stem and into the stuffing box. Be sure the gland fits the stuffing box without binding.

4. Install the gland plate and hex nuts and tighten the gland down. Be sure the gland shoulder is never closer than 1/4" from the top of the stuffing box. If the gland is this close, add an additional ring of packing.

Note : observe caution when tightening the gland hex nuts. Make sure to pull the gland down evenly and that the gland and gland plate are not touching the stem.

5. Reinstall the top plate onto the yoke rods. Tighten the hex nuts to secure the top plate in place.
6. Attach the stem guide anti rotation device, hex head capscrews, lockwashers and hex nuts.

Note: It may be necessary to re tighten the packing gland after the application of pressure. The gland should be followed up when possible after re-commissioning to maintain packing density and prevent leakage. Glands should be followed up when leakage is detected to obtain optimum service.

3.7.7 Installing electric motor or gear operators

1. Using an overhead hoist, position the actuator over the stem. Turn the handwheel counterclockwise (as if opening the valve). Caution must be observed that the stem threads are not damaged.
2. As the operator comes down the stem, line up the actuator's studs with the holes in the top plate so the handwheel stays in its proper orientation.
3. After the actuator comes down on the top plate and it just starts to raise the stem upward, attach the operator mounting bolting. Refer to section 5 for the correct final torque value.
4. Turn the handwheel counterclockwise to bring the valve to its fully open position. With the stem's backseat firmly against the cover, re tighten the cover bolting to ensure the cover is firmly against the seal ring.
5. When the actuator is installed cycle it manually from fully open to closed to ensure that the valve operates smoothly. For electric motor operators readjust the limit switches as described in section 3.3.9.

3.7.8 Installing Air or Hydraulic Actuators

Note: Air or Hydraulic operators are connected to the valve stem by a variety of coupling devices. In most cases the valve stem and actuator push rod are threaded into the coupling. In some Split couplings, the stem and push rods are keyed to the coupling. When the coupling is a split style, the coupling can be installed by bolting the two halves together. When the coupling is solid, the actuator push rod must be threaded into the coupling.

1. Attach a suitable hoist to the operator to support its weight during the disassembly process.
2. For split style couplings, Lower the actuator onto the top plate and bolt the coupling halves together. Thread the coupling fully onto the stem then while lowering the actuator thread the pushrod into the coupling until the actuator is seated on the topplate.
3. Once the actuator is seated, install and tighten the bolting that attaches the actuator to the top plate. Refer to section 5 for the final torque value.
4. When the actuator is installed cycle the valve to make sure that it operates smoothly.

3.7.9 Adjusting Motor Operator Limit Switches

1. The Parallel Slide Gate Valve is designed to provide a tight shut-off by having the disc seats and the body seats directly in line. When setting the valve stroke, setting the motor operator limit switches is important so that the disc and body seat are in alignment. The stroke of Parallel Slide Gate Valves is limited by position and not by torque.

CAUTION: DO NOT REWIRE THE MOTOR OPERATOR TORQUE SWITCH. THE PARALLEL SLIDE GATE VALVE IS POSITION SEATED, AND THE MOTOR OPERATOR IS SET TO LIMIT STROKE WITH THE TRAVEL LIMIT SWITCHES, THE TORQUE SWITCH IS ONLY USED AS A BACKUP IF THE LIMIT SWITCHES FAIL. SETTING THE PARALLEL SLIDE GATE VALVE MOTOR OPERATOR TO STOP ON THE TORQUE SWITCH MAY RESULT IN SERIOUS DAMAGE TO THE VALVE INTERNALS AND DEGRADE VALVE PERFORMANCE.

2. To set the limit switch for the fully closed position use the manual override to stroke the valve by turning the valve hand wheel clockwise until the anti rotation bars are 1/16" from the fully closed stop position. Set the limit switch at this position following the motor operator manufacturer's procedures.
3. Assure that the operator’s torque setting is not in the minimum position. The torque switch setting should be in the mid range position.
4. To set the limit switch for the fully opened position, use the manual override to stroke the valve. Turn the valve handwheel counterclockwise until the stem’s backseat meets the cover’s backseat, inside the valve. When the backseats are in contact, the handwheel will be difficult to turn. Now, turn the handwheel clockwise closing the valve until the stem has moved 1/16" closed. Set the limit switch at this position following the motor operator manufacturer’s procedures.
5. Now operate the valve using the motor operator to stroke the valve. Stroke the valve from the fully closed to the fully open position to ensure that the valve stroke is properly adjusted. This is done by observing the anti rotation bars. When the stroke is correctly adjusted, the anti rotation bars should just meet the stops on the yoke rod. The motor operator should be stopping because the limit switches have tripped, and not because of torque stalls. The stem should completely stop before hitting the backseat or the external stops.

CAUTION: SOME THREE PHASE MOTOR OPERATORS ARE PHASE ROTATION SENSITIVE. READ AND FOLLOW THE MOTOR OPERATOR INSTALLATION PROCEDURES. FAILURE TO FOLLOW THE INSTALLATION PROCEDURES MAY CAUSE EQUIPMENT DAMAGE OR IMPROPER OPERATION.

4.0 REPLACEMENT PARTS

Recommended spare parts are identified on the valve assembly drawing by an "*".

When ordering spare parts, WVC needs the following information:

- WVC Serial Number or Original Sales Order Number
- Assembly drawing number
- Item number and description (obtained from the assembly drawing)
- Quantity of each part being ordered

5.0 BOLTING TORQUE SHEET

The torque values listed below are based on an approximate preload of 45,000 PSI for ASTM A193 B7 material. The preload will be affected by many factors in assembly. If the threads are not properly cleaned and lubricated, the preload will not be obtained. It is very important to ensure that the bolting is clean and well lubricated before attempting to get the final torque value.

BOLTING SIZE	TORQUE FT. LBS.	NEWTON METERS
3/8" - 16 UNC	20	27
7/16" - 14 UNC	30	41
1/2" - 13 UNC	50	68
9/16" - 12 UNC	70	95
5/8" - 11 UNC	100	136
3/4" - 10 UNC	170	230
7/8" - 9 UNC	270	366
1" - 8 UNC	410	556
1-1/8" - 8 UNC	600	813
1-1/4" - 8 UNC	840	1139
1-3/8" - 8 UNC	1140	1546
1-1/2" - 8 UNC	1510	2047
1-5/8" - 8 UNC	1950	2644
1-3/4"- 8 UNC	2460	3335
1-7/8" - 8 UNC	3050	4135
2" - 8 UNC	3740	5071
2-1/4" - 8 UNC	5410	7335
2-1/2" - 8 UNC	7490	10155

