



## External-Style Pressure Relief Valve A-14167-KY & A-14167-3KY 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.

## 1.2 Safety Warnings and Precautions

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

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**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**
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**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.

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**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.

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**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 valve body 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: Field Repair.** The repair procedure for leaking valves in the field 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.



**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.

## 2 Introduction

The A-14167 Series External-Style Pressure Relief Valves are designed for use in Chlorine service and to operate at 75 or 165 psig with flow rates from 2,027 to 3,612 standard cubic feet per minute (scfm).

### 2.1 Valve Details

ITEM	QTY.	PART NAME	MATERIAL	PART NUMBER
1	1	TOP GUIDE <sup>1</sup>	STAINLESS STEEL	14-101-SSTF
2	1	STEM	HASTELLOY B/ML	14-2-XB
3	1	PLUG <sup>3</sup>	SEE TABLE BELOW	SEE TABLE BELOW
4	1	BODY <sup>1</sup>	STAINLESS STEEL	14-102-MOL-ETFE
5	1	SPRING	STAINLESS STEEL	SEE TABLE BELOW
6	1	FOLLOWER	STAINLESS STEEL	14-6-SS
7	1	GUIDE	STAINLESS STEEL	14-7-SS
8	1	TOP LOCKNUT	STAINLESS STEEL	15-8-SS
9	1	TOP GASKET	VITON A	15-9-VA
10	1	SHAFT SEAL	PTFE	17-10-TF
11	1	ADJUSTING SCREW <sup>6</sup>	STAINLESS STEEL	15-11-SS
12	1	SEAL RETAINER <sup>3</sup>	SEE TABLE BELOW	SEE TABLE BELOW
13	–	–	–	–
14	1	CAP	STAINLESS STEEL	14-14-SSTF
15	1	SEAL SCREW	CARBON STEEL	15-15-CSTF
16	4	CAP SCREW	316 STAINLESS <sup>2</sup>	15-160-MO
17	–	–	–	–
18	1	WIRE SEAL	SS WIRE, LEAD SEAL	22-72-PB
19	1	RETAINER	HASTELLOY B	14-19-HB
20	1	SEAT O-RING	BUNA-N <sup>3</sup>	10-10-BN
21	1	PLUG O-RING	BUNA-N <sup>3</sup>	10-11-BN
22	–	–	–	–
23	1	NAMEPLATE	STAINLESS STEEL	SEE TABLE BELOW
24	1	BODY INSERT <sup>3</sup>	SEE TABLE BELOW	SEE TABLE BELOW
25	8	SOCKETED-HEAD CAP SCREWS	316 STAINLESS <sup>2</sup>	14-250-MOTF
26	1	RING <sup>1</sup>	STAINLESS STEEL	14-260-SS
27	1	O-RING (-226)	VITON A	15-27-VA
28	1	FLUE	PLASTIC <sup>5</sup>	14-24-PC
29	1	CAP & CHAIN ASSEMBLY	POLYETHYLENE/SS	14-311-PE-SS
30	1	FLUE O-RING	VITON A	14-27-VA

#### NOTES:

<sup>1</sup> GREEN ETFE-COATED PER DRG 14-142

<sup>2</sup> BLACK PTFE-COATED

<sup>3</sup> ALTERNATE MATERIAL IS AVAILABLE

<sup>4</sup> AAR PRD132005

<sup>5</sup> FOR STAINLESS STEEL FLUE, ADD SUFFIX –S TO MODEL NUMBER

<sup>6</sup> USE 15-116-SS SCREW FOR A-14167 VALVE

Table 2-1 Valve Components – XX-S01 Series

VALVE P/N	ITEM #3	ITEM #12	ITEM #24	MATERIAL	PRESSURE SETTING (PSIG)	FLOW RATE (SCFM AIR)	SPRING P/N	NAMEPLATE P/N
A-14167-KY-S01	14-3-KY	14-12-KY	14-240-KY	KYNAR (PVDF)	165	3612	15-225-SS	14-167-SS
A-14167-PK-S01	14-3-PK	14-12-PK	14-240-PK	PEEK	165	3612	15-225-SS	14-167-SS
A-14167-RY-S01	14-3-RY	14-12-RY	14-240-RY	RYTON R5 (PPSR5)	165	3612	15-225-SS	14-167-SS
A-14167-UL-S01	14-3-UL	14-12-UL	14-240-UL	ULTEM (50)	165	3612	15-225-SS	14-167-SS

Table 2-2 Valve Technical Specifications – XX-S01 Series

ITEM	QTY.	PART NAME	MATERIAL	PART NUMBER
1	1	TOP GUIDE <sup>1</sup>	STAINLESS STEEL	14-101-SSTF
2	1	STEM	HASTELLOY B/ML	14-2-XB
3	1	PLUG <sup>3</sup>	SEE TABLE BELOW	SEE TABLE BELOW
4	1	BODY <sup>1</sup>	STAINLESS STEEL	14-40-MOL
5	1	SPRING	STAINLESS STEEL	SEE TABLE BELOW
6	1	FOLLOWER	STAINLESS STEEL	14-6-SS
7	1	GUIDE	STAINLESS STEEL	14-7-SS
8	1	TOP LOCKNUT	STAINLESS STEEL	15-8-SS
9	1	TOP GASKET	VITON	15-9-VA <sup>5</sup>
10	1	SHAFT SEAL	PTFE	17-10-TF
11	1	ADJUSTING SCREW <sup>6</sup>	STAINLESS STEEL	15-11-SS
12	1	SEAL RETAINER <sup>3</sup>	SEE TABLE BELOW	SEE TABLE BELOW
13	–	–	–	–
14	1	CAP <sup>1</sup>	STAINLESS STEEL	14-14-SSTF
15	1	SEAL SCREW <sup>1</sup>	STAINLESS STEEL	15-15-CSTF
16	4	CAP SCREW <sup>2</sup>	316 STAINLESS	15-160-MO
17	–	–	–	–
18	1	WIRE SEAL	SS WIRE, LEAD SEAL	22-72-PB
19	1	RETAINER	HASTELLOY B	14-19-HB
20	1	SEAT O-RING	VITON	10-10-VG <sup>5</sup>
21	1	PLUG O-RING	VITON	10-11-VG <sup>5</sup>
22	–	–	–	–
23	1	NAMEPLATE	STAINLESS STEEL	SEE TABLE BELOW
24	1	BODY INSERT <sup>3</sup>	SEE TABLE BELOW	SEE TABLE BELOW
25	8	SOCKETED-HEAD CAP SCREW	316 STAINLESS <sup>2</sup>	14-250-MOTF
26	1	RING <sup>1</sup>	STAINLESS STEEL	14-260-SS
27	1	O-RING (-226)	VITON	14-27-VA <sup>5</sup>

**NOTES:**

<sup>1</sup> GREEN ETFE-COATED PER DRG 14-142

<sup>2</sup> BLACK PTFE-COATED

<sup>3</sup> ALTERNATE MATERIAL IS AVAILABLE

<sup>4</sup> AAR PRD132005

<sup>5</sup> ALTERNATE MATERIALS ARE AVAILABLE

<sup>6</sup> USE 15-116-SS SCREW FOR A-14167 VALVE

Table 2-3 Valve Components – Base Series

VALVE P/N	ITEM #3	ITEM #12	ITEM #24	MATERIAL	PRESSURE SETTING (PSIG)	FLOW RATE (SCFM AIR)	SPRING P/N	NAMEPLATE P/N
A-14167-KY	14-3-KY	14-12-KY	14-240-KY	KYNAR (PVDF)	165	3612	15-225-SS	14-167-SS
A-14167-PK	14-3-PK	14-12-PK	14-240-PK	PEEK	165	3612	15-225-SS	14-167-SS
A-14167-RY	14-3-RY	14-12-RY	14-240-RY	RYTON R5 (PPSR5)	165	3612	15-225-SS	14-167-SS
A-14167-UL	14-3-UL	14-12-UL	14-240-UL	ULTEM (PEI)	165	3612	15-225-SS	14-167-SS

