DEFINING | WHAT'S NEXT

External-Style Pressure Relief Valve

A-1402C Series

Installation, Operation & Maintenance (IOM) Manual

MIDLAND
PART OF OPW a DOVER company

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1.0 INTRODUCTION

The A-1402C Series External-Style Pressure Relief Valves are corrosion-resistant safety valves improved to include redundant seals to atmosphere, eliminating potential leak paths and further increasing the long life and reliability in Chlorine transportation.

- Corrosion-resistant materials provide maximum protection from wet Chlorine
- Successfully used in Chlorine and AHCL applications
- Triple seals on all potential leak paths to atmosphere

1.1 TECHNICAL SPECIFICATIONS

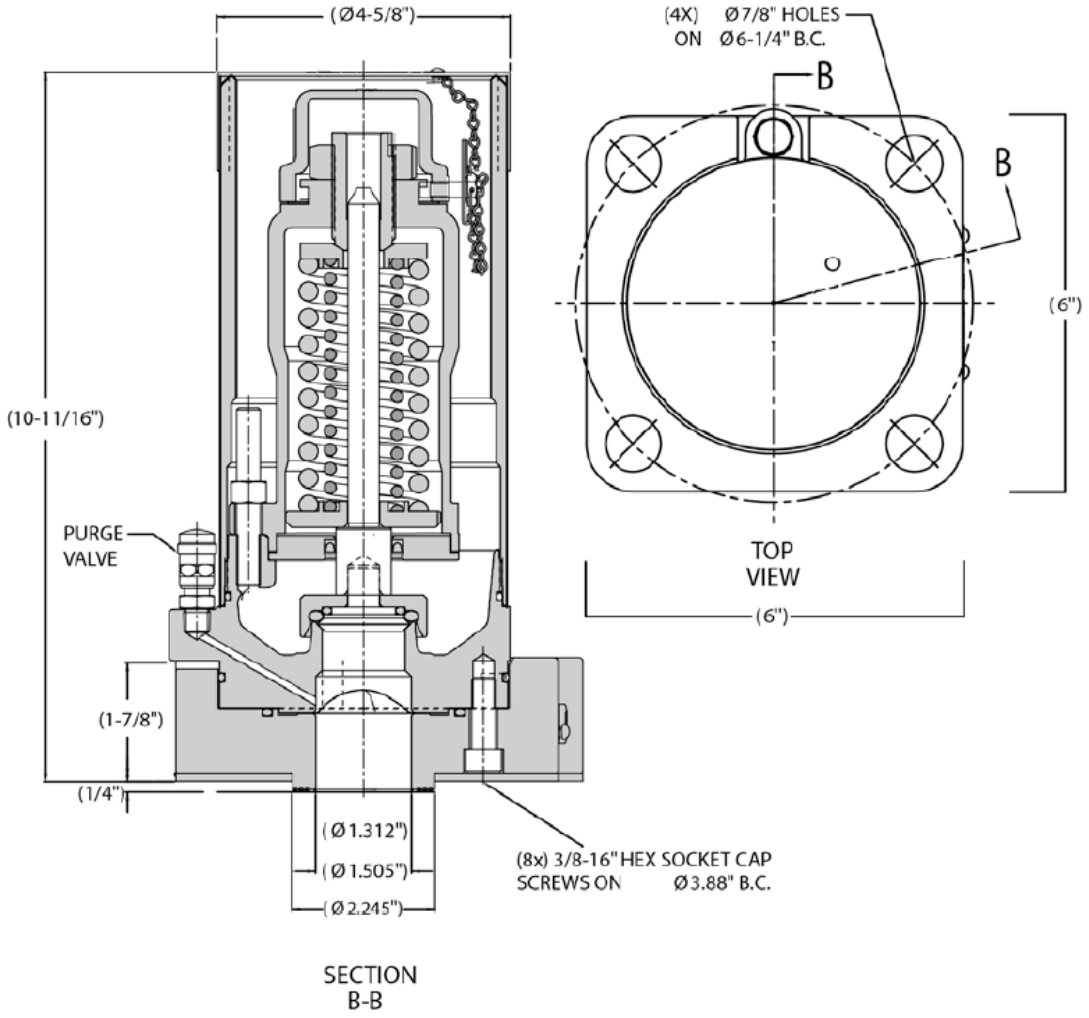


Figure 1-1 Valve Specifications

Valve Model	Rupture Disc Setting (PSIG)	Flow Rate @ 10% > R.D. Setting (SCFM)	Minimum Vapor Tight Pressure (PSIG)	Minimum Vapor Tight Pressure (PSIG)
A-14377C-ML	375	7070	356	285
A-14227C-ML	225	4367	213	171

Valve Model	Outer Spring	Inner Spring	Name Plate	Adjusting Screw Part #	Rupture Disc Part #
A-14377C-ML	15-375-SS	14-13-SS	14-377-ML-C	15-112-SS	14-23-TA-375-F
A-14227C-ML	15-150-MO	14-13-SS	14-227-ML-C	15-11-SS	14-23-TA-225-F

