

*Anchor Darling Cast Flex Wedge Gate Valves*

Sizes 2-1/2" through 24"

*FCD ADENIM0010-02*

*Installation  
Operation  
Maintenance*





## *Revision Record*

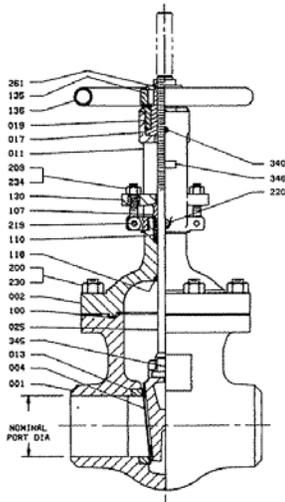
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-	All	Original Issue	03/15/2006
01	1.3.1	correct gasket material	05/18/2011
02	5.4.4	180° was 1800	10/3/2011

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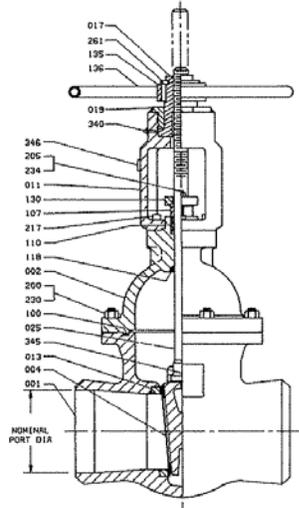
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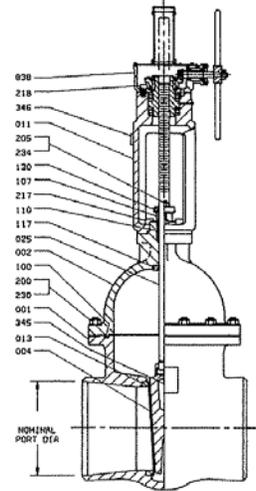
## FLEX WEDGE GATE VALVE DESIGNS



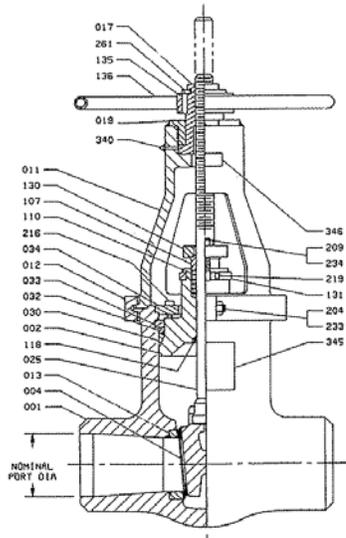
1/2" THRU 4"  
150-300#



6" AND 8"  
150-300#

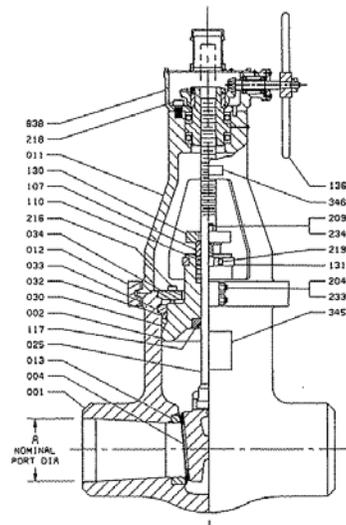


10" THRU 24"  
150-300#



1/2" THRU 6"  
600-2500#

ITEM NO.	DESCRIPTION
001	BODY
002	BONNET
004	DISC
011	YOKE
012	YOKE CLAMP
013	SEAT RING
017	YOKE SLEEVE
019	YOKE CAP
025	STEM ("T" HEAD)
030	PRESSURE SEAL GASKET
032	SPACER RING
033	GASKET RETAINER
034	BONNET RETAINER
100	GASKET
107	GLAND
110	PACKING
117	BACKSEAT
118	BACKSEAT-INTEGRAL
130	GLAND FLANGE
131	GLAND RETAINER
135	HANDWHEEL KEYS
136	HANDWHEEL
200	BONNET STUDS
204	YOKE CLAMP STUDS
205	GLAND STUDS
209	GLAND EYEBOLTS
216	BONNET CAPSCREWS
217	YOKE CAPSCREWS
218	ACTUATOR CAPSCREWS
219	GLAND RET. CAPSCREWS
220	SETSCREWS
230	BONNET NUTS
233	YOKE CLAMP NUTS
234	GLAND STUD NUTS
261	RETAINING RINGS
340	GREASE FITTING
345	NAMEPLATE
346	I.D. PLATE
838	BEVEL GEAR ACTUATOR



8" THRU 24"  
600-2500#

## 1.0 VALVE DESCRIPTION

### 1.1 Recommended Uses

Anchor/Darling Gate valves are designed to provide isolation of a piping system or a component when closed. They are not suitable for modulation of flow, i.e. throttling, and should not be used for that purpose.

### 1.2 Principles of Operation

The principle parts of a flex-wedge gate valve are the body, bonnet, disc, stem and top works (Fig. 1). The body and bonnet contain the fluid within the system. The gate is positioned by the stem to either block flow through the body or is raised into the body neck to leave an unobstructed flow passage.

The disc to seat seal in the flex-wedge gate valve is created by a combination of internal pressure and mechanical wedging force. When the line pressure is high, the differential between the upstream and downstream ports forces the disc against the downstream seat and creates a seal. At lower line pressures (under approximately 100 psi), the pressure force alone is not sufficient to create a seal. A mechanical force resulting from the disc being wedged between the seat rings provides the additional force necessary to seal.