Table 2-4 Valve Technical Specifications – Base Series

ITEM	QTY.	PART NAME	MATERIAL	PART NUMBER
1	1	TOP GUIDE <sup>1</sup>	STAINLESS STEEL	14-101-SSTF
2	1	STEM	HASTELLOY B/ML	14-2-XB
3	1	PLUG <sup>3</sup>	KYNAR (PVDF)	14-3-KY
4	1	BODY <sup>1</sup>	STAINLESS STEEL	14-401-MOL
5	1	SPRING	STAINLESS STEEL	SEE TABLE BELOW
6	1	FOLLOWER	STAINLESS STEEL	14-6-SS
7	1	GUIDE	STAINLESS STEEL	14-7-SS
8	1	TOP LOCKNUT	STAINLESS STEEL	15-8-SS
9	1	TOP GASKET	VITON	15-9-VA <sup>5</sup>
10	1	SHAFT SEAL	PTFE	17-10-TF
11	1	ADJUSTING SCREW	STAINLESS STEEL	SEE TABLE BELOW
12	1	SEAL RETAINER <sup>3</sup>	KYNAR (PVDF)	14-12-KY
13	–	–	–	–
14	1	CAP <sup>1</sup>	STAINLESS STEEL	14-14-SSTF
15	1	SEAL SCREW <sup>1</sup>	STAINLESS STEEL	15-15-CSTF
16	4	CAP SCREW <sup>2</sup>	316 STAINLESS	15-160-MO
17	–	–	–	–
18	1	WIRE SEAL	SS WIRE, LEAD SEAL	22-72-PB
19	1	RETAINER	HASTELLOY B	14-19-HB
20	1	SEAT O-RING	VITON	10-10-VG <sup>5</sup>
21	1	PLUG O-RING	VITON	10-11-VG <sup>5</sup>
22	–	–	–	–
23	1	NAMEPLATE	STAINLESS STEEL	SEE TABLE BELOW
24	1	BODY INSERT <sup>3</sup>	KYNAR (PVDF)	14-240-KY
25	9	SOCKETED-HEAD CAP SCREWS	316 STAINLESS <sup>2</sup>	14-250-MOTF
26	1	RING <sup>1</sup>	STAINLESS STEEL	14-261-SS
27	1	O-RING (-226)	VITON	14-27-VA <sup>5</sup>

**NOTES:**

<sup>1</sup> GREEN ETFE-COATED PER DRG 14-142

<sup>4</sup> AAR PRD132005

<sup>2</sup> BLACK PTFE-COATED

<sup>5</sup> ALTERNATE MATERIALS ARE AVAILABLE

<sup>3</sup> ALTERNATE MATERIAL IS AVAILABLE

Table 2-5 Valve Components – 3KY Series

VALVE P/N	PRESSURE SETTING (PSIG)	FLOW RATE (SCFM AIR)	SPRING P/N	NAMEPLATE P/N	ADJUSTING SCREW P/N
A-14167-3KY	165	3612	15-225-SS	14-1670-SS	15-116-SS

Table 2-6 Valve Technical Specifications – 3KY Series

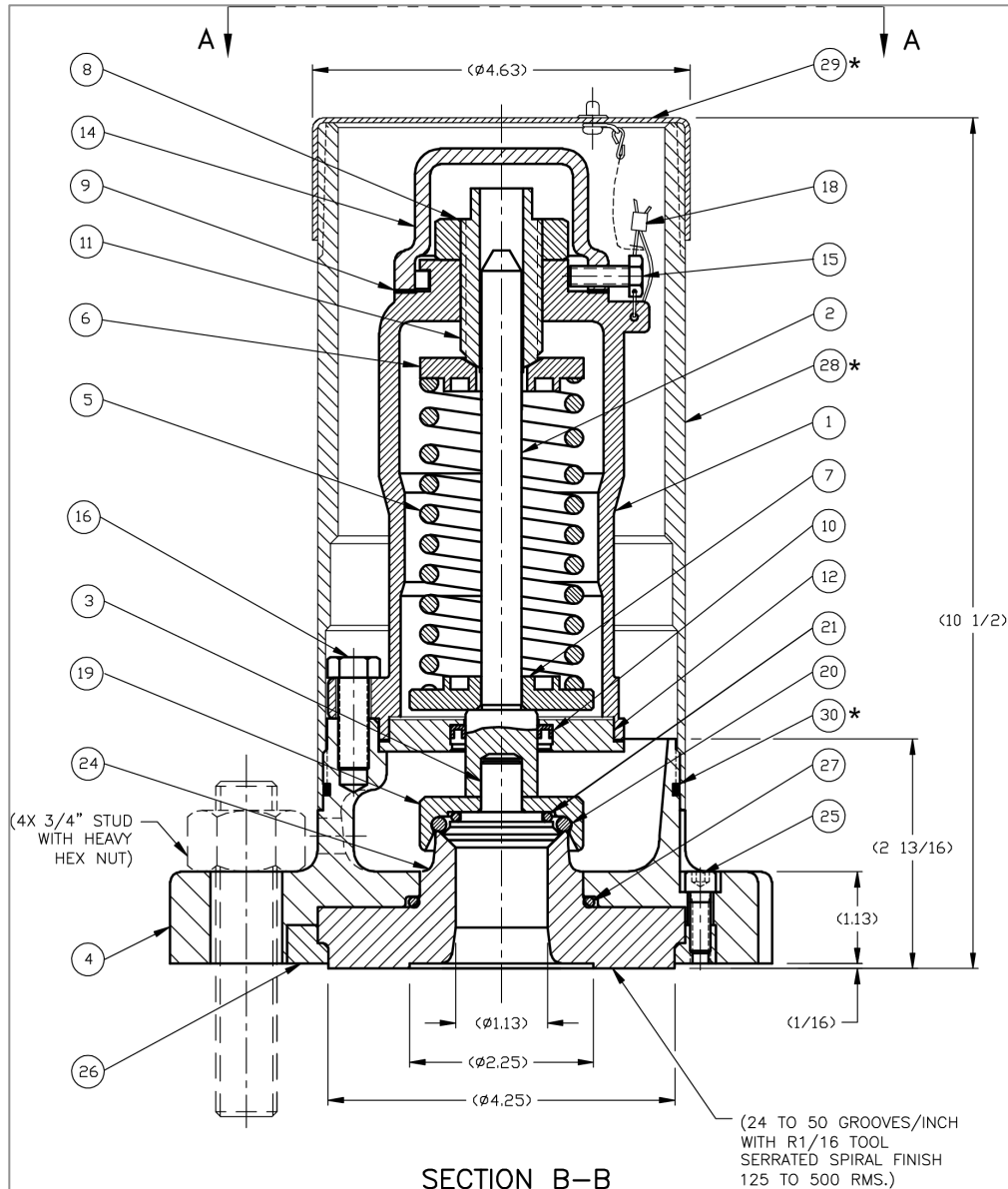


Figure 2-1 Valve Component Identification (Section B-B) – Base and -XX-S01 Series

\* **NOTE:** Parts indicated in -XX-S01 Series only.



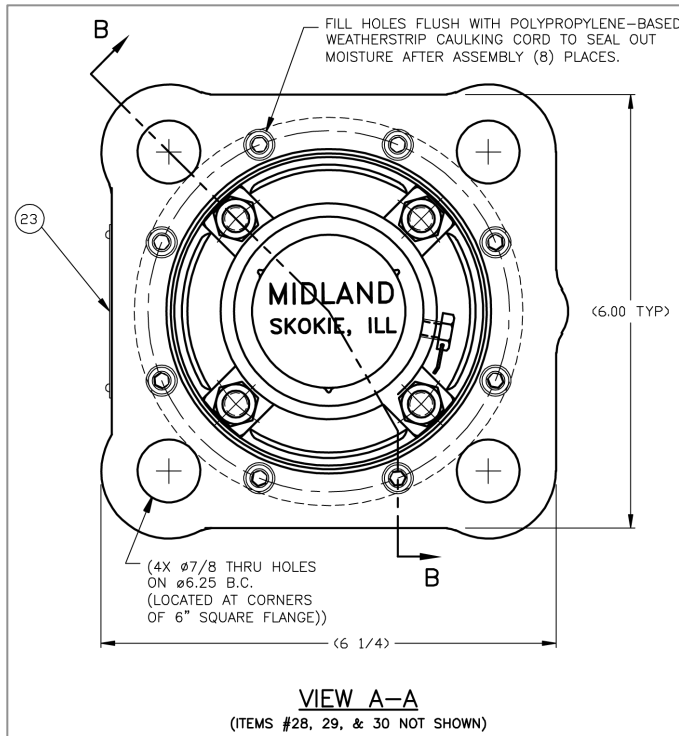


Figure 2-2 Valve Component Identification (Section A-A) – Base and -XX-S01 Series

