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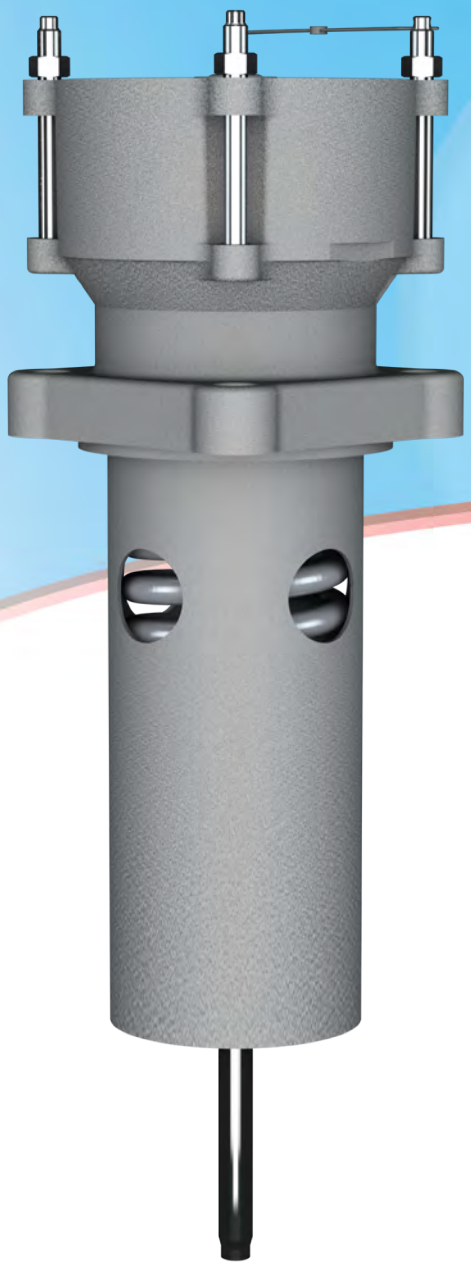

Large Internal-Style Pressure Relief Valve

A-3000, A-3100, A-3200, A-3400, A-35000 & A-37000 Series

Installation, Operation and Maintenance (IOM) Manual

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1.0 Introduction

The A-3000 Series Internal-Style Pressure Relief Valves provide flow rates suitable for commodities requiring high flow rates, ranging from 22,598 – 49,912 standard cubic feet per minute (scfm).

- High-quality steel construction
- Easy-to-replace seal design for ease of maintenance

1.1 Technical Specifications

Valve Model	Net Flow Area (in^2)	Flow Rate (scfm)	Valve Pressure Setting (psig)
A-3400 Series	7.85	20,500 – 31,771	150 - 330
A-35000 Series	6.91	22,682 – 35,107	220 - 330
A-37000 Series	7.85	34,713 – 49,912	225 - 330

Table 1-1 A-1000 Series Valve Specifications

1.2 Valve Components

ITEM	QTY	PART NUMBER
1	1	Top Guide
2	1	Stem
3	1	Retainer
4	1	Body
5	1	Spring
6	1	Follower
7	N/A	N/A
8	1	Top Locknut
9	1	Washer
10	1	Seat O-Ring
11	1	Stem O-Ring
12	1	Adjustment Nut
13	1	Locknut
14	N/A	N/A
15	4	Hex Nut
16	2	Wire Seal Kit
17	1	Nameplate

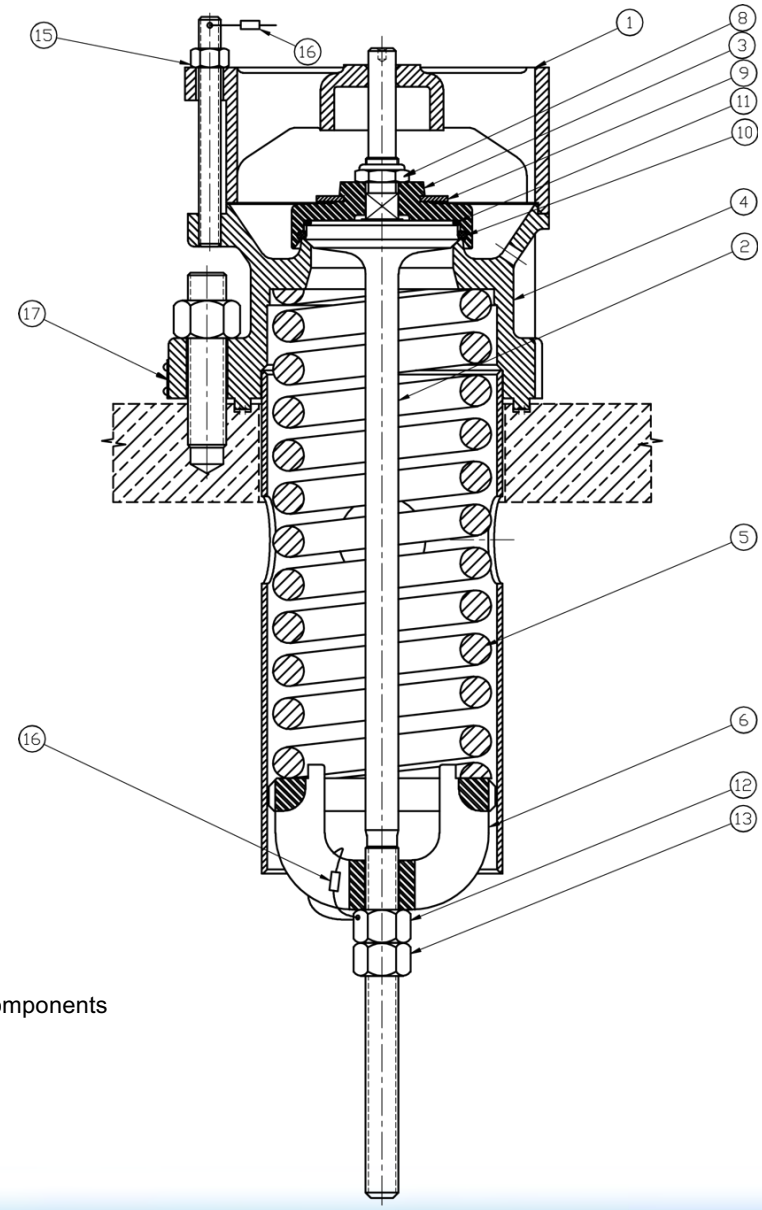

Figure 1-1 A-3400 & A-37000 Series Valve Components

ITEM	QTY	PART NUMBER
1	1	Top Guide
2	1	Stem
3	1	Retainer
4	1	Body
5	1	Spring
6	1	Follower
7	1	Spring Guide
8	1	Top Locknut
9	1	Washer
10	1	Seat O-Ring
11	1	Stem O-Ring
12	1	Adjustment Nut
13	1	Locknut
14A	2	Stud
14B	2	Stud w/Hole
15	4	Hex Nut
16	2	Wire Seal Kit
17	1	Nameplate
18	2	Drive Screws

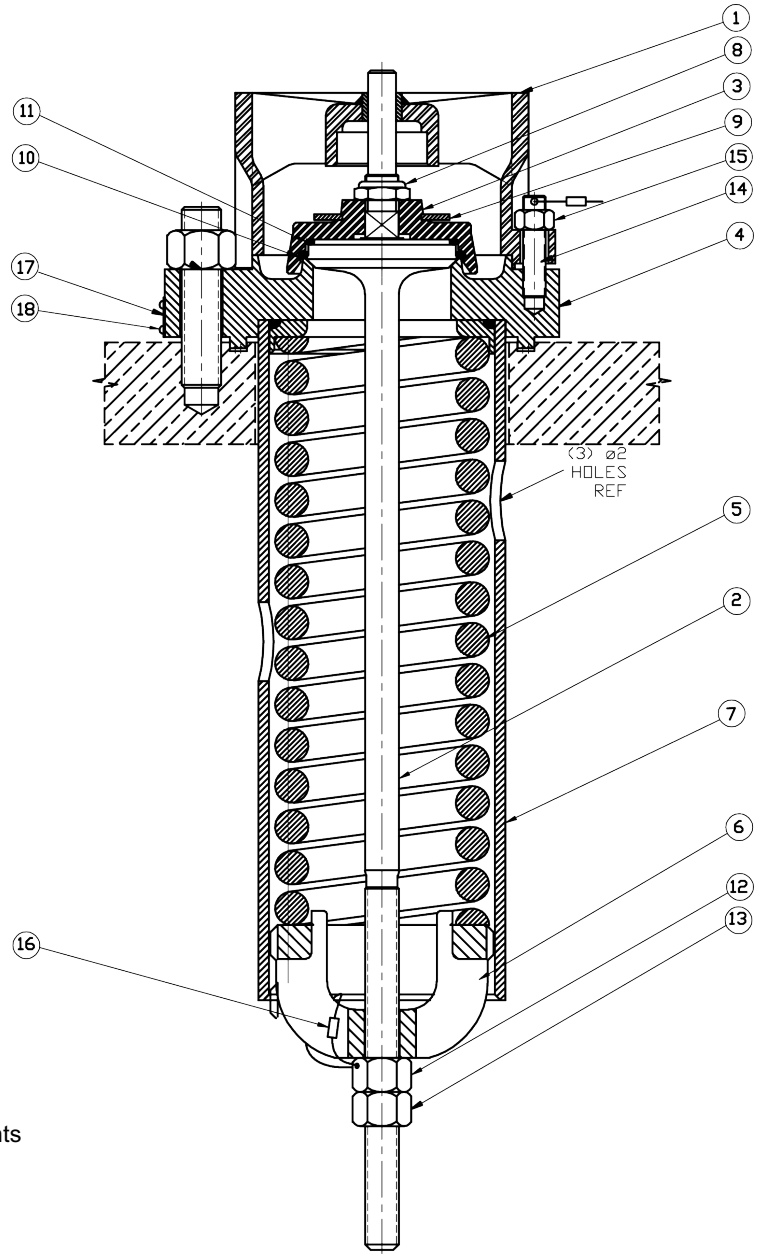

Figure 1-2 A-35000 Series Valve Components

ITEM	QTY	PART NUMBER
1	1	Top Guide
2	1	Stem
3	1	Retainer
4	1	Body
5	1	Spring
6	1	Follower
7	1	Spring Guide
8	1	Top Locknut
9	1	Washer
10	1	Seat O-Ring
11	1	Stem O-Ring
12	1	Adjustment Nut
13	1	Locknut
14A	2	Stud
14B	2	Stud
15	4	Hex Nut
16	2	Wire Seal Kit
17	1	Nameplate
18	1	Cover
19	1	Cover Locknut