Table 1-1 Technical Specifications Per Valve Model

1.2 VALVE PERSPECTIVES

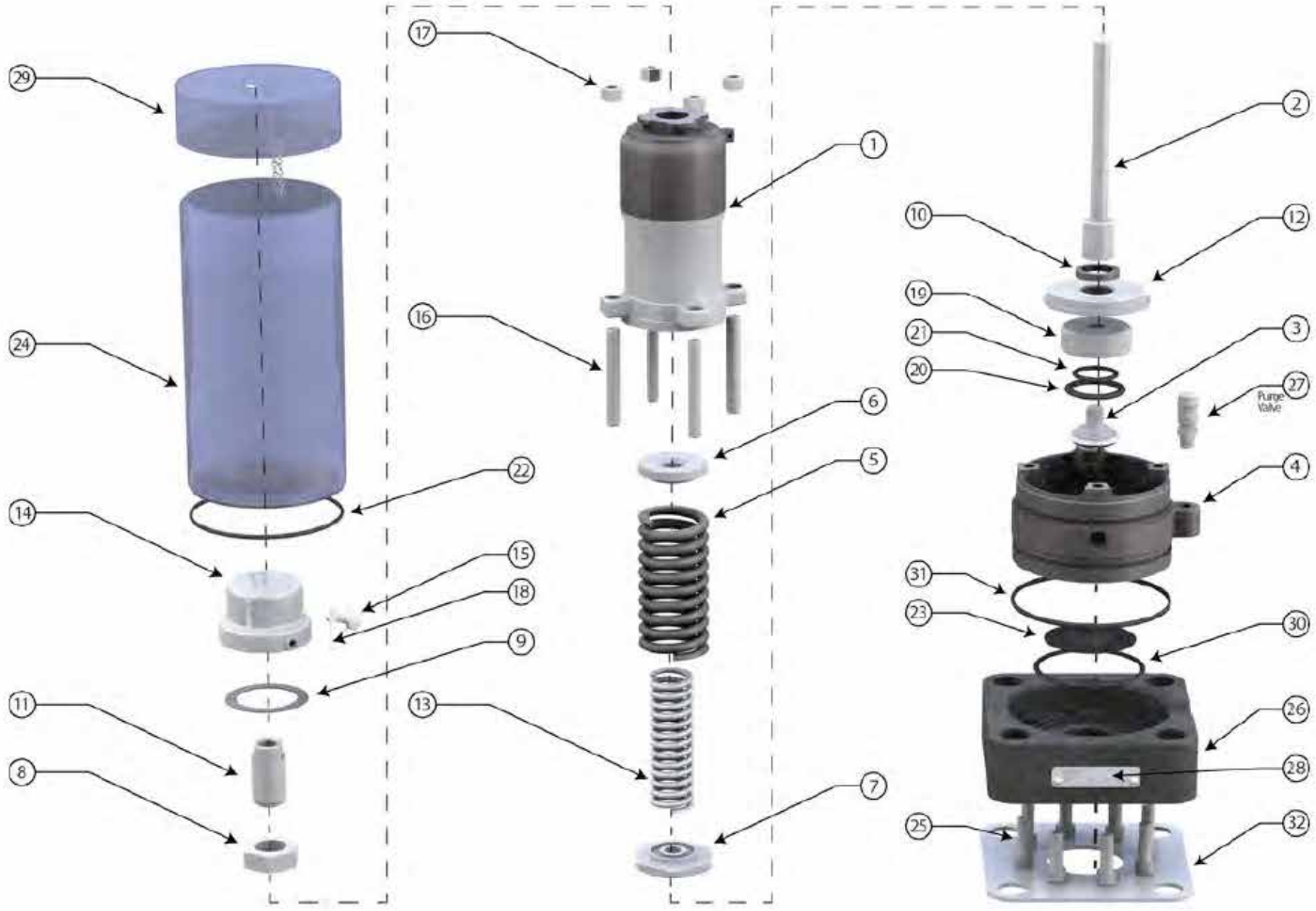


Figure 1-2 Exploded View

Item	Qty.	Part Name
1	1	Top Guide
2	1	Stem
3	1	Plug
4	1	Body
5	1	Outer Spring
6	1	Follower
7	1	Guide
8	1	Top Nut
9	1	Top Gasket
10	1	Shaft Seal
11	1	Adjusting Seal
12	1	Seal Retainer
13	1	Inner Spring
14	1	Cap
15	1	Seal Screw
16	4	Stud
17	4	Nut
18	1	Wire Seal
19	1	Retainer
20	1	Seat O-Ring
21	1	Plug O-Ring
22	1	Flue O-Ring
23	1	Rupture Disc
24	1	Flue
25	8	Rupture Disc Flange Bolts
26	1	Rupture Disc Flange
27	1	Purge Valve
28	1	Name Plate
29	1	Protective Cap/Chain
30	1	Flange O-Ring (inner)
31	1	Flange O-Ring (outer)
32	1	Filler Gasket

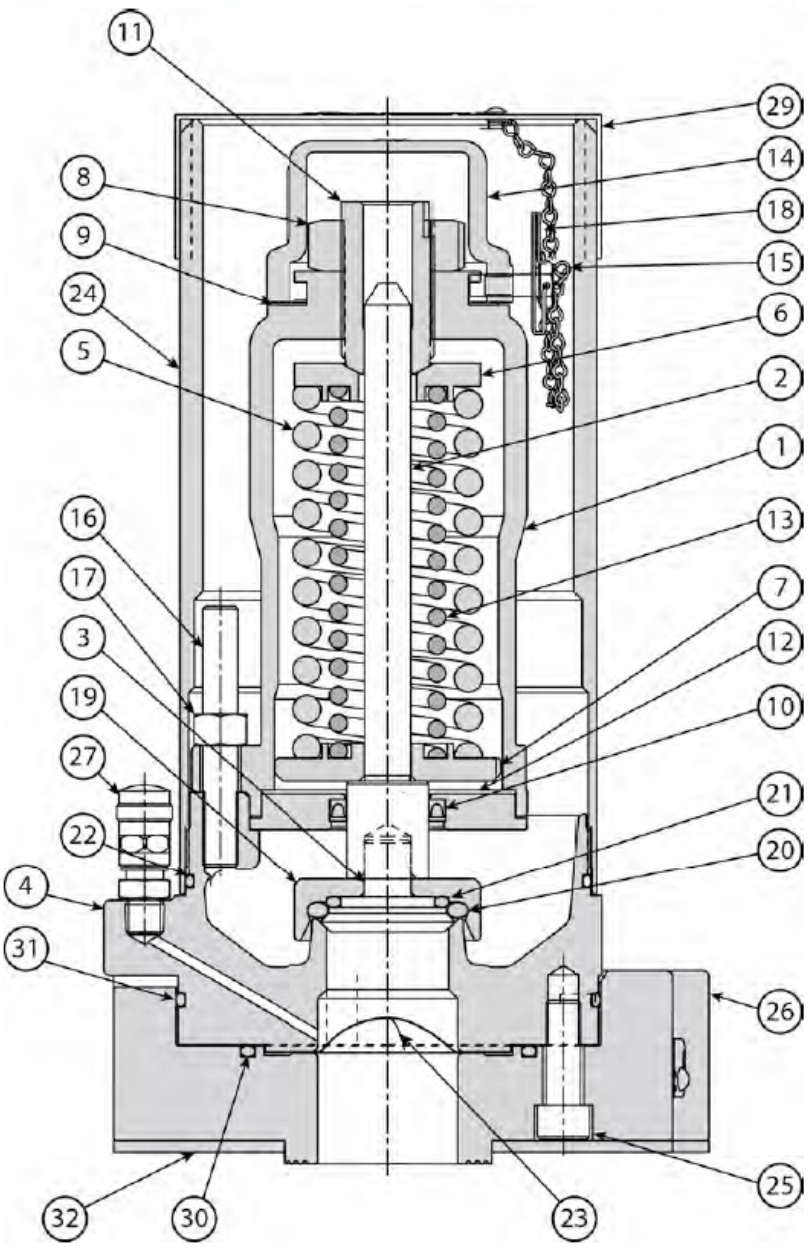


Figure 1-3 Cross-Sectional View with Callouts

1.3 PRE-INSTALLATION REGULATIONS / REQUIREMENTS

1.3.1 **Regulations** Midland External-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.

1.3.2 **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 external-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.