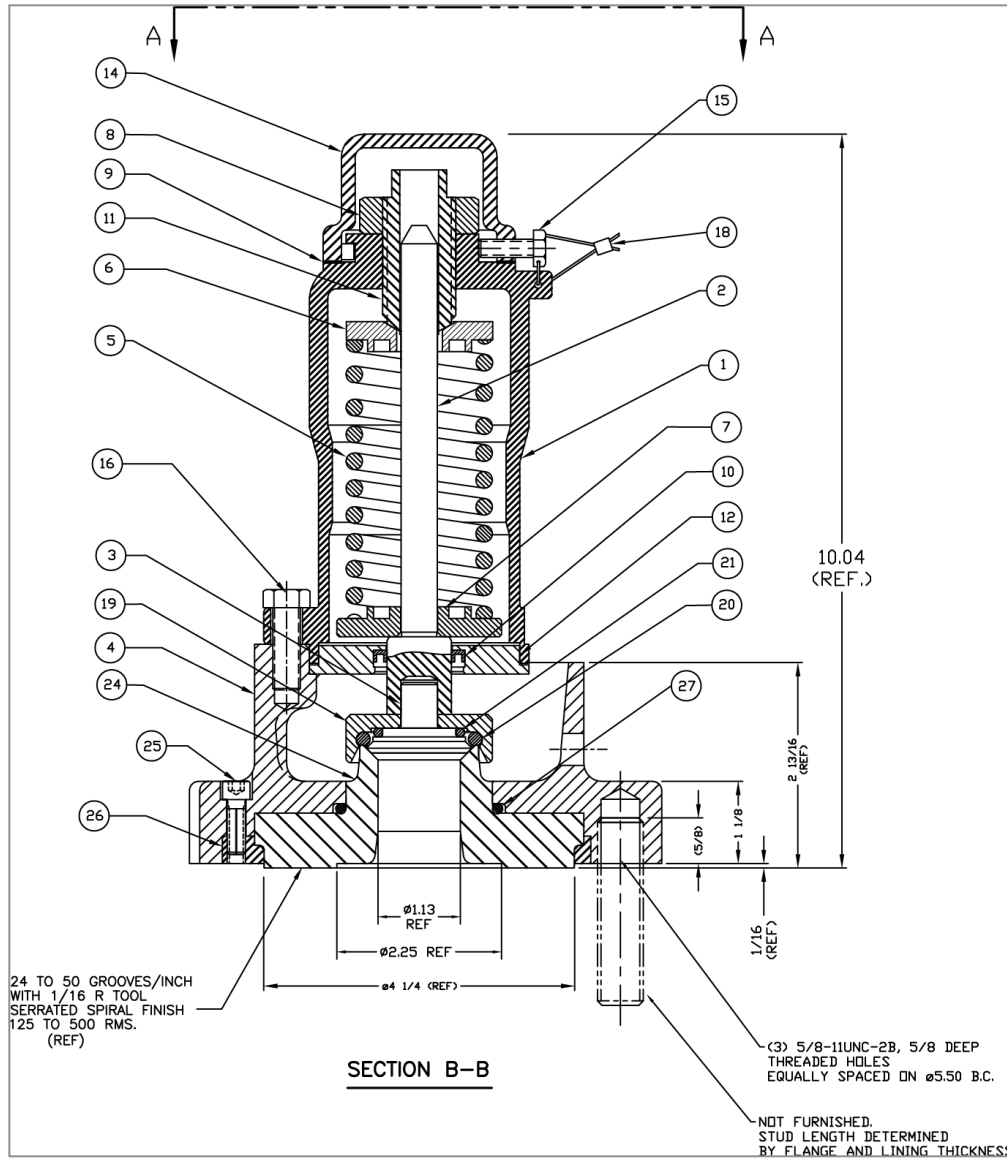


Figure 2-3 Valve Component Identification (Section B-B) – 3KY Series

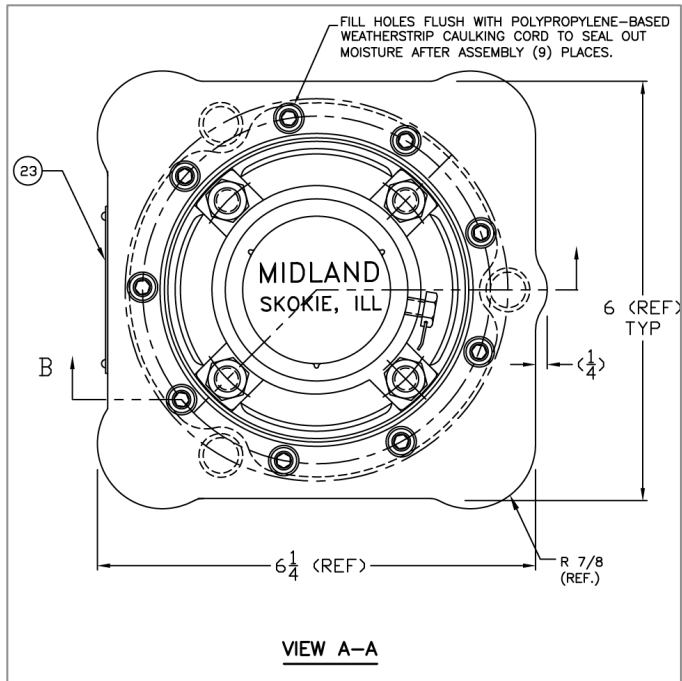


Figure 2-4 Valve Component Identification (Section A-A) – 3KY Series

## 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 Required Tools

SAE Wrench	Component(s)/Description
1-1/4" Wrench	Mounting Bolts
Torque Wrench	Mounting Bolts
<b>Other Tools, Supplies, and Equipment:</b>	
Wire Brush	
Replacement Gasket	As Specified

Table 3-1 Required Tools for Valve Assembly

- 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. Inspect threads for any sign of excessive wear, corrosion, pitting or other defects. If any are found, the part is rejectable and should be replaced.
- 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 lint-free cloth and appropriate cleaning solvent, wipe clean the valve and cover-plate seating surfaces and the mounting-stud threads. Inspect threads for any sign of excessive wear, corrosion, pitting or other defects. If any are found, the part is rejectable and should be replaced.

- 3.1.5 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.

- 3.1.6 Remove the rubber plug from the cover plate.
- 3.1.7 Position the valve gently into the mounting. Align the body holes over the studs.
- 3.1.8 Install the nuts and tighten them in 1/3-torque increments in a diagonally alternating sequence. Consult gasket manufacturer for recommended torque requirements.



**NOTICE:** Consult gasket manufacturer and Midland Manufacturing for torque requirements as max torque may vary by valve model. Do not exceed 200 ft-lb.



**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.



**TIP:** Use a 1-1/4" wrench to tighten mounting nuts.

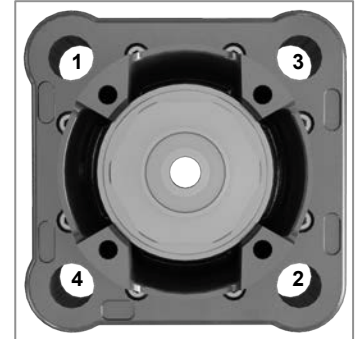


Figure 3-1 Tightening Sequence

## 3.2 Leak Inspection

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

## 3.3 Valve Operation Notes and Precautions



**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.



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

## 4 Valve Qualification



NOTICE

**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 top guide, stem, retainer, body, plug, follower and spring must be thoroughly inspected.

### 4.1 Valve Disassembly and Required Tools

SAE Wrenches	Component(s)/Description	Item #
7/16" Socket Wrench	Seat Screws	15
1-1/2" Wrench	Top Locknut	8
3/4" Wrench	Adjustment Screw	11
9/16" Socket Wrench	Cap Screws	16
3/16" Hex-Head Allen Wrench	Socket-Head Cap Screws	25
<b>Other Tools, Supplies, and Equipment:</b>		
Wire Cutter	Seal Wire	18
Non-Scratching Tool	O-Rings	20, 21, 27

Table 4-1 Required Tools for Valve Disassembly



NOTICE

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

- 4.1.1 Remove the orange protective cap (item 29) and cut the seal wire (item 18) to release the cap chain.

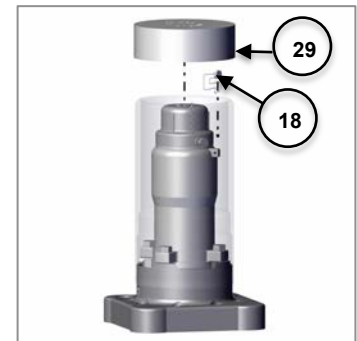


Figure 4-1 Remove Cap and Seal Wire

- 4.1.2 Unscrew and remove the flue (tube) (item 28) from around the valve.

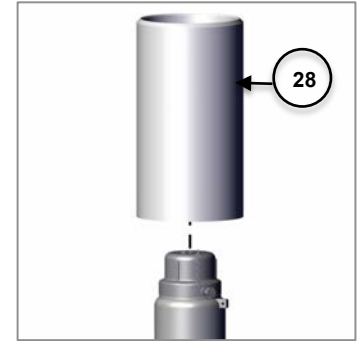


Figure 4-2 Remove Flue (Tube)

- 4.1.3 Place valve assembly in press to control the spring load for disassembly.

