



**Smart-Flow**  
PRESSURE RELIEF VALVE

## External-Style Pressure Relief Valve A-19075 Series

Installation, Operation & Maintenance (IOM) Manual

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# 1 Regulations and Safety Requirements

## 1.1 Regulations

Midland external-style pressure relief valves are used in contact with a variety of products, many of which are hazardous materials and could cause serious injury or damage if mishandled. 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. However, 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.

This valve should only be installed, operated and maintained by qualified personnel. Read all of these instructions carefully before proceeding.

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



**NOTICE:** The content of this manual are meant to support the proper installation and qualification of the Midland valve on a tank car.

The specific instructions and recommendations within this manual should be used as part of a qualified, comprehensive program for safe transport and operation of a tank car. However, the content here is not intended to supercede those of a tank car owner. Those procedures take precedent and should be followed whenever applicable.

## 1.2 Safety Warnings and Precautions

Please carefully read each of the following warnings and cautions prior to performing any work.



**WARNING: 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.

- **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**



**WARNING: Spring-Loaded Assembly:** 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.

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 of the 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.



**WARNING: 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 the minimum and a bench clamp or press used for disassembly.



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



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



**CAUTION: 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.



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



**CAUTION: 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.



**CAUTION: 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.



**CAUTION: 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.



**CAUTION: O-Ring Replacement.** Conducting this procedure may be hazardous (depending on the commodity 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.



**NOTICE:** This manual is not intended to provide all the information necessary to conduct emergency repair procedures. Personnel must be specially trained and qualified in hazmat procedures before attempting to service a leaking valve on a rail tank car.



**NOTICE:** 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).



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



**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:** If necessary, a thread gauge can be used to verify the quality of the threads. Failure to pass the appropriate thread-gauge test indicate a rejectable part that should be replaced.



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



**NOTICE:** Remember to review all related safety materials (MSDS) and follow grease supplier's specifications for handling and application.



**NOTICE:** During inspection or reassembly, while installing the stem/retainer assembly into the spring tube, rotate the stem component throughout the full range of the spring tube to ensure that there are no points at which binding of the stem/retainer is a possibility. If binding occurs, the nonconforming component must be replaced.



**WARNING:** Ensure that the vise is clamped to flat edge of the stem. If the vise is clamped to the rounded portion of the stem, damage can result and it will require replacement.



**CAUTION: O-Ring Degradation.** O-rings can develop micro-cracks, swell, shrink, harden or soften with age and chemical exposure. An O-ring that fits loosely in the retainer, or can only be inserted with difficulty, is not the correct size for the application and will need to be replaced.



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



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



**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.



**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.



**NOTICE:** Consult gasket manufacturer and Midland Manufacturing for torque requirements as max torque may vary by valve model. Do not exceed 300 ft-lb.



**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.



**NOTICE:** To ensure best practice and consistency of your qualification procedure, O-rings, gaskets and wire seals should always be replaced. Nuts, washers and studs must be closely inspected before re-use or replaced regularly. Valve components such as the stem, retainer, body and spring must be thoroughly inspected.



**NOTICE:** Inspection and evaluation of components is the responsibility of the repair facility.



**NOTICE: Use of Enhanced Inspection Methods (Magnetic Particle, Dye-Penetrant Inspection, Ultrasonic, Eddy Current).** Evaluation of critical-component metal surfaces using enhanced inspection methods provide a higher probability of detection of defects than a standard visual inspection and, where applied appropriately, are recommended by Midland Manufacturing. Facilities performing these inspection methods must take steps necessary to ensure that their processes, training and personnel certifications are in compliance with accepted Non-Destructive Testing standards and practices. The best inspection methods can miss defects when applied incorrectly. A program developed under the guidance of a qualified American Society of Non-Destructive Testing (ASNT) Level III Technician is recommended to achieve desired results. Within such a program, specific evaluation criteria for cracks, pitting, etc., that would identify a part as defective will need to be determined. **As a rule, cracks and pitting detected by these methods or by standard visual inspection are cause for rejection and replacement of a part.**

**NOTICE:** When enhanced inspection methods are recommended for a specific inspection step, this manual will make note of them.

## 2 Introduction

The A-19075 Series Smart-Flow™ External-Style Pressure Relief Valves are designed to meet the latest requirements for high-hazard flammable trains (HHFT) and high-hazard flammable unit trains (HHFUT). The Smart-Flow's reliable flow rate minimizes product loss and environmental challenges, while providing excellent durability in a pool fire.

- High-quality stainless steel ensures durability
- Minimizes the amount of product released that could feed a fire and potentially mitigates environmental impacts

### 2.1 Technical Specifications

Valve Model	Flow Rating (psig)	Design Flow Rate (scfm)	Valve Pressure Setting (psig)
A-19075	85	10,730	75