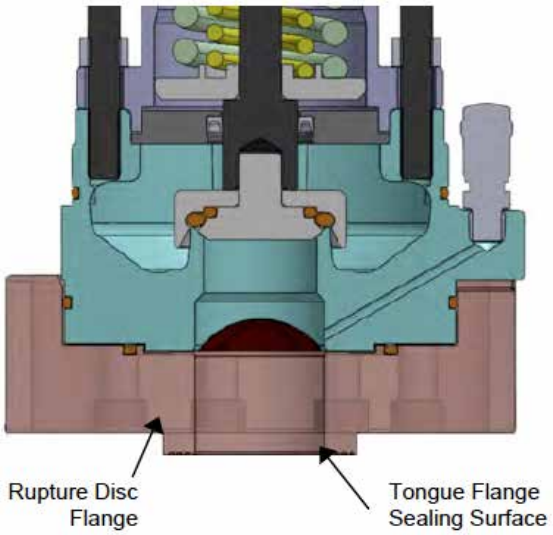
1.3.3 **Precautions for Mounted-Valve Repair** When performing maintenance on a pressure relief valve that is mounted on a railcar, observe the following precautions.

- 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 with a partner who can help you in the event of an emergency
- Follow approved safety precautions for hazardous or toxic materials

1.3.4 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				Recommended Gauges
SAE	Component	Torque (ft.-lbs.)	Item #	
5/16″ Hex	3/8″ Rupture Disc Flange Bolt	25	25	3/8-16 UNC 2A thread gauge
9/16"	1/2" Top Guide Nut	50	17	
1-1/2"	1" Top Lock Nut	45	8	
1/2"	1/8" NPT Needle Valve	Wrench Tight	27	
1-1/16"	Flats on Small Valve O-ring Retainer, 5/8" Mounting-stud Nuts			
1-1/4"	Flats on Large Valve O-ring Retainer, 3/4" Mounting-stud Nuts			
Table 1-2 Required Tools				



Tongue Mounting

Figure 2-1 Gasket-Sealing Surfaces

Other Tools and Supplies	
Screwdrivers	Pipe Wrench
Wheel Puller	Lint-free Cloth
Silicone Grease (or equivalent lubrication)	Emery Paper (400 grit, cut in 1" strips)
Torque Wrench	Wire Brush
Table 1-3 Additional Recommended Tools & Supplies	

2 VALVE INSTALLATION

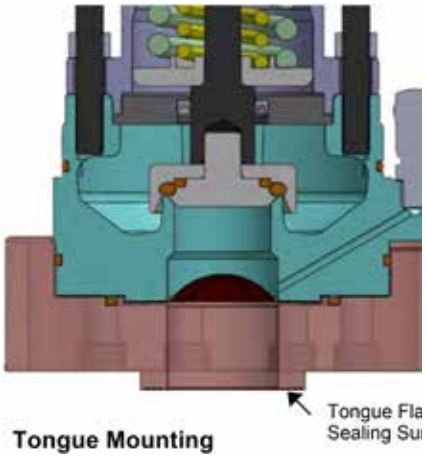


Figure 2-1 Gasket-Sealing Surfaces

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 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 that the gasket-sealing surfaces (Figure 2-1) are not damaged.

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 Wire 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 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 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 1) from the cover plate.

2.2.9 Install filler gasket (Item 32) over the mounting studs.

2.2.10 Hold the valve by the flue assembly (Figure 2-2) and lower it 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 Coverplate Groove. Verify that the valve tongue has fit into the coverplate groove. It must be so engaged before continuing with the next step or valve damage may result.

2.2.11 Install the nuts and tighten them in 1/3-torque increments in a diagonally alternating sequence to a torque specified by the gasket specified, as shown in Figure 2-3.

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.

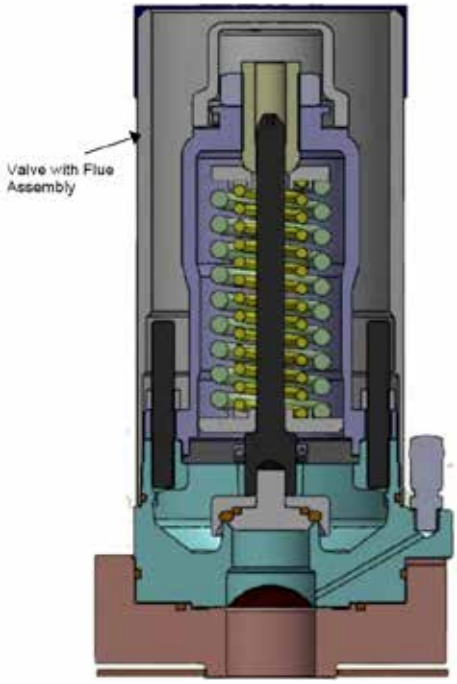


Figure 2-2 Valve with Flue Assembly and Filler Gaskets

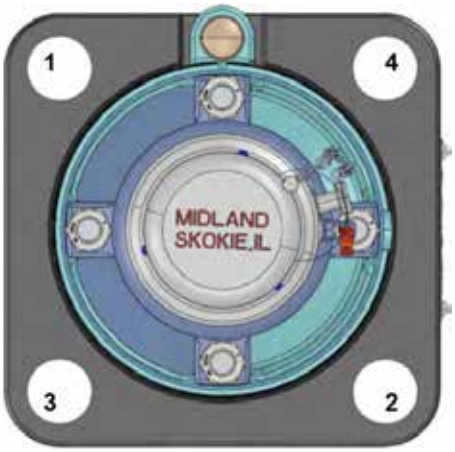


Figure 2-3 Mounting-Nut Tightening Sequence

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. Also, valves equipped with rupture discs should only be tested to 50% of rupture disc setting.

2.4 VALVE OPERATION NOTES AND PRECAUTIONS

NOTE: 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: Needle Valve Closure. For valves equipped with rupture discs, be sure that the needle valve is closed and the plug is installed, if required.

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 VALVE DISASSEMBLY

3.1 PROCEDURE

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.

Figure 3-1 Valve Cap Removal

Figure 3-2 Flue and Protective Cap

3.1.1 Remove the protective cap (blue) and cut the seal wire (Item 18 of Figure 1-3) to release the cap chain. Unscrew and remove the flue (tube) from around the valve.

3.1.2 If present, remove the plastic protector from the base or tongue of the valve.

3.1.3 If present, remove the flue O-ring (See Item 22 of Figure 1-3).

3.1.4 Remove the rupture disc flange bolts (Item 25 of Figure 1-3) from the valve base. Separate the disc flange from the valve base and remove the rupture disc (Item 23) inner and outer O-rings (Items 30 and 31 respectively; see Figure 1-3).