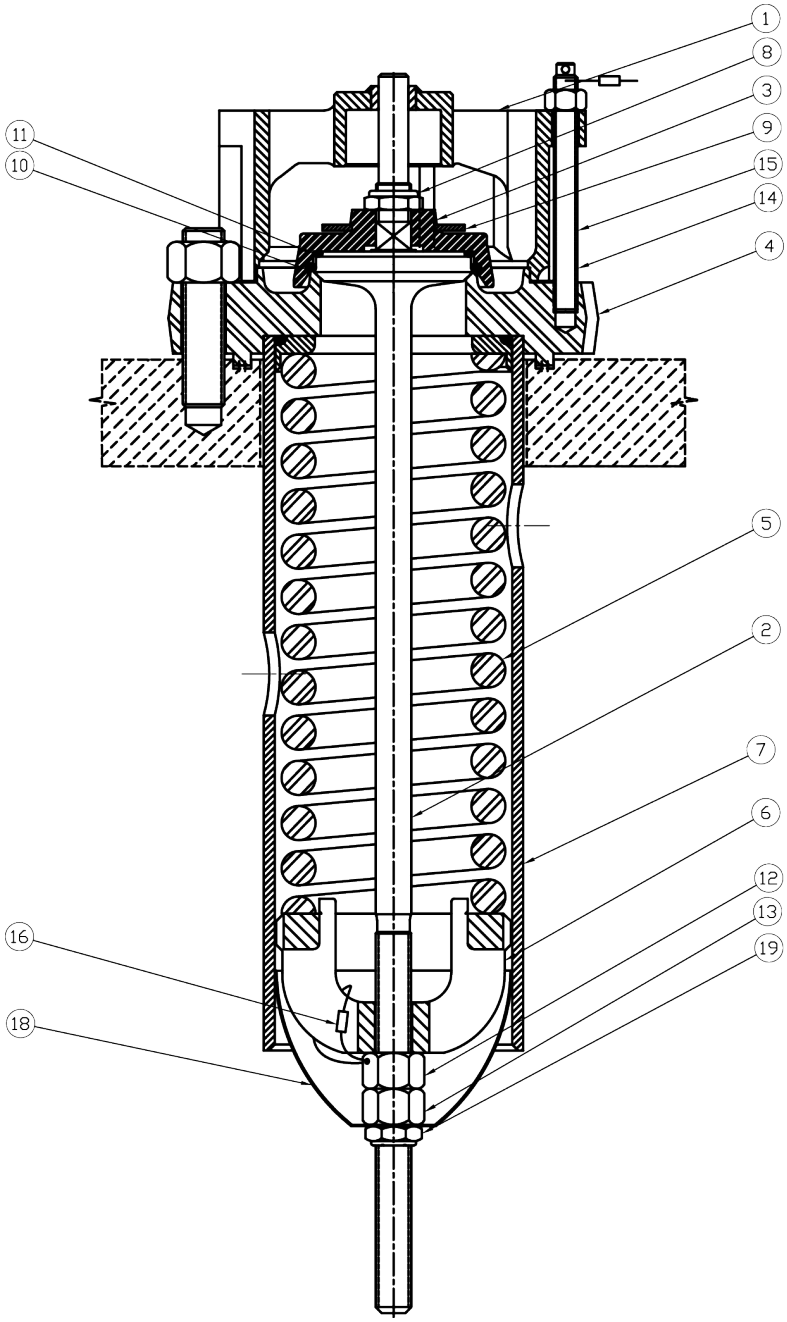

Figure 1-3 A-35280-XL Valve Components

ITEM	QTY	PART NUMBER
1	1	Top Guide
2	1	Stem
3	1	Retainer
4	1	Body
5	1	Spring
6	1	Follower
7	N/A	N/A
8	1	Top Locknut
9	1	Washer
10	1	Seat O-Ring
11	1	Stem O-Ring
12	1	Adjustment Nut
13	1	Locknut
14	N/A	N/A
15	4	Hex Nut
16	2	Wire Seal Kit
17	1	Nameplate
18	1	Cover
19	1	Cover Locknut