Table 2-1 Valve Specifications

### 2.2 Valve Dimensions

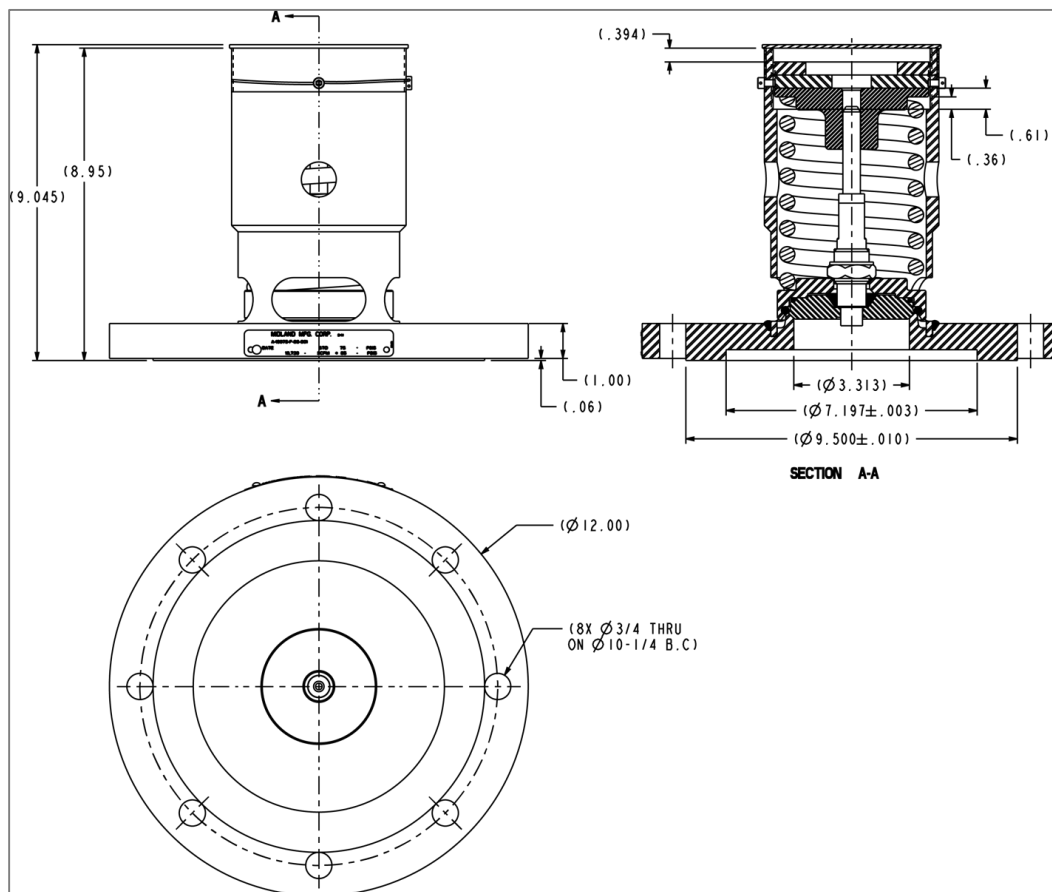


Figure 2-1 Dimensions – A-19075-F-SS-S01



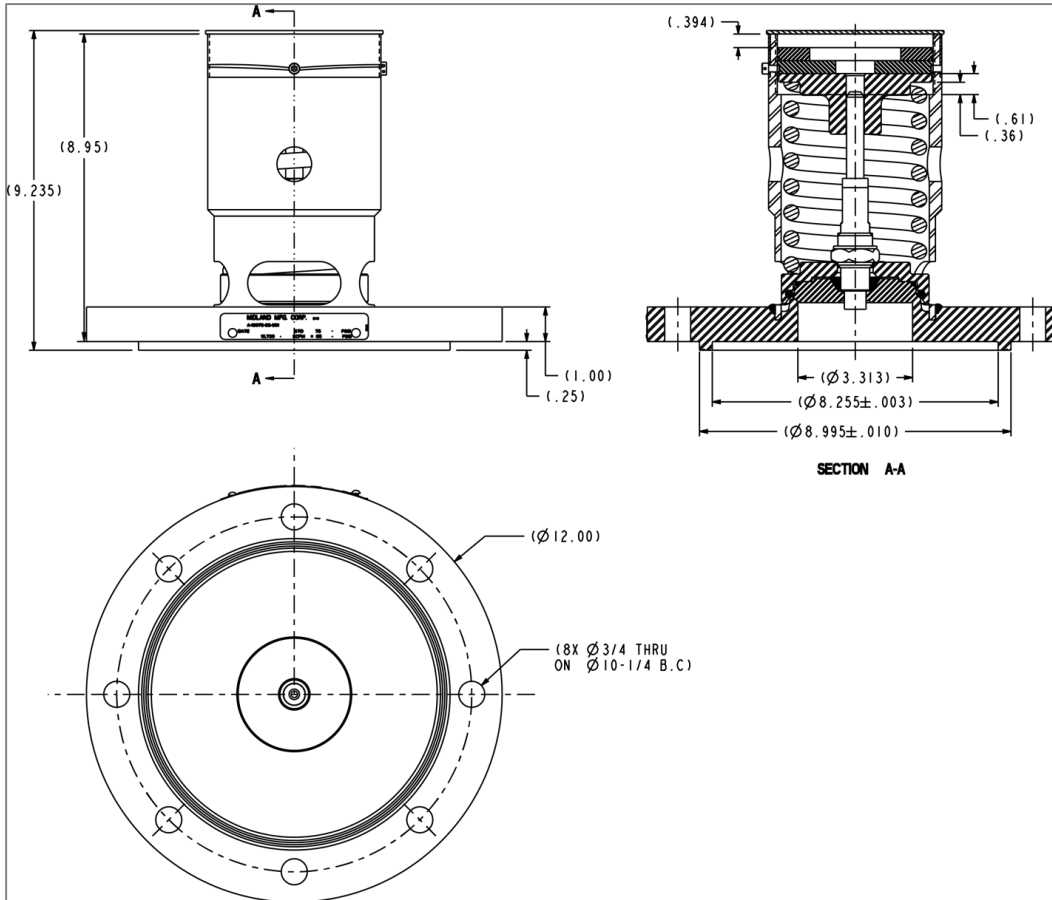


Figure 2-2 Dimensions – A-19075-SS-S01

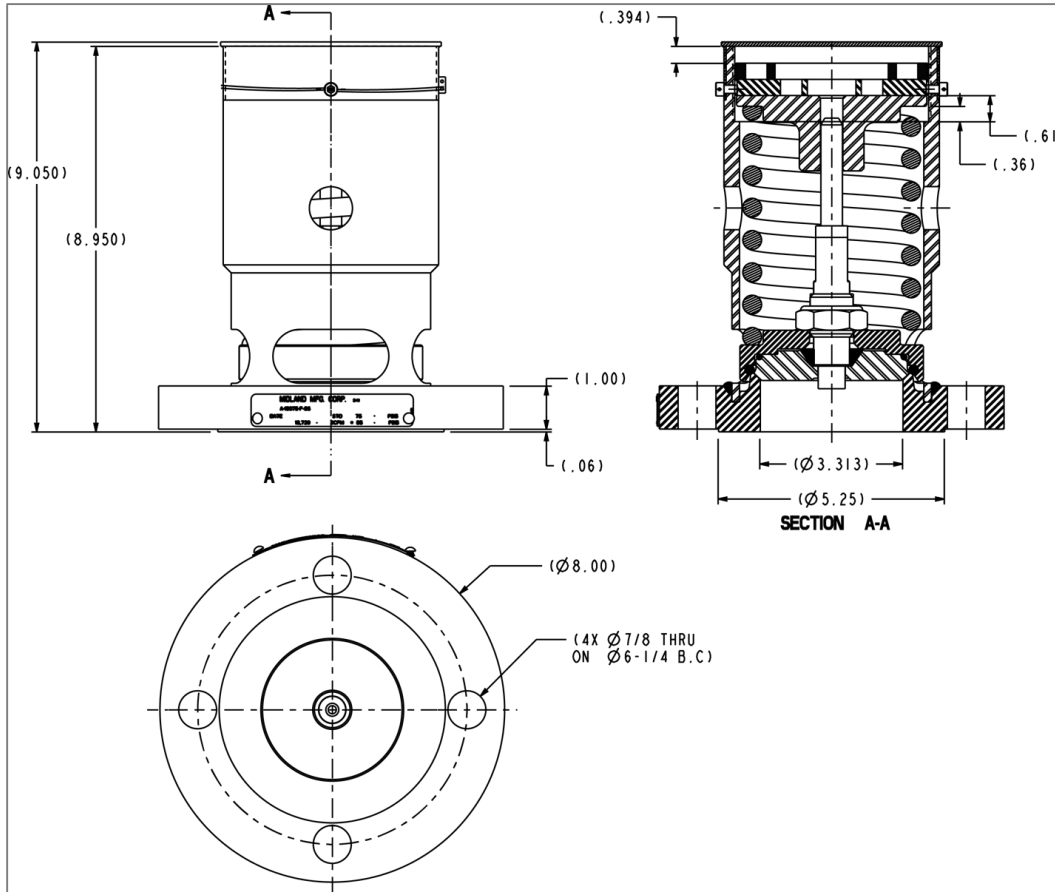


Figure 2-3 Dimensions – A-19075-F-SS

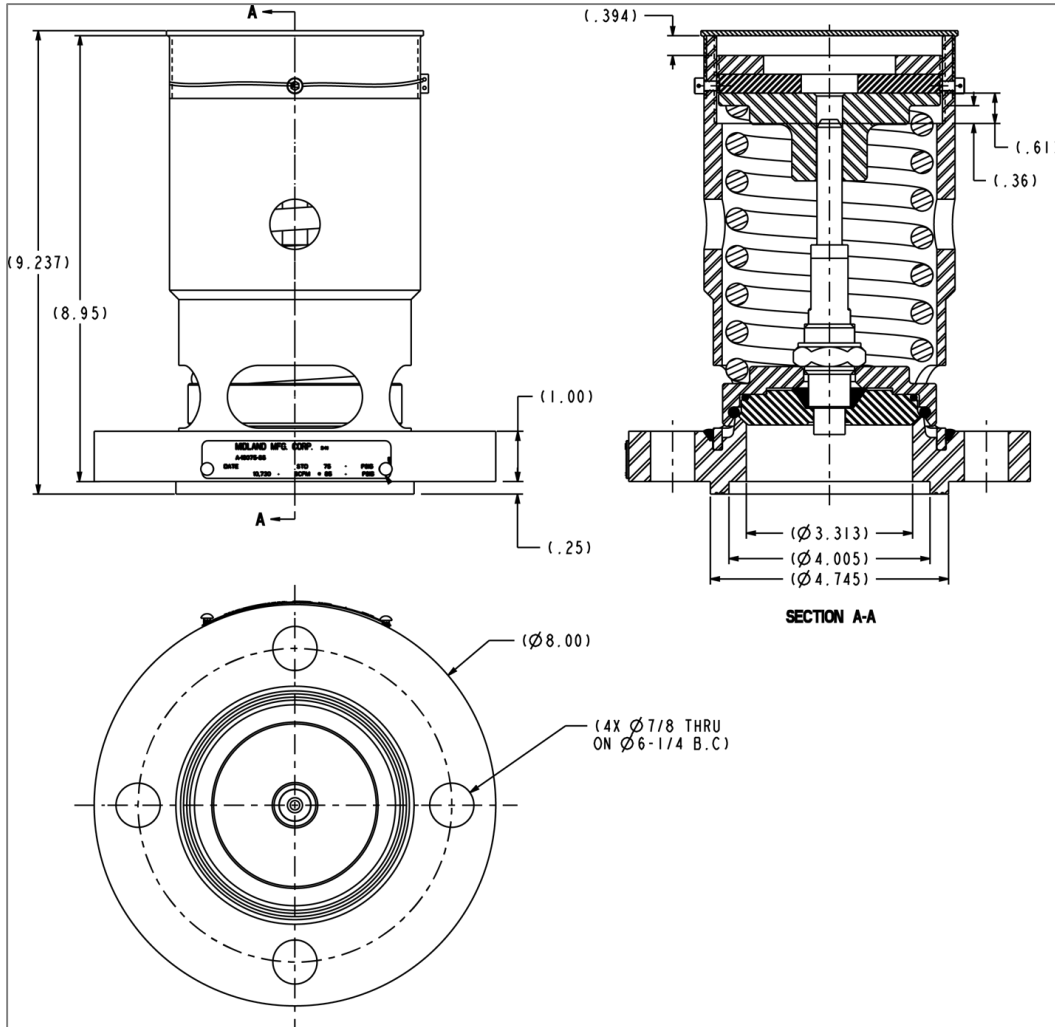


Figure 2-4 Dimensions – A-19075-SS

## 2.3 Valve Details

Item	Qty.	Part Name	Material
1	1	Body	Stainless Steel, Type 304
2	1	Stem	Stainless Steel, Type 304
3	1	Retainer	Stainless Steel, Type 304
4	1	Spring	Stainless Steel, 17-7PH
5	1	Follower	Stainless Steel, Type 304
6	1	Thin Nylon Insert Locknut, 1-7/16"	Stainless Steel, Type 18-8
7	1	Locking Ring	Stainless Steel, Type 304
8	1	Adjustment Ring	Stainless Steel, Type 304
9	1	O-Ring, 2-342	Elastomer option may vary
10	1	O-Ring, 2-236	Elastomer option may vary
11	1	Name Plate	Stainless Steel
12	2	Drive Screw	Stainless Steel
13	1	Wire Seal Kit	Lead
14	2	Bolt	Stainless Steel, Type 18-8
15	1	Weather Cap	Low-Density Polyethylene

Table 2-2 Valve Component Details – A-19075-SS

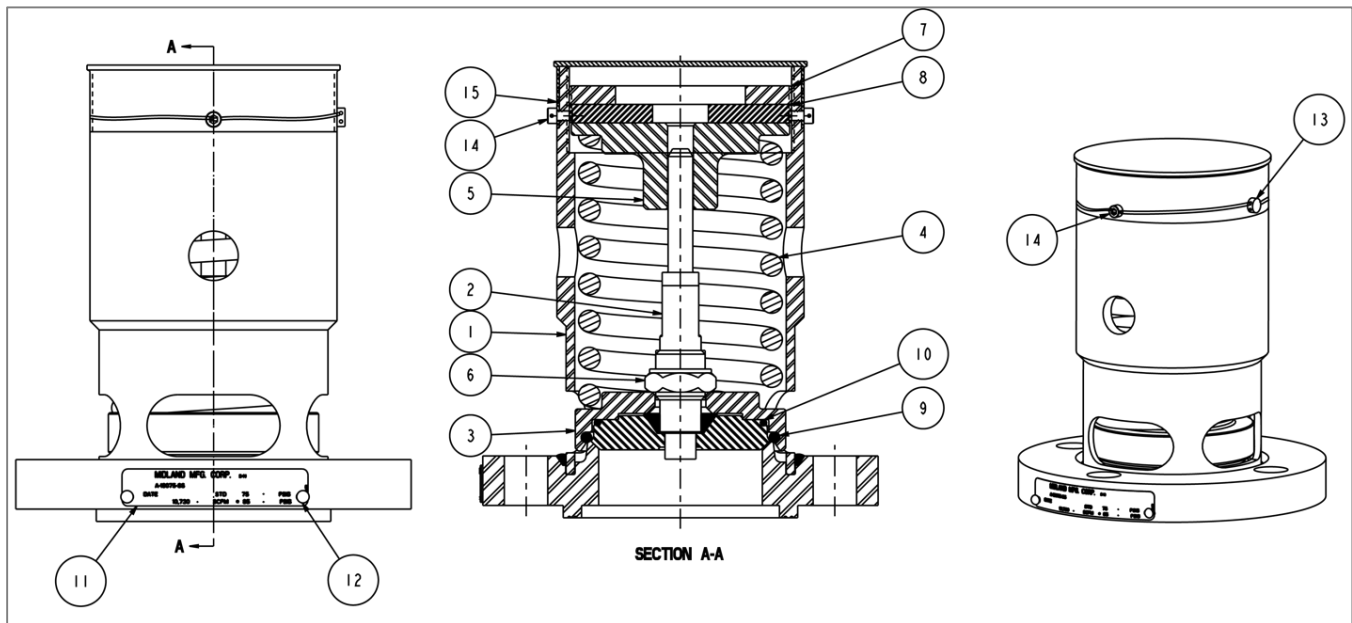


Figure 2-5 Valve Component Identification – A-19075-SS

### 3 Valve Installation

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.

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

#### 3.1 Installation Procedure and Recommended Tools

Tools, Supplies, and Equipment:	
Screwdrivers	Cloth
Wire Brush	Emery Paper (400-grit, cut in 1" strips)
Silicone Grease (or equivalent lubrication)	Torque Wrenches (0 – 300 ft-lb)

Table 3-1 Recommended Tools for Valve Assembly



**NOTICE:** Specific recommended practice for assembly of bolted flange joints can be found in AAR MSRP C-III Appendix J. This procedure is not intended to supersede the instructions detailed in that specification.



**NOTICE:** Consult gasket manufacturer and Midland Manufacturing for torque requirements as max torque may vary by valve model. Do not exceed 300 ft-lb.

- 3.1.1 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.