## 1.0 VALVE DESCRIPTION (Continued)

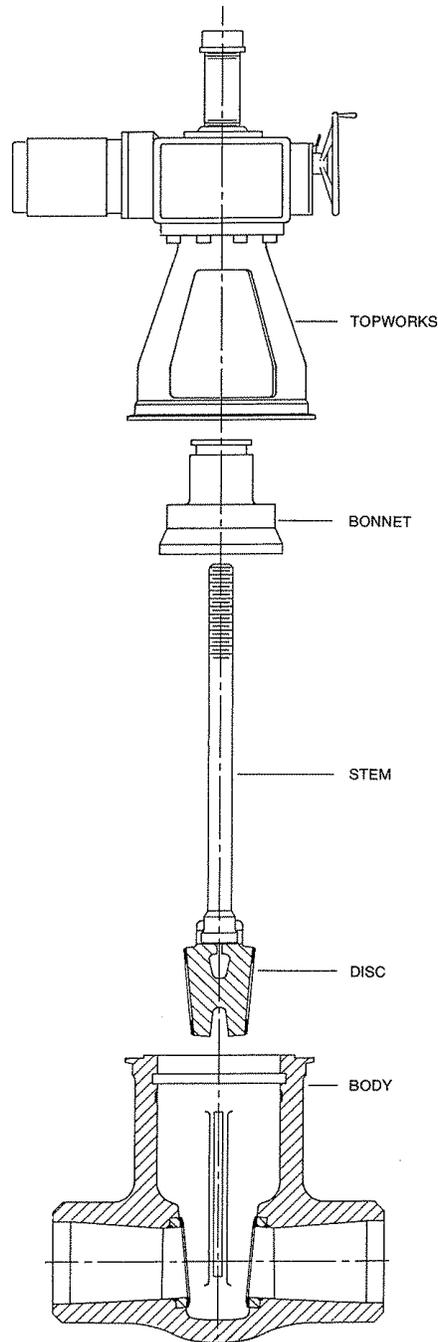


Figure 1

## 1.0 VALVE DESCRIPTION *(Continued)*

### 1.3 Design Features

#### 1.3.1 BONNET SEALS

Anchor/Darling flex-wedge valves are supplied with two basic types of body-bonnet closure: bolted bonnet or pressure seal bonnet. The bolted bonnet closure (Fig. 2) is a bolted flange tongue and groove joint with spiral-wound stainless steel gasket and graphite filler. The seal depends upon the bolt preload to maintain sufficient compressive force on the gasket. Pressure seal type closures (Fig. 3) utilize a tapered soft metal ring or graphite gasket for sealing. The gasket is contained within the body neck bore by a retaining ring. The tapered inner surface of the gasket bears against a mating annular surface on the valve bonnet. Under internal pressure, the bonnet is forced against the pressure seal gasket, wedging it against the body neck wall. A slight interference angle produces a line contact and high sealing pressure. The greater the valve pressure the tighter the metal-to-metal seal. No bolting is required to maintain the seal although the bonnet is initially drawn into contact with the pressure seal by cap screws.

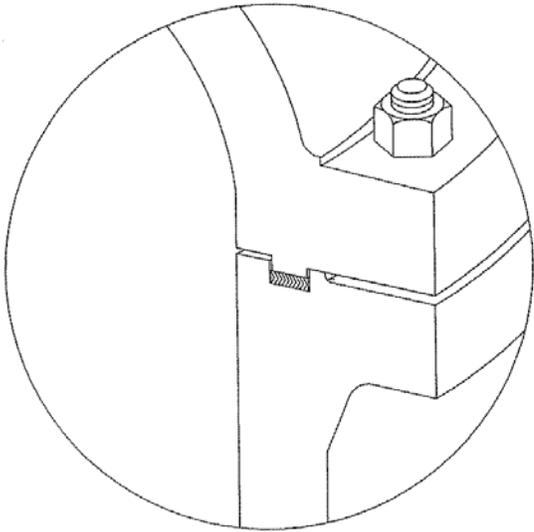


Figure 2

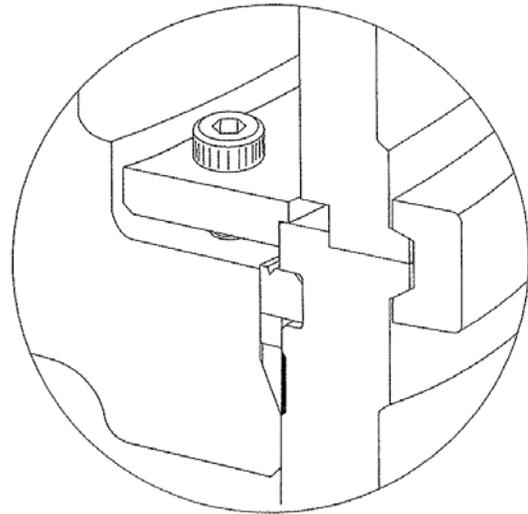


Figure 3

## 1.0 VALVE DESCRIPTION *(Continued)*

### 1.3 Design Features (Continued)

#### 1.3.2 Disc And Seats

The Anchor/Darling flexible wedge disc is a single cored casting consisting of symmetrical halves joined by a central boss (Fig. 4). The design of the cored cavity permits uniform flexibility in the disc faces, enhancing sealing. Body seat rings are set into machined recesses in the body which support and retain the rings (Fig. 5). A seal weld is provided between the body and the rings. This weld is for sealing only and is not structural. The seat rings are replaceable.

#### 1.3.3 Valve Actuation (Top Works)

A gate valve is operated by moving the disc in and out of the seats with the stem. The necessary thrust for opening or closing is imparted to the stem by the valve actuator which is supported and restrained by the yoke structure. Five types of actuators are normally supplied; handwheel, manual gear, electric motor, pneumatic cylinder, and hydraulic cylinder. The first three impart rotary motion to a stem nut which converts the rotary motion to linear stem movement via the acme stem threads. The pneumatic and hydraulic cylinder actuators provide direct linear motion to the stem. Sealing of the bonnet-stem penetration is accomplished by a bolted gland stuffing box containing ring type packing.

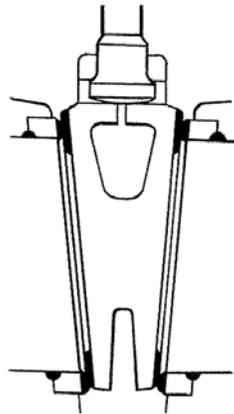


Figure 4

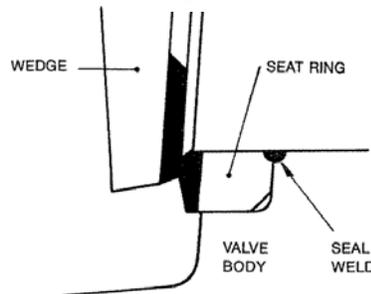


Figure 5

## 2.0 CARE OF VALVE PRIOR TO INSTALLATION

### 2.1 Receiving Inspection

Upon receipt of the valve, thoroughly inspect it for shipping damage. As a minimum, the following items should be checked:

1. Handwheel and shaft - check for bending or impact damage.
2. Switches and actuating mechanisms – bent or broken parts?
3. Missing or loose bolting?
4. End covers in place?
5. Is valve securely fastened to shipping skid?
6. Abrasion - damaged paint?
7. Are spare parts shipped with valve in place and secure?

### 2.2 Handling

Anchor/Darling valves are shipped strapped to wooden skids designed to be moved by forklift. It is recommended that when being handled prior to installation, the valve be kept on its skids and a forklift truck be used for moving. If an overhead crane is used, care must be exercised to center the load. The slings should not lift the valve by the wooden skid structure alone, but must pass under the valve.

### 2.3 Storage

Store valves on their shipping skids in a clean dry area protected from weather. Anchor/Darling valves are shipped without the permanent packing installed. Experience indicates that stem corrosion pitting can result when valves are stored with the packing in place. For this reason, we do not recommend installing the packing until valve is to be put in service. The service packing is shipped with the valve, contained in a plastic bag placed in the valve port or attached to the yoke. If the packing is removed for storage elsewhere, reseal the valve end covers to protect the internal cleanliness of the valve. Motor actuated valves, if stored for more than a few months, require special care of the operator. Motor and switch compartment heaters, if supplied, should be connected. The major concern is condensation on the internal parts of the actuator. For this reason, rapid and/or extreme temperature and humidity changes should be avoided. Storage in a temperature and humidity controlled environment is desirable. Long-term storage of motor actuators may affect the terms of the warranty and the manufacturer should be contacted for specific information.