Figure 1 Parallel Slide Gate Valve Design Features

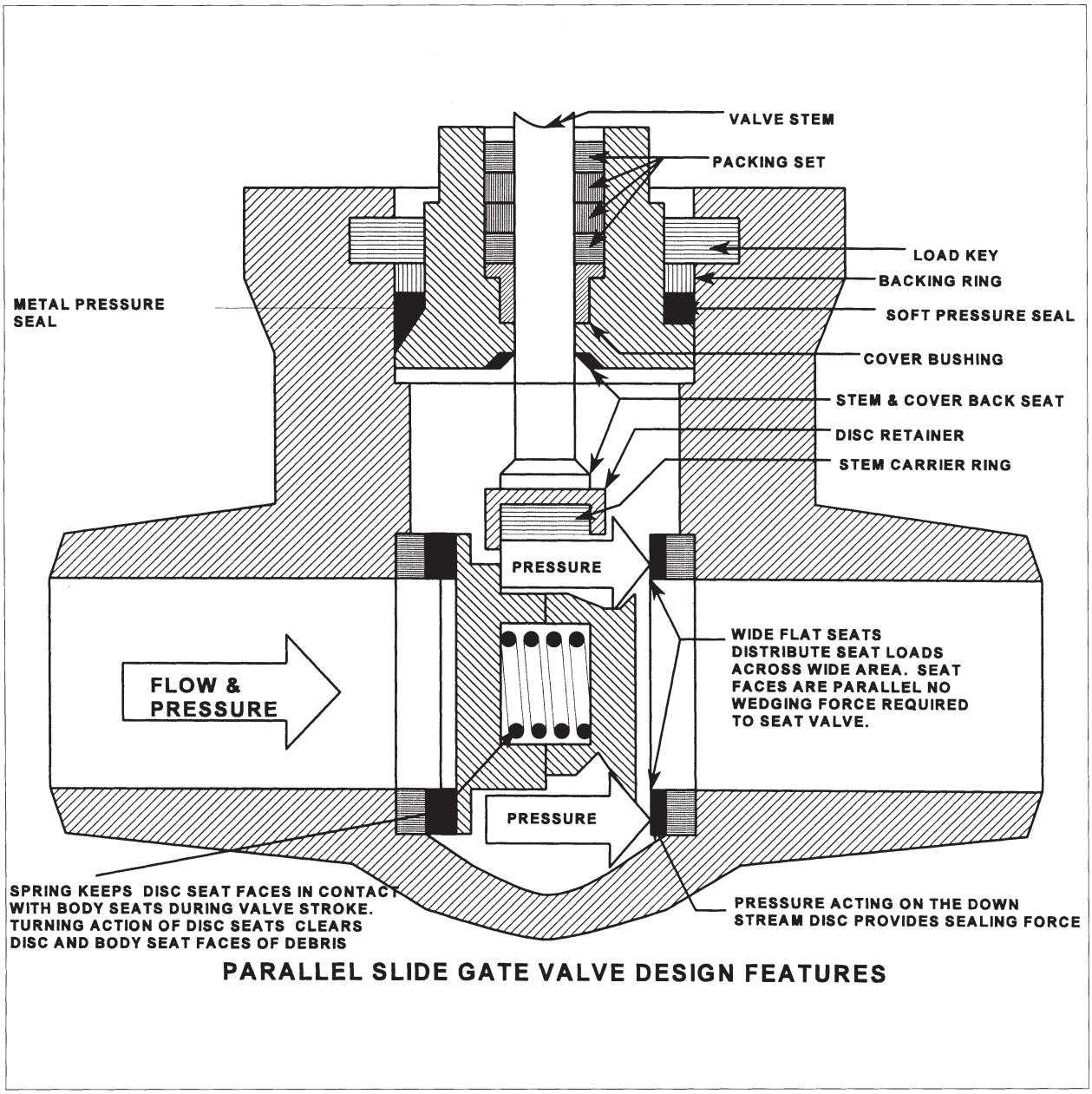


Figure 2 Anti-Rotation Device position when Valve is Closed

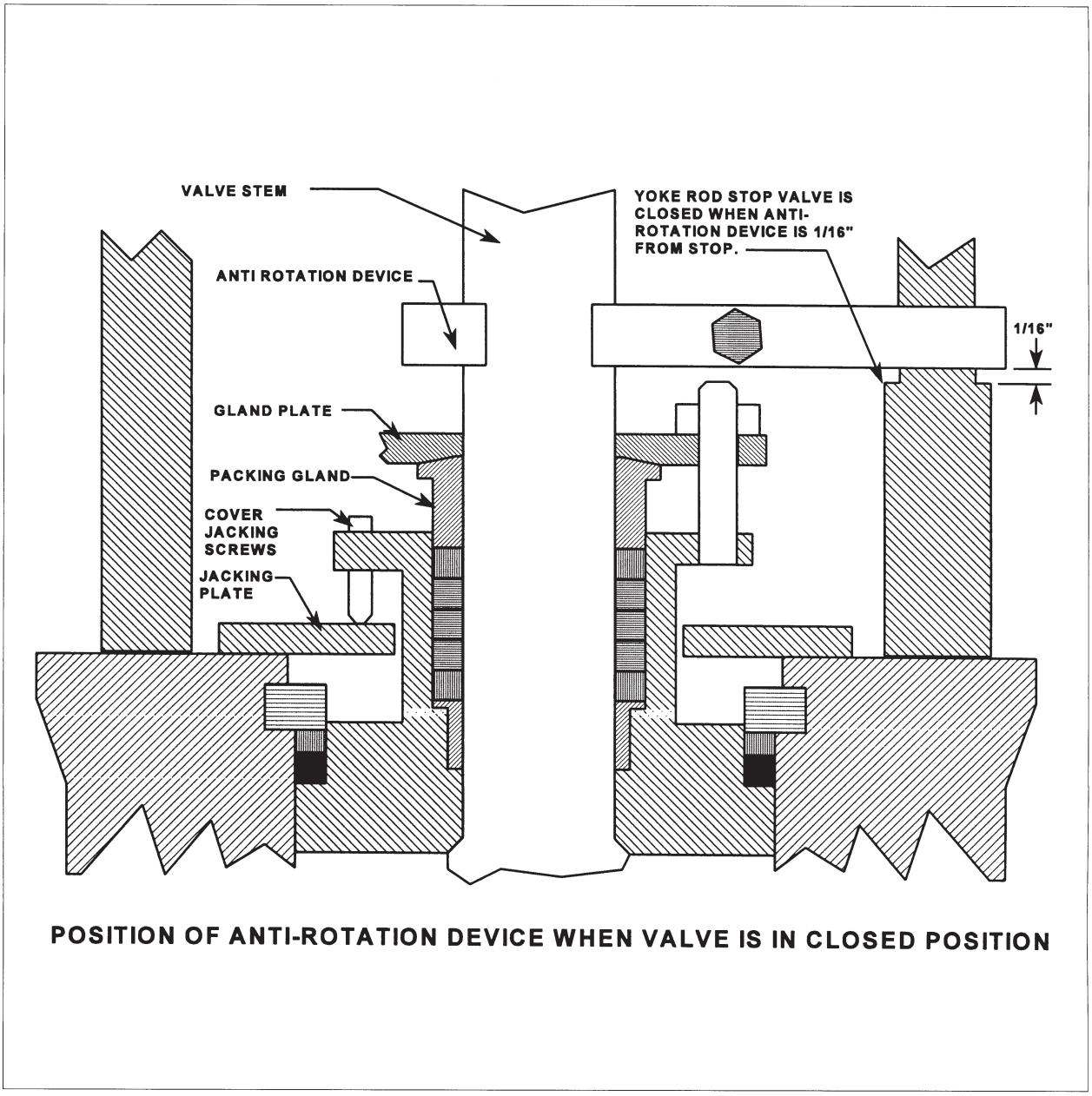


Figure 3 Center Cavity Over Pressurization

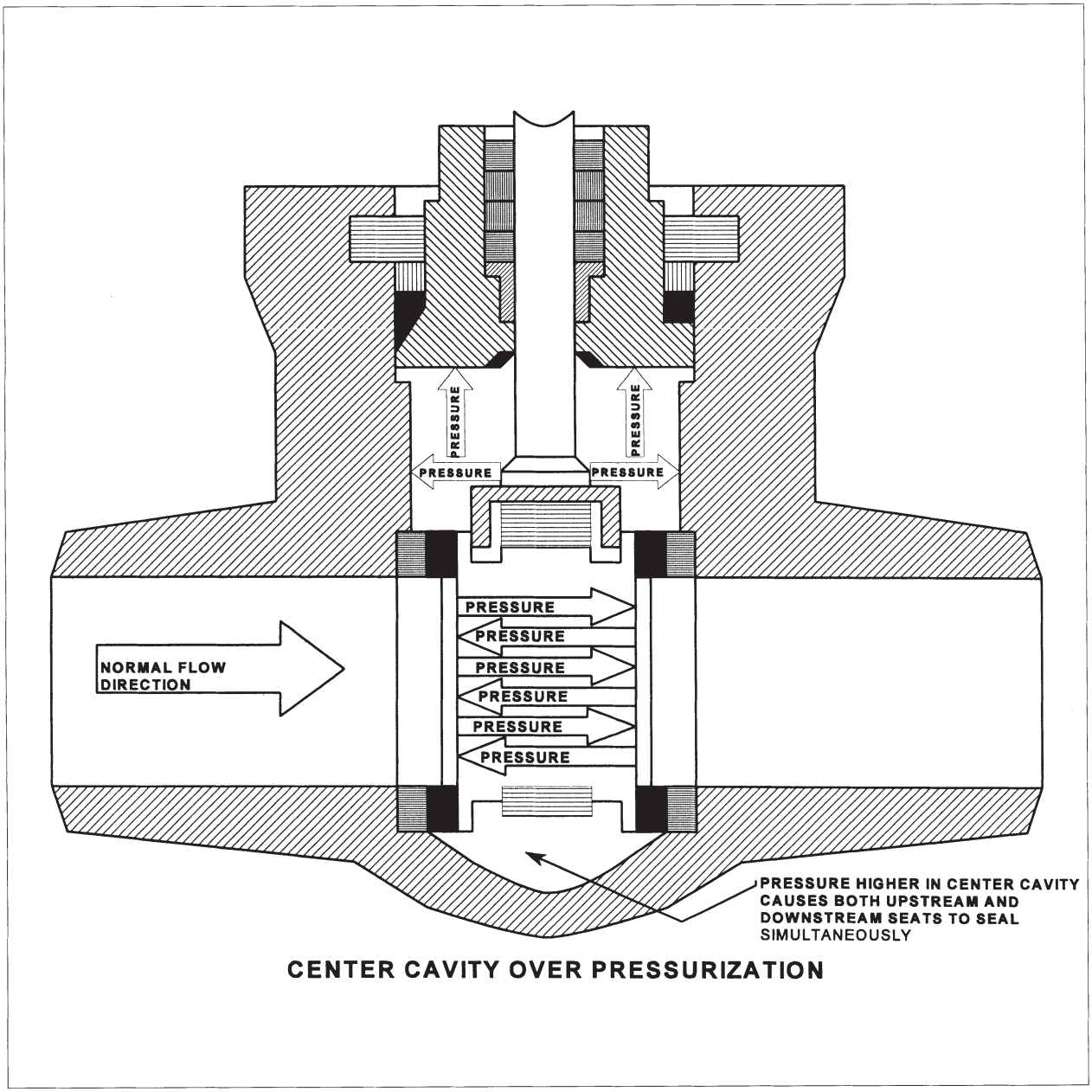