- 3.1.2 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.
- 3.1.3 Remove and discard all used gasket material.



**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.

- 3.1.4 Using a clean cloth and appropriate cleaning solvent, wipe the valve clean along with the cover-plate sealing surfaces and the mounting-stud threads.

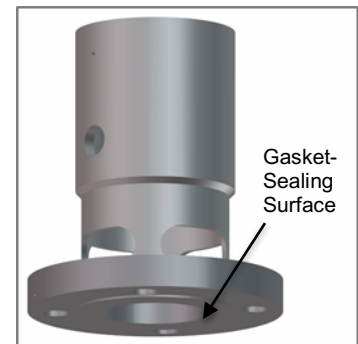


Figure 3-1 Gasket-Sealing Surface

- 3.1.5 For tongue-and-groove mountings, examine the sides of the groove. 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.
- 3.1.6 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:** Do not use a sharp tool to press the new gasket into place or gasket damage may result.

- 3.1.7 For tongue-and-groove mountings, inspect the tongue of a new, 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  $\pm 0.003$ ", 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:** To prevent tongue damage, do not install a valve having damaged sealing surfaces.

- 3.1.8 Remove the rubber plug from the cover plate.
- 3.1.9 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: 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.

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



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



**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.

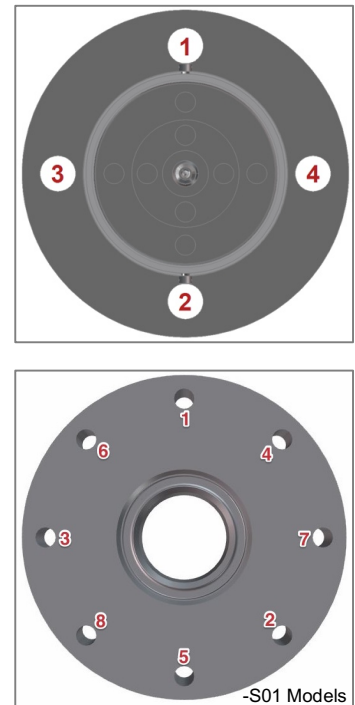


Figure 3-2 Tightening Sequence

## 3.2 Leak Inspection

3.2.1 Test all newly installed valves to conform to car-owner specifications. No leaks should be 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.

## 3.3 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.

## 4 Valve Qualification



**NOTICE:** To ensure best practice and consistency of your qualification procedure, O-rings, gaskets and wire seals should always be replaced.

Nuts, washers and studs must be closely inspected before re-use or replaced regularly.