## 3.0 INSTALLATION INSTRUCTIONS

### 3.1 Rigging

When lifting the valve for installation in the line, it is important that slings of adequate size be used. The capacity of the sling must exceed the weight of the valve. Slings should pass under the valve body and through the yoke arms. Block carefully to prevent damage or abrasion of component parts and finishes.

### 3.0 **INSTALLATION INSTRUCTIONS** *(Continued)*

#### 3.2 Cleaning

Prior to installation, remove the valve end covers and inspect for cleanliness. If any sign of foreign matter is observed in the valve internals, open the valve and place it on its side (stem horizontal) and flush thoroughly with water. Steam or air may be used if water is not available but exercise caution that the high velocity does not drive debris into clearance spaces.

#### 3.3 Installing Valve in Line

3.3.1 The pipe must be properly supported and aligned with the valve. Seat leakage in valves is frequently caused by seat misalignment resulting from excessive end moments introduced in the cold springing of the connecting pipe.

3.3.2 Before weld end valves are welded into the line, raise the disc off the seat a sufficient distance to prevent arcing.

3.3.3 Gate valves may be installed with either port upstream or downstream. However, check the assembly drawings for specific orientation requirements of the handwheel which may dictate the port location.

3.3.4 It is recommended that the valve be installed with the stem vertical, when possible. This orientation provides enhanced packing life and simplifies disassembly/reassembly.

3.3.5 Following installation of the valve in the line, install the packing supplied with the valve. (See the maintenance section 5.4 for specific instructions). This operation may be performed following valve cleaning if more convenient.

3.3.6 Before the valve is placed in operation, check all bolting for tightness and lubrication per section 5.5.

### 4.0 **OPERATING THE VALVE**

Prior to operating the valve for the first time, verify that the valve has been prepared in accordance with the preceding sections of this manual.

#### 4.1 Hand Actuated

Handwheel actuated valves close on clockwise rotation of the wheel and open counterclockwise. This is true also for the handwheel on gear and motor actuators.

4.1.1 Anchor/Darling gate valves, if properly set up and maintained, will close with only ordinary effort on the handwheel. The maximum total force at the rim of the handwheel will not generally exceed 100 lbs. and will usually be much less. If tight shut-off is not achieved, do not use "cheaters" or other means of extra leverage. Instead, open and close the valve once in an attempt to dislodge any foreign matter on the seating area that may be interfering with closure. If this fails, disassemble the valve and inspect the internals for galling or other damage.

4.1.2 The impactor feature on valves supplied with impactor handwheels is intended to be used only in unseating the disc. If the impactor is used to seat the disc, it may be difficult or impossible to reopen the valve.

## 4.0 OPERATING THE VALVE *(Continued)*

### 4.2 Motor Actuated

4.2.1 The motor actuators on Anchor/Darling valves are adjusted for correct operation when shipped from the plant. It should not be necessary to re-adjust the torque and limit switches when the valve is placed in operation unless the actuator has been removed from the valve or the switch adjustments have been tampered with.

4.2.2 Adjustments of torque or limit switches should not be attempted without first consulting Anchor/Darling Service Engineers. Failure to obtain proper authorization when resetting torque or limit switches may void the warranty. Under no circumstances should the torque and/or limit switches be completely bypassed. They are included to provide protection of the valve internals. Removal of their protection can cause extensive damage to the equipment.

4.2.3 The valve is normally supplied with the torque switch wired to stop the operator in the closed position and the limit switch wired to stop in the full open position. Using the torque switch to control travel in the opening direction may damage the backseat. The valve should be backseated only by using the handwheel.

4.2.4 When powering the actuator for the first time, observe that the direction of rotation is correct. If not, the power leads must be reversed.

4.2.5 Manual operation may be performed at any time by pulling the declutch lever downward. The lever will stay in the manual mode until the electric motor is actuated whereupon it will automatically disengage.

### 4.3 Operating Tips

Do: Operate valves at least every 6 months.  
Keep stem clean and lubricated.  
Inspect valves regularly.  
Lap seats promptly if valve leaks.  
Use normal torque on handwheel.  
Check packing regularly.

Do Not: Over tighten packing.  
Torque-out motor operator against backseat.  
Keep valve backseated during normal operation.  
Keep gate valve in a partially open position for any length of time or use for throttling.  
Bypass or reset torque or limit switches.  
Use unauthorized operator assisters - pipe wrenches - cheaters.  
Bring valve to fully backseated position immediately upon opening valve.  
Allow 15 minutes for stem to cool before backseating valve.

## 5.0 VALVE MAINTENANCE

Anchor/Darling Valves are designed to be essentially maintenance free pieces of equipment. When used in the proper application and operated correctly they will provide reliable operation for many years. The only area that is expected to require regular attention is the adjustment and (if necessary) replacement of the stem packing. The frequency of this operation will be dependent on the service conditions, the type of packing used and the care with which it is installed. Some other maintenance recommendations are included in the following sections for information.

### 5.1 Inspection

The most important aspect of valve maintenance is periodic inspection. The early detection of a malfunction can, in many cases, prevent a minor defect from becoming a major problem. It is very important that leakage from any of the major seals (packing, disc/seat, body-bonnet) be addressed immediately. The smallest weepage can quickly become a major problem if it is not treated promptly. Some other areas that should be included in a periodic inspection program are:

1. Lubrication:
  - Stem
  - Yoke Sleeve
  - Motor Actuator Drive Sleeve
  - Pneumatic Actuator Sliding Surfaces
2. Cleaning:
  - Stem
  - Packing Area
  - Pressure Seal Area
  - Body Bonnet Studs
3. Bolting:
  - Body-Bonnet
  - Bonnet Yoke
  - Motor Actuator
4. Packing Adjustment

### 5.2 Lubrication

1. Stem: Keep stem threads lubricated with a light coating of grease (NLG1 No. 2 or equal).
2. Yoke Sleeve: Lubricate with general purpose grease every six months. Apply with grease gun to grease fitting (Item 340).
3. Air cylinder operated valves require only a light coating of grease or oil on the stanchions.
4. Motor Actuator: Every six months, lubricate drive sleeve top bearing, using grease gun on pressure fitting in housing cover. See Motor Actuator Manual for further information.

## 5.0 VALVE MAINTENANCE *(Continued)*

### 5.3 Cleaning

The frequency and extent of cleaning will depend on the valves' location and service conditions. It is important that the stem and packing gland parts be kept clean and free of foreign material. Do not allow water or dirt to collect in the body neck bore area above the pressure seal of pressure seal valves. The build up of corrosion or extraneous material may interfere with removal of the bonnet. For the same reason, excessive rust should not be allowed to build-up on the body-bonnet bolting of bolted bonnet valves.