CAUTION: Flange Damage. To prevent flange handle damage during dissambly, handle the valve body and rupture disc flange carefully after disassembly. Avoid allowing their machined surfaces to contact the metal workbench and hand tools or damage may result.

3.1.5 Loosen the set screw (Item 15 of Figure 1-3) thus securing the cap (Item 14).

3.1.6 Use a pipe wrench and unscrew the cap as shown in Figure 3-1. Remove the cap.

3.1.7 Remove the top gasket or bumper (Item 9 of Figure 1-3).

3.1.8 Loosen the top nut (Item 8 of Figure 1-3) one turn counterclockwise.

Figure 3-3 Clamping for Top Guide Removal

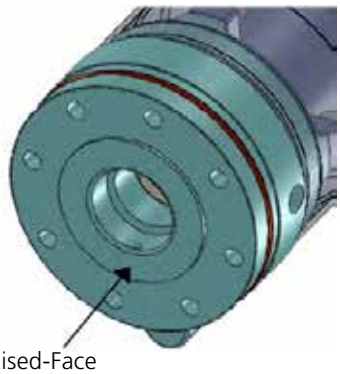


Figure 3-4 Underside of Valve Body Flange

Figure 3-5 Valve After Top Guide Removal

3.1.9 With a locking bench clamp (Figure 3-3), apply pressure to the adjusting screw (Item 11 of Figure 1-3). While so clamped, remove the four nuts (Item 17) securing the top guide (Item 1) to the valve base.

CAUTION

CAUTION: Rupture Disc Seat Damage. When clamping the valve, support the base only near the edges to prevent damage to the rupture disc's raised face on the underside of the valve body (Figure 3-4).

3.1.10 Slowly release the clamp to relieve remaining valve spring pressure and then lift the top guide housing off the valve base.

3.1.11 Remove the adjusting screw (Item 11 of Figure 1-3) and top nut (Item 8) from the top guide and from one another.

3.1.12 From the valve stem (Item 2 of Figure 1-3) remove the follower (Item 6), outer spring (Item 5), inner spring (Item 13) and the guide (Item 7).

3.1.13 Lift the stem (Item 2 of Figure 1-3) and seal retainer (Item 12) straight up and off the shaft and off the plug (Item 3).

3.1.14 Remove the shaft seal (Item 10 of Figure 1-3) from the seal retainer (Item 12).

3.1.15 Lift or pry up the retainer (Item 19 of Figure 1-3). It will likely lift off with the valve plug (Item 3) as a single unit.

3.1.16 Remove the plug from the retainer.

Figure 3-6 Valve Stem and Seal Retainer

CAUTION

CAUTION: O-Ring Groove Damage. Remove the O-rings from the retainer using only a non-scratching tool or scratching and gouging of the O-ring may result.

Figure 3-7 Retainer, Valve Stem, O-Rings and Plug

Figure 3-8 Retainer with O-Ring

3.1.17 Remove the two (2) O-Rings (Items 20 and 21 respectively; see Figure 1-3) from the retainer using only a non-scratching tool.

3.1.18 Unscrew and remove the needle valve (Item 27 of Figure 1-3) from the valve body.

4 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.

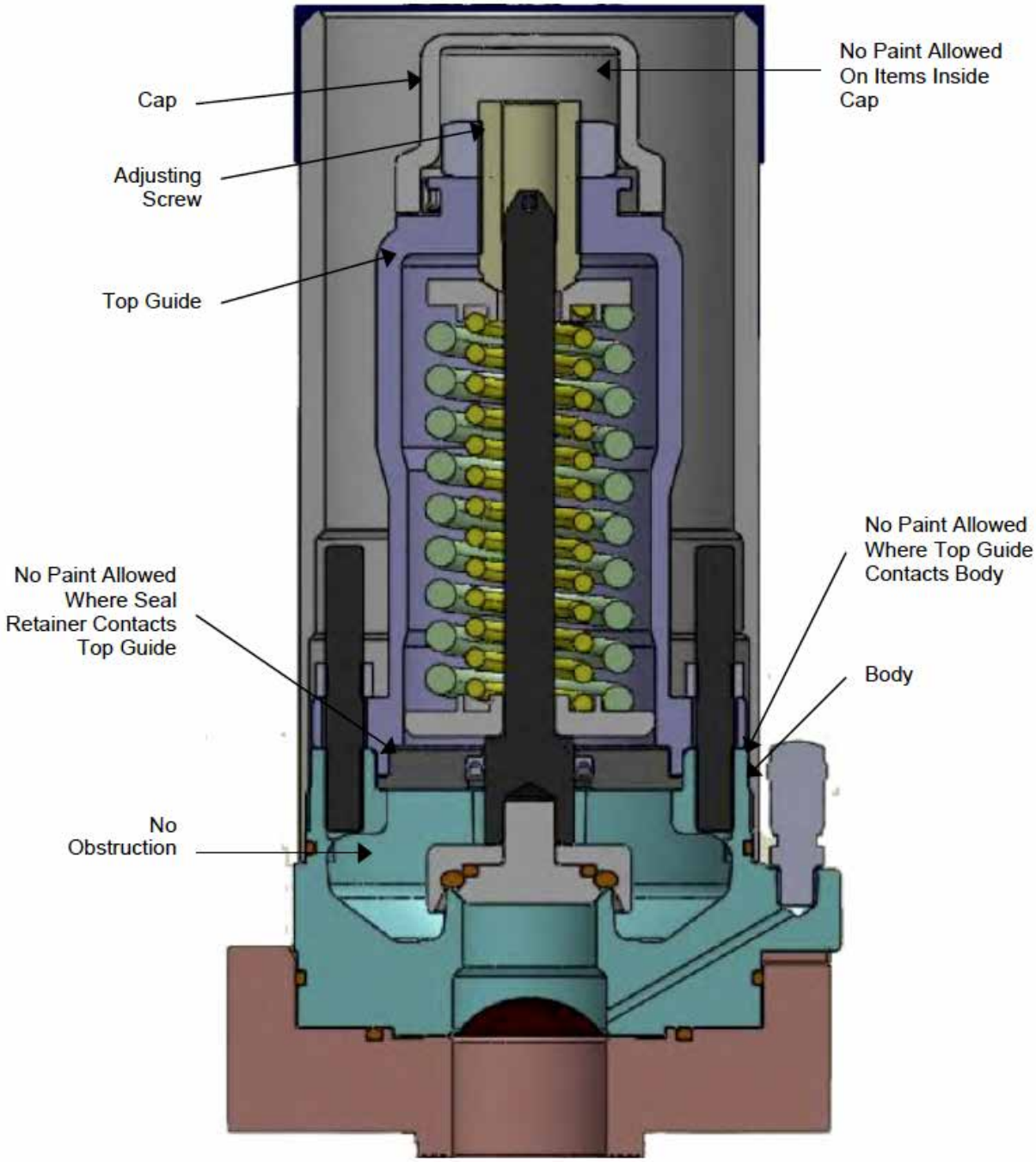


Figure 4-1 Valve Components (Inspection)

4.1 INSPECTION PROCEDURES

4.1.1 TOP GUIDE

4.1.1.1 The Top Guide (Figure 4-1) is principally a structural part. There should be no paint on any components covered by the cap, or between adjacent surfaces on the top guide and valve body. The vent area of the valve body must be unobstructed by foreign matter that would hinder free flow of discharging fluid.