Valve components such as the stem, retainer, body and spring must be thoroughly inspected.

### 4.1 Valve Disassembly and Recommended Tools

SAE Wrenches	Component(s)/Description	Item #
5/32" Allen Wrench	Weather Cap Bolts	14
1-7/16" Box Wrench	Locknut	6
<b>Other Tools, Supplies, and Equipment:</b>		
Spring Compression Press	Spring	4
<ul style="list-style-type: none"> <li>• Press Clearance: 12" x 12" x 13.5" minimum</li> <li>• Cylinder Stroke: 6.25" minimum; press cylinder shaft must clear 1.25" diameter hole to reach and compress spring</li> </ul>		
Non-Scratching Tool to Remove O-Rings	O-Rings	9, 10

Table 4-1 Recommended Tools for Valve Disassembly



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



## 4.2 Valve-Disassembly 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 the minimum and a bench clamp or press used for disassembly.



NOTICE

**NOTICE:** Please note that following instructions are based on the A-19075-F-SS valve model. Your specific valve model may vary from configuration shown; however, valve-disassembly procedure will be the similar.

4.2.1 With an appropriate lifting device, place the valve onto a suitable work surface fixture. **Bench clamp and press are required for disassembly. Note press requirements specified in Table 4-1.**

4.2.2 Remove the seal wire (item 13) and two (2) weather-cap bolts (Item 14).



**TIP:** Use a 5/32" Allen wrench to remove the weather-cap bolts (item 14).

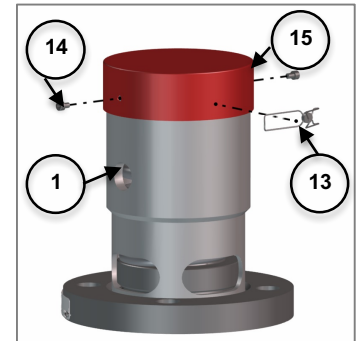


Figure 4-1 Remove Wire Seal and Bolts

4.2.3 Remove cap (item 15) from the body (item 1).

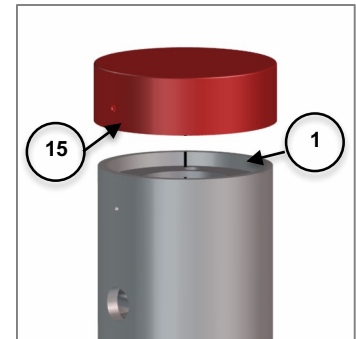


Figure 4-2 Remove Cap

- 4.2.4 Remove the locking ring (item 7) from the body (item 1) by turning the ring counterclockwise.



**TIP:** The Smart-Flow PRV toolkit can be used to remove the locking and adjustment rings.

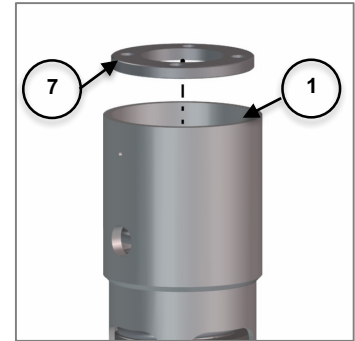


Figure 4-3 Remove Locking Ring

- 4.2.5 Insert the valve into the disassembly tool fixture and carefully place in a press, being careful to properly position the valve to achieve alignment of the press with the circular area inside the adjustment ring and on the valve follower.

- 4.2.6 Slowly lower the press onto the valve, **making sure to release the spring force from the adjustment rings.**

- 4.2.7 Remove the adjustment ring (item 8) from the body (item 1) by turning the ring counterclockwise



Figure 4-4 Remove Adjustment Ring

- 4.2.8 Slowly raise the press, allowing the spring (item 4) to decompress.

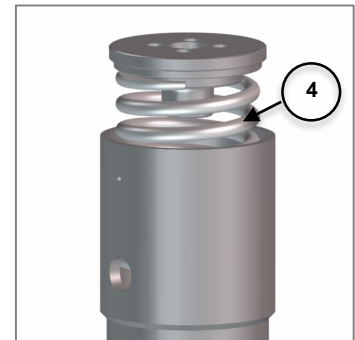


Figure 4-5 Decompress the Spring

- 4.2.9 Slide the valve out from under the press.

4.2.10 Remove the follower (item 5).

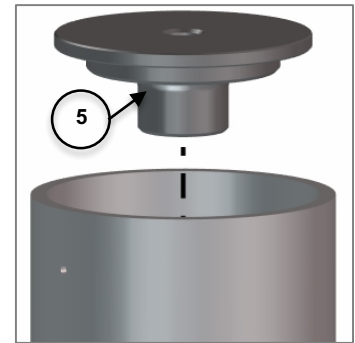


Figure 4-6 Remove Follower

4.2.11 Remove the valve spring (item 4).

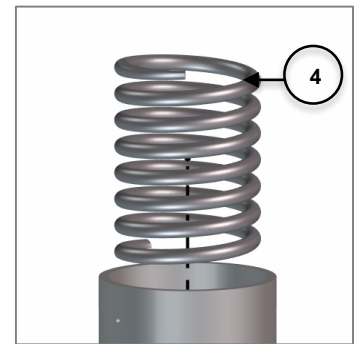


Figure 4-7 Remove Spring

4.2.12 Remove valve plug assembly (items 2, 3 and 6).

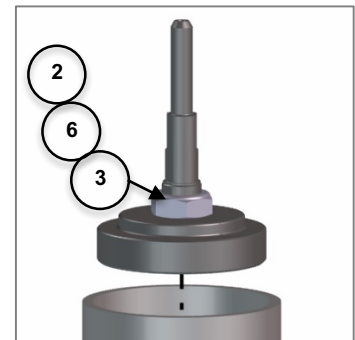


Figure 4-8 Remove Plug Assembly

## 4.3 Valve Plug Disassembly

4.3.1 Place the valve plug assembly in a vise, or a suitable tooling fixture.



**WARNING:** Ensure that the vise is clamped to flat edge of the stem. If the vise is clamped to the rounded portion of the stem, damage can result and it will require replacement.

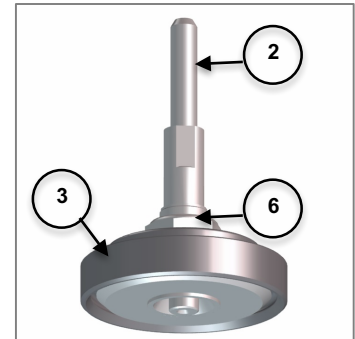


Figure 4-9 Valve Plug Assembly

4.3.2 Unscrew nylon-insert locknut (item 6) counterclockwise.



**TIP:** Use a 1-7/16" wrench to remove the locknut (item 6).

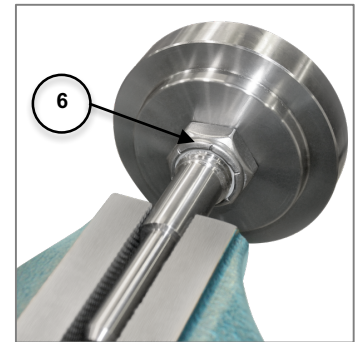


Figure 4-10 Unscrew Locknut

4.3.3 Remove retainer (item 3) from the stem (item 2).

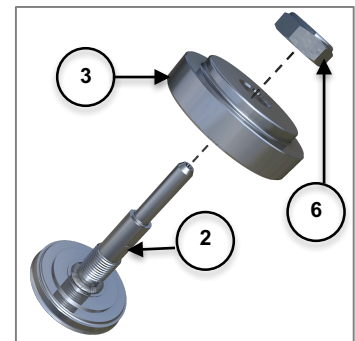


Figure 4-11 Remove Retainer

4.3.4 Remove O-rings (items 9).



**CAUTION: O-Ring Degradation.** O-rings can develop micro-cracks, swell, shrink, harden or soften with age and chemical exposure. An O-ring that fits loosely in the retainer, or can only be inserted with difficulty, is not the correct size for the application and will need to be replaced.