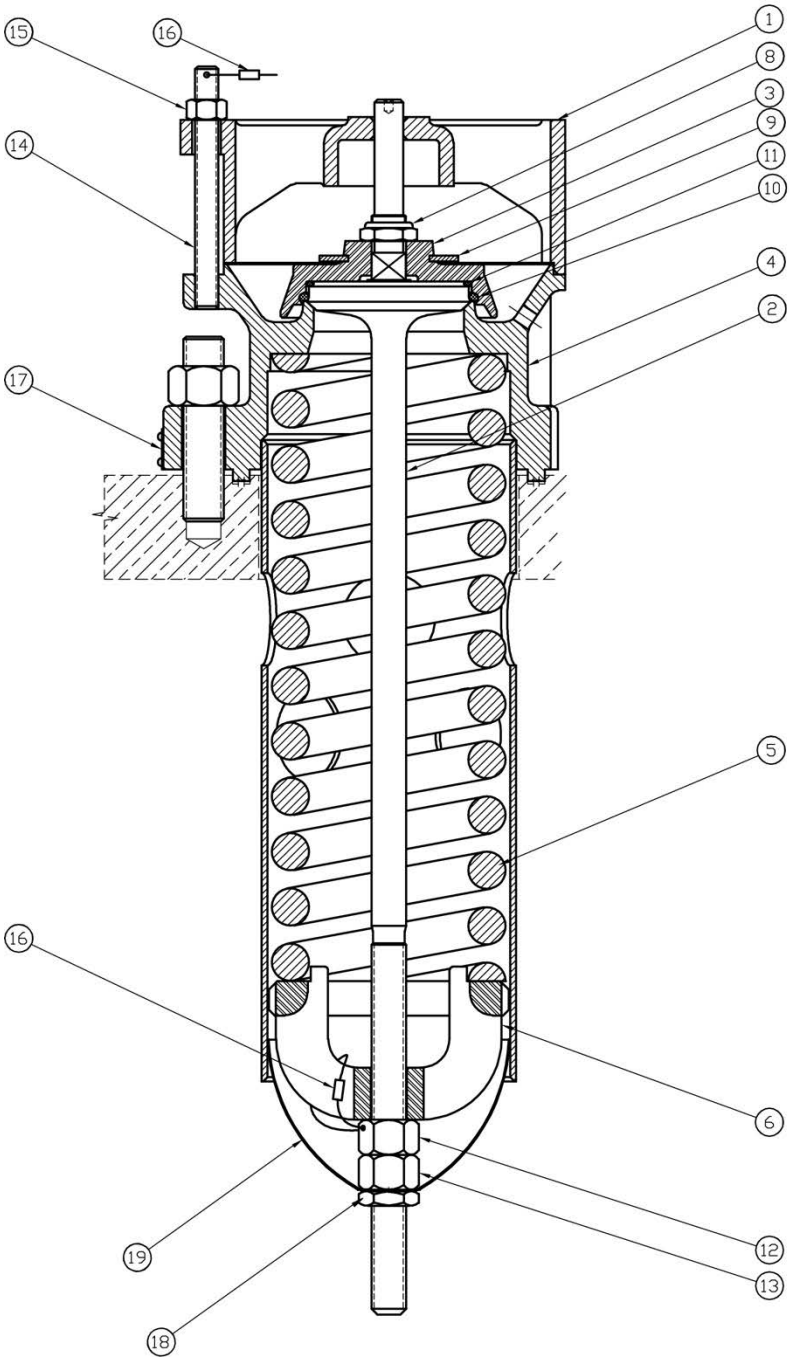

Figure 1-4 A-37000-XL Valve Components

1.3 Valve Dimensions

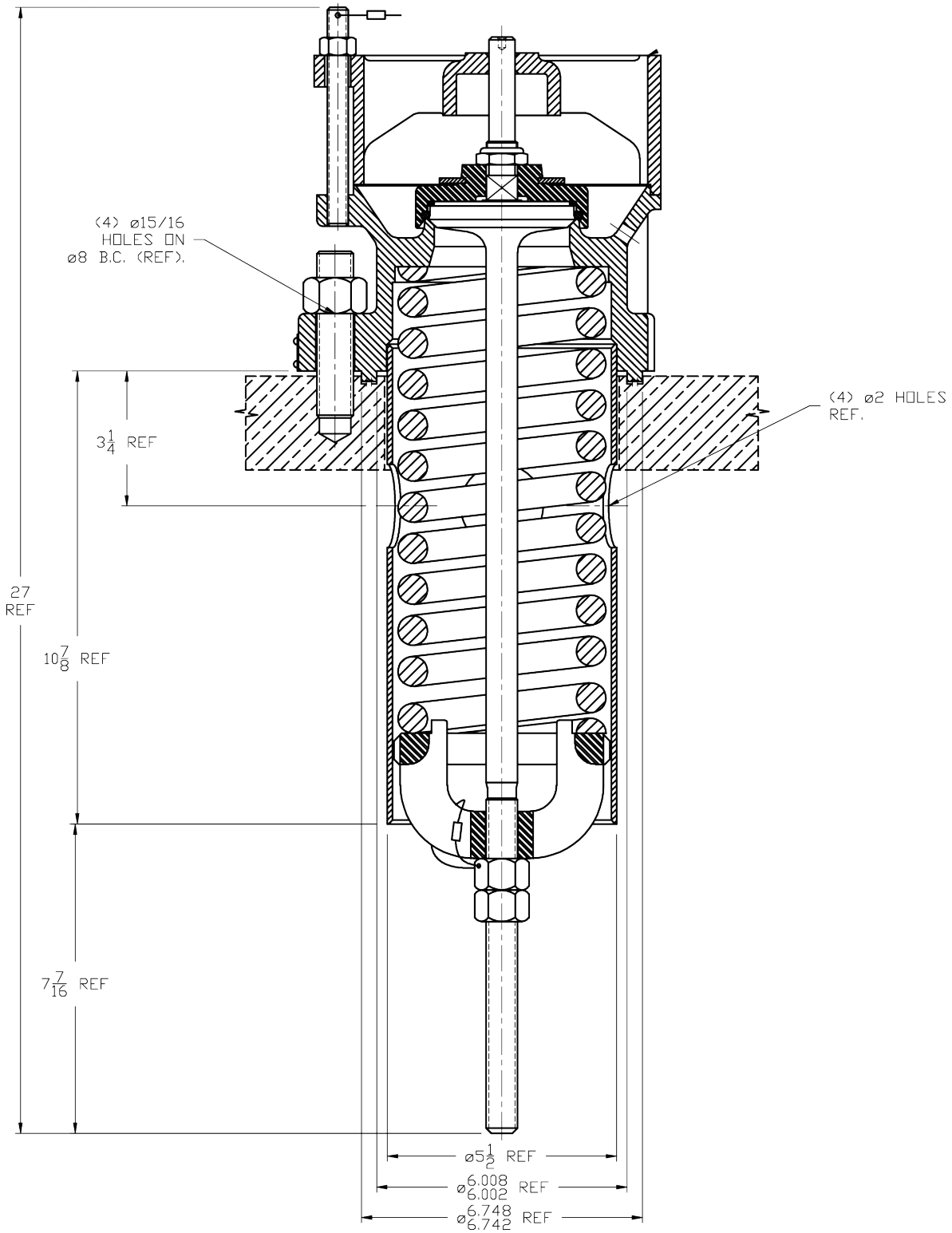

Figure 1-5 A-3400 & A-37000 Series Valve Dimensions

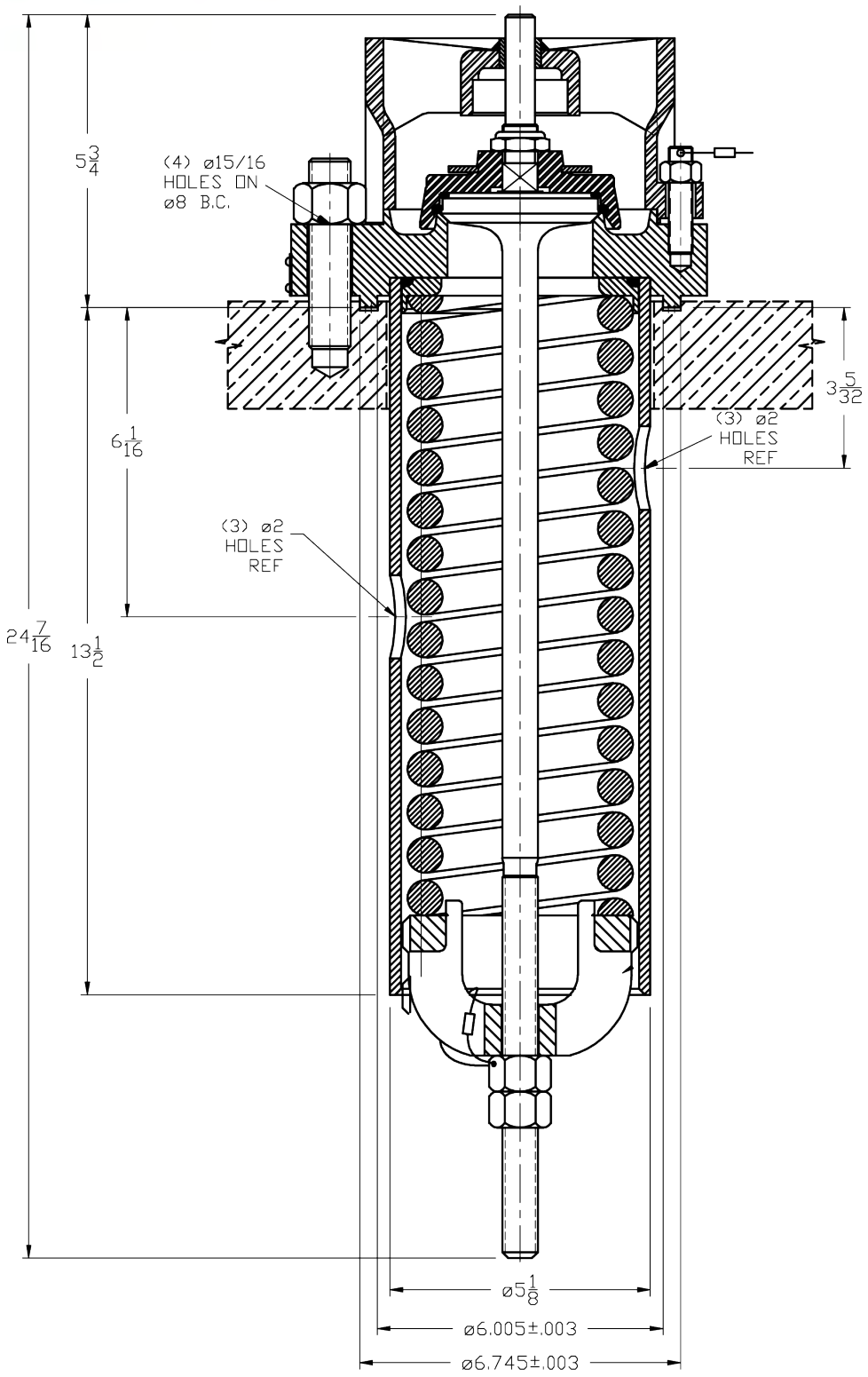

Figure 1-6 A-35000 Series Valve Dimensions

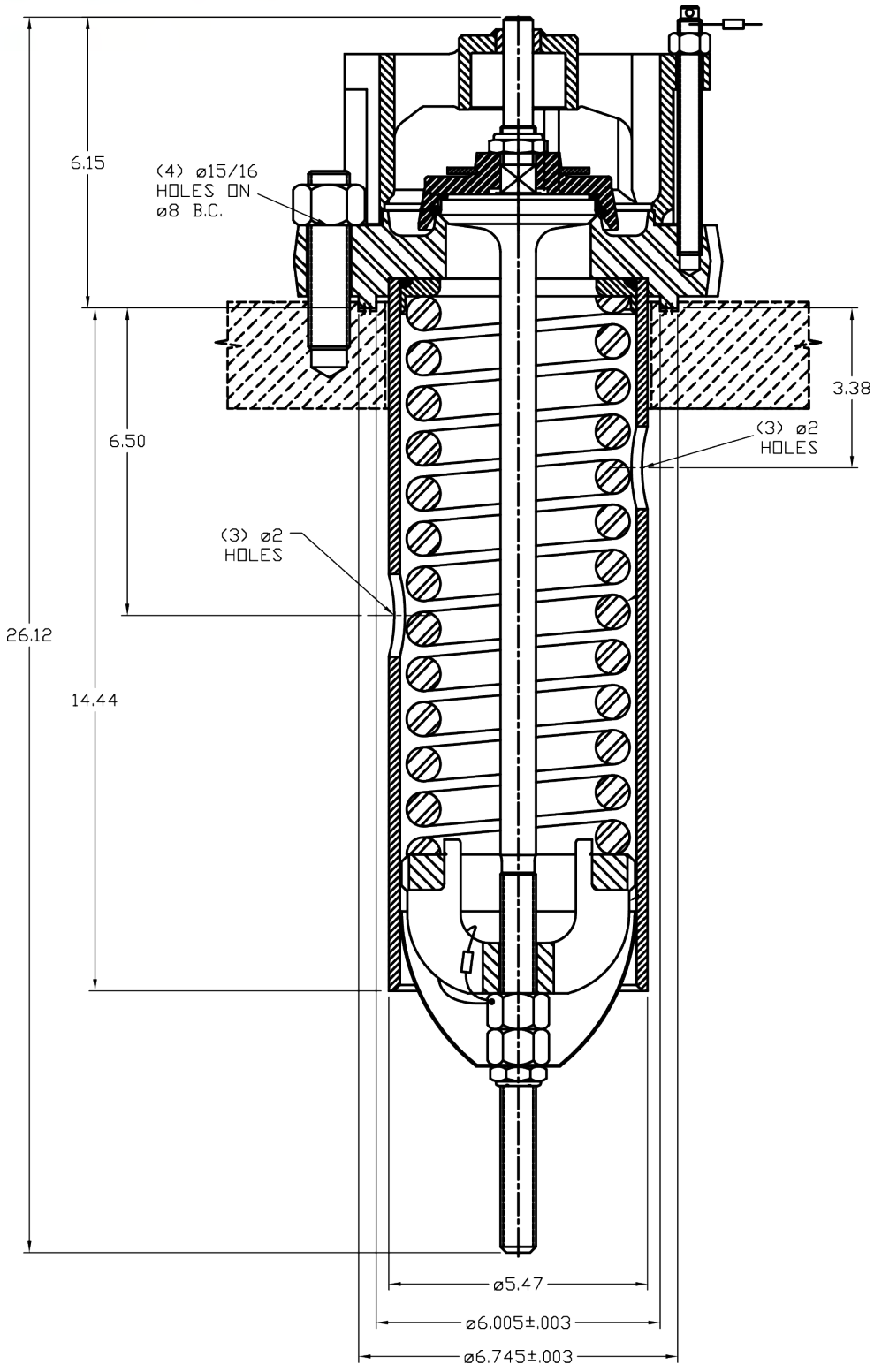

Figure 1-7 A-35280-XL Series Valve Dimensions

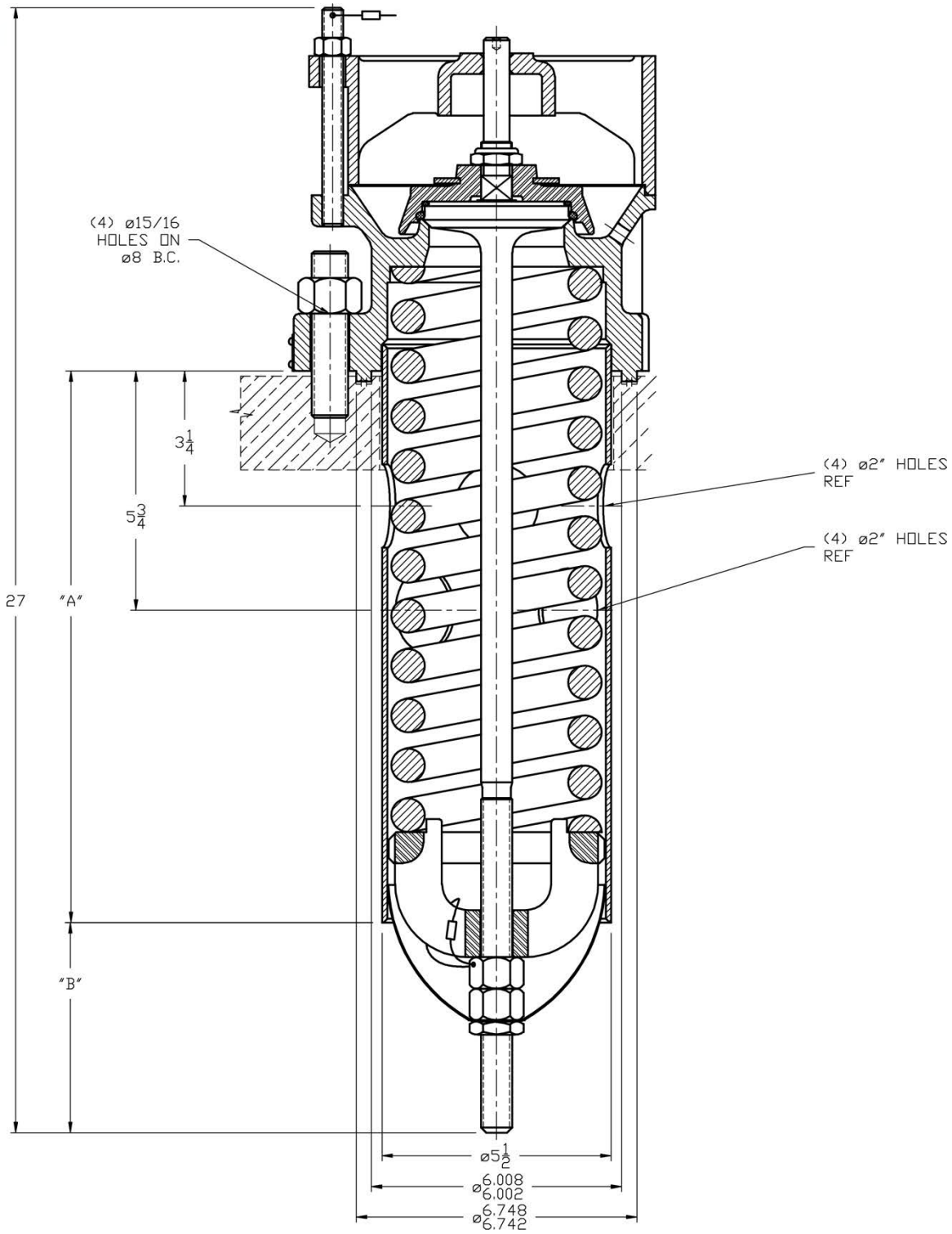

Figure 1-8 A-37000 Series Valve Dimensions

1.4 Pre-Installation Regulations/Requirements

1.4.1 Regulations

Midland internal-style valves are used in contact with a variety of products, many of which are hazardous materials. The acceptance and transportation of products are regulated by the DOT and AAR in the U.S.A., and in Canada by CTC and Transport Canada. Regulations of other governmental bodies must be complied with for stationary and mobile applications. All personnel should be familiar with and follow these regulations. Nothing in these instructions is intended to conflict with or supersede these regulations. The information in this document was gathered from knowledgeable sources, but Midland Manufacturing Corporation makes no representations or guarantees about its accuracy or completeness and assumes no liability for this information.

Specifications are subject to change without notice.

1.4.2 Safety Precautions

Midland valves are used in connection with a variety of products, many of which are hazardous materials and could cause serious injury or damage.

This valve should only be installed, operated and maintained by qualified personnel.

Read all of these instructions carefully before proceeding.

CAUTION: **Toxic Hazard.** Always use extreme caution and proper equipment when involved with hazardous materials. To avoid exposure to toxic or hazardous materials, make sure the tank car is empty and clean, and that the work area is free of hazardous chemicals before removing or installing any valve.

WARNING: These internal-style pressure relief valves are spring-loaded assemblies with a large amount of stored potential energy in the spring. Handle with care to avoid damage to the valve stem, which could result in breakage and ejected piece parts.

WARNING: When assembling or disassembling the valve, DO NOT position oneself directly in front of the spring and stem. Instead, position oneself to the side away from the valve. Unexpected component failure – valve-stem or spring breakage may cause a sudden energy release that can discharge component parts a short distance in an uncontrolled manner. Personal injury may be a result.

1.4.3 Precautions for Mounted-Valve Repair

When performing maintenance on a pressure relief valve that is mounted on a railcar, observe the following precautions:

- Wear protective clothing and equipment suitable for withstanding the materials to which you may be exposed
- Position yourself on the upwind side of the valve when possible
- Work in a well-ventilated area
- Work with a partner who can help you in the event of an emergency
- Follow approved safety precautions for hazardous or toxic materials
- Obtain MSDS sheets for all the commodities used with the associated valve

1.4.4 Required Tools

Before arriving at the installation site obtain the required tools and supplies prior to performing the procedures indicated in this guide.

Recommended Wrenches			
SAE	Component	Torque (ft-lb)	Item #
3/4”	Hex Nut	75 ± 7	15
1-1/8"	Lock Nut	150 ± 10	13
1-1/16"	Top Lock Nut (Retainer)	100 ± 10	8
1"	Flats on O-ring Retainer		
1-3/8"	7/8" Mounting Stud Nuts		

Table 1-2 Required Tools with Torque Specifications

Other Tools and Supplies	
Screwdrivers	Lint-free Cloth
2-Ton Two-Arm Puller	Emery Paper (400 grit, cut in 1" strips)
Silicone Grease (or equivalent lubrication)	Wire Brush
Torque Wrenches (0 – 300 ft-lb)	

Table 1-3 Additional Recommended Tools and Supplies

2.0 Valve Installation

2.1 Preliminary Considerations

2.1.1 New valves are tested, adjusted and sealed at Midland. If a new valve has been left in its original packaging, is undamaged and is not more than six (6) months old, it may be installed on a tank car without retesting or recalibration.