Figure 4 Center Cavity Over Pressure Protection Drilled Upstream Disc

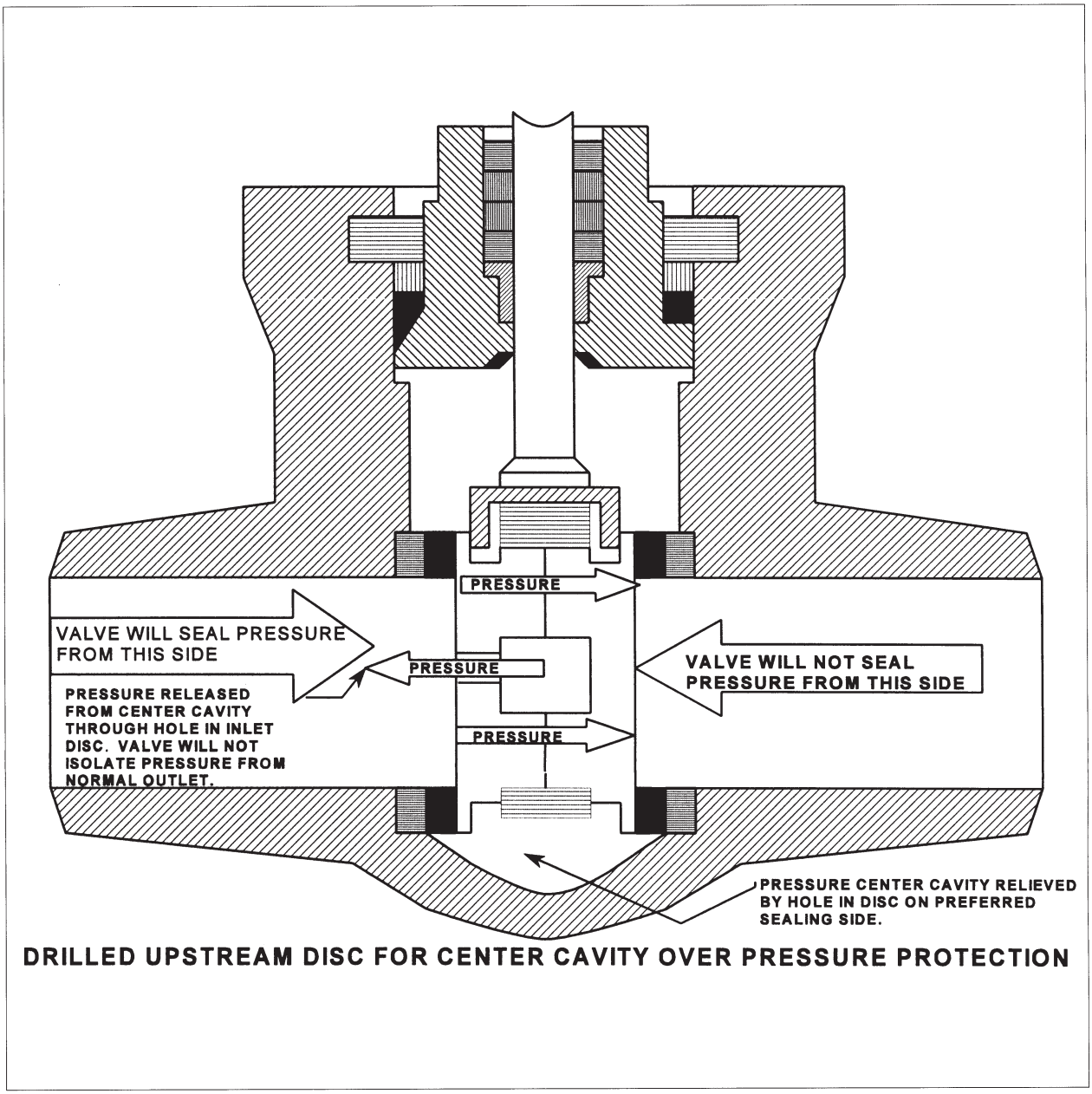


Figure 5 Intergate Relief Line for Center Cavity Protection

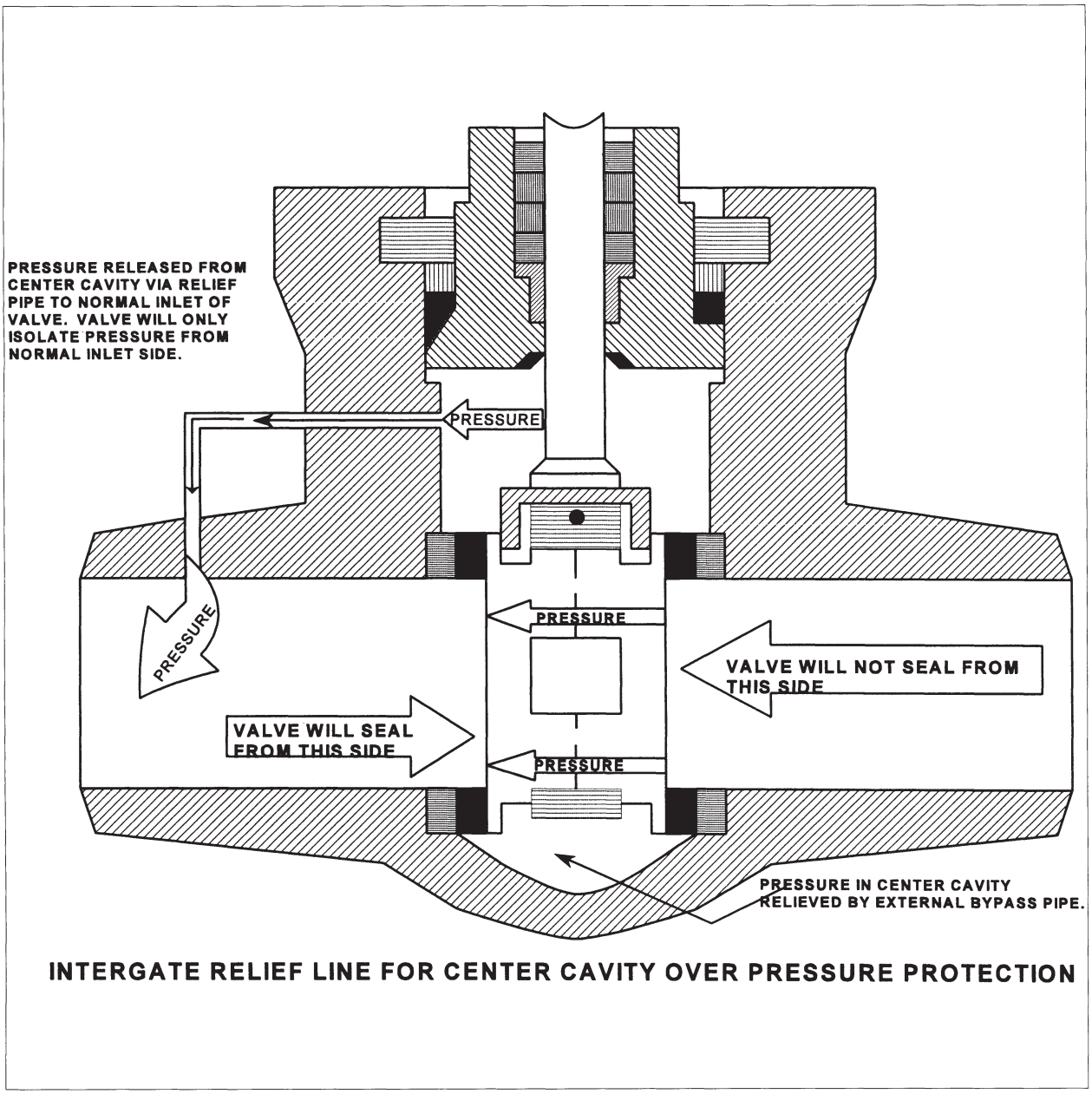
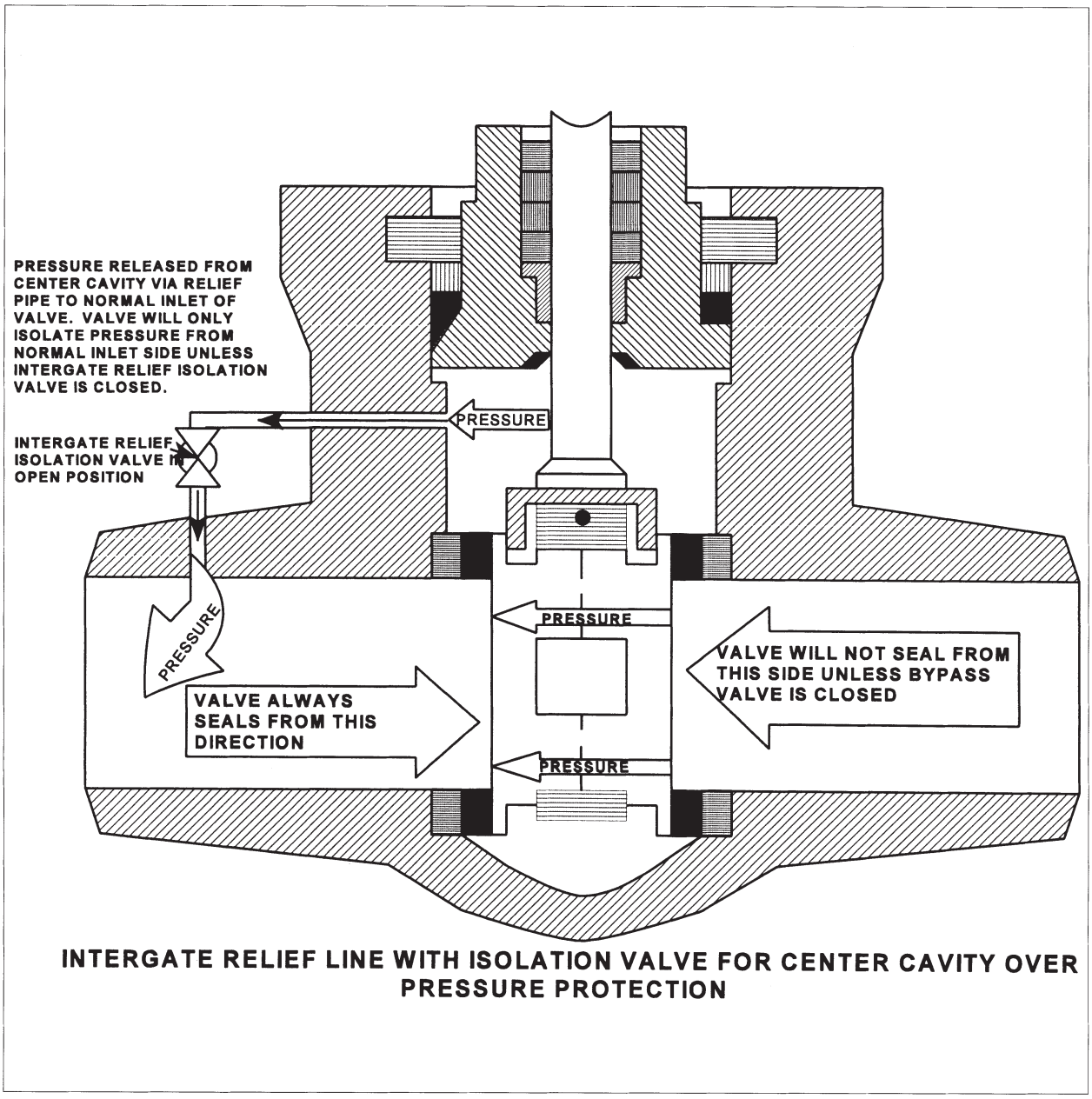