4.3.4.1 Remove the large O-ring (item 9) from the retainer.



**TIP:** Use a non-scratching tool to remove the O-ring (item 9).

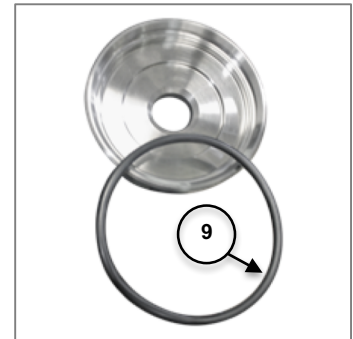


Figure 4-12 Remove O-Ring

4.3.4.2 Remove the O-ring (item 10) from the plug.



**TIP:** Use a non-scratching tool to remove the O-ring (item 10).



Figure 4-13 Remove O-Ring

If your company has an approved component cleaning and inspection procedure, follow it. If it does not, follow the processes and procedures set in this manual for valve component cleaning, inspection and, if necessary, replacement. Reassemble the valve per Section 5 of this manual.

## 4.4 Component Inspection

### 4.4.1 Enhanced Inspection Methods



**NOTICE: Use of Enhanced Inspection Methods (Magnetic Particle, Dye-Penetrant Inspection, Ultrasonic, Eddy Current).** Evaluation of critical-component metal surfaces using enhanced inspection methods provide a higher probability of detection of defects than a standard visual inspection and, where applied appropriately, are recommended by Midland Manufacturing. Facilities performing these inspection methods must take steps necessary to ensure that their processes, training and personnel certifications are in compliance with accepted Non-Destructive Testing standards and practices. The best inspection methods can miss defects when applied incorrectly. A program developed under the guidance of a qualified American Society of Non-Destructive Testing (ASNT) Level III Technician is recommended to achieve desired results. Within such a program, specific evaluation criteria for cracks, pitting, etc., that would identify a part as defective will need to be determined. **As a rule, cracks and pitting detected by these methods or by standard visual inspection are cause for rejection and replacement of a part.**

**NOTICE:** When enhanced inspection methods are recommended for a specific inspection step, this manual will make note of them.

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

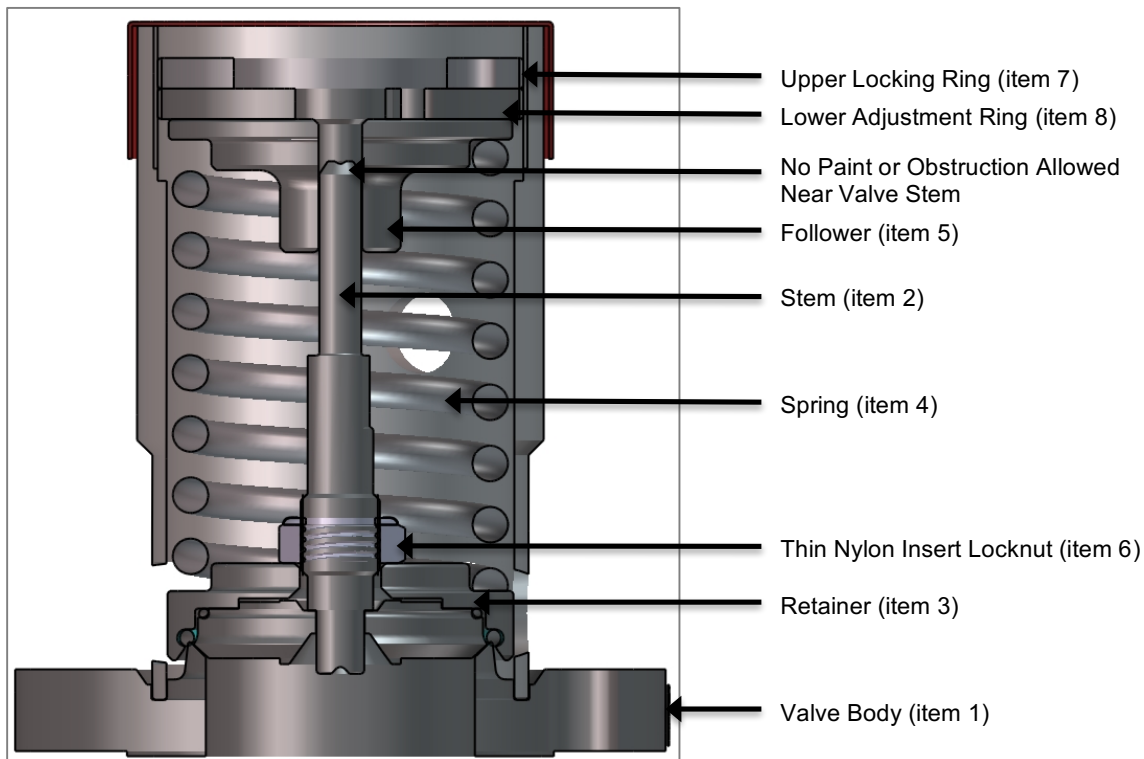


Figure 4-14 Valve-Inspection Points



**NOTICE:** Inspection and evaluation of components is the responsibility of the repair facility.



**NOTICE:** The ordering of the procedure within this section is not intended to imply a requirement for parts to be intended in a specific order.



**NOTICE: Without consent from the valve manufacturer or car owner,** repair work is limited to cleaning and polishing. See AAR M1002, Paragraph A3.11.1 of the Tank-Car Specifications.



**WARNING: Machining Not Allowed. Without consent from the valve 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:** Unless specified otherwise, it is acceptable to clean parts with a cloth and suitable solvent. If necessary, 400-grit sandpaper can be used to clean and polish surfaces for inspection.

#### 4.4.2 Follower Inspection

The follower (item 5) is a structural part. There should be no paint or debris on the follower where the valve stem enters it, or between adjacent surfaces of the top guide and valve body. Inspect for cracks. If any cracks are detected, the part is rejectable and should be replaced.

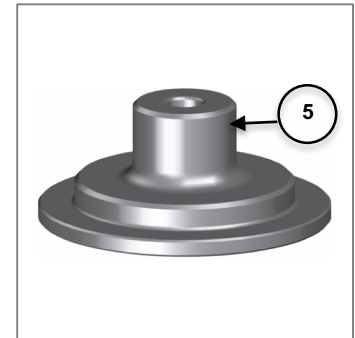


Figure 4-15 Follower Inspection

#### 4.4.3 Stem Assembly Inspection

Remove scale, residual product and other foreign material from the stem. Inspect part for cracks in the highlighted inspection area and threads.

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

All nickel-bearing stainless steels have a likelihood of galling. Wrenching the locknut may result in galled stem threads. Always check for galled threads and chase the threads with a thread die or replace stems that show significant thread damage. Stem threads and nuts are 1-8 UNC thread.

Inspect all weld areas for cracks or pitting. If there are any imperfections, the part should be rejected.

Inspect sealing surfaces on stem, O-ring seal and outer edge of stem. They should be smooth and free of any damage.



NOTICE

**NOTICE:** Per AAR MSRP C-III Appendix A, the use of dye penetrant or magnetic particle testing is required for proper inspection of stem weld areas.



CAUTION

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

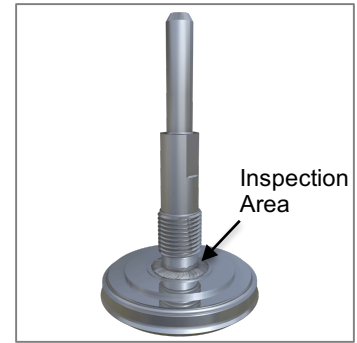


Figure 4-16 Stem Assembly Inspection

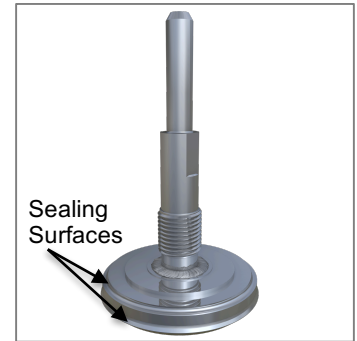


Figure 4-17 Stem Sealing Surfaces Inspection

#### 4.4.4 Stem Concentricity

The valve stem (item 2) runout must not exceed 0.010" maximum on stem sealing surfaces as shown in Figure 4-17. If not, replace the stem.



NOTICE

**NOTICE:** Valve-stem concentricity can be checked using a uni-level concentricity fixture and gauge (not supplied by Midland. For this or any other devices used to measure concentricity, refer to your company's or to your specific instrument's IOM for proper use instructions.