### 5.4 Packing

Most grafoil Anchor/Darling gate valves are supplied with packing with braided graphite end rings unless otherwise specified.

1. Unbolt gland bolts and raise gland flange and gland. These two parts may be held out of the way with wire or twine. To prevent the loss of the two gland nuts, thread back on the gland bolts.
2. If the valve is being repacked, remove the old packing with a packing hook. The lantern ring in double packed valves should also be removed with the packing hook, utilizing the holes drilled in the top of the lantern ring, which, in the case of larger valves, are threaded. This feature permits the use of threaded rods for removal in difficult cases. During these operations take care not to scratch the stem.
3. After the old packing is removed, inspect the stuffing box for cleanliness. Blowout with compressed air if available.
4. Install new rings one at a time in the sequence shown on the valve assembly drawing (Fig. 12). Be careful that the cut ends of the rings butt together and do not overlap. This is particularly important when packing is cut from roll stock. Install the rings with the butt joints offset 180° from each other. Do not use a pointed instrument to push the rings into position. A packing iron should be used for this purpose. The ability of packing to seal the stem is dependent on the amount of loading that each individual ring receives. It is particularly important for the bottom rings in the stuffing box to be forced tightly into place. This is most easily accomplished by ramming the rings into place with the packing iron. When packing double packing boxes with leak-off, it is essential that sufficient rings of lower packing be installed to position the lantern ring at the level of the leak-off. When the stuffing box is full, tighten the gland nuts evenly to ensure that the gland is concentric with the stem. Cocking of the gland or gland flange can cause binding and scoring of the stem.
5. Operate the valve once to verify that the packing is not too tight and binding the stem.

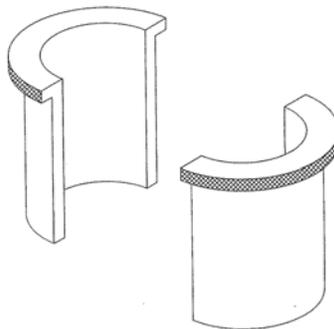


Figure 6

## 5.0 VALVE MAINTENANCE *(Continued)*

### 5.4 Packing (Continued)

6. After the valve has been in operation a few days, retighten the packing nuts to compensate for compression of the packing. At this time, if there is room, it is advisable to add another ring of packing.

7. Remove stem from backseated position so that packing does not dry out.

### 5.5 Bolting Torque Values

At intervals of not more than six months, check the tightness of all bolting. Bolted bonnet valves should have the body-bonnet bolting torqued to the values shown below (Table TA-108-2)



### Max. Torques for Field Service (ft.-lb.)

The following torque values are provided for guidance in field work. The torque values provided for design were developed using an assumed friction coefficient of 0.2. These maximum torque values provide for a range of friction coefficients without damage to the designated bolting material.

STUD SIZE	A193 B7 & B16	A193 B8 & B8M	A564 630-1100	A453 660	CAP SCREW SIZE	A574
5/16 - 18	11	6.5	13	12	5/16 - 18	15
3/8 - 16	20	12	23	20	3/8 - 16	26
7/16 - 14	30	19	36	30	7/16 - 14	44
1/2 - 13	45	28	55	50		
9/16 - 12	70	40	80	70		
5/8 - 11	90	56	110	100	1/2 - 13	67
3/4 - 10	165	100	195	165	5/8 - 11	130
7/8 - 9	270	160	310	280		
1 - 8	400	240	470	420		
1 1/8 - 8	600	350	690	600	3/4 - 10	230
1 1/4 - 8	800	500	970	850	7/8 - 9	375
1 3/8 - 8	1100	675	1320	1200	1 - 8	560
1 1/2 - 8	1500	900	1750	1600		
1 5/8 - 8	1900	1150	2250	2000		
1 3/4 - 8	2400	1450	2850	2500	1 1/8 - 7	800
1 7/8 - 8	3000	1800	3500	3200	1 1/4 - 7	1140
2 - 8	3700	2200	4300	3900	1 3/8 - 6	1500
2 1/8 - 8	4400	2650	5200	4700		
2 1/4 - 8	5300	3200	6200	5600		
2 1/2 - 8	7400	4400	8600	8000	1 1/2 - 6	1970
2 3/4 - 8	8700	5900	11600	10400	1 3/4 - 5	3100
3 - 8	11400	7800	15200	13000	2 - 4 1/2	4600

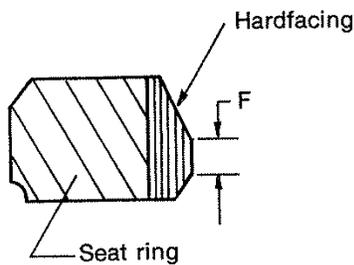
## 5.0 VALVE MAINTENANCE *(Continued)*

### 5.6 Refinishing Sealing Surfaces

Minor discontinuities in both the disc and seat sealing surfaces, which may cause leakage, can, in many cases, be removed by lapping. Major defects such as cracks or deep gouges will generally require replacement of the part.

NOTE: Lapping is a polishing process in which a sealing surface is ground with an abrasive held in place by a special fixture. The abrasive is commonly found in paste form or bonded to a paper backing. Detailed instructions on the use of lapping abrasives and fixtures, normally supplied with such equipment, should be adhered to. In addition to following lapping materials manufacturers' recommendations, the following precautions should be observed when refinishing sealing surfaces in Anchor/Darling flex-wedge valves:

1. Both seat and disc sealing surface angles must be maintained with a great degree of accuracy. Extreme care must be taken to lap these surfaces evenly and assure their flatness.
  
2. Anchor/Darling flex-wedge valves are supplied with a crowned sealing surface on the seat in order to provide precise seat width and tight sealing. Lapping of the seat will cause the sealing band width to be significantly increased. Subsequent to all seat refinishing operations, the seat width must be checked against the dimensions supplied in Table 2 and reduced if necessary. Failure to do so may create leakage problems, particularly at lower pressures.



For 150# and 300# Class valves:  $F = 3/32''$

VALVE SIZE	F		
	600#	900#	1500#
2½	.090	.090	.125
3			.125
4			.156
6	.125	.125	.187
8	.125	.156	.218
10	.156	.156	.250
12		.187	
14		.187	
16	.187	.218	.218
18			.312
20			
22			
24			

Table 2

## 6.0 DISASSEMBLY

By carefully following these instructions, any Anchor/Darling valve can be easily disassembled and reassembled. If problems are encountered with equipment, Anchor/Darling Field Service should be contacted. The use of improper tools or methods may cause severe damage to the valve and may void the warranty. Prior to attempting disassembly of a particular valve, the specific assembly drawing for the valve should be referred to.