2.1.2 Prior to installation, ensure that the valve remains clean and the gasket-sealing surfaces are not damaged.

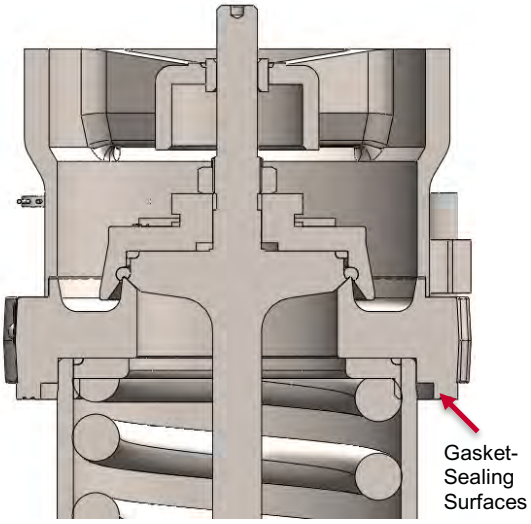

Figure 2-1 Gasket Sealing Surfaces

2.2 Procedure

2.2.1 Remove the old valve and then insert a soft rubber plug into the tank opening to prevent debris from entering the tank during cleaning of the valve-mounting groove and studs on the manway cover plate.

2.2.2 Using a wire brush, brush the threads of the mounting studs to remove rust or scale. Nuts should move freely on clean studs. Studs should not exhibit excessive corrosion.

2.2.3 Remove and discard all used gasket material.

CAUTION

CAUTION: **Groove Damage.** In order to avoid groove damage, do not scratch the metal in the bottom of the groove when removing the old gasket.

2.2.4 Using a lint-free cloth and appropriate cleaning solvent, wipe clean the valve and cover-plate sealing surfaces and the mounting-stud threads.

2.2.5 For tongue-and-groove mountings, examine the sides of the groove. Because the valve tongue fits tightly into the groove, any peening-over of the edges of the groove may make it difficult to properly fit the valve tongue into the groove. If the sides of the groove are peened over, make corrections to meet the AAR's groove tolerances.

2.2.6 Install the new gasket. Ensure it is fully seated. When a groove gasket is fully seated, 1/16" of free space should remain above the gasket to permit locating and entry of the valve tongue.

CAUTION

CAUTION: Do not use a sharp tool to press the new gasket into place or gasket damage may result.

2.2.7 For tongue-and-groove mountings, inspect the tongue of a reconditioned or retested valve by running your fingernail around its inner and outer edges to check for damage. The tongue dimensions have diameter tolerances of ±0.003", thus any excess material on these diameters will make it difficult to fit the tongue into the groove. If the tongue is peened over, remove excess material to meet AAR tongue tolerances.

CAUTION

CAUTION: To prevent **tongue damage**, do not install a valve having damaged sealing surfaces.

2.2.8 Remove the rubber plug (which was inserted in Step 2.2.1) from the cover plate.

2.2.9 Position the valve gently into the mounting. Align the body holes over the studs and lower the valve while positioning the valve tongue in the cover-plate groove.

CAUTION

CAUTION: **Tongue Not in Cover-Plate Groove**. Verify that the valve tongue has fit into the cover-plate groove. It must be so engaged before continuing with the next step or valve damage may result.

2.2.10 Install the nuts and tighten them in 1/3-torque increments in a diagonally alternating sequence, as shown in Figure 2-2 below. Consult gasket manufacturer for recommended torque requirements.

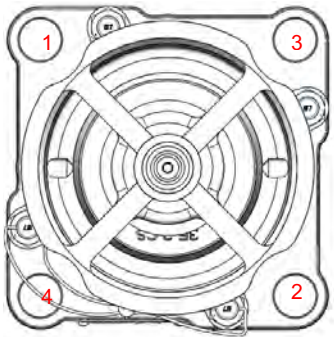

Figure 2-2 Tighten in Alternating Sequence

NOTICE

NOTICE: This is for installation to the car, so the pattern is on the outside bolts.

CAUTION

CAUTION: **Uneven Gasket Compression.** Do not over-tighten the nuts on one side of the valve as this may tilt the valve and result in uneven gasket compression.

2.3 Leak Inspection

2.3.1 Test all newly installed valves under pressure to confirm that no leaks are present.

WARNING: **Valve Leakage.** Improper valve-tongue seating in the flange groove, loose nuts and damaged gaskets may result in leaks at the valve-mounting joint.

2.4 Valve Operation Notes and Precautions

NOTICE: Operation of the valve must conform with all applicable TC, AAR, DOT specifications (Parts 173.31, 174.67, etc.), other governmental bodies, and the operating instructions of your company.

The pressure relief valves are spring-loaded and are actuated by overpressure in the railcar tank. There are no provisions for manual activation of the valve.

CAUTION: **Incorrect Setting.** Never adjust the spring compression of a valve while it is mounted on the vessel cover plate or incorrect settings may result.

3.0 Valve Disassembly

NOTICE

NOTICE: Valve disassembly should only be done by trained personnel with access to the proper machines, tools, procedures and personal-protective equipment (PPE).

3.1 Procedure

CAUTION

CAUTION: Spring-loaded Assembly. During valve-spring disassembly, the valve contains springs under load. **DO NOT** attempt to disassemble the valve without first reading these instructions or injury may result. Spring pressure must be adjusted to minimum and a bench clamp or press used for disassembly.

3.1.1 Remove the seal wires (item 16) from top-guide studs (items 14 and 14A). Then, remove the four (4) nuts (item 15) securing the top guide (item 1) to the valve body (item 4). Now, remove the top guide (item 1) from the body (item 4). You may have to tap it loose with a brass hammer.

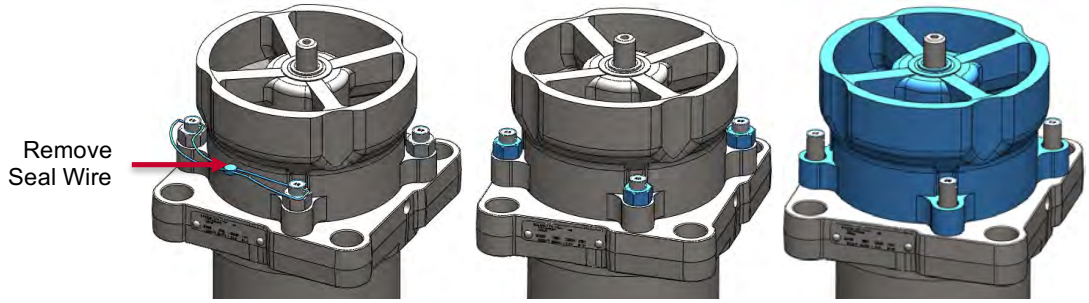

Figure 3-1 Remove Wire, Four (4) Bolts and Top Guide

3.1.2 Loosen the locknut (item 8) on the stem (item 2) while holding the retainer in place. See Table 1-2 for recommended wrench size. Remove the locknut from the valve stem. Next, lift up the O-ring retainer (item 3), use of a pair of screwdrivers maybe required. Use a non-scratching tool to remove the O-rings (items 10 and 11) from the O-ring groove of the retainer.

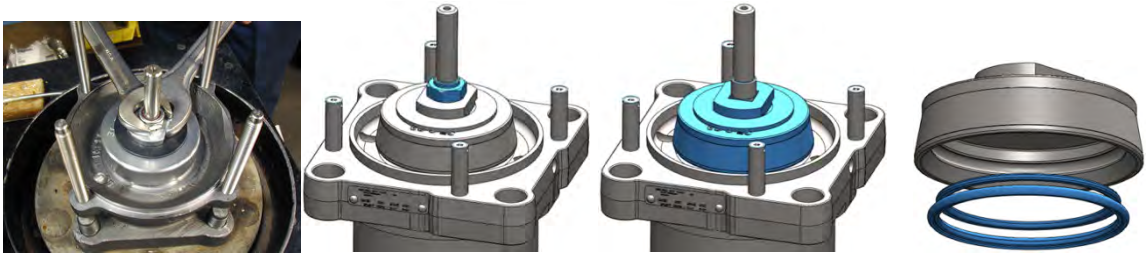

Figure 3-2 Remove Locknut and Retainer and Retainer O-Rings

3.1.3 Clean and lubricate the stem thread. Loosen the locknut (item 13) from adjustment nut (item 12) using 1-1/8" and 1-1/16" wrenches of suitable length. Next, remove only the locknut (item 13) from the stem. Do not attempt to remove the adjustment nut at this step.

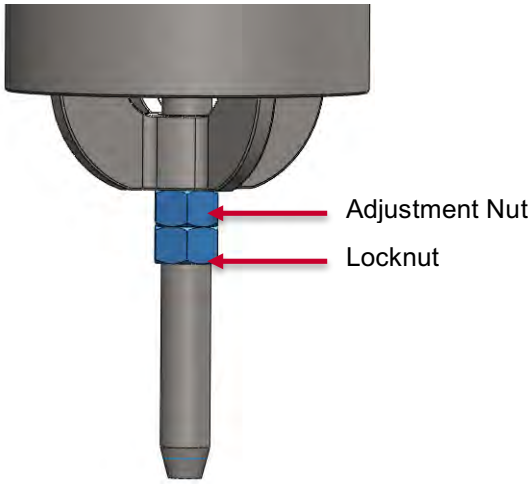

Figure 3-3 Loosen Locknut and Adjustment Nut, then Remove Locknut Only

3.1.4 Place the valve into a press having a support block or floorboard to allow pass-through of the valve stem. Using a press yoke having a cutaway as shown in Figure 3-10, compress the valve spring enough to allow loosening of the adjustment nut (item 12). Remove the spring-adjustment nut while taking care to support the valve stem. Next, slowly and carefully back off the press head, allowing the valve spring (item 5) to expand fully.

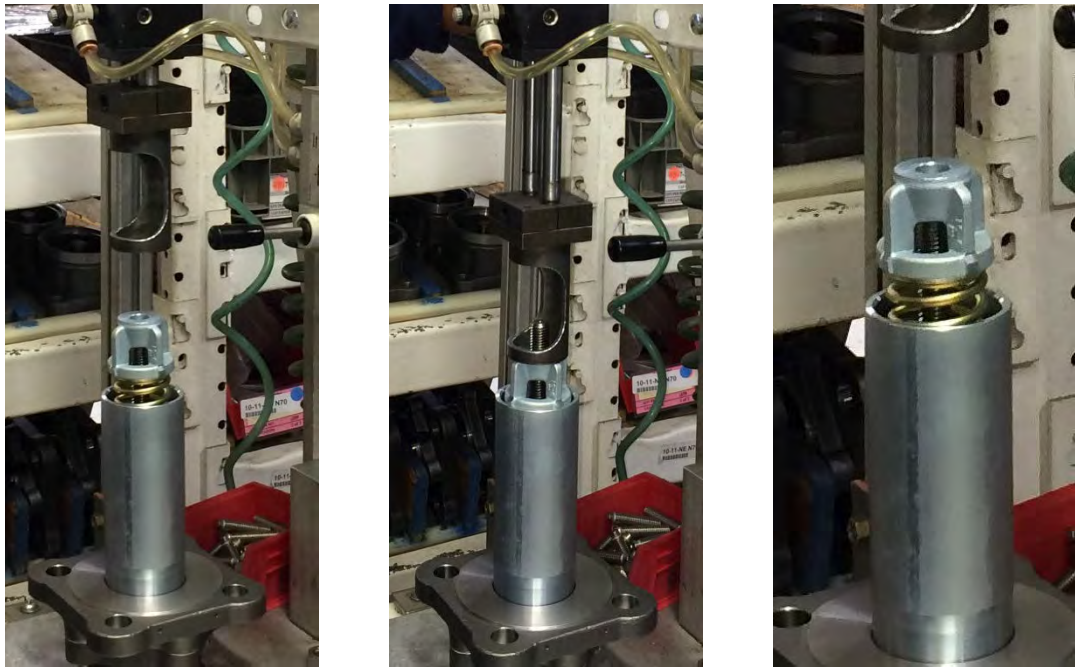

Figure 3-4 Compress and Expand the Valve Spring

CAUTION

CAUTION: The valve stem may or may not stick in the valve seat. Take care when loosening the adjustment nut to prevent the stem from falling loose and sustaining damage. Support the stem and let it down gently.