WARNING

**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.



#### 4.4.5 O-ring Retainer Grooves Inspection



**WARNING: Seat Inspection.** Inspect the seat for any corrosion, nicks, gouges or pitting. Clean and polish, if necessary, and replace if damage is significant.

4.4.5.1 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. The retainer (item 3) grooves must be free of gouge marks, corrosion, pits and rust. If present, the part is rejectable and should be replaced.

4.4.5.2 The sealing surface is the crown of the seat. 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. If any flaws are found, the part is rejectable and should be replaced.

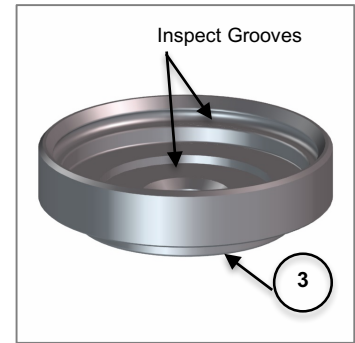


Figure 4-18 Retainer Inspection



**WARNING: Machining Not Allowed.** Without consent from the valve 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.

#### 4.4.6 Valve Body Inspection

4.4.6.1 On the underside of the valve body (item 1) is the surface that seals the valve to the mounting plate on the railcar. If Tongue and groove, clean the tongue and underside of the valve body with emery paper (400-grit) then wipe it with a cloth and a suitable solvent. Visually inspect for gouges and corrosion. Run your fingernail around the tongue to detect any flaws. Use a flashlight and or magnifying glass if you are uncertain about the condition of this sealing surface. If flaws are unreparable, replace this part.

4.4.6.2 If flat-face, clean the sealing surface and underside of the valve body with a soft wire brush then wipe it with a cloth and a suitable solvent. Visually inspect for gouges and corrosion. Use your fingernail to detect any flaws. If a gouge is detected that runs from the I.D. to the O.D. of the sealing surface, replace this part.

4.4.6.3 Inspect the valve body seat for any corrosion, nicks, gouges or pitting. Clean and polish, if necessary, and replace if damage is significant. Clean the seat with emery paper (400-grit) then wipe it clean with a cloth and a suitable solvent. Check for any corrosion, nicks, gouges or pitting. Run your fingernail around the surface to detect any flaws. If any flaws are found, the part is rejectable and should be replaced.

4.4.6.4 Inspect and clean the internal threads of the valve body.



**NOTICE:** Any thread damage or debris in the threaded area can cause locking and adjustment rings to seize. Seizure of locking rings may impede valve assembly and prevent set-to-discharge pressure adjustment.

4.4.6.5 Inspect weld area for cracks or pitting. If present, part should be replaced.



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

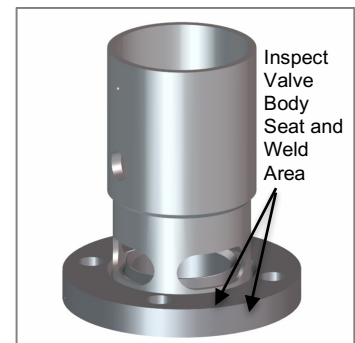
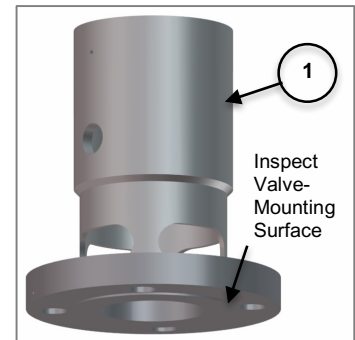


Figure 4-19 Valve Body Inspection

4.4.7 Valve Spring Inspection

4.4.7.1 The valve spring (item 4) part is highly stressed. The exterior surface must be free of pitting, cracks and corrosion. If any pitting 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 cracks or corrosion pits are detected, the spring is rejectable and should be replaced.

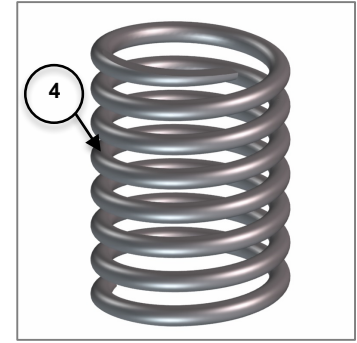


Figure 4-20 Inspect Spring



NOTICE

**NOTICE:** Use of Enhanced Inspection Methods (LPI, MPI, etc.) is recommended.



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.

4.4.7.2 Test the springs by pressing them to 80% of maximum deflection in a press for two (2) minutes (refer to Table 4-2). Remove from the press and then measure the spring free-height. If free-height is less than the minimum indicated in Table 4-2, 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. 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. This will adversely affect the pressure settings. If any of the defects mentioned above are observed, the spring cannot be repaired and must be replaced.

Spring Part Number	Wire Size (REF) (Inches)	Height at 80% of Max. Deflection (Inches)	Minimum Free-Height (Inches)
19075-5-SS	0.437	4.61	9.89

Table 4-2 Minimum Free-Heights for Spring After Pressing 80% of the Maximum Deflection for Two (2) Minutes

#### 4.4.8 Adjustment Ring/Spring Tube Inspection

Visually inspect the threads around the entire circumference of the upper locking ring (item 7) and lower adjustment ring (item 8) for any nicks or damage. Be aware that any chipped, missing or damaged plating is an indication that the component should be replaced.

##### 4.4.8.1 Locking and Adjustment Rings

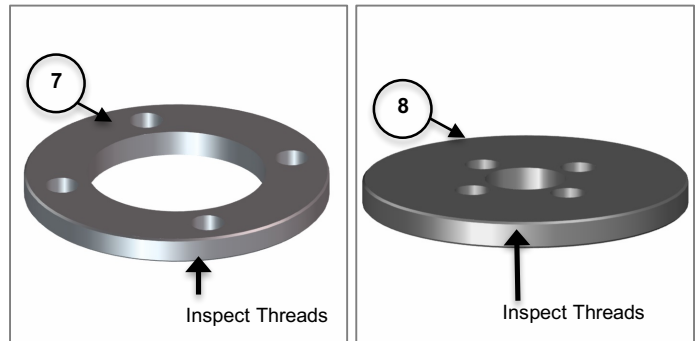


Figure 4-21 Locking Ring (Left) and Adjustment Ring (Right) Inspection

##### 4.4.8.2 Spring Tube Inspection

Inspect interior threads for damage nicks, marring and indications of cross-threading. If any of these are present, the part is rejectable and should be replaced.



**NOTICE:** If necessary, a thread gauge can be used to verify the quality of the threads. Failure to pass the appropriate thread-gauge test indicate a rejectable part that should be replaced.

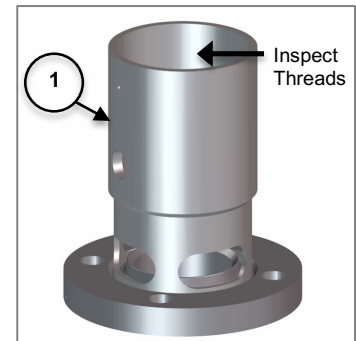


Figure 4-22 Spring Tube Inspection

##### 4.4.9 O-rings Inspection

O-rings (items 9 and 10) must be replaced at the time of any periodic valve retest and when the valve is disassembled.



**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, or can only be pushed into the O-ring retainer with difficulty, is quite likely not the correct size.

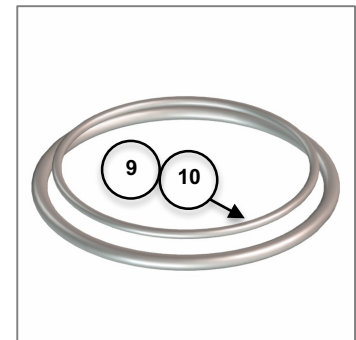


Figure 4-23 O-Ring Inspection

#### 4.4.10 Special Inspection Considerations

- 4.4.10.1 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.
- 4.4.10.2 Facilities performing recommended dye-penetration and magnetic-particle testing must carry out such testing according to a qualified procedure conducted by certified trained personnel.
- 4.4.10.3 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
- 4.4.10.4 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.