Figure 6 Intergate Relief Line With Isolation Valve



INTERGATE RELIEF LINE WITH ISOLATION VALVE FOR CENTER CAVITY OVER PRESSURE PROTECTION

Figure 7 Intergate Relief Isolation Valve Operation

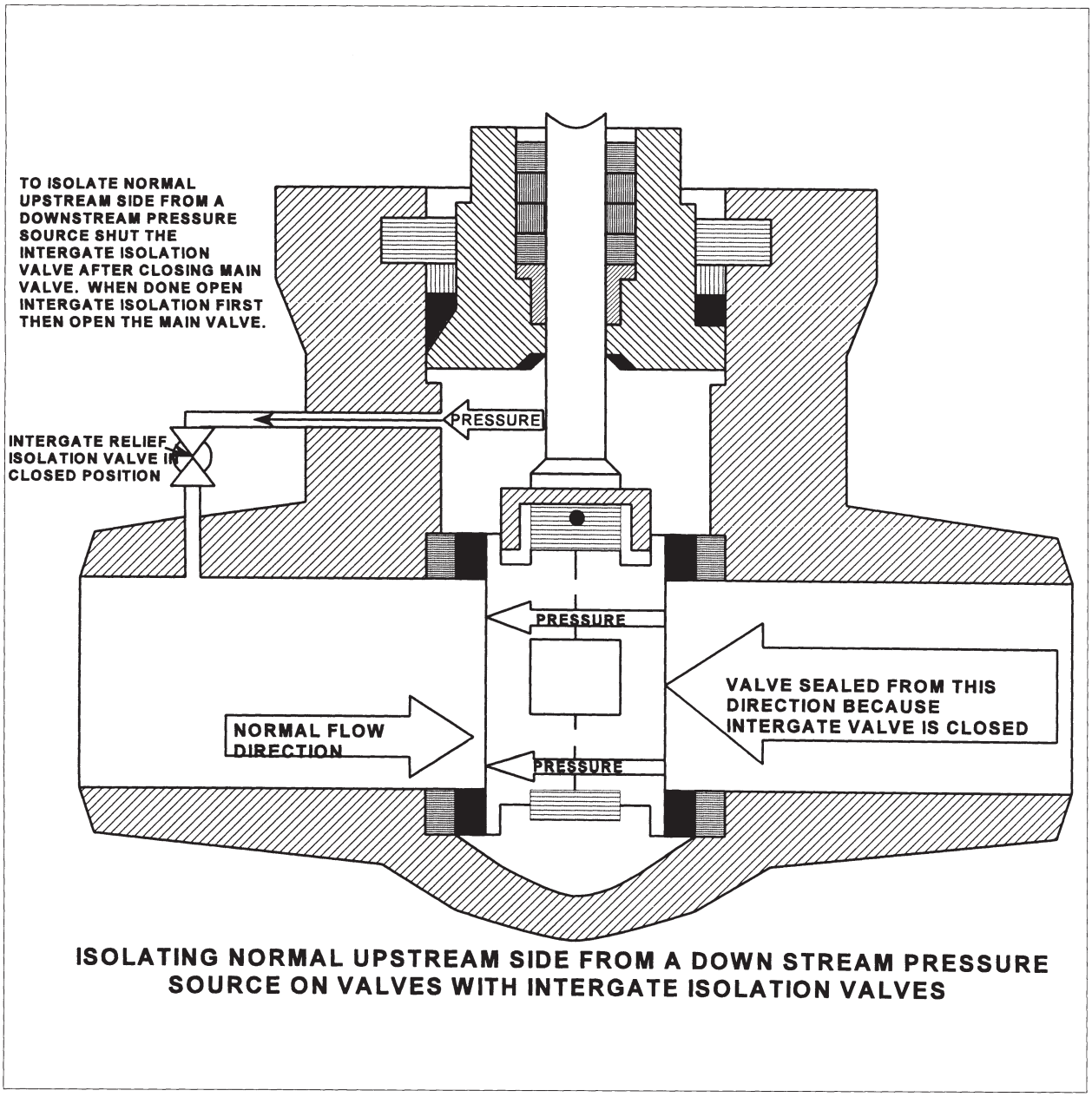


Figure 8 Type 1 Cover Arrangement