3.1.5 Remove the valve from the press taking care to lift it by the threaded valve stem (item 2). This will prevent the stem from falling out of the valve body.

WARNING

WARNING: **Valve/Seat Damage.** With spring pressure removed from the valve stem, the stem can easily shift, allowing the sealing edges of the stem to contact metal surfaces or to improperly contact the valve seat. When laying the valve onto the workbench, keep a constant lifting force on the valve stem above the spring to keep the valve seated. Lay the assembly down on its side carefully and immediately grasp the opposite (short) end of the stem to prevent valve/seat damage.

3.1.6 Lay the valve on a bench and place a properly-sized wooden block beneath the short end of the valve stem to prevent it dropping and damaging the valve seat.

3.1.7 Remove the spring follower (item 6) and the valve spring (item 5) from the guide tube.

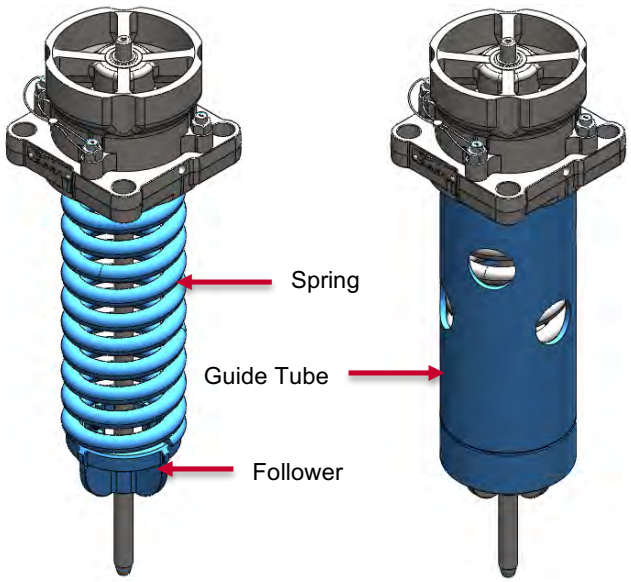

Figure 3-5 Remove Spring Follower, Spring and Guide Tube

4.0 Valve Inspection

Follow the guidelines in this section for inspecting the condition of valve components after disassembly. In some instances, a component can be properly evaluated for damage or cracks only with the use of specialized techniques, such as dye-penetration or magnetic-particle testing according to a qualified procedure by certified trained personnel. Such testing is indicated within this document where mandatory.

Additionally, specific inspections must be performed during and after reassembly of the valve to ensure proper and reliable operation.

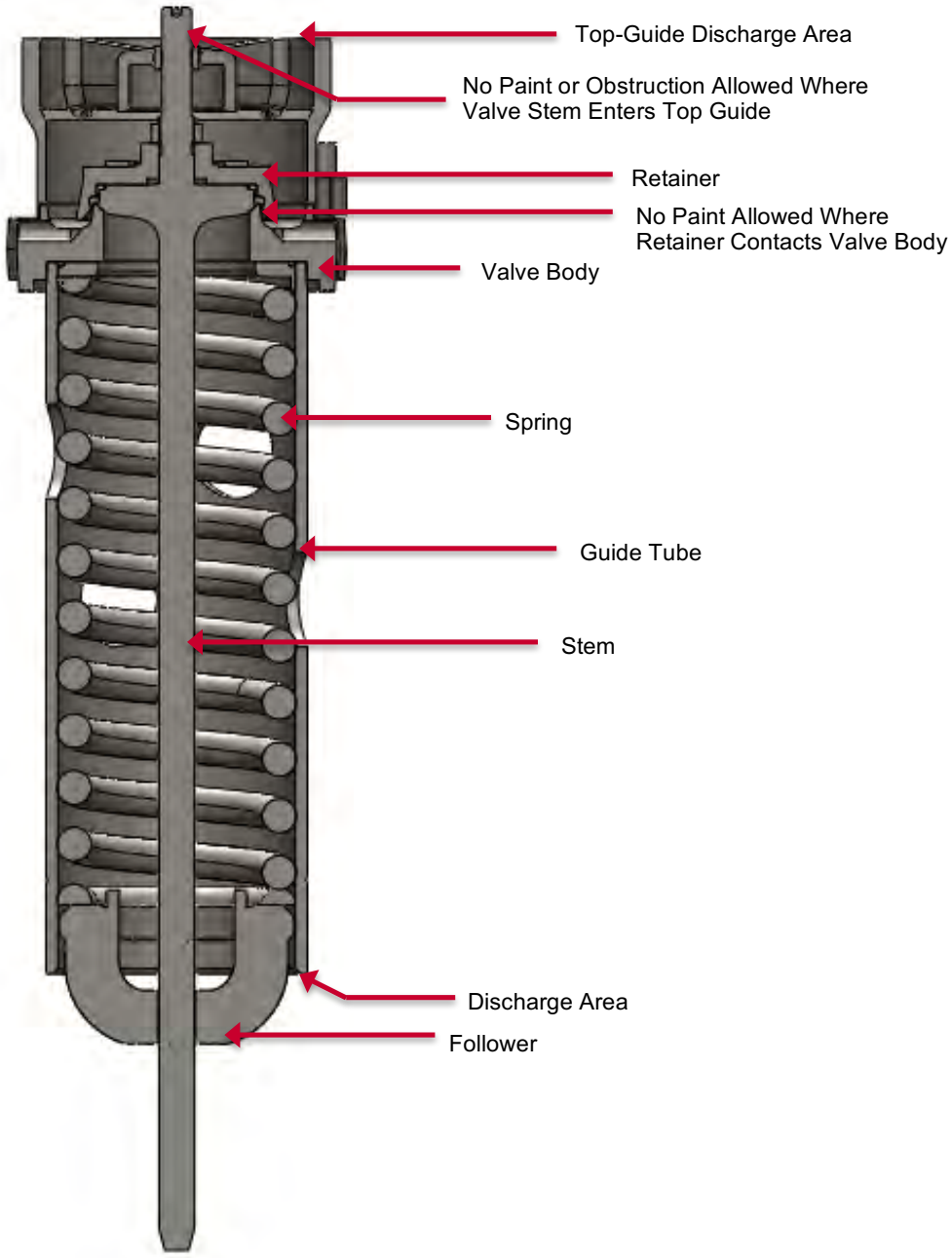

Figure 4-1 Valve Inspection Points

4.1 Inspection Procedure

NOTICE

NOTICE: Without consent from the manufacturer or car owner, repair work is limited to cleaning and polishing. See Paragraph A3.11.1 of the Tank-Car Specifications.

WARNING

WARNING: Machining Not Allowed. Without consent from the manufacturer or car owner, machining, grinding, welding or other alterations to the valve seat or stem seat is not allowed per AAR M1002, Paragraph A3.11.1 of the Tank-Car Specifications.

4.1.1 Top Guide

4.1.1.1 The top guide (item 1) is principally a non-structural part. There should be no paint on the guide bushing of this part where the valve stem enters it, or between adjacent surfaces of the top guide and valve body. The area of discharge through the top guide (Figure 4-1) must be unobstructed by foreign matter that would hinder free flow of discharging fluid.

4.1.2 Stem Inspection

4.1.2.1 Remove scale, residual product and other foreign material from the stem. Use magnetic-particle or dye-penetration inspection to detect cracks to the seating area of the stem.

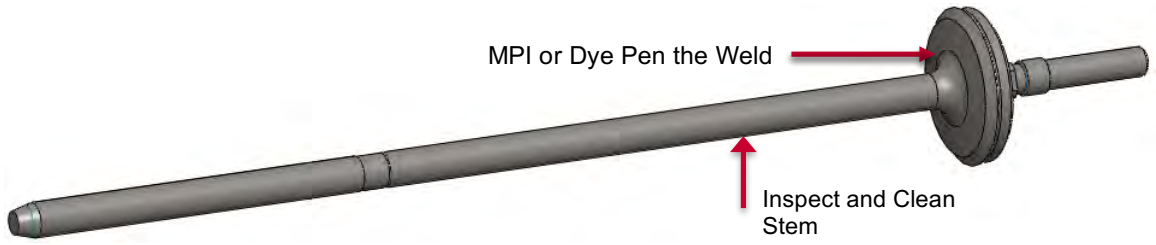

Figure 4-2 Valve Stem

CAUTION

CAUTION: **Check for Cracks**. Cracks are stress concentrators and can cause catastrophic failure of the stem and uncontrolled venting.

4.1.2.2 Also inspect for corrosion pitting. Any corrosion pitting is reason for rejection since it may indicate more severe corrosion at the threads and the starting point for difficult-to-detect cracking.

4.1.2.3 All nickel-bearing stainless steels have a likelihood of galling. Wrenching the adjusting nut without relieving the spring's load will frequently result in galled stem threads. A new hex nut should move freely up and down the threads. If the hex nut does not move freely, the stem should be replaced.

4.1.2.4 The sealing surface is the stem seat (Figure 4-2). Clean the stem seat with emery paper (400 grit) then wipe it clean with a cloth and a suitable solvent. Run your fingernail over the seat surface to detect any flaws.

4.1.3 Stem Concentricity

4.1.3.1 The valve stem must be straight within 0.025" (maximum). Rotate and center the stem on V-blocks set up with a dial indicator at the stem seat. If the dial indicator readings are not 0.025", replace the stem or return it to Midland for repair.

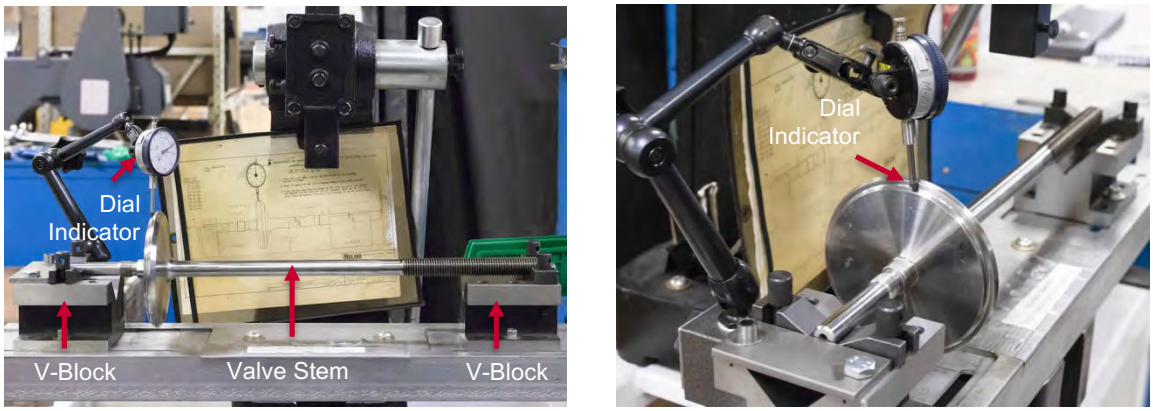

Figure 4-3 Stem Concentricity Check

WARNING: Valve-Stem Eccentricity. Excessive valve-stem eccentricity will cause binding that can result in high start-to-discharge pressure settings, reduced valve capacity and/or low vapor-tight pressures.

WARNING: Valve-Stem Failure. Cracks and corrosion of pressure relief valve stems can result in stem failure and uncontrolled venting.

WARNING: Valve-Stem Straightening. Straightening of the stem by bending it in a press may result in the buildup of uneven stresses in the stem, which may result in valve malfunction.

4.1.4 O-ring Retainer Grooves

4.1.4.1 The grooves (Figure 4-4) must be free of gouge marks, corrosion, pits and rust. Since the O-rings must seal against these surfaces, any irregularities can cause the valve to leak. Clean the groove by sanding it lightly with emery paper (400 grit). If this does not effectively clean the groove, replace this part.