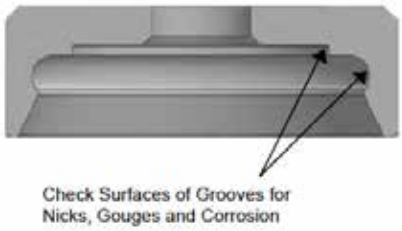


Figure 4-2 Retainer O-ring Grooves

4.1.2 ADJUSTING SCREW THREADS

4.1.2.1 The threads of the adjusting screw (Figure 4-1) should be clean and lightly lubricated.

4.1.3 O-RING RETAINER GROOVES

4.1.3.1 The grooves (Figure 4-2) 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.

4.1.4 VALVE BODY

4.1.4.1 The sealing surfaces are the crown of the seat and rupture disc, sealing surface (Figure 4-3). Clean the seat with emery paper (400 grit) then wipe it clean with a cloth and a suitable solvent. Run your fingernail around the surface to detect any flaws.

NOTE **NOTE:** Repair work is limited to cleaning and polishing. See Paragraph A4.11.1 of the Tank Car Specifications.

NOTE **NOTE:** All threads shall be inspected for excessive wear, corrosion, pitting, or any other defect per AAR M-1002 Appendix D.

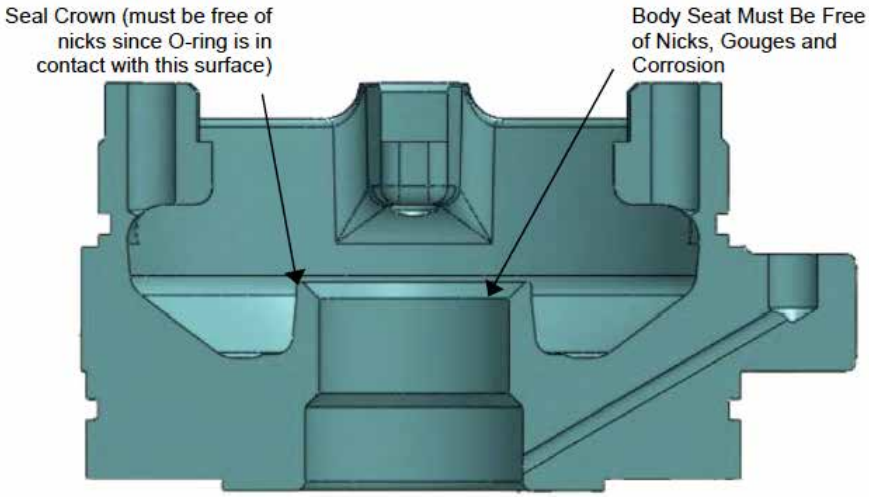


Figure 4-3 Valve Body Seat

Figure 4-4 Valve Plug

4.1.5 PLUG

4.1.5.1 The sealing surface is the plug seat (Figure 4-4) Clean the plug with the 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.

NOTE

NOTE: Repair work is limited to cleaning and polishing. See Paragraph A4.11.1 of the Tank Car Specifications.

WARNING

WARNING: Machining Not Allowed. Machining, grinding, welding or other alterations to the valve seat or plug seat is not allowed per AAR M1002, Paragraph A4.11 of the Tank Car Specifications.

4.1.6 SEALING SURFACE (VALVE MOUNTING)

4.1.6.1 The underside of the rupture disc flange is the surface that seals to the mounting plate on the railcar (Figure 4-5). Machining of this surface is permitted. A good seating surface is necessary to ensure there are no leaks in this area.

NOTE

NOTE: Please refer to paragraph A4.11.2 of the Tank Car Specifications and consult Appendix E for dimensions and applicable tolerances.

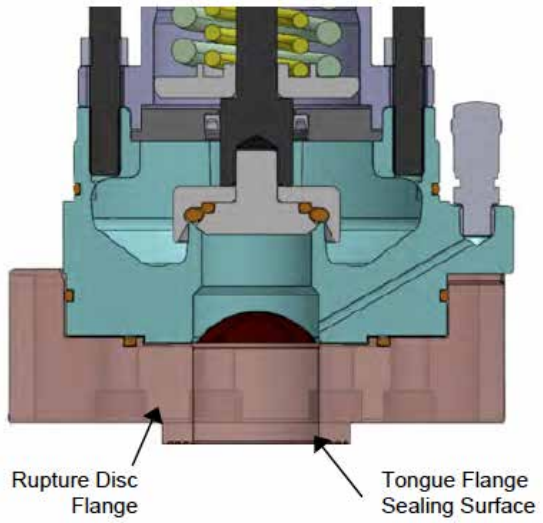


Figure 4-5 Machinable Surfaces (Tongue Flange)

4.1.7 VALVE SPRING

4.1.7.1 This part is highly stressed. The exterior surface must be free of pitting, cracks, and corrosion. If any 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.

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.

4.1.7.2 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 undersize free-height, will not allow the valve to open fully.

Spring Part Number	Wire Size (REF) (Inches)	Height at 80% of Max. Deflection (Inches)	Minimum Free-Height (Inches)
14-13-SS	0.19	3.12	4.63
15-375-SS	0.34	3.61	5.00
15-150-MO	0.28	2.80	4.00

Table 4-1 Minimum Free-Heights for Springs After Pressing 80% of the Maximum Deflection for 2 Minutes

4.1.8 SPRING GUIDE

4.1.8.1 This structural part has guides on its outer edges (Figure 4-8). Move it up and down the length of the top guide as indicated below. If it binds, look for dents or gouged surfaces on the inside of the top guide. Repair the damage to allow free movement of the spring guide.

WARNING

WARNING: Valve Sticking. If the spring guide binds in the top guide bore, 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 RUPTURE DISC

4.1.9.1 These valves include a rupture disc (Figure 4-6) beneath the main valve assembly. The rupture disc should not be reused. Install a new rupture disc at reassembly.