- 4.1.4 Remove the four (x4) cap screws (item 16) connecting the top guide (item 1) to the body (item 4).



**TIP:** Use a 9/16" socket wrench to remove the cap screws (item 16).

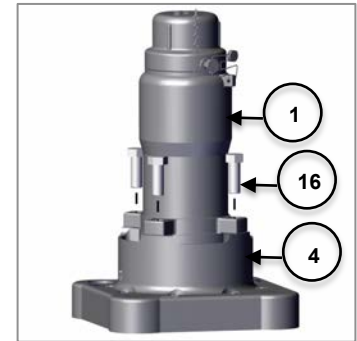


Figure 4-3 Remove Cap Screws

- 4.1.5 Ease assembly press up to safely release the spring pressure from the assembly.



**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.

- 4.1.6 Remove cap (14) and top guide (item 1) assembly exposing the valve spring internal components for disassembly.

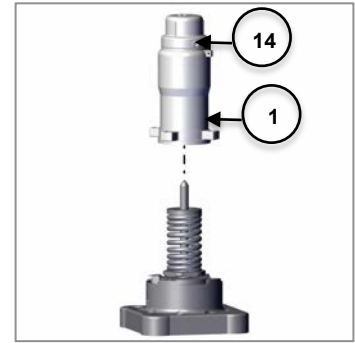


Figure 4-4 Remove Cap and Top Guide

- 4.1.7 Remove follower (6), spring (5), and guide (7).

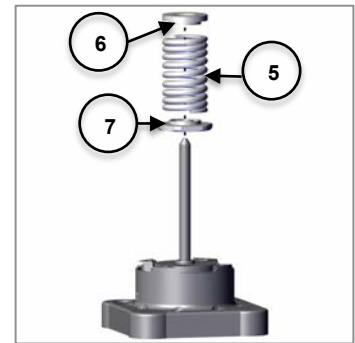


Figure 4-5 Remove Follower, Spring and Guide

- 4.1.8 Remove stem (item 2).

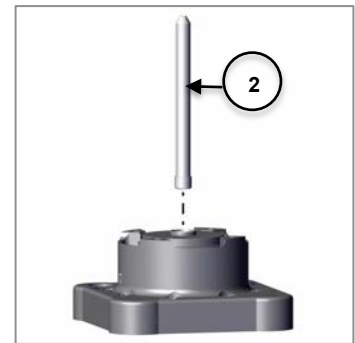


Figure 4-6 Remove Stem

- 4.1.9 Remove seal retainer (item 12) and shaft seal assembly (item 10).

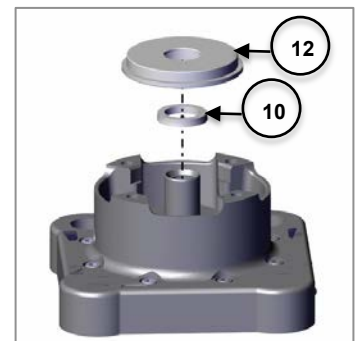


Figure 4-7 Remove Retainer and Shaft Seal Assembly



- 4.1.10 Remove retainer (item 19) with O-ring (item 20). Remove O-ring (item 20).



**NOTICE:** To ensure best practices and consistency of the qualification process O-rings must always be replaced.



**TIP:** Use a non-scratching tool to remove O-ring (item 20).

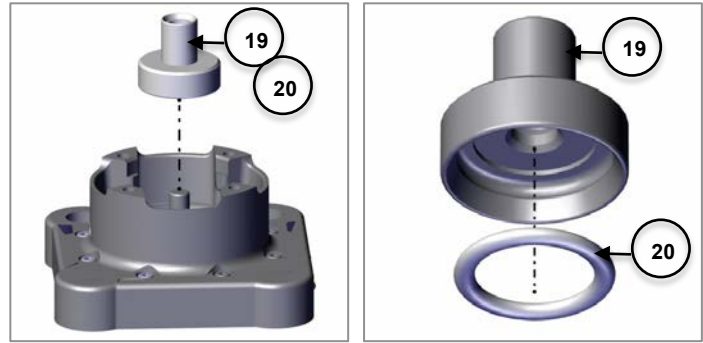


Figure 4-8 Remove Retainer and O-Ring

- 4.1.11 Remove plug (item 3) with O-ring (item 21). Remove O-ring (item 21).



**NOTICE:** To ensure best practices and consistency of the qualification process O-rings should always be replaced.



**TIP:** Use a non-scratching tool to remove O-ring (item 21).

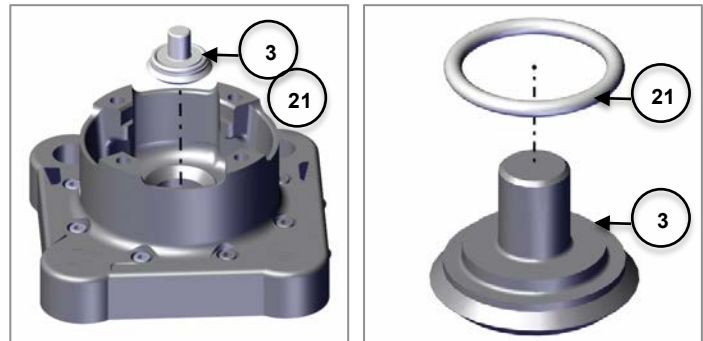


Figure 4-9 Remove Plug and O-Ring

- 4.1.12 Disassemble the cap (item 14) and top guide (item 1) assembly by cutting the seal wire (item 18) and remove the seal screw (item 15).



**TIP:** Use a 7/16" socket wrench to remove the seal screw (item 15).

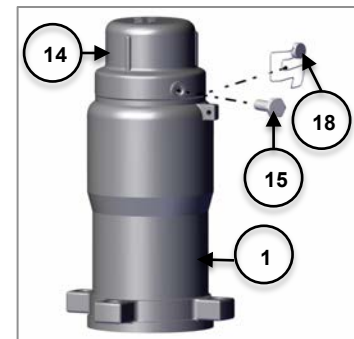


Figure 4-10 Remove Seal Wire and Seal Screw

- 4.1.13 Remove the cap (item 14) from the top guide (item 1).

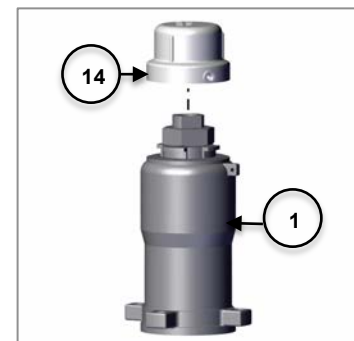


Figure 4-11 Remove Cap

#### 4.1.14 Remove the top gasket (item 9).



**NOTICE:** To ensure best practices and consistency of the qualification process gaskets should always be replaced.



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

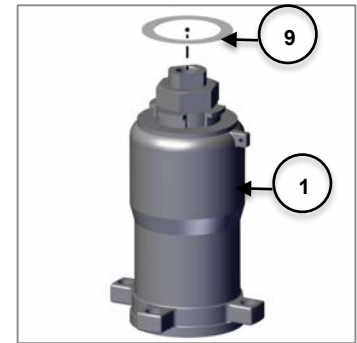


Figure 4-12 Remove Top Gasket

#### 4.1.15 Secure the top guide (item 1) in a vise and loosen the top locknut (item 8).



**TIP:** Use a 1-1/2" wrench to remove the top locknut (item 8).

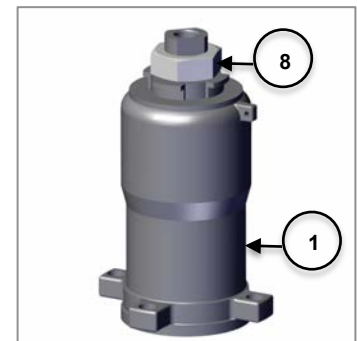


Figure 4-13 Remove Top Locknut

#### 4.1.16 Remove the adjusting screw (item 11) with loosened top locknut (item 8) from the top guide (item 1). Separate the top locknut from the adjusting screw.



**TIP:** Use a 3/4" wrench and a 1-1/2" wrench to remove the adjusting screw (item 11).

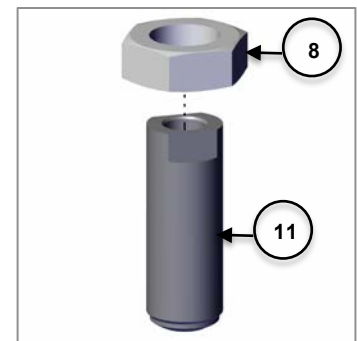


Figure 4-14 Remove Adjusting Screw and Top Locknut

#### 4.1.17 Disassemble the body (item 4) and body insert (item 24) by removing the eight (x8) socket-head cap screws (item 25).