## 4.5 Valve Reassembly and Recommended Tools

SAE Wrench	Component(s)/Description	Item #	Torque (ft-lb)
5/32" Allen Wrench	Weather Cap Bolts	14	—
1-7/16" Box Wrench	Install Locknut	6	—
Torque Wrench	Locknut	6	75
	Locking Ring	7	100
<b>Other Tools, Supplies, and Equipment:</b>			
Spring Compression Press	Spring	4	—
Silicon Grease	Stem	2	—

Table 4-3 Recommended Tools for Valve Reassembly

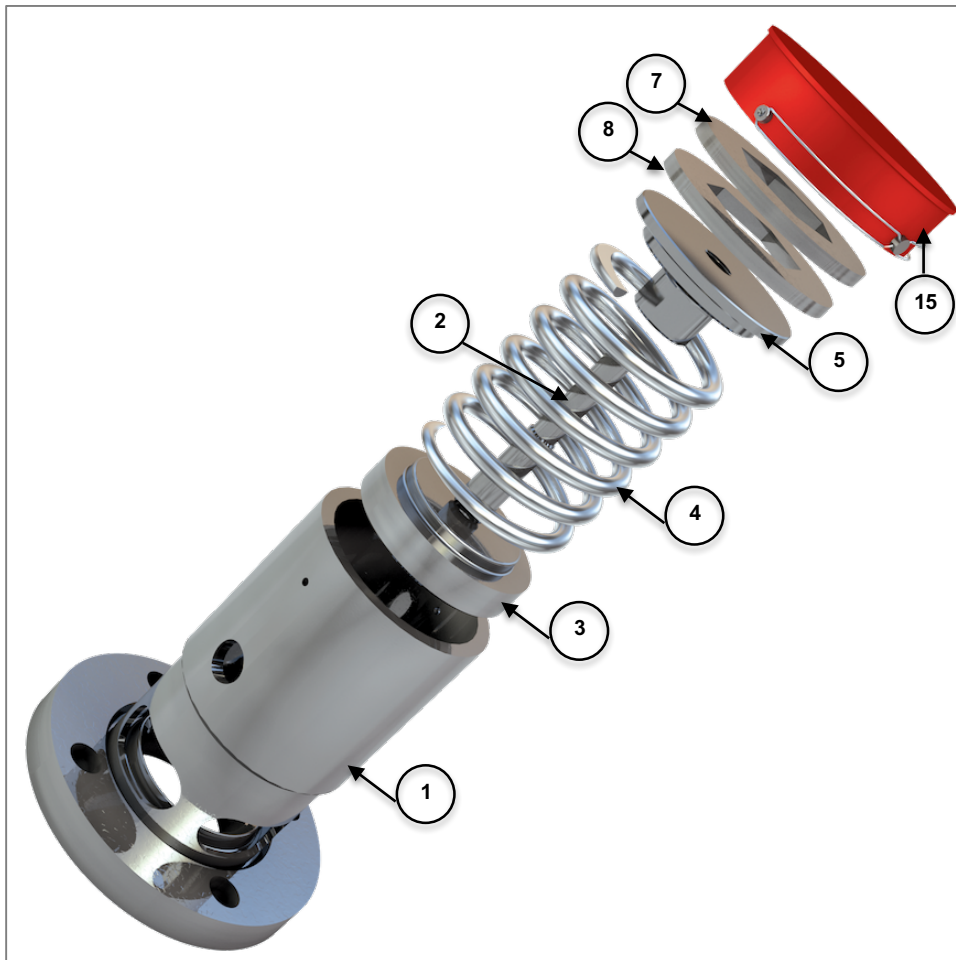


Figure 4-24 Valve Exploded View

#### 4.5.1 Valve-Plug Reassembly (If Required)

4.5.1.1 Place the small O-ring (item 10) onto the stem (item 2).

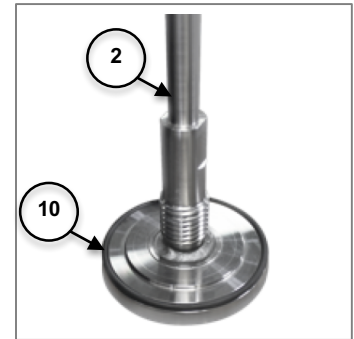


Figure 4-25 Install O-Ring on Stem

4.5.1.2 Place the large O-ring (item 9) onto the retainer (item 3).

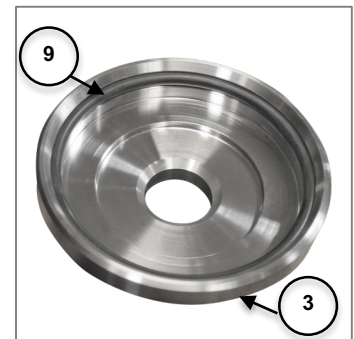


Figure 4-26 Install O-Ring on Retainer

4.5.1.3 Place the retainer (item 3) on the stem (item 2).

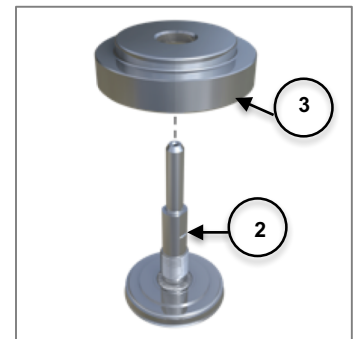


Figure 4-27 Install Retainer on Stem

4.5.1.4 Apply grease onto the threads of the stem (item 2).



NOTICE

**NOTICE:** Remember to review all related safety materials (MSDS) and follow grease supplier's specifications for handling and application.

4.5.1.5 Brace the stem (item 2) in a fixture.

4.5.1.6 Attach the stem (item 2) to the retainer (item 3) with the locknut (item 6).



**TIP:** Use a 1-7/16" wrench to apply the locknut (item 6).

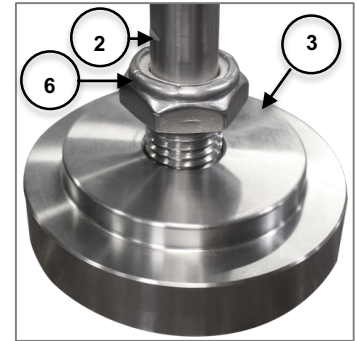


Figure 4-28 Attach Stem to Retainer

4.5.1.7 Torque the locknut (item 6) to 75 ft-lb.



**WARNING:** Ensure that the tool is braced to the flat edge of the stem. If the tool is braced to the rounded section of the stem, damage can result and will require replacement. The recommended position is with the disc down. This helps with assembly and prevents the O-ring from being misplaced.

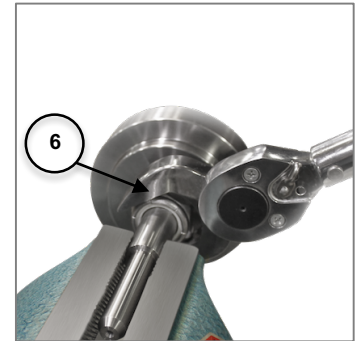


Figure 4-29 Torque Locknut

#### 4.5.2 Valve-Reassembly Procedure

4.5.2.1 Place the valve body (item 1) on the fixture.

4.5.2.2 Place the valve-plug assembly (item 2, 3 and 6) on the body seat, then place spring (item 4) in body.



**NOTICE:** During inspection or reassembly, while installing the stem/retainer assembly into the spring tube, rotate the stem component throughout the full range of the spring tube to ensure that there are no points at which binding of the stem/retainer is a possibility. If binding occurs, the nonconforming component must be replaced.

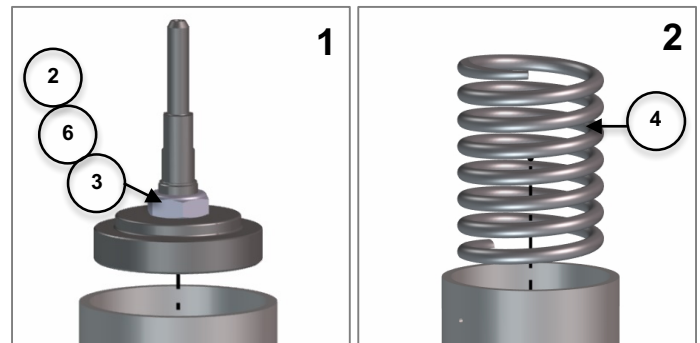


Figure 4-30 Reassemble Plug Assembly and Spring

**NOTICE:** For proper spring orientation in the assembly, the spring is engraved with the word "TOP."

- 4.5.2.3 Apply grease onto the follower (item 5).  
 Place the follower on top of the spring.