Figure 4-6 Rupture Disc

4.1.10 RUPTURE DISC FLANGE

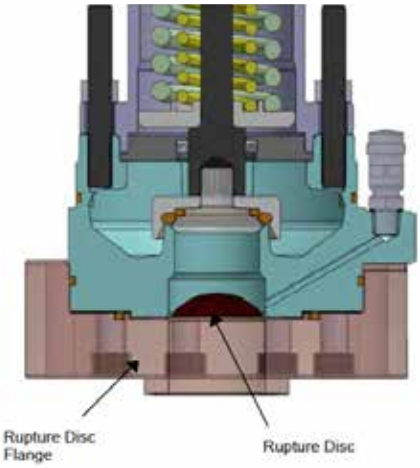


Figure 4-7 Rupture Disc and Disc Flange

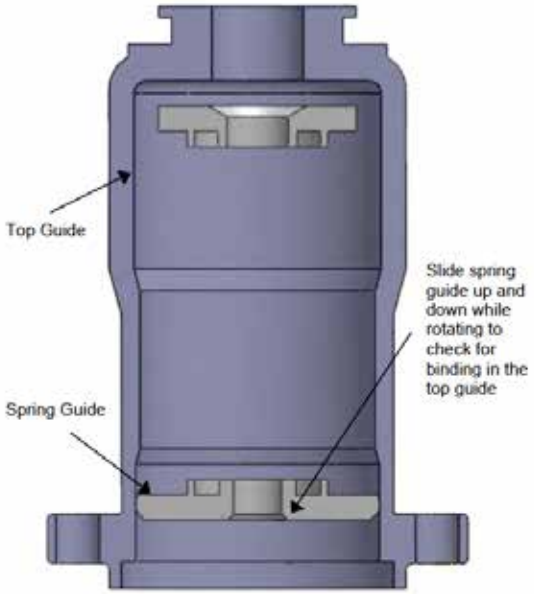
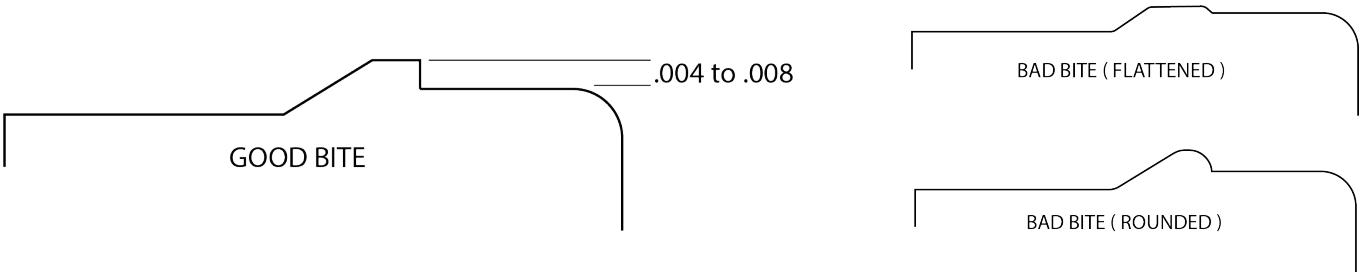


Figure 4-8 Spring Guide

CAUTION: Bead or Sand blasting of sealing surfaces may cause excessive wear to sealing features and surfaces and should be avoided. Excessive wear may cause small leaks past the rupture disc leading to disc damage or disc failure. If excessive wear is observed or suspected, the rupture disc flange should be replaced.

4.1.10.1 Look very carefully at the bite section of the disc flange (Figure 4-7) that is contoured to hold the disc. No scratches, radial tool marks, nicks, burrs, or corrosion can be present on the bite or the disc will fail to maintain a pressure-tight seal. If dents, pits or gouges are observed, do not attempt to remove them by machining. Discard the flange and obtain a new one.



NOTE: A good bite is smooth, uninterrupted 360°, raised, and will catch finger nail. If surface finish or bite feature wear cannot be determined by visual inspection, quantitative inspection may be performed. Step feature should measure .004-.008" and surface finish should not exceed 32 Ra.

4.1.10.2 Similarly, on the raised surface on the underside of the valve body flange (also in contact with the rupture disc) must be completely free of imperfections, see Figure 4-9. Examine it carefully. No re-machining is permissible. Replace the valve body if defects are observed.

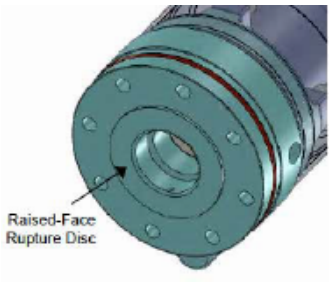


Figure 4-9 Underside of Valve Body Flange

4.1.11 RUPTURE DISC FLANGE BOLTS

4.1.11.1 Inspect rupture disc flange bolts with a 3/8-16 UNC 2A thread gauge. If no gauge is available, replace all bolts.

4.1.11.2 Replace any bolt that does not pass the thread gauge inspection.

4.1.12 O-RINGS

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

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

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

4.1.13 SPECIAL INSPECTION CONSIDERATIONS

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.

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

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.