**TIP:** Use a 3/16" hex-head Allen wrench to remove the cap screws (item 25).

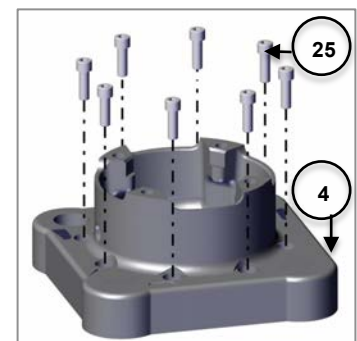


Figure 4-15 Remove Cap Screws

4.1.18 Remove the stainless-steel ring (item 26). Remove the body insert (item 24).

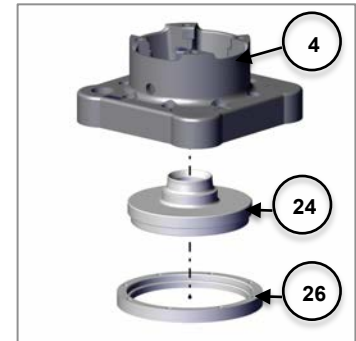


Figure 4-16 Remove Ring and Body Insert

4.1.19 Remove the O-ring (item 27) from the body insert (item 24).



NOTICE

**NOTICE:** To ensure best practices and consistency of the qualification process O-rings should always be replaced.



**TIP:** Use a non-scratching tool to remove O-ring (item 27).

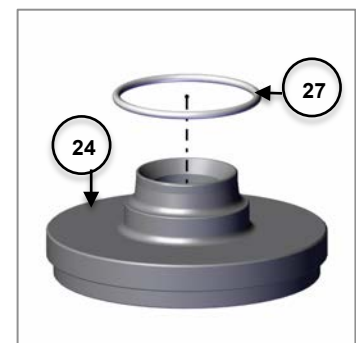


Figure 4-17 Remove O-Ring

## 4.2 Component Inspection

Key components must be thoroughly inspected during the qualification process. These components include the components highlighted in Figure 4-18.

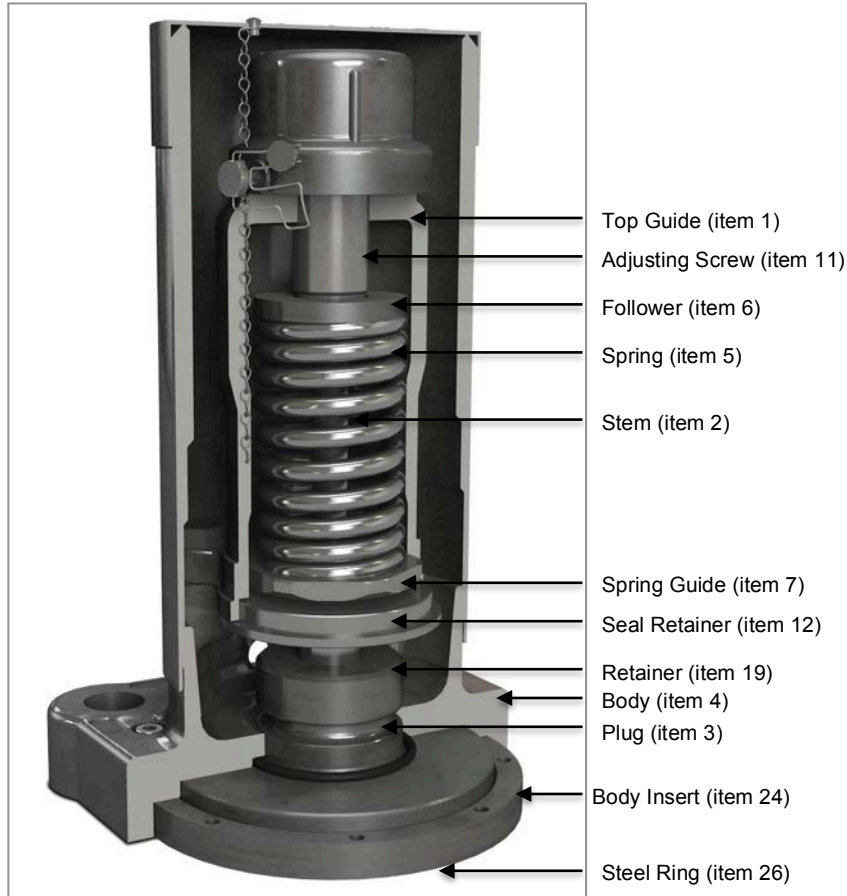


Figure 4-18 Component Inspection

**NOTICE:** Evaluation of critical component metal surfaces using enhanced inspection methods provides a higher probability of detection of defects than a standard visual inspection and, where applied appropriately, is 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.**

Refer to AAR MSRP C-111 [M-1002] Appendix J for requirements of non-destructive testing programs and the responsibilities for their administration.

O-Rings, gaskets and wire seals must always be replaced during this step.



**NOTICE:** Midland suggests that nuts, washers and studs be regularly replaced during the qualification process.



**NOTICE:** 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.

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.



**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.

#### 4.2.1 Adjusting Screw Threads Inspection

Visually inspect the adjusting screw (item 11). It should be free of corrosion, nicks, dents, scratches and pits. If any flaws are detected, replace this part.

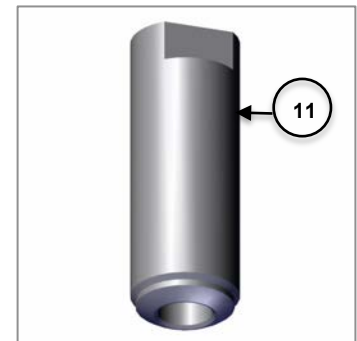


Figure 4-19 Adjusting Screw Inspection

#### 4.2.2 Follower Inspection

Visually inspect the follower (item 6). It should be free of corrosion, nicks, dents, scratches and pits. If any of these flaws are detected, replace this part.

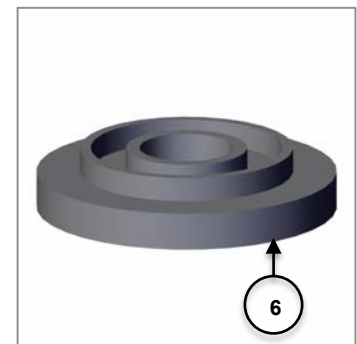


Figure 4-20 Follower Inspection

#### 4.2.3 Valve Stem Inspection

Remove scale, residual product and other foreign material from the stem (item 2).

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



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



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



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



**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.

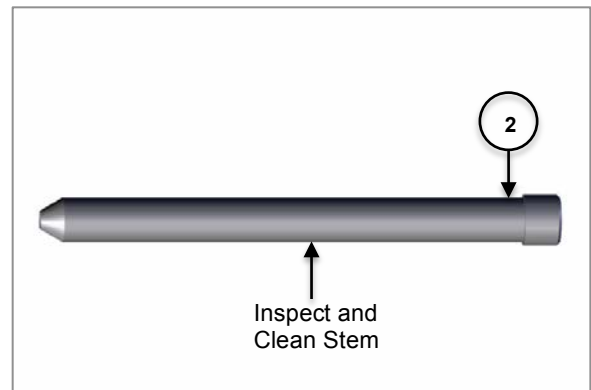


Figure 4-21 Valve Stem

#### 4.2.4 Stem Concentricity

The valve stem must be straight within 0.025" (maximum). If the measurements are greater than 0.025", replace the stem.



**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: 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 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.

#### 4.2.5 Spring Inspection

The spring (item 5) is a highly stressed part. The exterior surface must be free of pitting, cracks and corrosion. If necessary, use magnetic-particle or dye-penetration inspection (performed by certified and trained personnel) to evaluate the exterior surface and ensure that it is free of cracks and corrosion pits. If any excessive wear over 0.030" of the area is measured or observed, the spring cannot be repaired and must be replaced.



**WARNING: All springs marked "CTI" should be replaced.** If a spring's vendor marking is illegible, consider replacing the spring as a precautionary measure.



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



**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.

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 4-2, replace the spring.