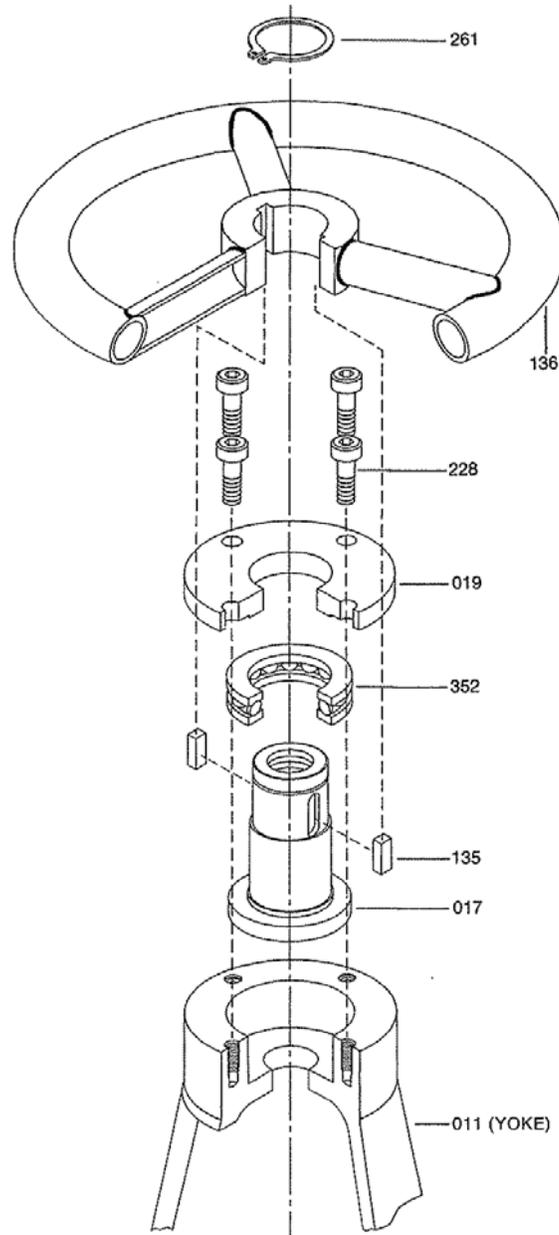


Figure 7

## 6.0 *DISASSEMBLY* (Continued)

### 6.1 Actuator Removal

Anchor/Darling Valves are supplied with a wide variety of actuating mechanisms. The degree of difficulty involved in their removal varies significantly. Simple bolt-on units such as handwheels, gear units and electric motor units are fairly commonplace. Their removal only requires the use of good mechanical practice. More complex pneumatic and hydraulic units may require specialized skills. Their removal and disassembly should only be attempted by trained personnel. More detailed information on special actuators will be provided in a separate manual when applicable. The following general guidelines are provided for information:

1. Before any attempt to remove the actuator is made, personnel should verify that the system is depressurized and drained.
2. The valve should then be cycled partially to remove any trapped pressure and to insure that the disc is not stuck in the seat.
3. The disc should then be gently lowered into the seat.
4. When the valve is to be completely disassembled, Anchor/Darling recommends that the actuator be removed from the valve separately from the yoke. This will simplify the rigging requirements.

#### 6.1.1 Handwheels

On handwheel actuated valves (Fig. 7) the handwheel can be removed by removing the retaining ring (261) and pulling the handwheel (136) off the yoke sleeve (017). Care should be taken not to lose the handwheel keys (135).

NOTE: If desired, the yoke and handwheel assembly may be separated from the valve in one piece. Once the yoke-bonnet fasteners are removed, the entire assembly can be raised off the stem by turning the handwheel while the yoke is held stationary.

If further disassembly of the handwheel mechanism is required, the yoke cap capscrews (228) and the yoke cap (019) must be removed first. Then the thrust bearing (352) and the yoke sleeve (017) can be lifted out of the yoke.

#### 6.1.2 Gear Actuators

Two types of gear actuators have been supplied on Anchor/Darling valves. Earlier model valves may have been supplied with gear units manufactured by Anchor/Darling (Fig. 8). This type of unit requires complete disassembly in order to remove it from the yoke. Specific instructions on disassembly were provided with the original equipment. Anchor/Darling service engineers can provide duplicates of this information when provided with the original order or drawing number. Later model valves (Fig. 9) are supplied with self-contained units that can be separated from the yoke by removing the actuator capscrews (218). If a stem protector is provided, it should be removed. With the actuator properly supported, it may be raised off the yoke either by turning the handwheel or rotating the entire unit.

## 6.0 DISASSEMBLY (Continued)

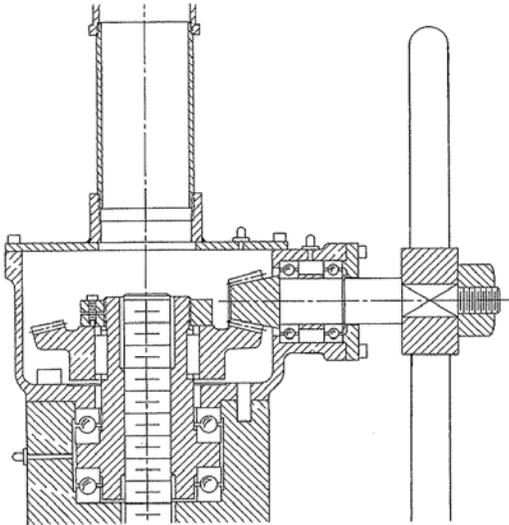


Figure 8

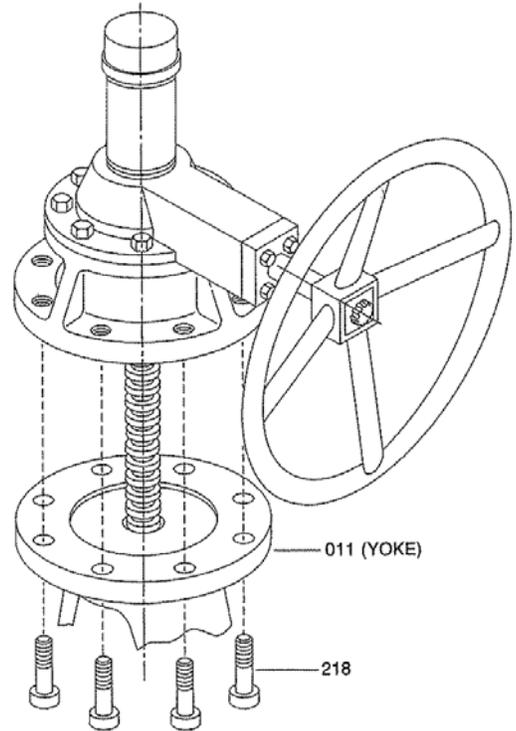


Figure 9

## 6.0 DISASSEMBLY (Continued)

### 6.1.3 Electric Motor Actuators

Although various types of electric motor actuators (Fig. 10) are supplied, all follow the same pattern with their removal from the valve. Prior to the removal, all power and control wiring should be disconnected from the actuator. With the stem protector (334) and capscrews (218) removed, and the actuator properly supported, it can be raised in the same manner as the gear unit.