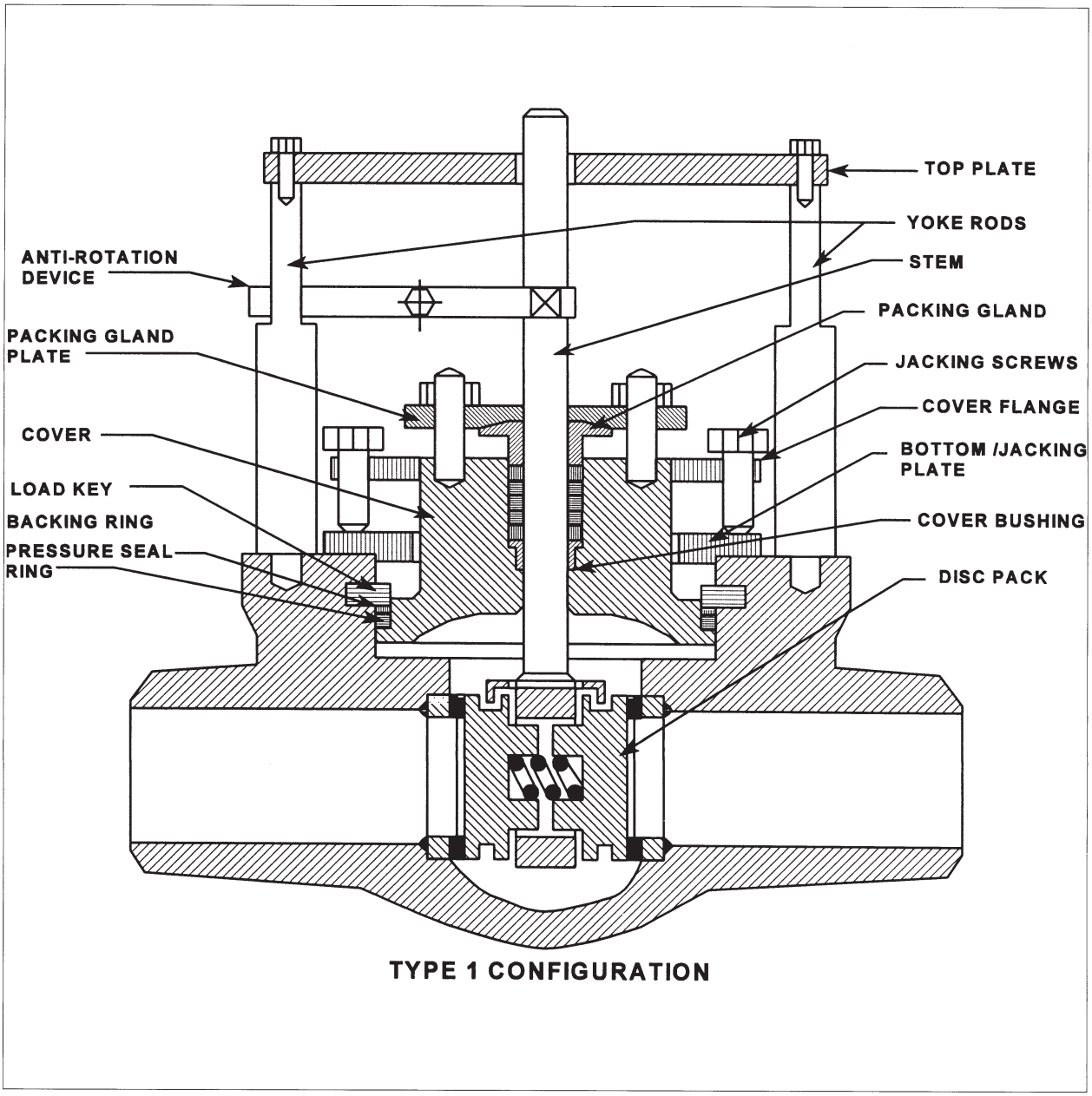


Figure 9 Type 2 Cover Arrangement

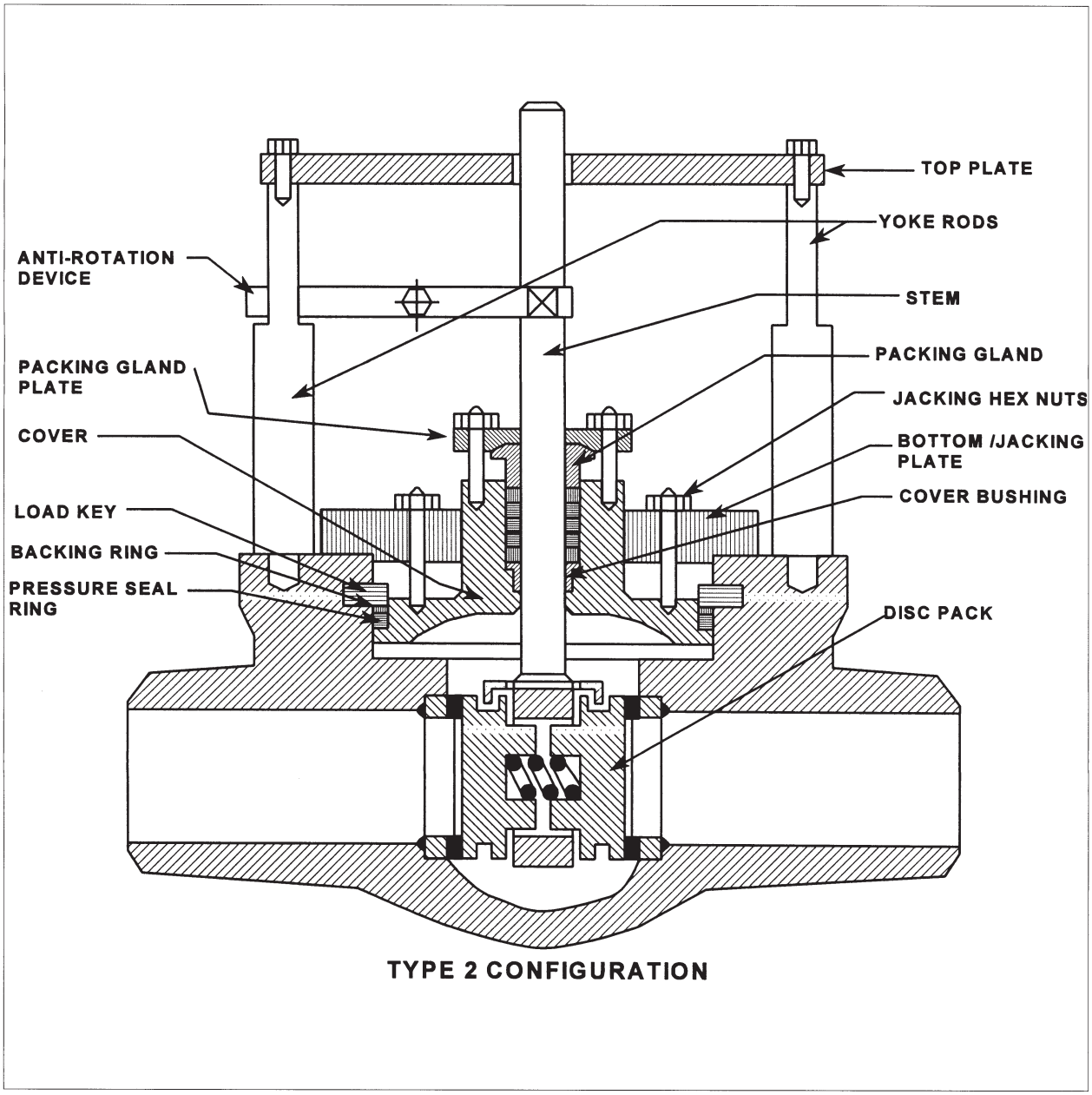


Figure 10 Type 3 Cover Arrangement

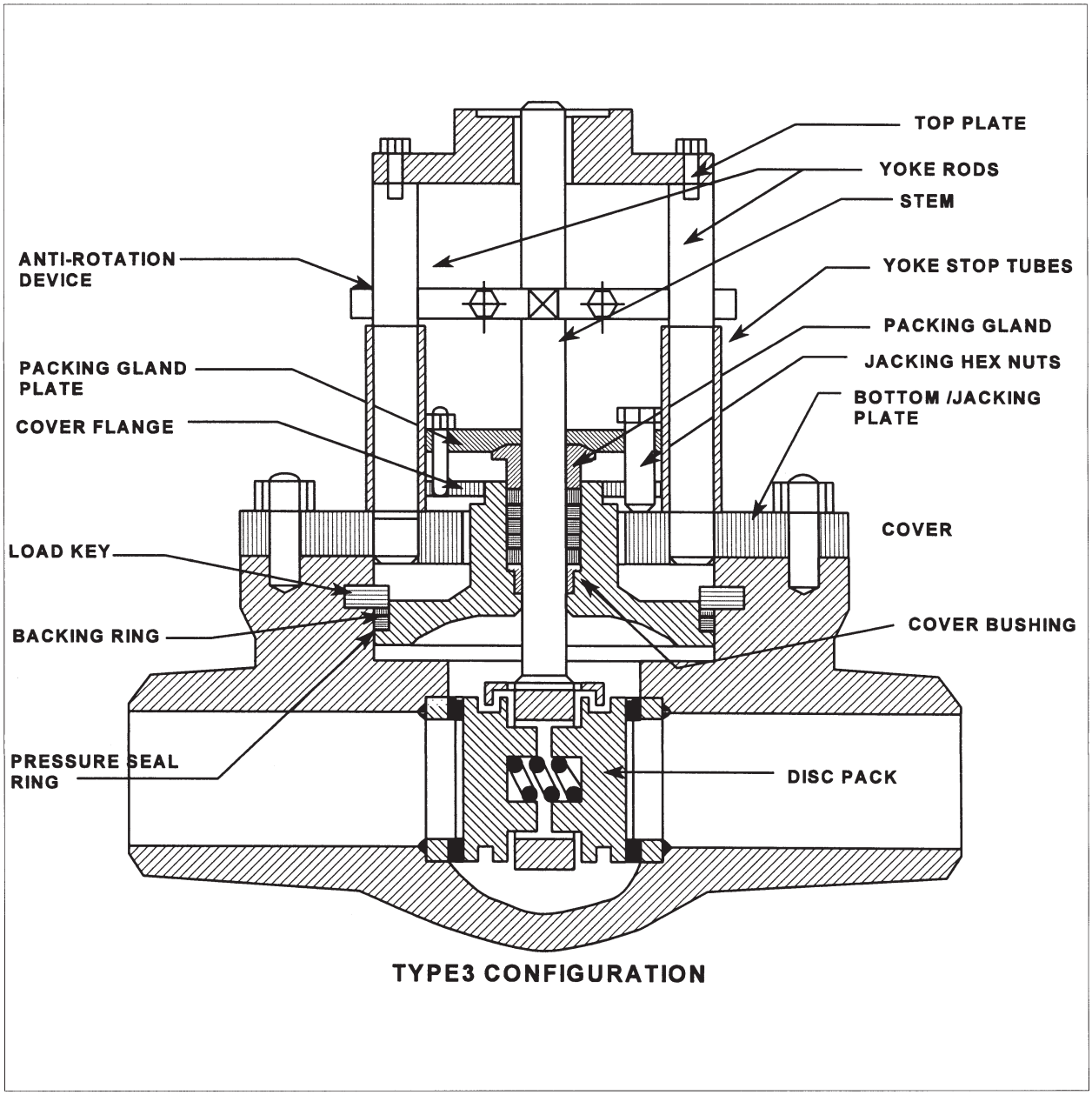


Figure 11 Type 4 Cover Arrangement

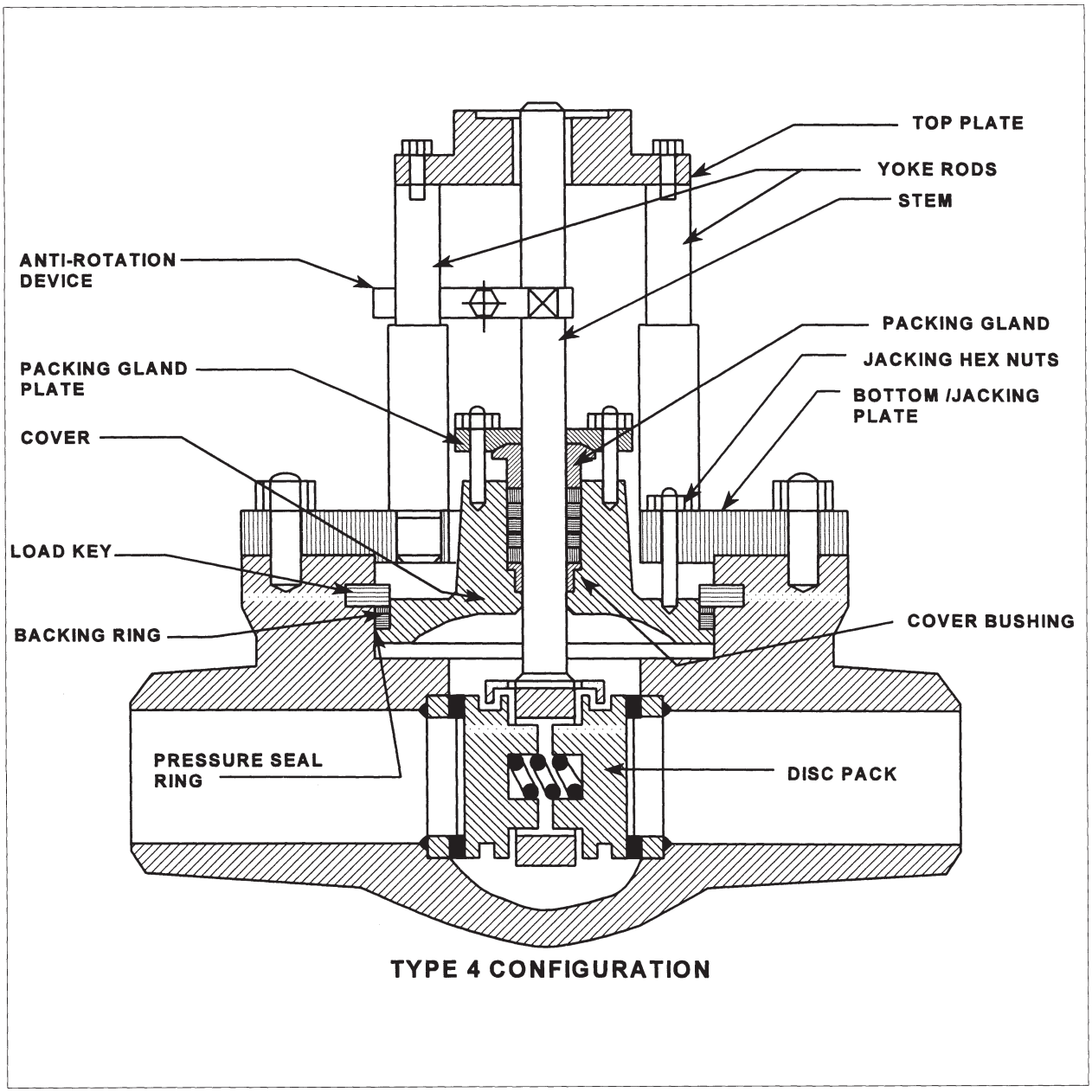