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 VALVE ASSEMBLY

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

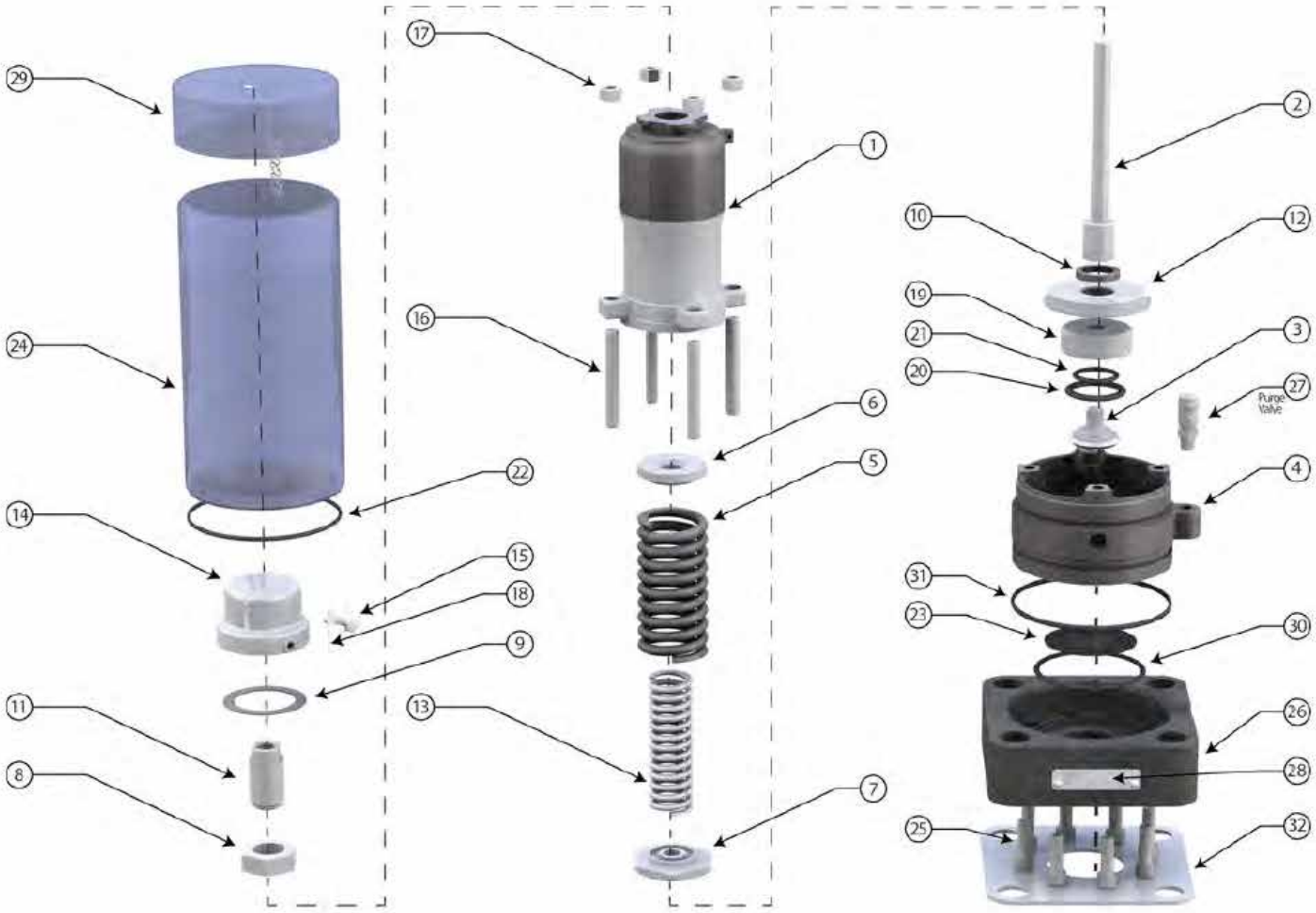


Figure 5-1 Exploded View of Valve

6 SPECIAL GUIDELINES AND PRECAUTIONS ON PRESSURE TESTING AND ADJUSTMENT

CAUTION

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" to start-to-discharge (STD) pressure and their tolerances.

NOTE

NOTE: 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 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 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 WITHOUT RUPTURE DISC INSTALLED

7.1.1 Install the valve on the test fixture and tighten down all the nuts alternately. Remove the protective cap

NOTE

NOTE: Make sure a thin plastic ring gasket (or something similar) is used in between the rupture disc flange and body in place of the rupture disc for this step of the procedure. This is recommended so that the sealing surfaces between the rupture disc flange and valve body are not damaged.

Figure 7-1 Blocking Water Drainage with Putty

7.1.2 Plug drain holes of the valve body with putty (Figure 7-1), or a similar material.

7.1.3 Fill the valve body to the top surface of the retainer with water to allow bubble detection at the valve seat.

7.1.4 Take a position allowing observation of the pressure gauge and bubbling of air in the valve body.

NOTE

NOTE: For valves with outlet piping, fill piping with water to manageable level.

7.1.5 Test the joint between the tell-tale valve threaded connection and the pressure relief valve mounting flange. Snoop around the tell-tale valve with a minimum pressure of 30-55 psi.

7.1.6 Increase the test air pressure slowly.

7.1.7 Increase the air pressure until the valve STD pressure is reached. The initial opening of the valve may be slightly high and not indicative of the actual STD pressure because the O-ring may have been partially stuck to the valve seat.

7.1.8 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.

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

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

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

8 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.