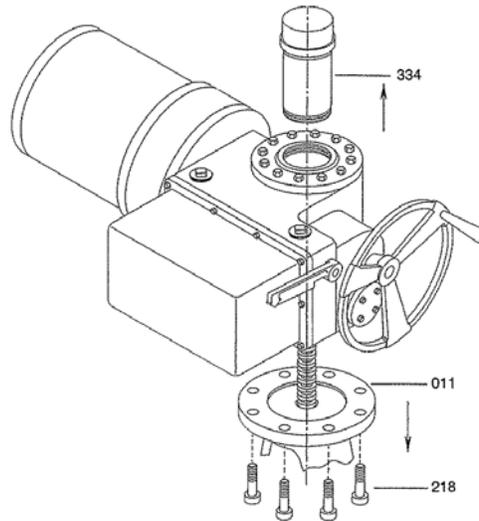


Figure 10

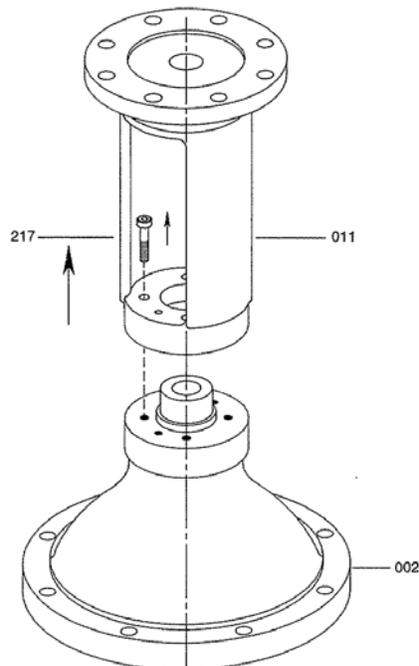


Figure 11

## 6.0 DISASSEMBLY (Continued)

### 6.2 Flanged Bonnet Valves

#### 6.2.1 Yoke: (Fig. 11)

Unbolt the capscrews (217) holding the yoke (011) to the bonnet (002). NOTE: If the valve is to be disassembled, open the valve slightly before doing this. The yoke may now be lifted off the bonnet.

#### 6.2.2 Bonnet: (Fig. 12)

Unscrew the gland nuts (234), remove the gland flange (130), gland (107) and pullout the packing. Now remove the nuts (230) from the bonnet studs (200). If the bonnet is too heavy to lift by hand, utilize a hoist with choker around the bonnet neck or two eye-bolts in the yoke bolt holes. Lift the bonnet clear of the valve body and stem. Remove the spiral-wound gasket (100) from its groove. This operation may require the use of a screwdriver or similar tool to pry the gasket from the groove. Be careful not to scratch the gasket seating surfaces.

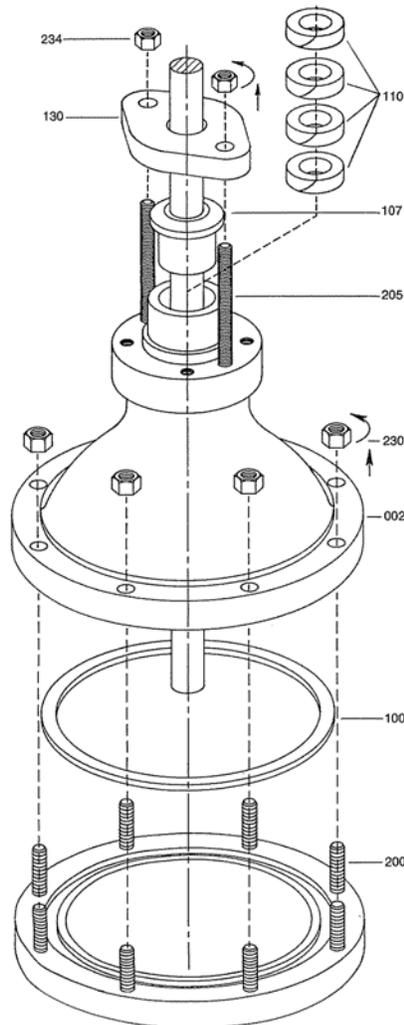


Figure 12

## 6.0 DISASSEMBLY (Continued)

### 6.2.3 Disc & Stem: (Figs. 13 & 14)

The disc (004) and stem (025) are lifted out of the body together utilizing an eye-bolt in the tapped hole provided at the end of the stem. Mark the disc and body so that the disc may be reinstalled in its original orientation. When the disc leaves the body, it is free to slide off the stem T-head. Exercise caution to prevent damage or injury. Lower the disc onto a flat surface and slide the stem free. Do not lay the disc flat on a rough or abrasive surface. Protect the seating surfaces from scratching.

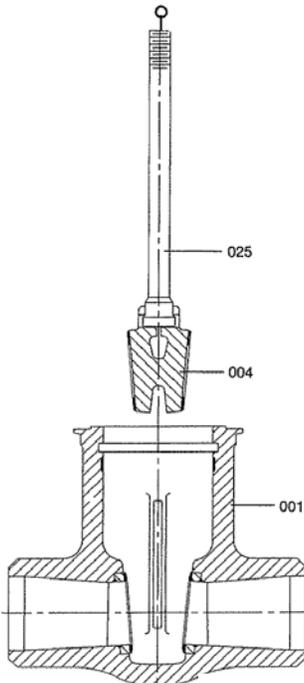


Figure 13

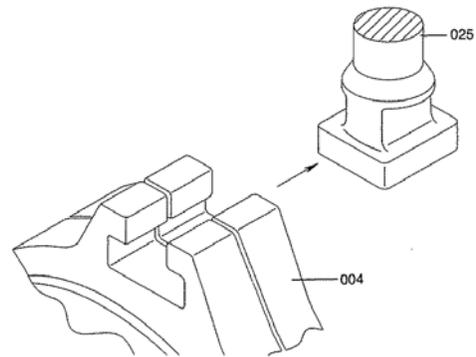


Figure 14

## 6.0 DISASSEMBLY (Continued)

### 6.3 Pressure Seal Bonnet Valves

#### 6.3.1 YOKE: Removal/Installation (Fig. 15)

Unbolt the yoke clamp bolting (204 & 233) and remove the yoke clamp (012). (It is advisable to thread the yoke clamp back together to prevent losing the parts.) The yoke (011) is now free to be lifted directly from the valve, if the actuator and yoke sleeve have been removed. If the actuator is in place, thread the yoke from the stem by turning the handwheel or rotating the yoke. Assembly is the reverse of the above procedure.

NOTE: If the valve is to be completely disassembled, unseat the disc slightly before removing the yoke and actuator.