Figure 12 Cover Inspection Points

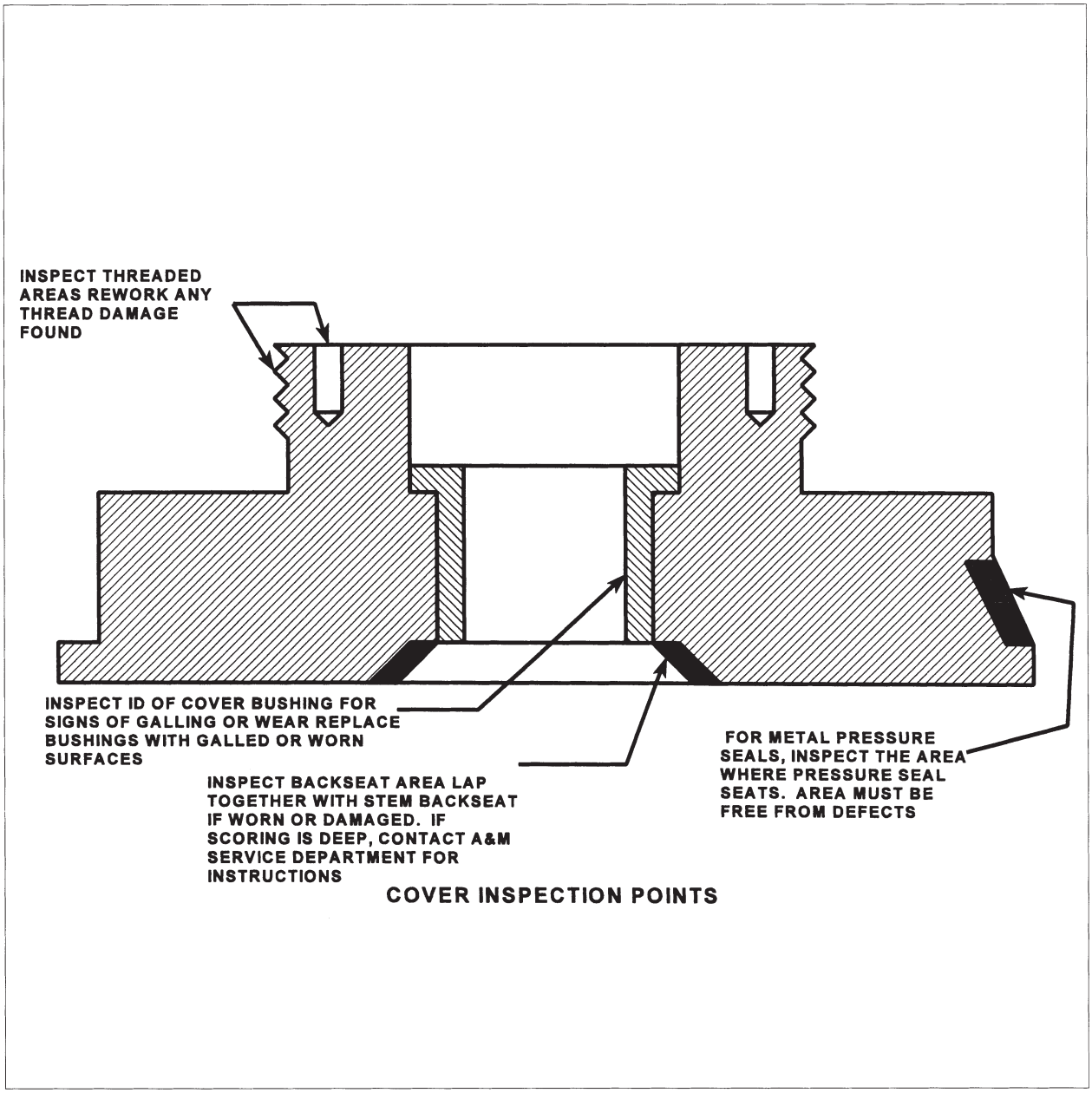


Figure 13 Stem Inspection Points

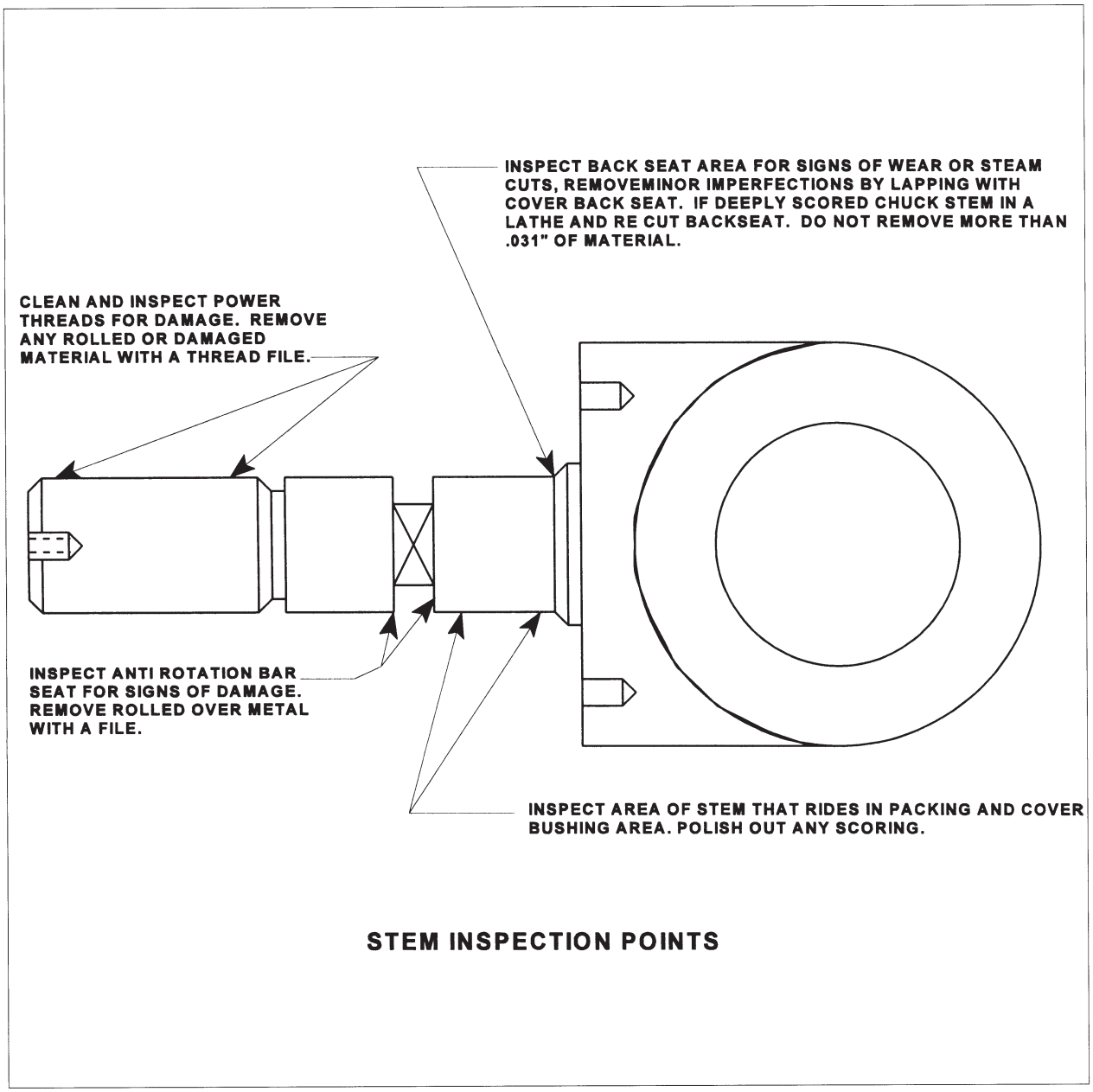


Figure 14 Body Inspection Points

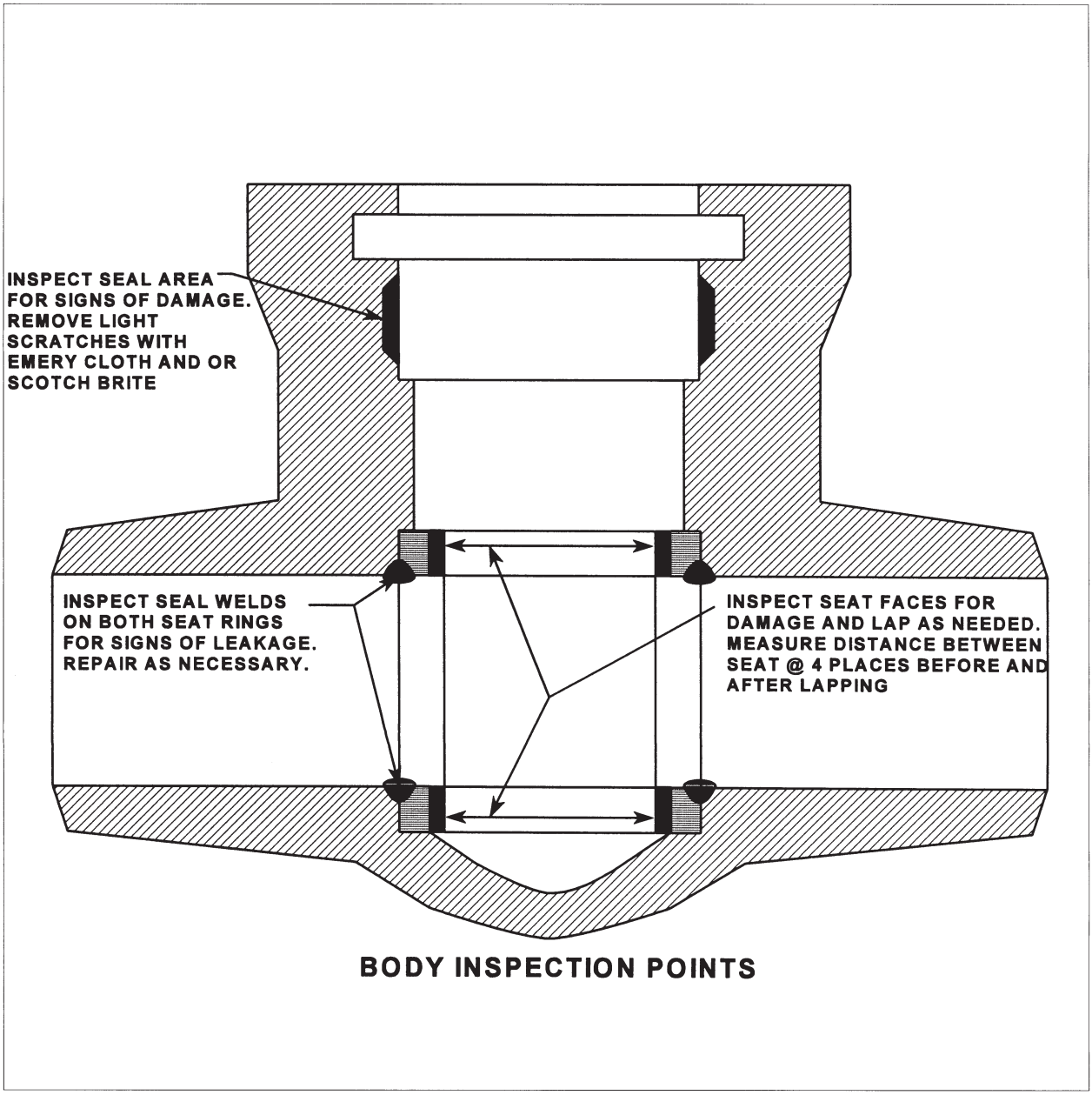