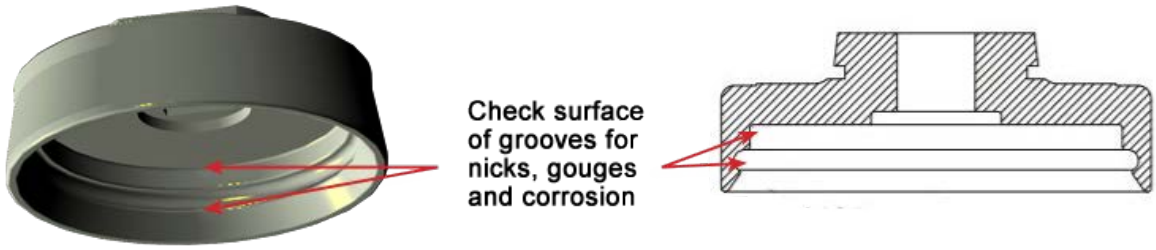

Figure 4-4 O-ring Retainer Grooves (A-35000 body shown)

4.1.5 Valve Body Sealing Surface (Valve Mounting)

4.1.5.1 On the underside of the valve body (item 4) is the surface that seals the valve to the mounting plate on the railcar (Figure 4-5). A good seating surface is necessary to ensure there are no leaks in this area. Clean it with emery paper (400 grit) then wipe it with a cloth and a suitable solvent. Run your fingernail around the surface to detect any flaws. **Repair work is limited to cleaning and polishing. All other procedures must be approved by Midland.**

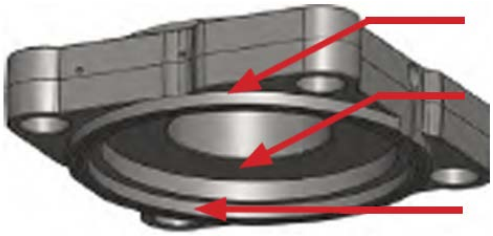

Figure 4-5 Valve-Body Sealing Surface (A-35000 body shown)

NOTICE

NOTICE: Without consent from the manufacturer or car owner, repair work is limited to cleaning and polishing. See Paragraph A3.11.2 of the Tank-Car Specifications.

WARNING

WARNING: Machining Not Allowed. Without consent from the manufacturer or car owner, machining, grinding, welding or other alterations to the valve seat or stem seat is not allowed per AAR M1002, Paragraph A3.11.1 of the Tank-Car Specifications.

NOTICE

NOTICE: Please refer to paragraph A3.11.2 of the Tank-Car Specifications and consult Appendix E for dimensions and applicable tolerances.

NOTICE: Some valves do not include a tongue flange. On valves with a flat-face mounting flange, refer to A3.11.2 of the Tank-Car Specification for machining specifications

4.1.6 Valve Body Sealing Surface (Seat Seal and Crown)

4.1.6.1 The valve body sealing (item 4) surface is the crown of the seat. Clean it with emery paper (400 grit) then wipe it with a cloth and a suitable solvent. Run your fingernail around the surface to detect any flaws. Repair work is limited to cleaning and polishing (Appendix A, Paragraph 3.11.1 of MSRP C-III, Specifications for Tank Cars).

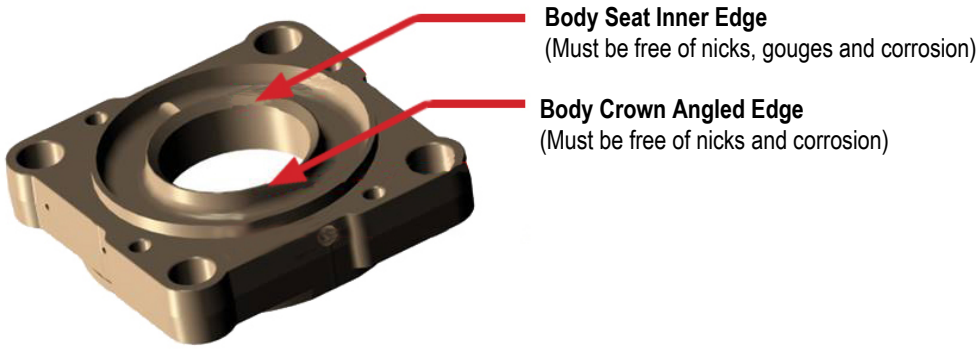

Figure 4-6 Valve-Body Sealing Surface (A-35000 body shown)

4.1.6 Spring Inspection

4.1.6.1 This part is highly stressed. The exterior surface must be free of pitting, cracks and corrosion. If any wear and/or corrosion is observed on the spring, use magnetic-particle or dye-penetration inspection (performed by certified trained personnel) to evaluate the exterior surface and ensure that it is free of cracks and corrosion pits. If any excessive wear over 0.030" of the area is measured or observed, the spring cannot be repaired and must be replaced.

WARNING

WARNING: Valve-Spring Failure. Defects in coil springs, such as cracks and corrosion pits, can act as stress concentrators. Failure to detect these defects can result in coil-spring breakage and uncontrolled valve venting.

4.1.6.2 Test the springs by pressing them to 80% of maximum deflection in a press for two (2) minutes. Remove from the press and then measure the spring free-height. If free-height is less than the minimum indicated in Table 4-1, replace the spring.

WARNING

WARNING: Deficient Valve Travel. Coil springs that have taken a "set," resulting in an undersized free-height, will not allow the valve to open fully. The spring should not be bowed more than 1/4" when in the assembled position. Bowing in excess of this amount can cause the spring to rub against the inside wall of the nozzle or guide tube and adversely affect the pressure settings. If any of the defects mentioned above are observed, the spring cannot be repaired and must be replaced.

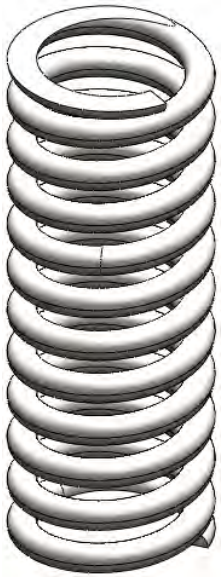

Figure 4-7
Valve Spring

Valve Model Number			Spring Part Number	Wire Size (REF) (Inches)	Minimum Free-Height (Inches)	Height at 80% of Max. Deflection (Inches)
A-3200	A-3280	--	32-5-AS	0.781	15.41	11.39
A-35280	A-35300	A-35330				
A-3450	--	--	34-150-AS	0.625	16.29	9.59
A-3454	--	--	34-154-SS	0.625	16.79	9.41
A-34225	A-37225	--	34-225-AS	0.719	16.03	10.21
A-34229	--	--	34-225-SS	0.75	15.09	10.30
A-34247	A-3455	A-37247-XL	34-255-AS	0.75	15.01	10.02
A-37255-XL	A-37247	A-37255				
A-3459	A-34251	--	34-259-SS	0.75	14.69	10.02
A-3400	A-3430	A-3480	34-280-AS	0.813	13.70	10.04
A-37280	A-37300	A-37330				
A-3404	A-3434	A-3484	34-280-SS	0.813	14.28	10.47
A-3430-XL	A-3480-XL	A-37280-XL	34-5-AS	0.781	16.90	12.10
A-35280-XL	--	--	35-281-SS	0.781	15.41	11.39
A-35200	A35220	A-35225	325-5-AS	0.719	16.52	11.10

Table 4-1 Minimum Free-Heights for Spring After Pressing 80% of the Maximum Deflection for Two Minutes

4.1.7 Spring Follower or Guide Tube

4.1.7.1 This structural part has guides on its outer edges (refer to Figure 4-1). Move it up and down the length of the guide tube as indicated below. If it binds, look for dents or gouged surfaces on the inside of the guide tube. Repair the damage to allow free movement of the spring guide.

WARNING: Valve Sticking. If the spring guide binds in the guide tube (nozzle), the valve may stick in the open position or be prevented from opening. Always ensure free travel of the spring guide before reassembling the valve.

4.1.8 Guide Tube

4.1.8.1 This guide tube is principally a non-structural part. There should be no paint on the inside of the guide tube. The area of discharge through the guide tube (Figure 4-1) must be unobstructed by foreign matter that would hinder free flow of discharging fluid. Inspect the guide tube by moving the top guide up and down the length of the guide tube as indicated below. If it binds, look for dents or gouged surfaces on the inside of the guide tube. Repair the damage to allow free movement of the spring guide.

WARNING: Valve Sticking. If the spring guide binds in the guide tube (nozzle), the valve may stick in the open position or be prevented from opening. Always ensure free travel of the spring guide before reassembling the valve.

4.1.9 O-rings and Gaskets

4.1.9.1 These must be replaced at the time of the periodic valve retest and when the valve is disassembled.

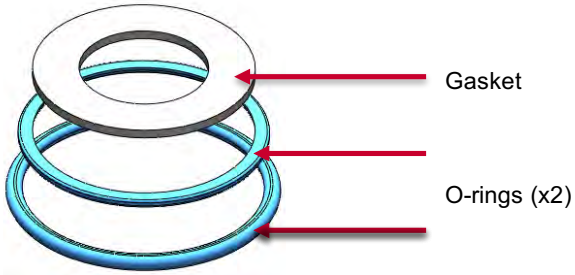

Figure 4-8 Gasket and O-rings

CAUTION

CAUTION: O-ring Degradation. O-rings develop micro-cracks, can swell or shrink, and become harder or softer with age and chemical exposure. An O-ring that fits loosely in the cap, or can only be pushed into the O-ring retainer with difficulty, is quite likely not the correct size. Many of Midland's O-rings are made on special molds to non-standard sizes and are obtainable only from Midland.

CAUTION: Defective Parts. If any parts appear defective, it is recommended they be replaced, or consult with Midland for recommended repair techniques when applicable.

4.1.10 Special Inspection Considerations

4.1.10.1 Previous procedures may not cover all conditions encountered in the field. Therefore, it is the responsibility of the repair agency to obtain approval from Midland for inspection, evaluation, repair and maintenance procedures not covered herein.

4.1.10.2 Facilities performing recommended dye-penetration and magnetic-particle testing must carry out such testing according to a qualified procedure conducted by certified trained personnel.

4.1.10.3 Evaluation of critical component metal surfaces of the valves after cleaning, inspection and specialized testing performed by agencies other than the repair facility are the responsibility of the repair facility

4.1.10.4 Where numerical tolerances cannot be provided, the disposition of the internal integrity and surface quality of parts is under the jurisdiction of the repair facility and dependent on its experience and judgment.

5.0 Valve Assembly

For valve assembly, please see valve-disassembly instructions. Reassemble in the reverse order of those instructions.

For recommended torque specifications for A-3000 Series valve reassembly, please refer to Table 1-2.

NOTICE

NOTICE: The image referenced below is for A-35000 Series valve. Your specific valve model components may vary from configuration shown below.

