Follow these steps to ensure leak-free performance of a hinged & bolted manway.

It is the shipper’s responsibility to ensure there are no contents of the tank car leaking from the manway before it is shipped.

Eliminating leaks around a hinged & bolted manway protects against the risks to life, property, & the environment.

By following these steps, an operator can achieve a consistent, high-level, process of assembling a hinged & bolted manway.

The key to eliminating NAR’s around a hinged & bolted manway requires a high-level process of assembly to ensure leak-free performance over a broad range of temperatures & pressures.

Common elements to consider when assembling a hinged & bolted manway include:

- Gasket-contact surface finish without unacceptable imperfections
- Suitable gasket
- Maintaining sufficient contact pressure on the manway cover, manway nozzle, & gasket surfaces (i.e., gasket stress)
- Condition of the eyebolt
- Maintaining sufficient contact pressure must consider the maximum & minimum temperature range & the internal pressure the joint may experience in service
- Bolt stretch, or relaxation, or gasket relaxation, or flow, may result because of changes in temperature & pressure
- Mechanical failure of an eyebolt may result from corrosion, fatigue, galling, self-loosening, stress corrosion cracking, & wear

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1. Inspect the Manway Area

- Examine the bolted manway cover for imperfections, bent & broken lugs, damaged manway gasket grooves, & detrimental residue on the gasket & sealing surfaces.
- Inspect the manway nozzle for imperfections.

2. Clean, Examine, & Install New Gaskets

- Clean as necessary to observe imperfections.
- Replace gaskets that have indications of abrasion, cuts, tears, or other damage that may affect the fluid sealing capability.
- When there is a need to replace a gasket, remove the gasket from the manway cover and inspect the gasket-contact sealing surface on the cover.
- When transporting a flammable liquid consisting of a mixture or solution having different compositional elements, it is important to choose a gasket material compatible with each element. Replace with gasket suitable for service. Gasket selection should also consider cyclic service conditions.

For flammable liquid shipment, select a gasket material that is:
- Within the permissible leak rate to control fugitive emissions;
- Chemically compatible with the product, including compositional elements;
- Mechanically compatible with the joint makeup (i.e., not over-compressed or under-compressed [receives proper compression/stress] by assembly bold load);
- Thermally compatible with the temperature range (i.e., loading, off-loading, and transportation).

3. Inspect & Lubricate the Eyebolts

- Examine eyebolt threads and hinge pins.
- Examine each nut to ensure same design. Replace nuts that are broken, cracked, missing or rounded.
- Use a proper lubricant on the eyebolts, safety eyebolt(s), & bearing surface of the nuts. Ensure the lubricant is compatible with the product.

4. Identify Eyebolt Number & Tightening Sequence

- Recognize the numbering of the eyebolts beginning with the safety eyebolt near the right side of the lifting handle.
- Follow the numbered sequence in a star pattern when tightening each eyebolt on to the manway.
- Select a proper tool with appropriate torque setting.

5. Preferred Torque Sequence and Value

<table>
<thead>
<tr>
<th>Sequence</th>
<th>VSP CYCLETIGHT® or Hard Gasket</th>
<th>SALCO Nozzle or Elastomeric Gasket</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6-Bolt</td>
<td>8-Bolt</td>
</tr>
<tr>
<td>Snug Pass</td>
<td>Snug</td>
<td>Snug</td>
</tr>
<tr>
<td>1st Pass</td>
<td>75 ft-lbs</td>
<td>70 ft-lbs</td>
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<tr>
<td>2nd Pass</td>
<td>160 ft-lbs</td>
<td>140 ft-lbs</td>
</tr>
<tr>
<td>3rd Pass</td>
<td>250 ft-lbs</td>
<td>200 ft-lbs</td>
</tr>
<tr>
<td>4th Pass</td>
<td>250 ft-lbs</td>
<td>200 ft-lbs</td>
</tr>
</tbody>
</table>

VSP CYCLETIGHT® or Hard Gasket

- ALWAYS use approved fastener lubrication on threads and nut bearing surface.
- ALWAYS start with the #1 bolt.
- DO NOT use a PIPE WRENCH, this will under torque, resulting in a leak.
- DO NOT use a CHEATER BAR, this will over torque, bend the manway cover and, result in a leak.

Download the entire ‘Guidelines for Hinged & Bolted Manway Assembly - Flammable Liquids’ at www.EthanolRFA.org/manwayguidelines