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

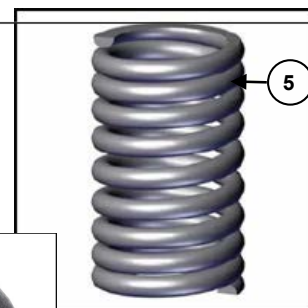


Figure 4-22  
Spring Inspection

Spring Part Number	Wire Size (REF) (Inches)	Height at 80% of Max. Deflection (Inches)	Minimum Free-Height (Inches)
15-150-MO	0.28	2.8	4.00
15-225-SS	0.28	3.13	4.80

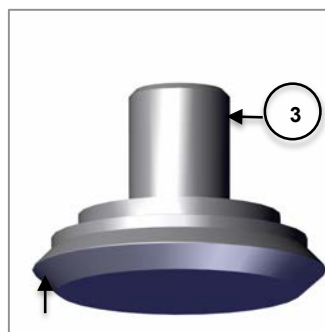
Table 4-2 Minimum Free-Heights for Spring After Pressing 80% of the Maximum Deflection for Two (2) Minutes

#### 4.2.6 Plug Inspection

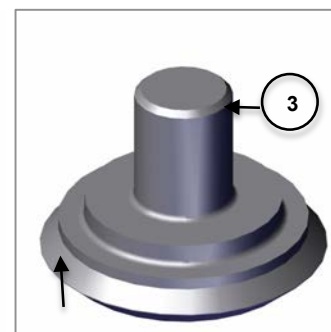
Visually inspect the plug (item 3) paying close attention to sealing surfaces. It should be free of corrosion, nicks, dents, scratches and pits.

Since the O-rings must seal against these surfaces, any irregularities can cause the valve to leak. Clean these areas by sanding lightly with emery paper (400-grit). If this does not effectively clean the part, replace this part. The plug must be free of gouge marks, corrosion, pits and rust. If present, this part is rejectable and should be replaced.

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.



Seat Sealing Surface



O-Ring Sealing Surface

Figure 4-23 Plug Inspection



#### 4.2.7 Retainer Inspection

Visually inspect the retainer (item 19) paying close attention to sealing surfaces. It should be free of corrosion, nicks, dents, scratches and pits.

Since the O-rings must seal against these surfaces, any irregularities can cause the valve to leak. Clean these areas by sanding lightly with emery paper (400-grit). If this does not effectively clean the part, replace this part. The retainer must be free of gouge marks, corrosion, pits and rust. If present, this part is rejectable and should be replaced.

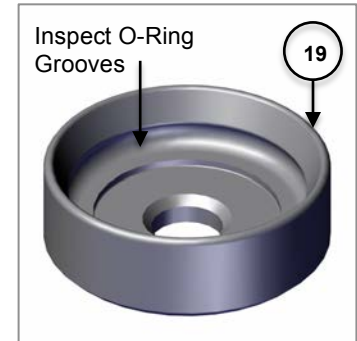


Figure 4-24 Retainer Inspection

#### 4.2.8 Body Insert Inspection

Visually inspect the body insert (item 24) paying close attention to sealing surfaces and seat. It should be free of nicks, dents, scratches and pits.

On the underside of the valve body (item 4) is the surface that the valve to the mounting plate on the railcar. Visually inspect for gouges or corrosion. 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.

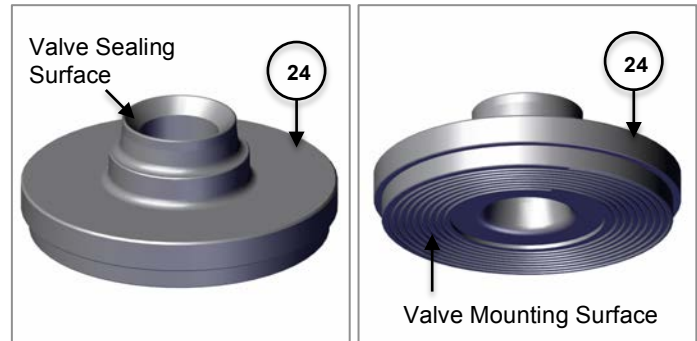


Figure 4-25 Body Insert Inspection

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

Inspect the valve body seat. Clean and beadblast, if necessary, and replace if damage is significant. Clean seat area by sanding lightly 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.

#### 4.2.9 Guide Inspection

Visually inspect the guide (item 7) paying close attention to sealing surfaces and seat. It should be free of nicks, dents, scratches and pits.

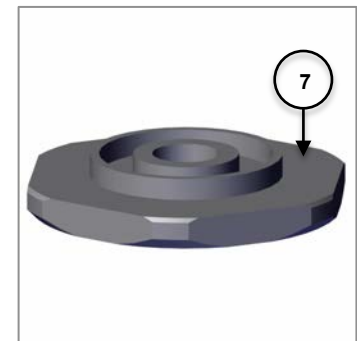


Figure 4-26 Guide Inspection



#### 4.2.10 Valve Body

Visually inspect the valve body (item 4) where it contacts the O-Ring. It should be free of nicks, dents, scratches, and pits.

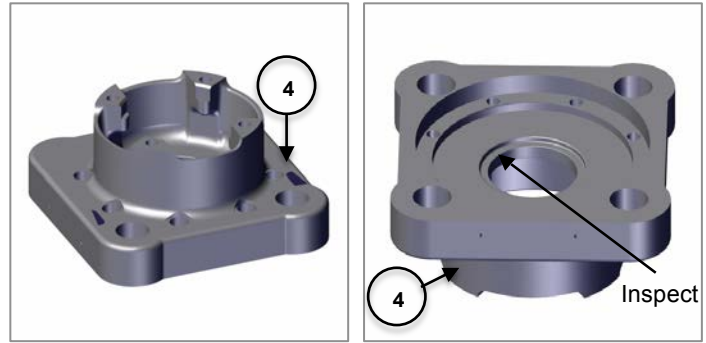


Figure 4-27 Valve Body Inspection

#### 4.2.11 Steel Ring

Visually inspect the steel ring (item 26). It should be free of corrosion, nicks, dents, scratches and pits. If any of these flaws are detected, replace this part.



Figure 4-28 Steel Ring Inspection

#### 4.2.12 Seal Retainer

Visually inspect the seal retainer (item 12). It should be free of corrosion, nicks, dents, scratches and pits. If any of these flaws are detected, replace this part.

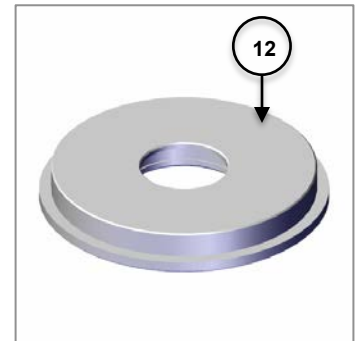


Figure 4-29 Seal Retainer Inspection

#### 4.2.13 Shaft Seal

Visually inspect the shaft seal (item 10). It should be free of corrosion, nicks, dents, scratches and pits. If any of these flaws are detected, replace this part.

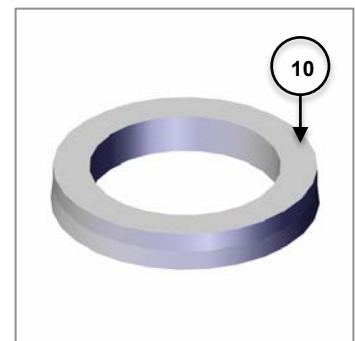


Figure 4-30 Seal Shaft Inspection

#### 4.2.14 Threaded Components

All threaded components must be thoroughly inspected and cleaned, or replaced. Inspect threads for any sign of excessive wear, corrosion, pitting or other defects. If any are found, the part is rejected and should be replaced.

#### 4.2.15 O-Ring and Gaskets Inspection

O-rings (items 20, 21, 27) and gasket (item 9) must be replaced at the time of the 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 in the cap, or can only be pushed into the O-ring retainer with difficulty, is quite likely not the correct size. Many of Midland's O-rings are made on special molds to non-standard sizes and are obtainable only from Midland.

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

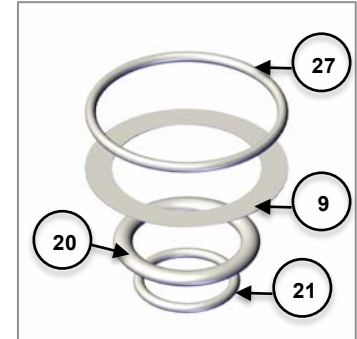


Figure 4-31 Elastomer Inspection

#### 4.2.16 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 integral integrity and surface quality of parts is under the jurisdiction of the repair facility and dependent on its experience and judgment.