Figure 15 Body & Disc Seat Lapping Plates

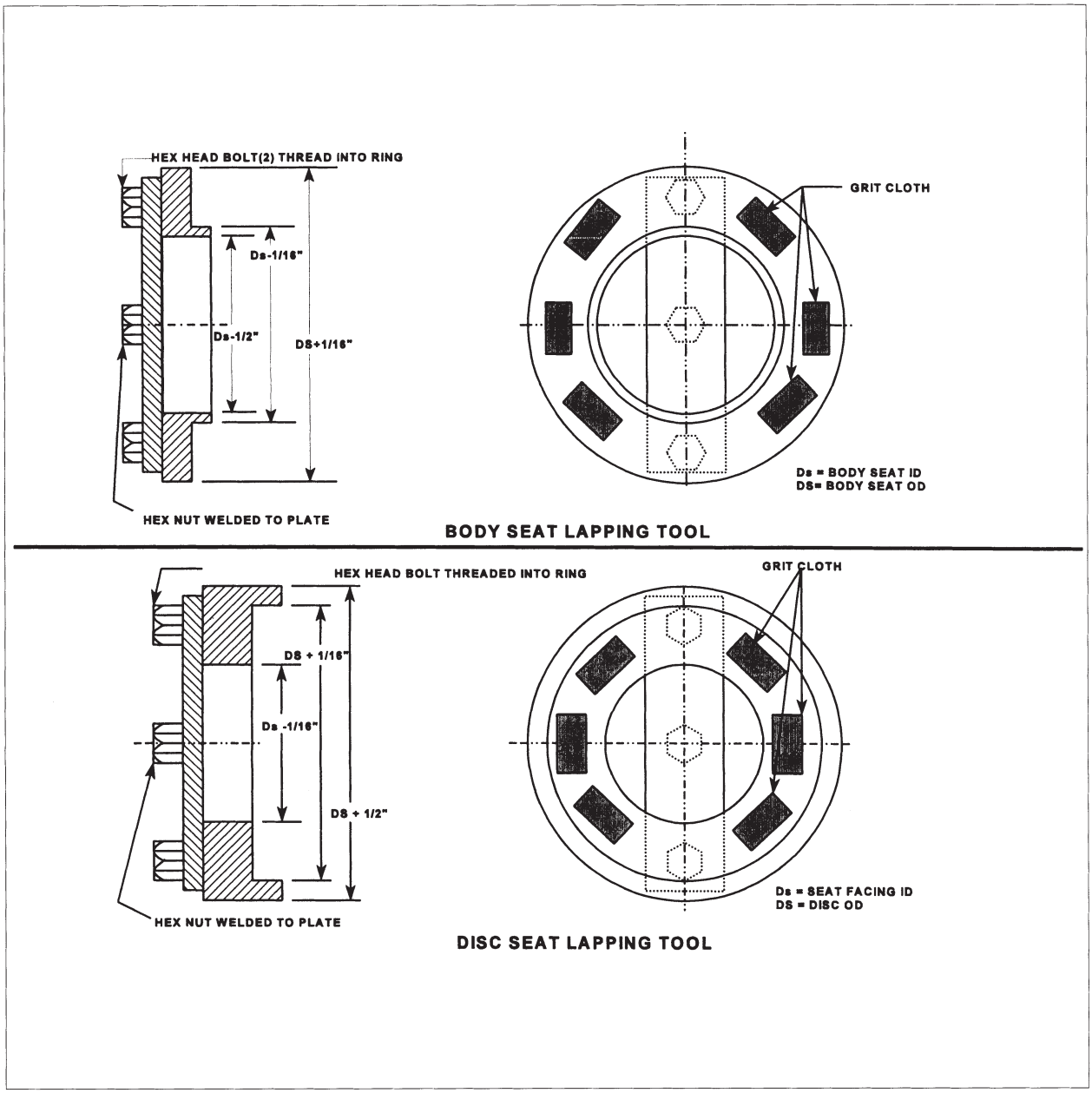
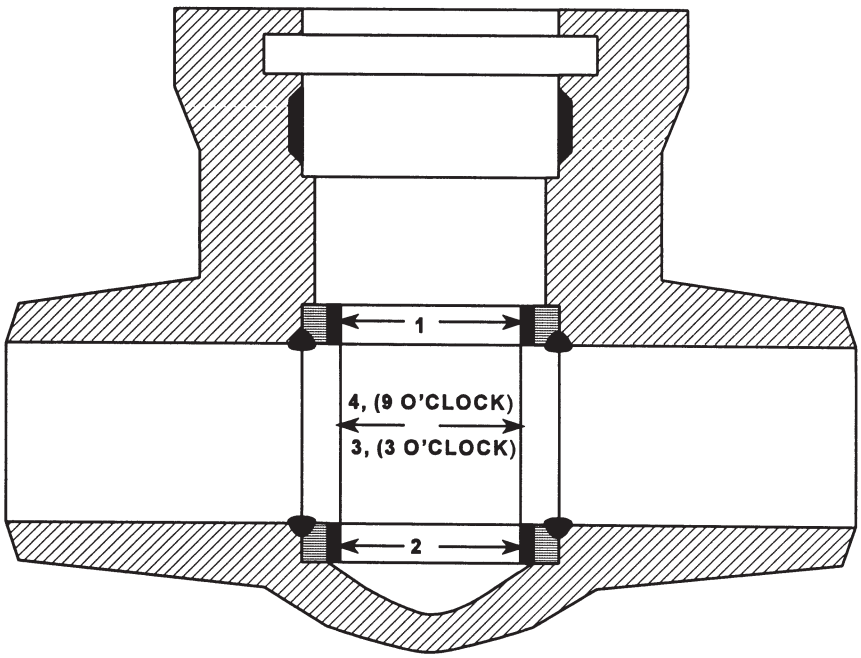


Figure 16 Body Seat Dimensions



POSITION	DIMENSION BEFORE LAPPING	DIMENSION AFTER LAPPING	MATERIAL REMOVED
12 O'CLOCK			
3 O'CLOCK			
6 O'CLOCK			
9 O'CLOCK			