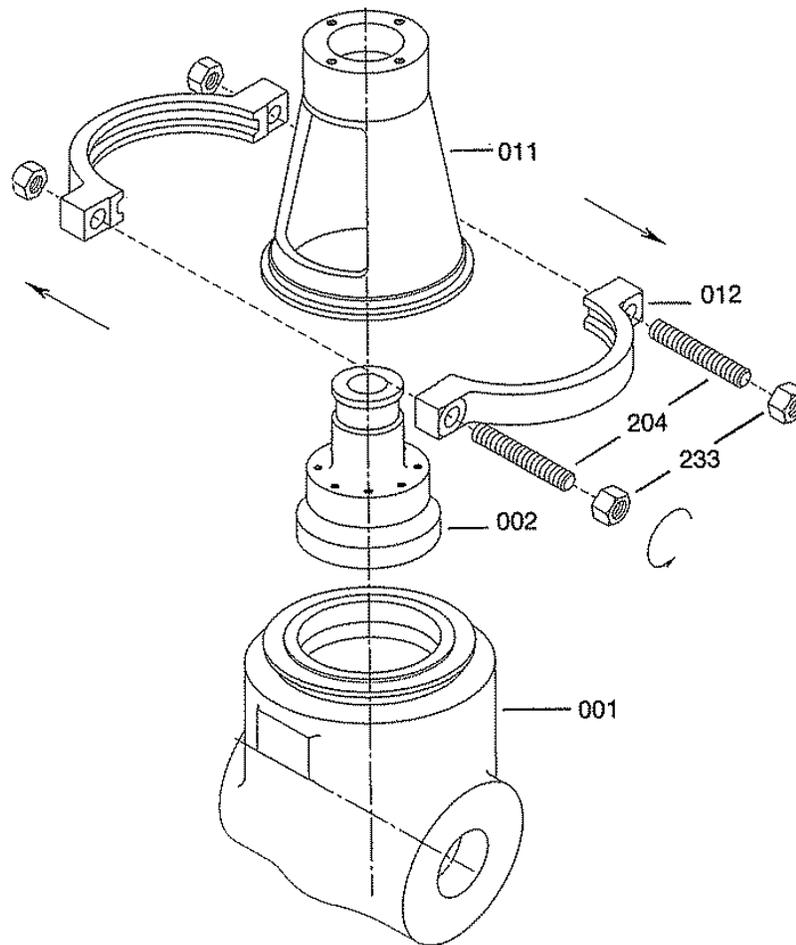


Figure 15

## 6.0 DISASSEMBLY (Continued)

### 6.3.2 Bonnet: (Figs. 16 & 17)

The following instructions assume the yoke has been removed as explained above.

- a. Unbolt the gland nuts (234) and remove the gland flange (130) and gland (107). Put them in a safe place and thread the nuts back on the gland studs to prevent loss. Remove the packing.
- b. Unbolt the capscrews (bonnet) (216) and remove the retaining ring (bonnet) (034). Set aside for use later.
- c. Tap the bonnet sharply to break the seal between it and the pressure seal gasket (030). The bonnet will drop downward against its stop, uncovering the retaining ring (gasket) (033).
- d. The retaining ring (gasket) (033) is comprised of four segments, one of which has a small drilled hole. Remove this piece first. The groove in the top of the retaining ring gasket permits the use of a pry bar or screwdriver in removing the segments. In some cases, it may be necessary to loosen the segments by tapping with a hammer or bar.
- e. The bonnet is now ready for removal from the body. The tight clearances between the body bonnet and gasket, necessary for a reliable seal, require that the bonnet be withdrawn squarely from the neck bore. The slightest cocking of the bonnet during withdrawal can cause it to bind. Therefore, it is recommended prior to removal, that the squareness of bonnet and gasket with respect to the body be checked. This is most easily accomplished by measuring the distance between the top of the gasket and top of the body neck. If the gasket is not square, it should be tapped with a brass rod until it is. With large bonnets, it is a good idea as well, to periodically check the squareness of bonnet as it is being withdrawn. Binding any time during withdrawal indicates the bonnet has cocked. Further efforts to force the bonnet will generally make the situation worse. At the first sign of binding, stop and check the squareness of the bonnet.

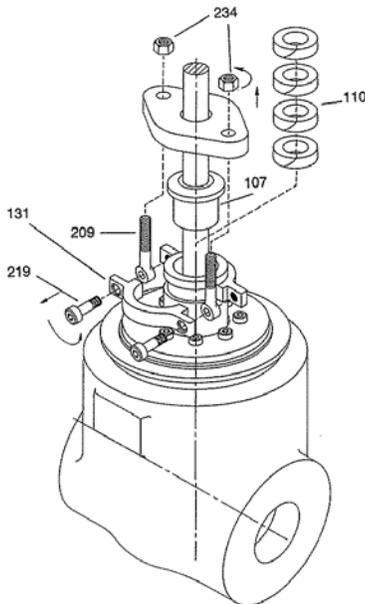


Figure 16

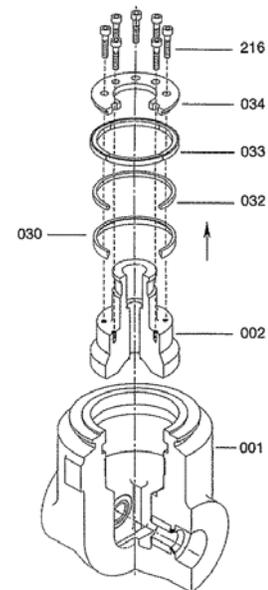


Figure 17

## 6.0 DISASSEMBLY (Continued)

### 6.3.2 Bonnet: (Figs. 16 & 17, Continued)

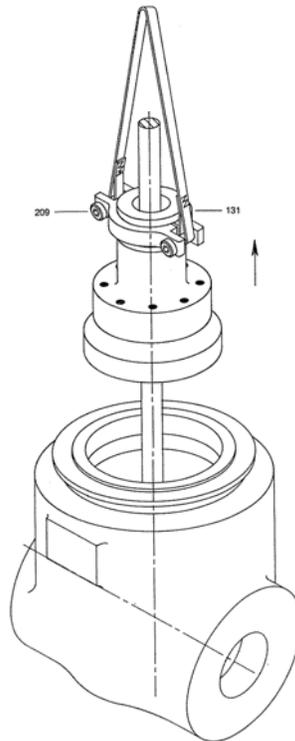
f. The preferred method of lifting the bonnet (See Fig. 18) is by using slings attached to the gland retainer (131). This means of lifting minimizes cocking. In order to attain the best attachment, the gland bolts (209) should be removed and the retaining rings' halves be reassembled on the bonnet. If desired, the sling can be looped through the retaining ring ears prior to assembly on the bonnet. Attempting to remove the bonnet by raising the stem, either with slings or the actuator, is not recommended. The load between the stem and the bonnet will be imparted to the backseat. Excessive force on the backseat sealing surface will cause it to deform or crack.

g. Following the above procedure will, in most cases, result in removal of the bonnet with little difficulty, However, certain circumstances such as installation of the valve with stem in other than a vertical orientation may cause complications, If greater difficulty is encountered, an ADV service engineer should be consulted, Excessive force which may damage critical surfaces should be avoided.

h. It is not normally recommended that the pressure seal gasket be reused. However, if a spare gasket is not available, mark the gasket, bonnet and body prior to removal so that the gasket may be reinstalled in its original orientation.