### 4.3 Valve Reassembly and Required Tools

SAE Wrenches	Component(s)/Description	Item #
7/16" Socket Wrench	Seat Screws	15
1-1/2" Wrench	Top Locknut	8
3/4" Wrench	Adjustment Screw	11
9/16" Socket Wrench	Cap Screws	16
3/16" Hex-Head Allen Wrench	Socket-Head Cap Screws	25
<b>Other Tools, Supplies, and Equipment:</b>		
Wire Cutter	Seal Wire	18
Non-Scratching Tool	O-Rings	20, 21, 27
Pipe Wrench		
Thread Lubricant		

Table 4-3 Required Tools for Valve Reassembly

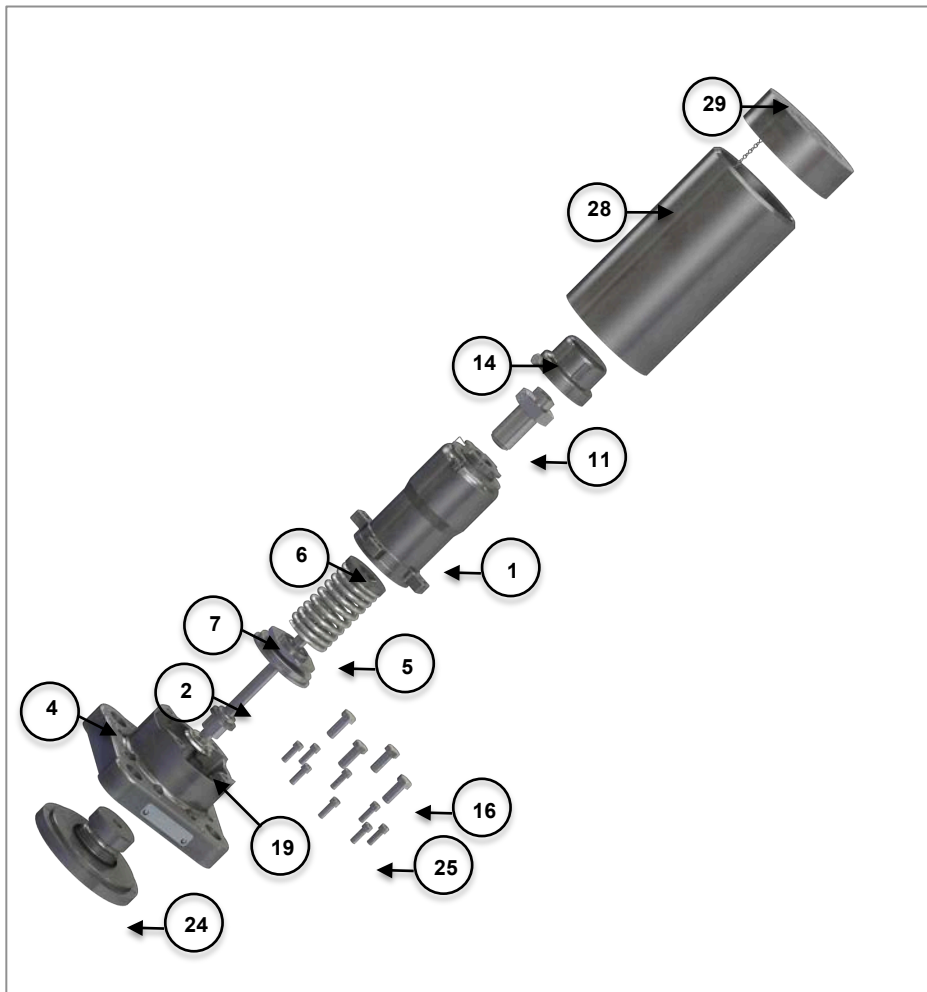


Figure 4-32 Valve Exploded View

- 4.3.1 Install the O-ring (item 27), insert (item 24), and ring (item 26) to the body (4) using eight (x8) cap screws (item 25).



**TIP:** Use a 3/4" Allen Wrench to install cap screws (item 25).

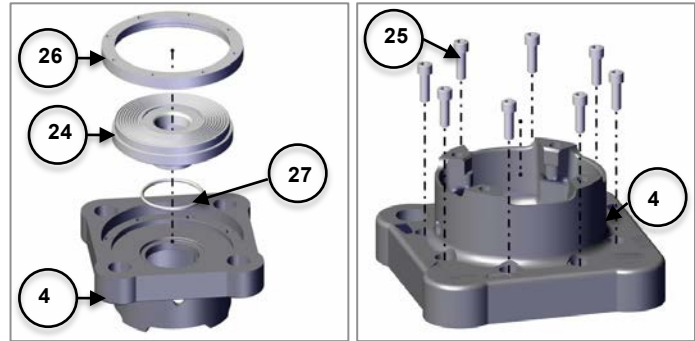


Figure 4-33 Install O-Ring, Body Insert and Steel Ring into Body

- 4.3.2 Mount the plug O-ring (item 21) into the plug (item 3).

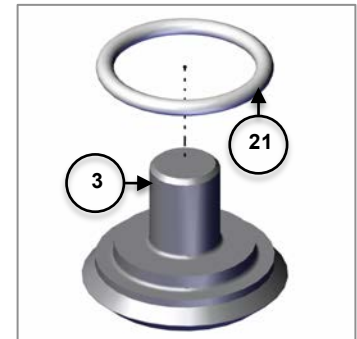


Figure 4-34 Mount Plug O-Ring

- 4.3.3 Place plug assembly (item 3) into the body (item 4).

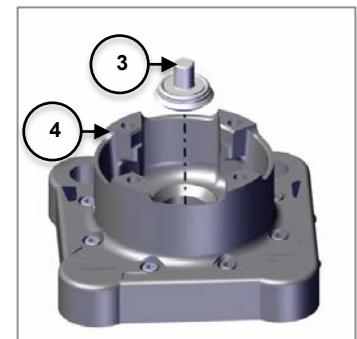


Figure 4-35 Place Plug Assembly into Body

- 4.3.4 Insert the retainer O-ring (item 20) into the retainer (item 19).