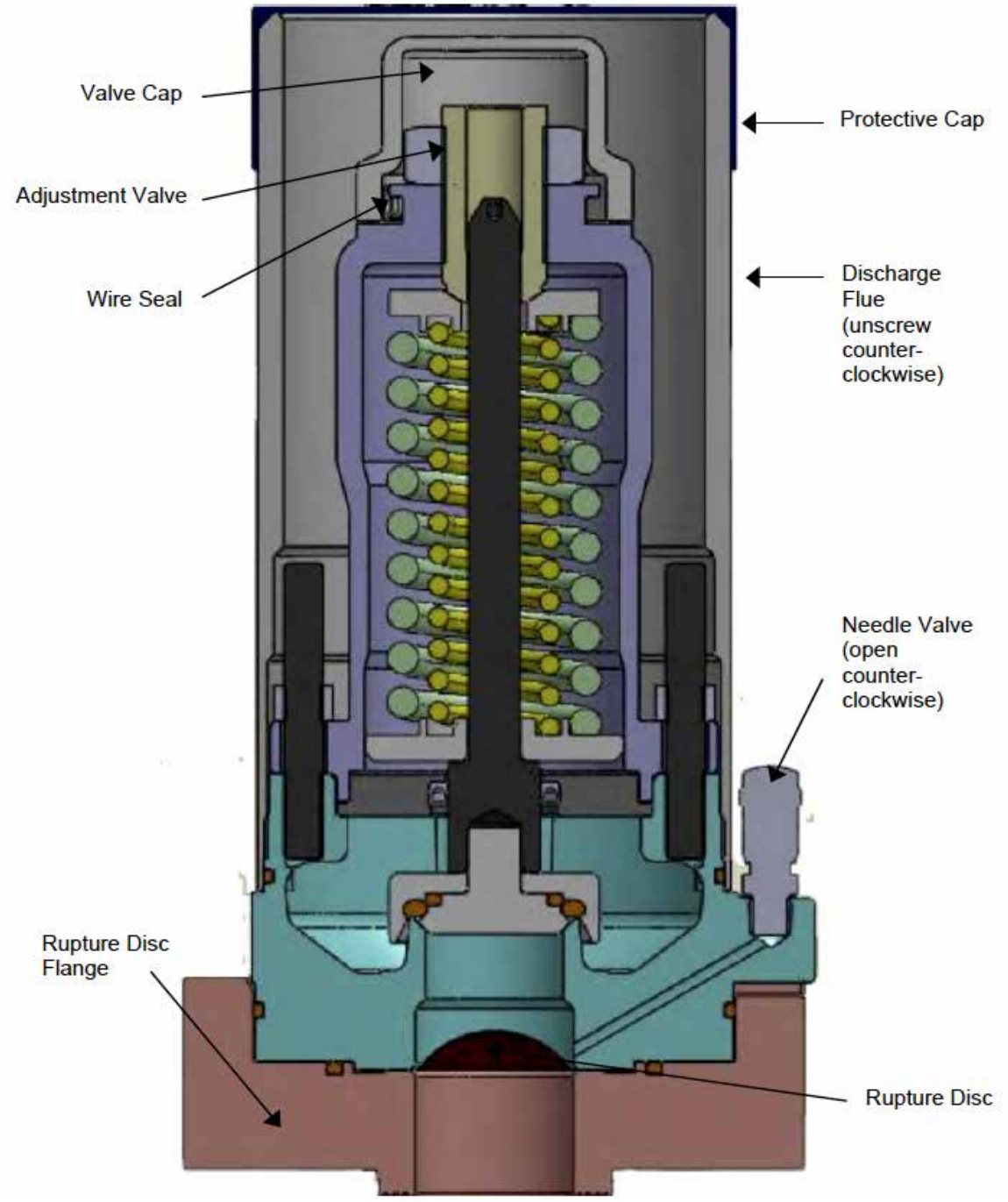


Figure 8-1 Valve Components

8.1 PROCEDURE WITHOUT RUPTURE DISC INSTALLED

NOTE

NOTE: Make sure a thin plastic ring gasket (or something similar) is used in between the rupture disc flange and body in place of the rupture disc for this step of the procedure. This is recommended so that the sealing surfaces between the rupture disc flange and valve body are not damaged.

8.1.1 Remove protective cap and flue by unscrewing counter-clockwise.

8.1.2 Remove the wire seal from the valve cap set screw. Loosen the set screw and remove the valve cap to expose the top nut (spring-adjustment screw nut).

8.1.3 Loosen the top nut to allow rotation of the spring-adjustment screw.

8.1.4 Loosen the spring-adjustment screw two (2) turns (counter-clockwise).

8.1.5 Tighten the top nut to lock the setting. Make sure that the spring-adjustment screw does not rotate when tightening the top nut.

8.1.6 Retest the valve STD pressure and determine how much pressure change occurred when the adjusting screw was loosened two turns. Based upon this calculation, re-compress the valve spring and alter the valve adjustment for the midpoint in the STD pressure tolerance range.

8.1.7 Retest the valve.

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

8.1.9 When the test results are acceptable, tighten the top nut to a torque of 45 ±3 ft.-lbs.

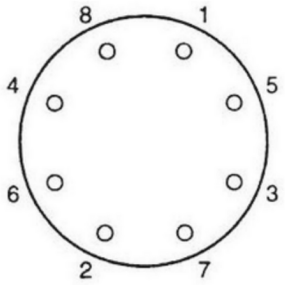
8.2 VALVE PRESSURE TESTING PROCEDURE WITH RUPTURE DISC INSTALLED

8.2.1 The rupture disc should not be reused. Install a new rupture disc (see figure 8-1). Make sure that the mounting flange is in serviceable condition as specified in the Valve Inspection instructions (see section 4.1).

8.2.2 Install the rupture disc flange bolts (item 25, Figure 1-3). Tighten bolts according to the following procedure.

NOTE: Apply a small amount of Grease to all bolts before installing them.

The Torque must be applied in 7 Steps:
Tier #1: Hand Tight.
Tier #2: 7 ft-lb - Cross Pattern.
Tier #3: 14 ft-lb - Cross Pattern.
Tier #4: 21 ft-lb - Cross Pattern.
Tier #5: 28 ft-lb - Cross Pattern.
Tier #6: 28 ft-lb - Cross Pattern.
Tier #7: 28 ft-lb - Clockwise



8-Bolts

Cross Pattern Sequential Order	Clockwise Rotational Order
1-2	1
3-4	5
5-6	3
7-8	7
	2
	6
	4
	8

CAUTION

CAUTION: Rupture Disc Damage. Rupture discs are made of very thin metallic films. Handle the discs only by their edges and do not dent them.

8.2.32 Install the assembled combination valve on the test stand and bolt it in place. Screw the stud nuts down evenly.

WARNING

WARNING: Flange Leakage. Cocking the flanges will cause the body-to-disc flange joint to leak.

8.2.4 If there is a needle valve (Figure 8-1) pipe plug, or indicator on the side of the valve, open the needle valve or remove the plug or indicator. This is necessary to equalize pressure in the chamber above the disc.

8.2.5 Slowly increase pressure in the test stand to 50% of the disc's burst pressure (see Table 1-1).

WARNING

WARNING: Disc Damage. Do not permit the pressure to exceed 60% of the disc's rating (or the disc may be damage or distorted). For example, if the disc is rated at 100 psi, do not allow the pressure to exceed 60 psi.

8.2.6 Put soap suds over the bleed hole opening or needle valve outlet and around the circumference of the flange joint. A bubble may form initially that is only the result of the disc slightly deforming upward and displacing air in the chamber above it. After two (2) minutes, if there is no change in the size of the soap bubble, slowly vent the pressure from the test stand and un-mount the valve.

8.2.7 If the soap bubble on the bleed hole or needle valve continues to grow in size, a pressure leak through the disc is indicated. Vent the pressure from the test stand, un-mount the valve and unscrew the bolts securing the rupture disc flange.

8.2.8 Inspect the disc crown for a crack or pinhole leak where the crown meets the flat part of the disc. If the disc does not include a vacuum support and Teflon® liner, hold it up to a light to detect defects. Also look at the radial seating surface of the disc for creases, or small bumps that could be leak paths. Since the disc is the most fragile part of the assembly, imperfections in any of the parts may be most easily seen in the disc. Also inspect the disc flange and mating surface on the underside of the valve body for any imperfections.

8.2.9 If there are any imperfections in the disc, it cannot be used. Replace it. If there is no visible cause for the leak, consult with your supervising engineer or with a Midland representative to determine other causes.

8.2.10 Close the needle valve or reinstall the plug or indicator.

8.3 POST-TEST PROCEDURE

8.3.1 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.

8.3.2 Wipe or blow away any remaining soap suds and water used in the testing.

8.3.3 Install a plastic protector over the rupture disc flange tongue to prevent tongue damage.

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.

8.3.4 Apply an appropriate preservative or paint to the exterior of the valve. Be sure to mask the nameplate so that it will be readable afterward.

CAUTION

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

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

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

9 MAINTENANCE

NOTE

NOTE: It is essential to establish a periodic retesting and preventive maintenance program for pressure relief valves. The DOT and AAR have set forth a retesting interval that should be considered the maximum length of time between tests. If your company's experience indicates that a shorter interval is advisable, a program with more frequent retesting should be implemented.

NOTE

NOTE: It is an AAR requirement (refer to D4.04) that new O-rings be installed when a valve is retested.

9.1 PRIOR TO MAINTENANCE TASKS PERFORMED

9.1.1 Retesting of Valves in Storage

Midland valves are factory set and sealed. If they have been left in their original shipping containers, are undamaged, and are no more than six (6) months old; they may be installed without being retested.

10 WARRANTY

Midland 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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