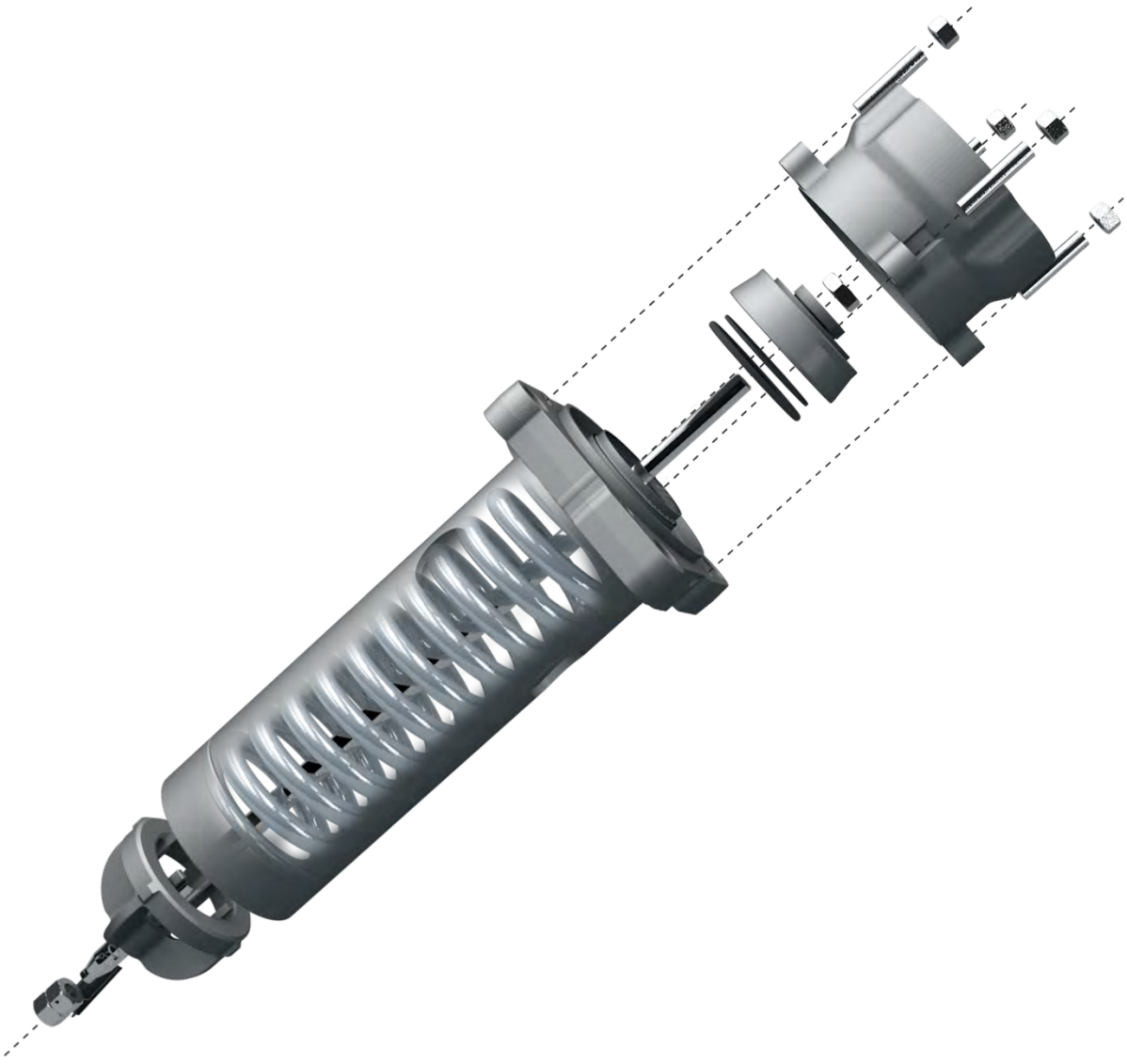

Figure 5-1 A-35000 Series Valve Exploded View

6.0 Special Guidelines and Precautions on Pressure-Testing and Adjustment

CAUTION: Safety Protection. Wear appropriate safety glasses or face-shield and protective clothing when conducting this procedure. Valve testing involves high-velocity air and water flow that can cause injury.

6.1.1 Determining Applicable Pressure Values

Refer to AAR publication “Regulations for Tank Cars.” Appendix A applies specifically to valves. This section prescribes the start-to-discharge pressure (STD), the vapor-tight pressure (VTP) and their tolerances.

NOTICE: A “popping pressure” is not specified. It is only necessary to ascertain the STD pressure as pressure is increased, and to establish the vapor-tight pressure as pressure is being reduced. (STD is defined as a continuous discharge in contrast to the start-to-leak pressure, which is defined as the first bubble leak. Vapor-tight is defined as the pressure at whch no further fluid is detected. Midland recommends that no bubbles be observed for two (2) minutes at vaport-tight.)

6.1.2 Test Stand and Gauge Requirements

It is recommended that the test stand mounting must be equivalent to the AAR M1002 figures E19.14 through E19.23 for the valve being tested. The pressure gauge must meet the requirements of D4.5 Test Gauge Standards and must be date-tagged.

7.0 Valve-Pressure Testing Procedure

If your company has an approved test procedure, follow it. If it does not, these procedures provide essential guidelines in regards to pressure testing.

7.1 Initial Setup

7.1.1 Install the valve on the test fixture and alternately tighten all of the nuts. Next, seal drain holes of the valve body with putty, or a similar material.

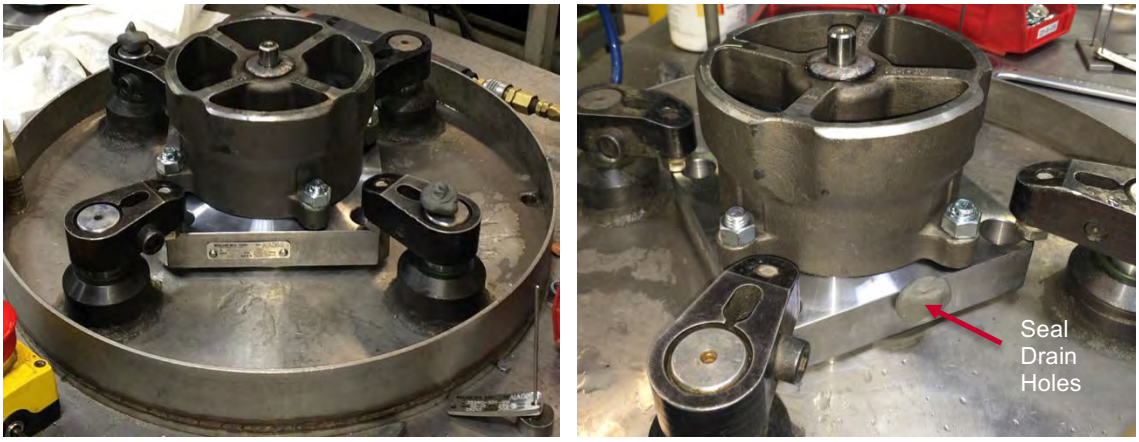

Figure 7-1 Affix Valve to Test Fixture and Seal Drain Holes; Fill with Water and Observe Gauge

7.1.2 Fill the valve body with water to allow bubble detection at the valve seat. Take a position allowing observation of the pressure gauge and bubbling of air in the valve body.

Figure 7-2 Fill with Water; Observe Pressure Gauge and Bubbling

7.2 Testing

7.2.1 Increase the test air pressure slowly.

7.2.2 Increase the air pressure until the valve start-to-discharge (STD) pressure is reached. The initial opening of the valve may be slightly high and not indicative of the actual STD because the O-ring may have been partially stuck to the valve seat. See Table 7-1 for valve start-to-discharge (STD) and vapor-tight pressure (VTP) settings.

STD Settings ± 3%	VTP Settings
75 psig ± 3 psig	60 psig minimum
150	120
165	132
225	180
247	198
255	204
280.5	224
300	240
330	264

Table 7-1 Start-To-Discharge (STD) and Vapor-Tight Pressure (VTP) Settings

7.2.3 Reduce the air pressure until leakage stops and then reduce pressure to less than one-half of the STD pressure. Then slowly increase the pressure.

7.2.4 Observe the STD pressure and then bleed off the pressure slowly to observe the VTP.

7.2.5 Repeat this procedure at least two (2) more times. The STD and VTP should be consistent in all three (3) occurrences.

7.2.6 AAR Specifications state that the VTP is 80% of the STD. Valves with good seats and O-rings should exhibit a VTP above 80% of the STD (usually up to 95% of the STD).

7.2.7 Retest the valve.

7.2.8 If the test results are erratic, troubleshooting is more complex. Consult your supervising engineer or a Midland representative.

7.2.9 When the test results are acceptable, tighten the bottom locknut to 150 ft-lb.

7.2.10 If the STD or VTP is not satisfactory, take the O-ring retainer cap off the valve and follow the Valve Adjustment procedure in Section 8.0.

8.0 Valve-Adjustment Procedure

If your company has an approved test procedure, follow it. If it does not, these procedures provide essential guidelines in regards to pressure testing.

8.1 Valve-Setting Adjustment

8.1.1 Remove the wire seal from the spring-adjustment nut, and lubricate the valve stem threads below the two spring-adjustment nuts.

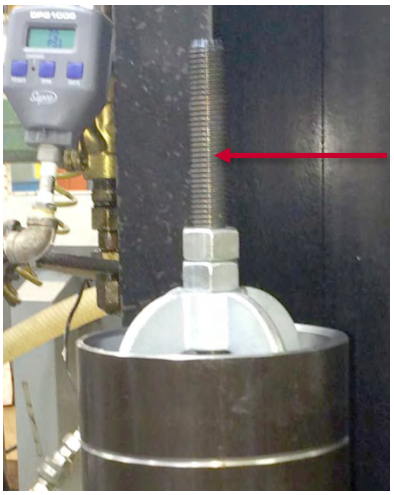

Figure 8-1 Remove Wire Seal and Lubricate Valve Stem

8.1.2 Loosen locknut from the spring-adjusting nut. Then, using a manual or an air-operated press, invert the valve to compress the spring and relieve pressure from the spring-adjusting nut. Use a tubular yoke (Figure 8-2) that is partially cut away to press down on the spring follower, further compressing the spring.

Figure 8-2 Loosen Locknut and Compress Valve Spring

CAUTION

CAUTION: Stem-Thread Damage. Since all nickel-bearing stainless steels have a likelihood of galling, wrenching the adjusting nut without relieving the spring's load will frequently result in damaged stem threads.

8.1.3 Apply indicator (reference) marks to the bottom spring-adjusting nut and the spring follower, and then loosen or tighten the spring-adjusting nut two turns. Next, release the spring compressor.

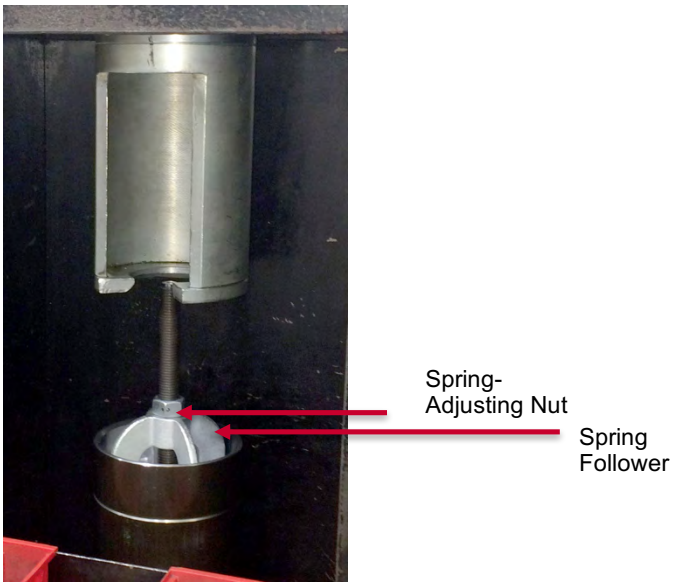

Figure 8-3 Loosen the Spring-Adjusting Nut and Release Spring Compressor

8.1.4 Tighten the locknut against the spring-adjusting nut to lock the setting.

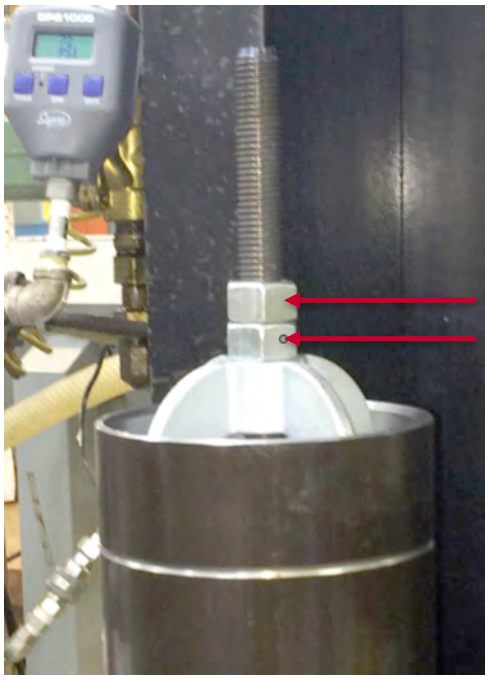

Figure 8-4 Tighten Locknut

8.1.5 Retest the valve STD and determine how much pressure change occurred when the spring-adjusting nut was rotated two (2) turns. Based upon this calculation, re-compress the valve spring and alter the valve adjustment for the midpoint in the STD tolerance range. Refer to **Table 7-1 for STD and VTP Settings.**

8.1.6 If the test results are erratic, troubleshooting is more complex. Consult your supervising engineer or a Midland representative.

8.1.7 When the test results are acceptable, tighten the top nut to torque at 100 ±10 ft-lb.

8.2 Post-Test Procedure

8.2.1 After testing the valve, close the pressure inlet valve to the test chamber, vent the pressure in the test stand. Remove putty and drain water. Then remove the valve from the test fixture.