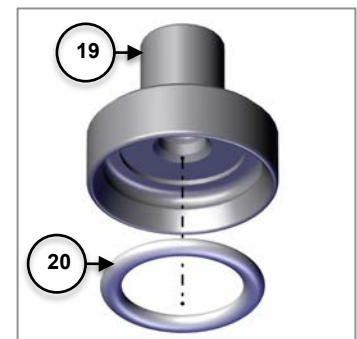


Figure 4-36 Insert O-Ring

4.3.5 Insert the plug (item 3) assembly into the body (item 4).

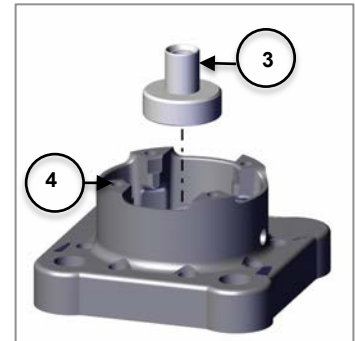


Figure 4-37 Insert Plug Assembly

4.3.6 Insert the shaft seal (item 10) into the seal retainer (item 12).

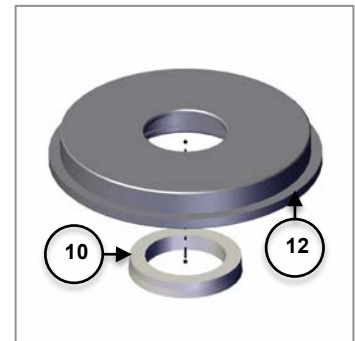


Figure 4-38 Insert Shaft Seal

4.3.7 Place the seal retainer (item 12) assembly onto the body (item 4).

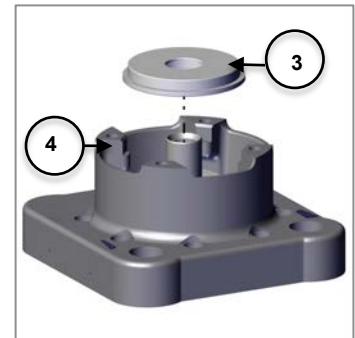


Figure 4-39 Insert Seal Retainer

4.3.8 Insert the stem (item 2) into the body (item 4) assembly.



**NOTICE:** Check that the spring guide move smoothly inside the top guide.

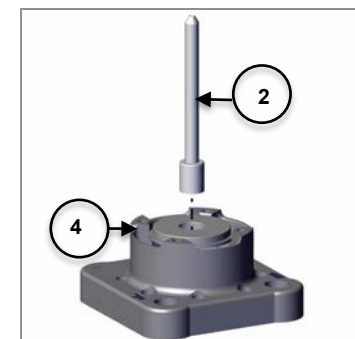


Figure 4-40 Insert Stem into Body

4.3.9 Place the spring guide (item 7) onto the stem (item 2).

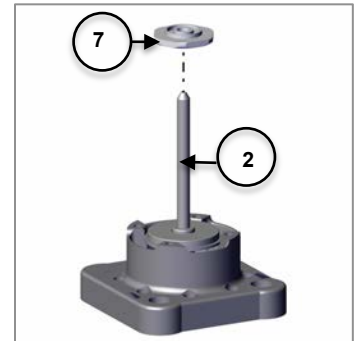


Figure 4-41 Place Spring Guide

4.3.10 Place the spring (item 5) onto the spring guide (item 7).

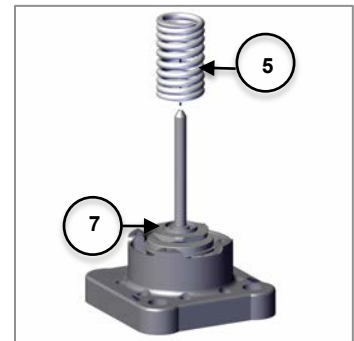


Figure 4-42 Place Spring

4.3.11 Insert the follower (item 6) onto the spring (item 5).

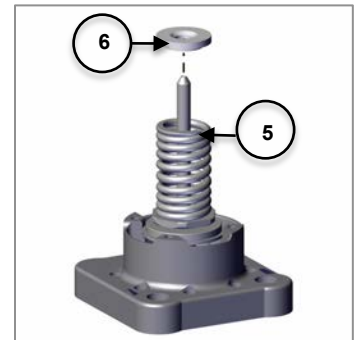


Figure 4-43 Insert Follower

4.3.12 Lubricate the threads of the top guide (item 1) and adjusting screw (item 11).  
Screw the adjusting screw (item 11) by hand.



**TIP:** Use a 3/4" wrench.

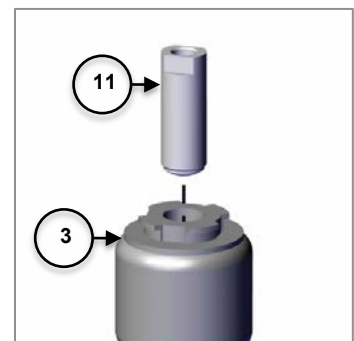


Figure 4-44 Insert Adjusting Screw

- 4.3.13 Screw the top locknut (item 8) onto the adjusting screw (item 11) by hand.  
Inspect the body to verify that the sealing surface is free of damage or debris.  
The threads of the adjusting screw should be cleaned and lightly lubricated.



**TIP:** Use a 1-1/2" wrench.

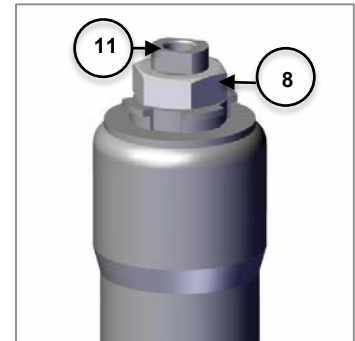


Figure 4-45 Install Top Locknut

- 4.3.14 Place the top guide (item 1) onto the assembly.

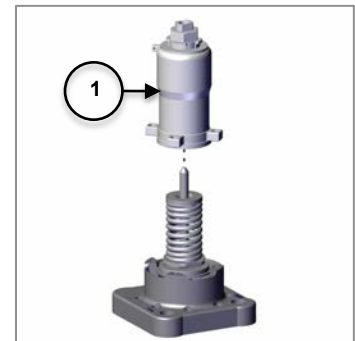


Figure 4-46 Place Top Guide

- 4.3.15 Place the cap (item 14) onto the top guide (item 1).

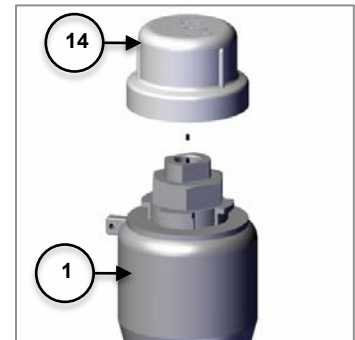


Figure 4-47 Place Cap

- 4.3.16 Using a press, compress and align the bolt holes of the valve.  
4.3.17 Fasten four (x4) bolts (item 16). Tighten the bolts evenly by hand.



**TIP:** Use a 9/16" socket.

- 4.3.18 Remove from the press.



Figure 4-48 Fasten Bolts

## 4.4 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.)

### 4.4.1 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.

### 4.4.2 Valve-Pressure Testing Procedure

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

- 4.4.2.1 Install the valve on the test fixture and alternately tighten all of the nuts. Next, seal drain holes of the valve body with putty, or a similar material.
- 4.4.2.2 Fill the valve body with water to allow bubble detection at the valve seat. Take a position allowing observation of the pressure gauge and bubbling of air in the valve body.



**CAUTION:** Do not look directly down into the valve as debris may discharge upwards.



#### 4.4.3 Testing

4.4.3.1 Increase the test air pressure slowly.

4.4.3.2 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 $\pm 3\%$	VTP Settings
75 psig $\pm 3$ psig	60 psig minimum
165 psig $\pm 3$ psig	148 psig minimum

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

4.4.3.3 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.

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

4.4.3.5 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).

4.4.3.6 Record the values.



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

4.4.3.7 When the test results are acceptable, proceed to Post-Test Final Assembly in Section 4.6.

## 4.5 Post-Test Final Assembly

- 4.5.1 After testing the valve, close the pressure inlet valve to the test chamber and vent the pressure in the test stand. Remove putty and drain water. Then remove the valve from the test fixture.
- 4.5.2 Wipe or blow away any remaining soap suds and water used in the testing.
- 4.5.3 Tighten top locknut (item 8) while holding the position of the adjusting screw (item 11) in place.



**TIP:** Use a 1-1/2" wrench to tighten top locknut (item 8) while holding the screw on flats with a 3/4" wrench.

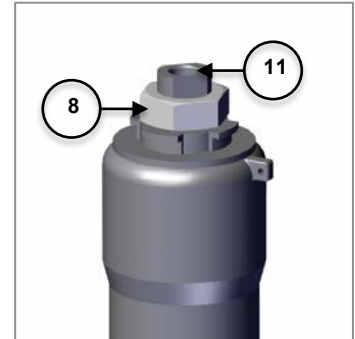


Figure 4-49 Tighten Locknut While Holding Adjustment Nut in Place

- 4.5.4 Mount the top gasket (item 9) around the top of the top guide (item 1).

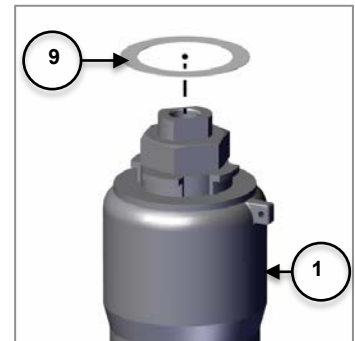


Figure 4-50 Mount Top Gasket

- 4.5.5 Attach the cap (item 14) so when closed the tapped hole is near the wiring point.

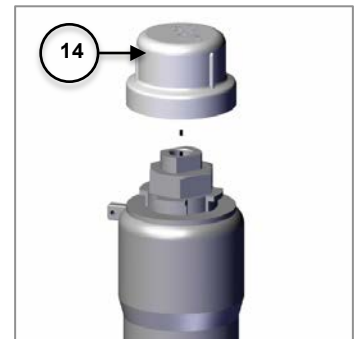


Figure 4-51 Attach and Tighten Cap

4.5.6 Insert the seal screw (item 15).



**TIP:** Use a 7/16" socket to tighten the seal screw.

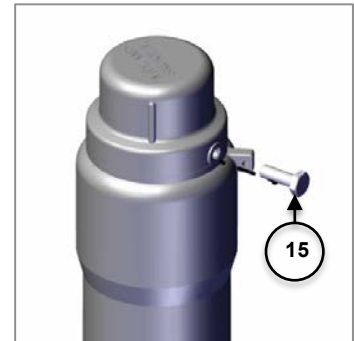


Figure 4-52 Insert Seal Screw

4.5.7 Thread the seal wire (item 18) through the set screw and wiring point on the top guide (item 1).

Clamp and trim the seal wire (item 18).



Figure 4-53 Install Seal Wire

4.5.8 Permanently attach a metal tag to the valve body with repair/test date, and repair facility identification.

## 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 Required Tools

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

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## 6 Emergency Response for Leaking Valve

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NOTICE

**NOTICE:** Emergency Response is the temporary remediation to a valve observed to be emitting product in an unintended manner. It is possible to replace o-rings on an internal style valve installed on a pressurized tank car. 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 qualification in accordance to the car owner's standard qualification and maintenance program. Leak repair is unscheduled maintenance and is not part of scheduled maintenance.

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### 6.1 Follow All Routine Maintenance Procedures

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NOTICE

**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.

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