BODY SEAT MEASUREMENTS

Figure 17 Disc Pack Dimensions

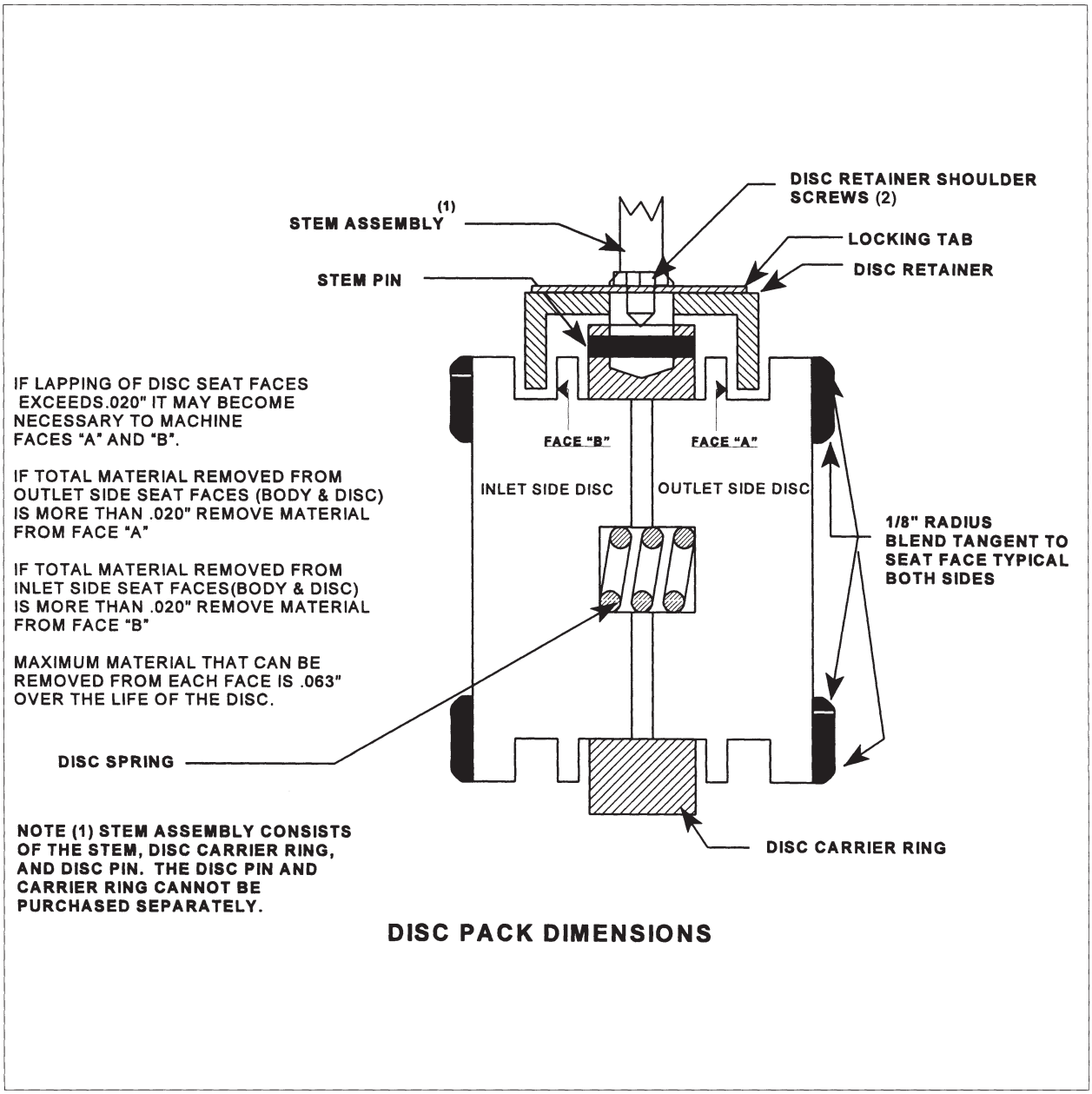
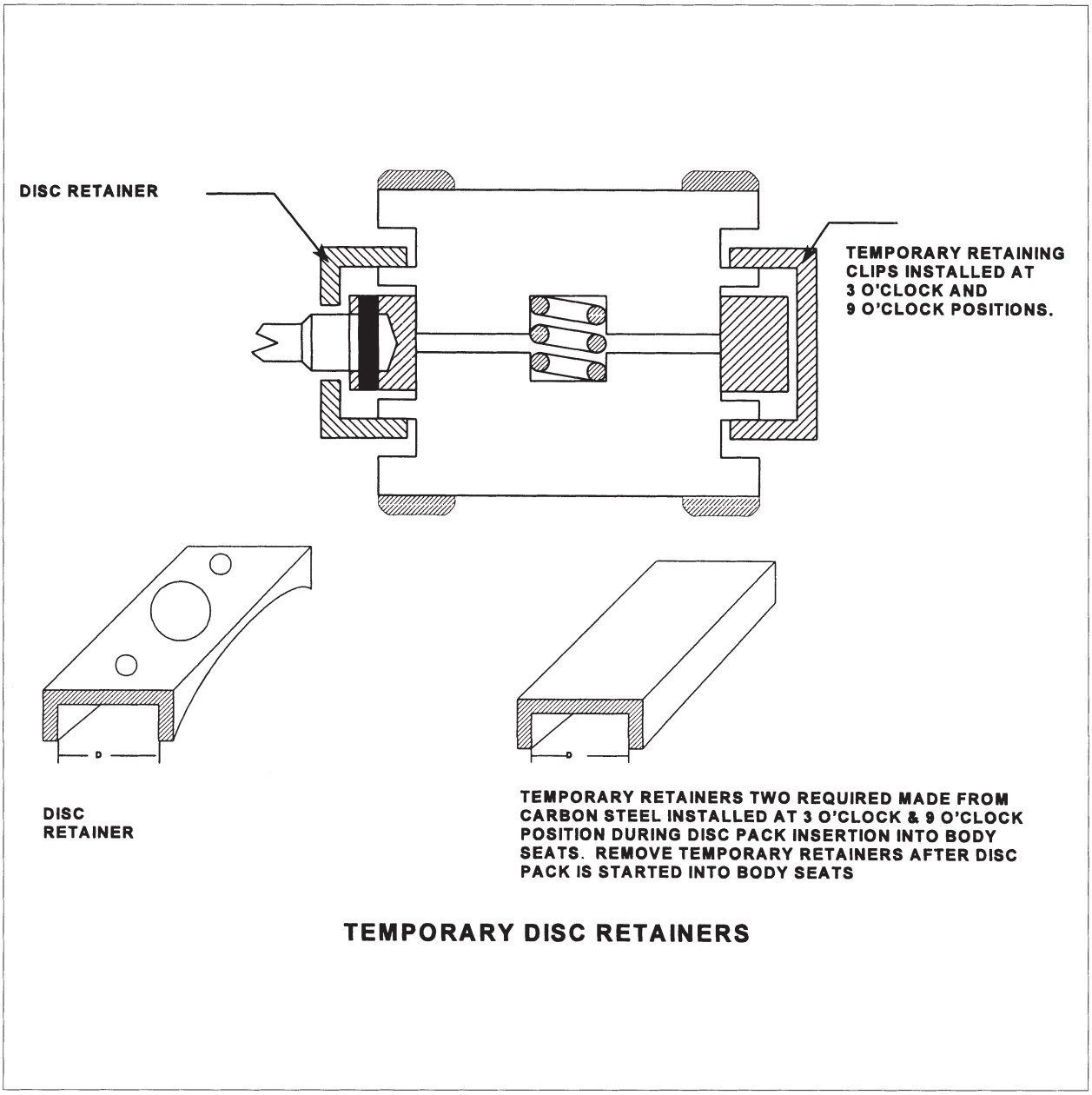
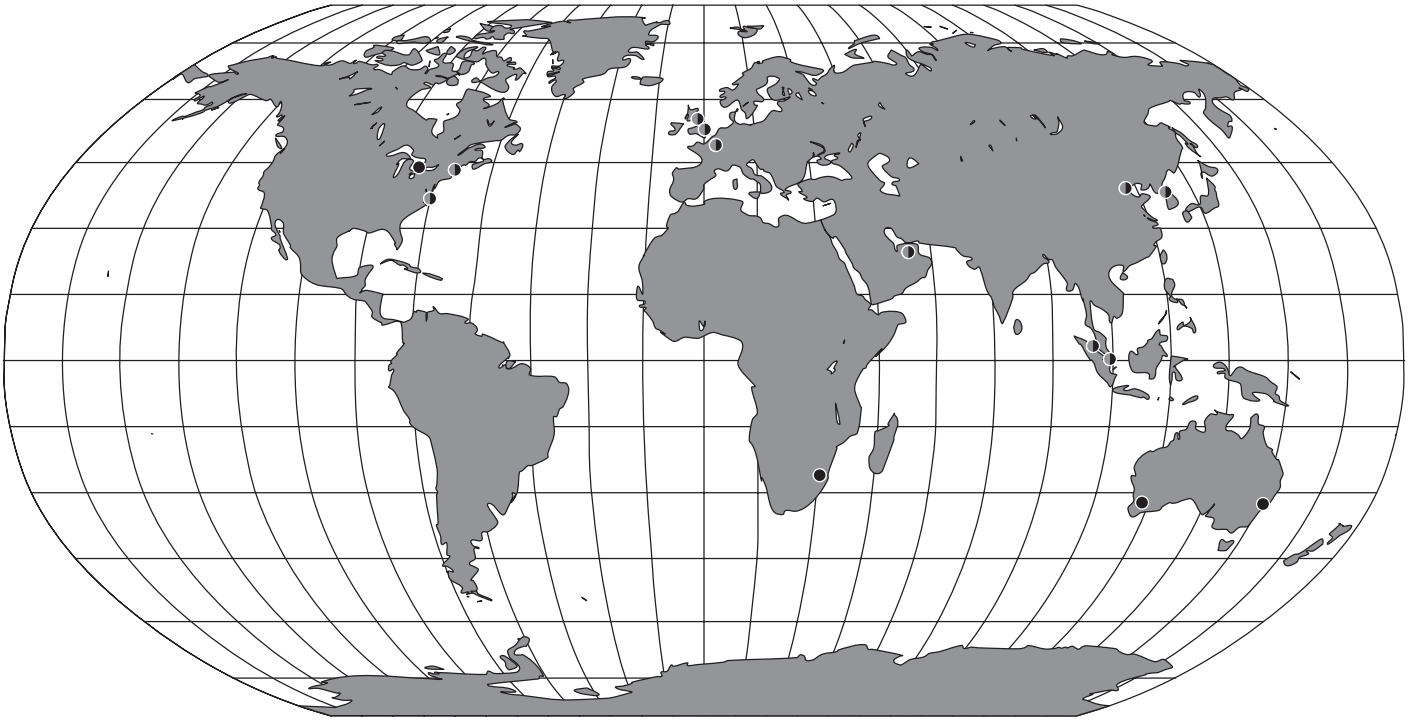


Figure 18 Temporary Disc Retainers





Companies of the WEIR Valves & Controls Division:

Head Office:
WEIR Valves & Controls

Tel: +44 (0) 1484 820465
Fax: +44 (0) 1484 820220
Email: division@weirvalve.com

● **SALES**

◑ **SALES/MANUFACTURING**

Sales/Manufacturing

◑ **WEIR VALVES & CONTROLS UK LTD**
Tel: +44 (0) 1484 820820
Fax: +44 (0) 1484 820484
Email: sales@weirvalve.com

◑ **WEIR VALVES & CONTROLS - FLOWGUARD LTD**
Tel: +44 (0) 1663 745976
Fax: +44 (0) 1663 742788
Email: sales@flowguard.com

◑ **WEIR VALVES & CONTROLS - SEBIM SAS**
Tel: +33 (0) 4 42 07 00 95
Fax: +33 (0) 4 42 07 11 77
Email: coseb@sebim.fr

◑ **WEIR VALVES & CONTROLS - FRANCE SAS**
Tel: +33 (0) 3 21 79 54 50
Fax: +33 (0) 3 21 28 62 00
Email: sarasin@sarasin.fr

Regional Sales Offices:

● **CHINA**
Tel: +86 10 8427 5536
Fax: +86 10 8427 7049
Email: china@weirvalve.com

● **MALAYSIA**
Tel: +60 3 2287 3560
Fax: +60 3 2287 3561
Email: malaysia@weirvalve.com

● **DUBAI**
Tel: +971 4 881 9868
Fax: +971 4 881 9870
Email: dubai@weirvalve.com

● **KOREA**
Tel: +82 2 515 2887
Fax: +82 2 516 6581
Email: korea@hopkinsons.co.uk

● **AUSTRALIA**
Tel: +61 2 4349 2999
Fax: +61 2 4349 2900
Email: tony.simpson@weir.com.au

● **SOUTH AFRICA**
Tel: +27 1 1929 2906
Fax: +27 1 1929 2925
Email: jgeorgiou@weir-envirotech.co.za

LOCAL REPRESENTATIVE

A list of worldwide agents is available on request

Weir Valves & Controls USA Inc.

285 Canal Street
Salem MA 01970-4595
USA

Tel: 978 744 5690
Fax: 978 741 3626
Email: sales@weirvalveusa.com
www.weirvalve.com

Excellent
Engineering
Solutions

WEIR
VALVES & CONTROLS