8.2.2 Wipe or blow away any remaining soapsuds and water used in the testing, and install seal wire.

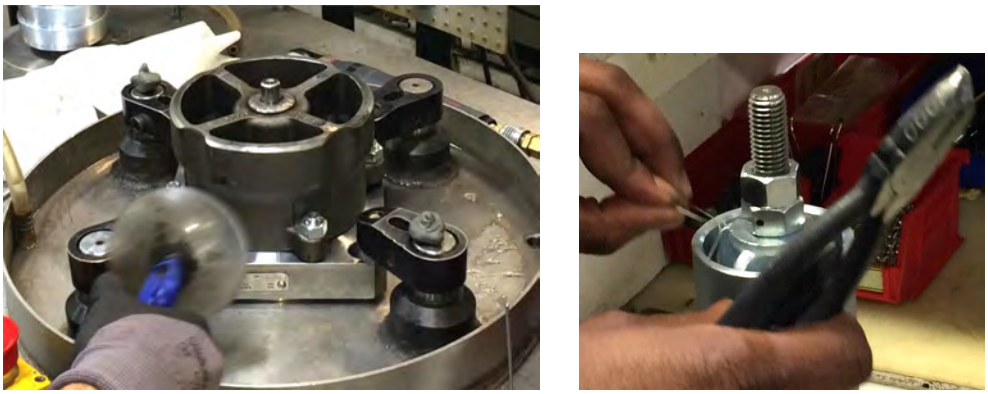

Figure 8-5 Blow Away Remaining Liquid and Install Seal Wire

WARNING

WARNING: Tongue Damage. A damaged valve tongue may prevent proper sealing on the tank-car mounting and result in leakage of the tank contents.

CAUTION

CAUTION: Mounting Interference. DO NOT paint the sealing surfaces of the valve that will contact the manway's cover-plate surfaces or valve cocking may result.

8.2.3 Permanently attach a metal tag to the valve body with repair/test date, repair facility identification and technician I.D.

8.2.4 Store the valve in a clean, dry place until ready to use.

9.0 O-Ring Replacement in the Field

NOTICE: Maintenance, Scheduled Defined. Scheduled maintenance involves valve inspection and component replacement for valves in–service on tank cars, that is in accordance to the car owner's standard qualification and maintenance program, that ensures the valve performs its intended function without failure until its next qualification or for its design life.

NOTICE

NOTICE: Leak Repair Defined. Leak repair is the temporary remediation to a valve observed to be emitting product in an unintended manner. Since leak repair is a temporary measure, once the car is unloaded and pressure is relieved, the valve should be removed for complete inspection, repairs, and full requalification in accordance to the car owners standard qualification and maintenance program. Leak repair is unscheduled maintenance and is not apart of the scheduled maintenance.

CAUTION

CAUTION: The repair procedure for leaking valves is intended only as a temporary repair to get the car to an unloading destination. Once the product is unloaded and pressure is relieved, the valve should be removed for a complete inspection and requalification.

9.1 Required Tools

9.1.1 Obtain the required tools and supplies before attempting maintenance or repair procedures. Table 1-3 outlines some suggested tools that may be needed.

9.2 Routine O-Ring Replacement

9.2.1 When performing this procedure as part of the scheduled maintenance, there should be no pressure in the tank car. The retainer O-rings should be elastic in the retainer, and removable.

NOTICE

NOTICE: Valve Installed on a Pressurized Tank Car. It is possible to replace O-rings on an internal-style valve installed on a pressurized tank car. This procedure may be conducted to stop minor leakage when valve rebuilding or replacement must be delayed. If temporary repair are made, once the car is unloaded and pressure is relieved, the valve should be removed for complete inspection, repairs, and full requalification in accordance to the car owners standard qualification and maintenance program.

CAUTION

CAUTION: If the valve still leaks after following the O-Ring replacement procedures outlined in steps 9.2.3 through 9.2.12, it may be necessary to follow Emergency Response procedures to cover and cap the valve, depending on the material in the tank car.

CAUTION

CAUTION: Conducting this procedure may be hazardous (depending on the material in the tank car). Maintenance personnel should be carefully trained before being permitted to perform the procedure below on a pressure relief valve mounted on a pressurized tank.

9.2.2 Remove the top guide seal wire (item 16). Then, remove the four (4) top-guide nuts and studs (items 15 and 14) and store them so they won't be dropped or lost.

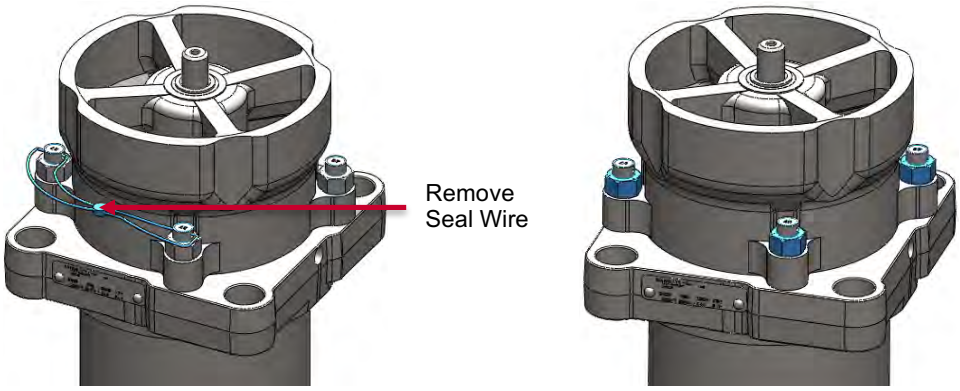

Figure 9-1 Remove Seal Wire and Bolts; Set Aside Bolts

9.2.3 Mark the top guide (item 1) and body (item 4) with a vertical line to allow the top guide to be reinstalled in the same orientation. Lift up and remove the top guide (item 1). Next, put a wrench on the flats of the O-ring retainer (item 3) and another wrench on the top locknut (item 8). See Table 1-2 for recommended wrenches. Hold the retainer in place to prevent it from rotating while backing off and removing the top locknut.

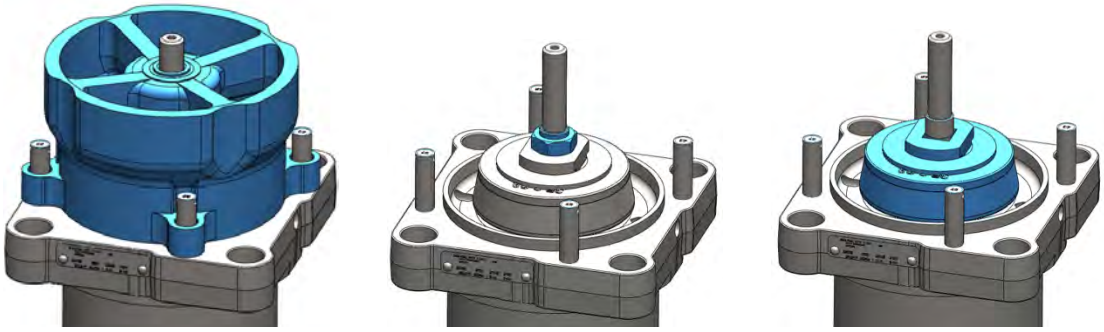

Figure 9-2 Remove Top Guide, Top Locknut, then Retainer

CAUTION

CAUTION: Valve Discharge. When the O-ring retainer cap is raised up, there will be a significant amount of product discharging. Have the emery paper, cleaning cloth, replacement O-ring retainer cap (with epoxied O-rings) and silicone grease close at hand. Use a wheel puller, or two screwdrivers 180° apart, to quickly dislodge the O-ring retainer.

9.2.4 Remove the O-ring retainer (item 3). Remove the two (2) O-rings (items 10 and 11) from the retainer and inspect the O-ring grooves.

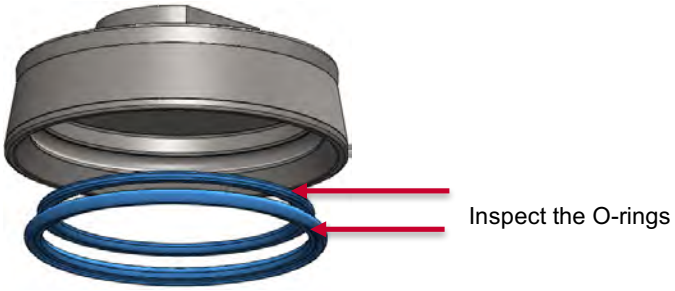

Figure 9-3 Remove Retainer and Inspect O-rings

9.2.5 After cleaning and confirming that the valve seat area is clean and free of defects, apply a small amount of lubricant to the exposed thread of the valve stem. Next, install the new O-ring retainer (item 3) and secure it with the top locknut (item 8). Take care to prevent rotation of the retainer using two wrenches. Refer to Table 1-2 for tools and torque requirements. Next, Install the top guide (item 1), then secure with the four (4) top-guide nuts. Refer to Table 1-2 for tools and torque requirements.

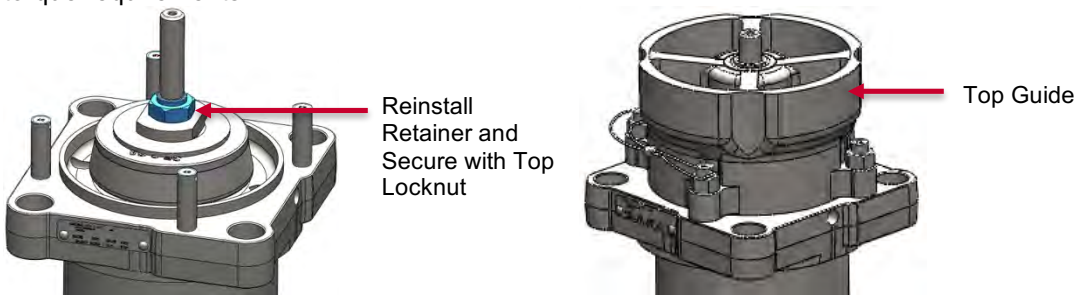

Figure 9-4 Reinstall Retainer, Locknut, Top Guide, Washer and Nuts

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CAUTION

CAUTION: Replace Retainer. After the tank-car pressure is relieved, replace the retainer having epoxied O-rings with another one containing non-epoxied O-rings. If valve leakage exceeds the sealing capability of the O-ring, replace or rebuild the valve.

CAUTION: If the valve is installed and still leaks after following the procedures outlined in Steps 9.2.3 through 9.2.11, it may be necessary to follow Emergency Response Prcedures to cover and cap the valve, depending on the material in the tank car.

9.2.6 For special guidelines and precautions on pressure-testing and adjustment and for determining applicable pressure values refer to AAR publication “Regulations for Tank Cars.” Appendix A applies specifically to valves. This section prescribes the start-to-discharge pressure (STD), the vapor-tight pressure (VTP) and their tolerances.

NOTICE

NOTICE: A “popping pressure” is not specified. It is only necessary to determine the STD pressure as pressure is increased, and to determine the vapor-tight pressure as pressure is being reduced. [STD is defined as a continuous discharge in contrast to the start-to-leak pressure, which is defined as the first bubble leak. Vapor-tight is defined as being bubble-tight, with no bubbles for two (2) minutes.]

9.2.7 Test Stand and Gauge Requirements. The test stand must have a mounting equivalent to the AAR M1002 figures E19.14 through E19.23 for the valve being tested. The pressure gauge must meet the requirements of D4.5 Test Gauge Standards and date-tagged.

9.2.8 Valve-Testing Procedure. If your company has an approved test procedure, follow it. If it does not, this procedure provides essential guidelines.

10.0 Warranty

Midland Manufacturing Corp. warrants the products of its own manufacture to be free of defects in material and workmanship for a period of one (1) year from the date of invoice. Furnished materials and accessories purchased from other manufacturers are warranted only by and to the extent of those manufacturers' warranties, if any.

MIDLAND MAKES NO WARRANTY OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, OTHER THAN AS SPECIFICALLY STATED HERE. MIDLAND MAKES NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE.

Midland's obligation under this warranty is strictly limited, at its option, to 1) repair or replacement at its factory of a like quantity of product: 2) refunding to purchaser money paid to Midland for its product: or 3) issuance of written authorization for the Purchaser to repair or replace, at costs comparable to Midland's normal manufacturing costs those parts proven defective, provided that Purchaser has given to Midland immediate notice upon discovery of such defect. Merchandise claimed to be defective shall not be returned without first obtaining Midland's written consent. The undertaking of repair or replacement by the Purchaser, or its agents, without Midland's written consent, shall void Midland's warranty and relieve Midland of all responsibility. Under no circumstances shall Midland be liable for any direct, incidental, consequential or other damages of any kind in connection with the installation, operation, maintenance, repair, inspection or other use of any product purchased from it.

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