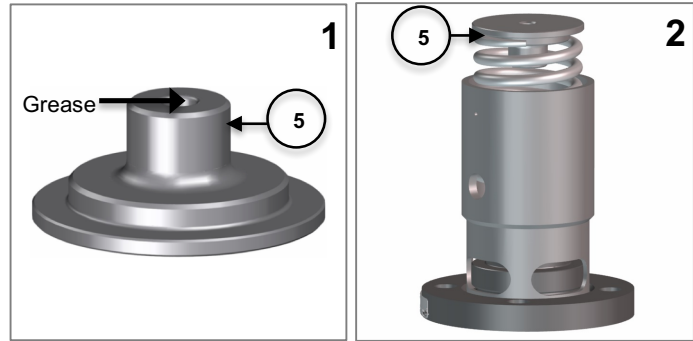


Figure 4-31 Follower Inspection and Installation

- 4.5.2.4 Place the adjustment ring (item 8) on top of the follower (item 5).

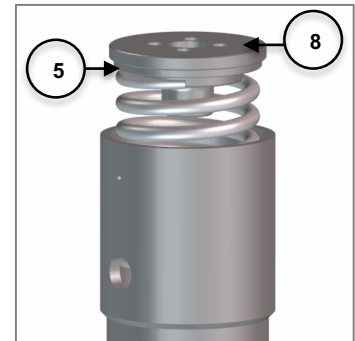


Figure 4-32 Install Adjustment Ring

- 4.5.2.5 Insert the valve assembly into a press that will allow compression of the valve spring.  
 4.5.2.6 Compress spring using a press.  
 4.5.2.7 Assemble the adjustment ring (item 8) by threading the ring clockwise to the body (item 1). Adjust the ring clockwise to increase the pressure setting; adjust the ring counterclockwise to decrease the pressure setting.  
 4.5.2.8 Slowly remove the press. Use caution as the spring is now under load.



**WARNING: 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 the minimum and a bench clamp or press used for disassembly.

- 4.5.2.9 Verify/adjust the valve's set-to-discharge and vapor-tight pressure settings per instructions included in Section 7, "Valve Pressure-Testing Procedures."

- 4.5.2.10 Once the set-to-discharge pressure is set, apply the locking ring (item 7) to the valve body by threading it clockwise into the body (item 1) to affix the adjustment ring (item 8) in place. Torque the locking ring (item 7) to 100 ft-lb.



**TIP:** The Smart-Flow PRV toolkit can be used to install the locking and adjustment rings.

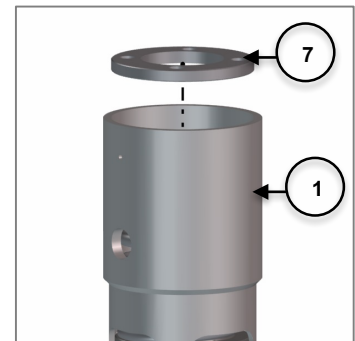


Figure 4-33 Install Locking Ring



4.5.2.11 Install weather cap (item 15) on to body (item 1).

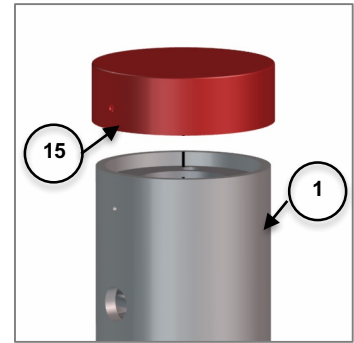


Figure 4-34 Install Weather Cap

4.5.2.12 Install the two (2) weather-cap bolts (Item 14).



**TIP:** Use a 5/32" Allen wrench to remove the weather-cap bolts (item 14).

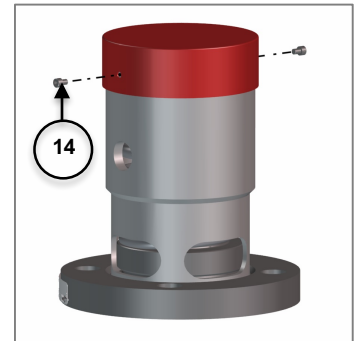


Figure 4-35 Install Weather Cap Bolts

4.5.2.13 Attached wire seal (item 13) through holes in the weather-cap bolts (item 14).



**TIP:** Tighten with pliers.

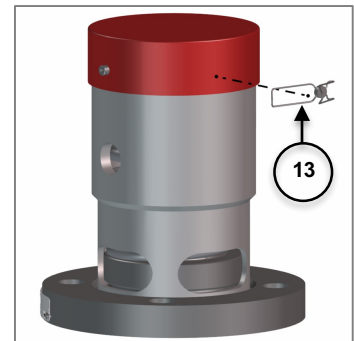


Figure 4-36 Install Seal Wire



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

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

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

## 4.6 Testing Process



**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.

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 which no bubbles are detected. Midland recommends that no bubbles be observed for two (2) minutes at vapor-tight.)

### 4.6.1 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.

### 4.6.2 Initial Setup

- 4.6.2.1 Install the valve on the test fixture and alternately tighten down all of the nuts.
- 4.6.2.2 Create a barrier in the area around the seal drain vents of the valve body with putty, or a similar material, just above the retainer. Optionally, the test fixture can be flooded to just above the retainer.
- 4.6.2.3 Fill the enclosed area with water to allow bubble detection at the valve seat.
- 4.6.2.4 Take a position allowing observation of the pressure gauge and bubbling of air in the valve body.

### 4.6.3 Testing

- 4.6.3.1 Increase the test air pressure slowly.
- 4.6.3.2 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 below for valve start-to-discharge (STD) and vapor-tight pressure (VTP) settings.

STD Settings ± 3%	VTP Settings
75 psig ± 3 psig	60 psig minimum

Table 4-4 Start-To-Discharge (STD) and Vapor-Tight Pressure (VTP) Settings

- 4.6.3.3 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.
- 4.6.3.4 Observe the STD pressure and then bleed off the pressure slowly to observe the VTP.
- 4.6.3.5 Repeat this procedure to ensure performance. The STD and VTP should be consistent.



**NOTICE:** 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).

- 4.6.3.6 Record the values.



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

4.6.3.7 If the STD or VTP is not satisfactory, follow the Valve-Setting Adjustment procedure in Section 4.5.

## 4.7 Valve-Setting Adjustment Procedure

- 4.7.1 Place valve onto suitable work surface with spring press to secure for adjustments
- 4.7.2 Slowly lower the press onto the valve, making sure to release the spring force pressure from the adjustment ring (Item 8)
- 4.7.3 Turn the adjustment ring (Item 8) to adjust the valve's spring pressure setting. Turn the ring clockwise to increase pressure and counter-clockwise to decrease pressure.
- 4.7.4 Slowly raise the press and remove the valve to re-place in the test fixture and test.
- 4.7.5 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. Remove the valve from the test fixture
- 4.7.6 Repeat adjustment procedure steps as necessary to achieve the desired set-to-discharge pressure.
- 4.7.7 Wipe or blow away any remaining soapsuds and water used in the testing

## 4.8 Final Assembly

For final assembly procedure, please refer to steps 4.5.2.11 through 4.5.2.15.

## 5 Routine Maintenance



**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: 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:** 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.

### 5.1 Recommended Tools

- 5.1.1 Obtain the recommended tools and supplies before attempting maintenance or repair procedures. Table 3-1 and Table 4-1 outline some suggested tools that may be needed.

## 6 Smart-Flow Pressure Relief Valve Tool Kit

To augment assembly and disassembly of the A-19075 Series valves, Midland offers a set of tools designed for those functions. The Smart-Flow valve (Part No. K-T-A-19075) contains three (3) tools that interface with the valve's ring configuration.

Tools included are:

- Y-Locking Ring Wrench



Figure 6-1 Wide Y-Locking Ring Wrench

- Adjustment Ring Wrench



Figure 6-2 Narrow Adjustment Ring Wrench

- Adjustment Ring Hand Tool



Figure 6-3 Adjustment Ring Hand Tool

Contact Midland customer service at (847) 677-0333 for price and availability of this kit.