### 6.3.3 Disc And Stem Removal/Installation

Removal of the disc and/or stem is the same as for bolted bonnet valves. Exercise caution that the disc does not slide off the stem T-head prematurely while being lifted.



**Figure 18**

Before starting the reassembly of the valve, all parts should be thoroughly cleaned and inspected, All foreign material should be removed from any area of the valve. However, there are certain critical areas that must be free of dirt, weld spatter, filing, etc. These include the following:

1. Disc and seat sealing surfaces
2. Bonnet OD (on pressure seal valves)
3. Body neck ID (on pressure seal valves)
4. Gasket tongue (on flanged bonnets)
5. Gasket groove (on flanged bodies)
6. Bonnet studs and nuts
7. Stem (all)
8. Stuffing box (ID)
9. Gland (all)
10. Pressure seal gasket

The above areas must also be free of any nicks, scratches, gouges, etc. Any damage in these areas must be repaired. Any questions about the acceptability of any surface condition should be discussed with a service engineer prior to using the part.

## 7.1 Flanged Bonnet Valves

### 7.1.1 Disc-Stem Assembly

Prior to installing the disc (004), the stem (025) should be attached. The stem can then be used to lower the disc in the body. The T-Head of the stem should slide freely in the slot in the disc. When raising the assembly be careful to hold the T-Head in the disc slot. Failure to do so may allow the disc to come loose and fall, damaging the sealing surface and possibly injuring personnel. In lowering the disc into the body, take care not to damage either the disc sealing surface or the neck bore (if it is a pressure seal valve). If the valve is installed with stem in other than the vertical position, it may be easier to insert the disc in the body prior to connecting the stem. Once the disc is firmly supported by the guides, the stem can be slid into the T-Head slot.

## 7.0 ASSEMBLY *(Continued)*

### 7.1.2 Bonnet

Prior to lowering the bonnet (002) into position, a new gasket should be placed in the gasket groove on the body flange. Carefully insert the stem into the backseat bushing in the bonnet and lower it into position on the body. In lowering the bonnet, be careful that neither the backseat nor the stem are scratched or gouged. Damage to either of these surfaces can impair their sealing ability. If orientation of the actuator is important, the bonnet should be rotated to its proper position prior to lowering it onto the gasket. With the bonnet in place, the studs (200) and nuts (230) can be installed. Prior to installation the studs and nuts should be cleaned and thoroughly lubricated with a high quality lubricant. Any nuts or studs with damaged threads should be replaced. It is very important that the body-bonnet bolting be torqued to specific values in accordance with a specific procedure. The torque values are shown on page 9, Table TA-108-2 for various diameter studs. The nuts should be tightened evenly using a criss-cross pattern similar to the one shown in Fig. 19. Tighten all of the nuts to 1/3 of the recommended valve initially. Then repeat the sequence raising the torque to 2/3 of the full torque. Finally, torque all the nuts to the recommended value following the criss-cross pattern. It is essential that the flange faces remain parallel and all the bolting has uniform tension. Failure to achieve this may cause gasket weepage when the joint is subjected to operating pressures and temperatures.

### TYPICAL BOLT TIGHTENING SEQUENCE

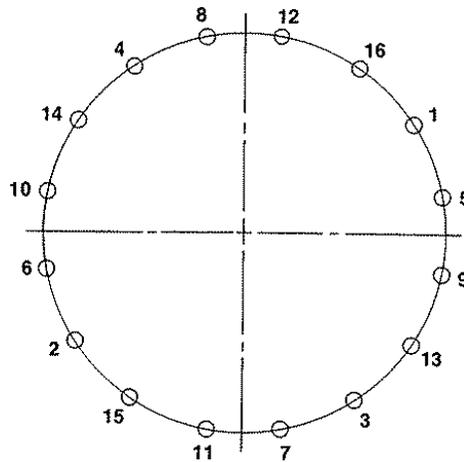


Figure 19

### 7.1.3 Yoke

As with the bonnet, care must be taken in lowering the yoke (011) over the stem. Once it is properly positioned, the yoke capscrews (217) can be installed and tightened.

## 7.0 ASSEMBLY *(Continued)*

### 7.2 Pressure Seal Bonnet Valves

#### 7.2.1 Disc - Stem Assembly

The procedure for assembling the disc to the stem in a pressure seal valve is identical to the one for flanged bonnet valves included in section 7.1.1. Refer to it for instructions.

#### 7.2.2 Bonnet

Once the stem-disc assembly is in place the bonnet (002) can be inserted into the neck. Care must be taken in lowering the bonnet on the stem, so that neither the backseat nor any surface of the stem is damaged. It is again very important to keep the bonnet from cocking as it is lowered into the body. If it does bind, the bonnet must be straightened before insertion can continue. Measuring from the bonnet bolting surface to the top of body is the simplest way to detect cocking. With the bonnet resting on the counterbore in the neck, a new gasket (030) and the spacer ring (032) can be inserted. In that the gasket may also cock, it must be inserted with care. Once these are in place, the four-piece gasket retainer (033) can be put into place. It is important to remember that the piece with the drilled hole must be positioned last. If the valve is installed in other than a stem vertical position, it may be necessary to orient or hold the retainer such that the pieces stay in place until the bonnet is moved into its raised position. With the gasket retainer in its proper position, the bonnet retainer (034) can be lowered over the stem and placed in its position on top of the body neck. The bonnet should be brought to the fully raised position and held (either by hand or a hoist depending on the size) until the capscrews can be threaded into their holes in the bonnet. Note that cocking must be avoided in raising the bonnet. If the bonnet binds before it is fully raised, it should be checked for squareness. Note that while the capscrews need not be torqued to a specific value to maintain a tight seal at system pressures, they should be tightened with wrench to insure good gasket-body-bonnet seal contact before the full pressure is reached.

#### 7.2.3 Yoke

The same procedure detailed in 7.1.3 for flanged bonnet valves should be followed. However, with pressure seal valves the yoke attachment interface is different. The following steps should be substituted accordingly. With yoke in its proper position on the body neck, the halves of the yoke clamp (012) should easily fit over the mating lips on the yoke and the body. The yoke clamp studs (204) can then be inserted, and the nuts (233) threaded on and tightened.

## 7.3 ACTUATORS

#### 7.3.1 Manual

Reassembly of both gear actuators and handwheels can be accomplished by reversing the instructions provided in section 6.1.1.

#### 7.3.2 Motor And Air Cylinder

Instructions pertaining to the assembly of specific power actuators are included in supplements to this manual.



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