



The Lee Company
Process Specification

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Revision A
February 6, 2019

Change Order #380

The Installation of Lee 3-Port Inserts

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Revision Status

Sheet	Revision	Date	By	Approved	Description
1 – 13	A	2/06/19	DJR	<i>FA</i>	Initial Release

1.0 Scope

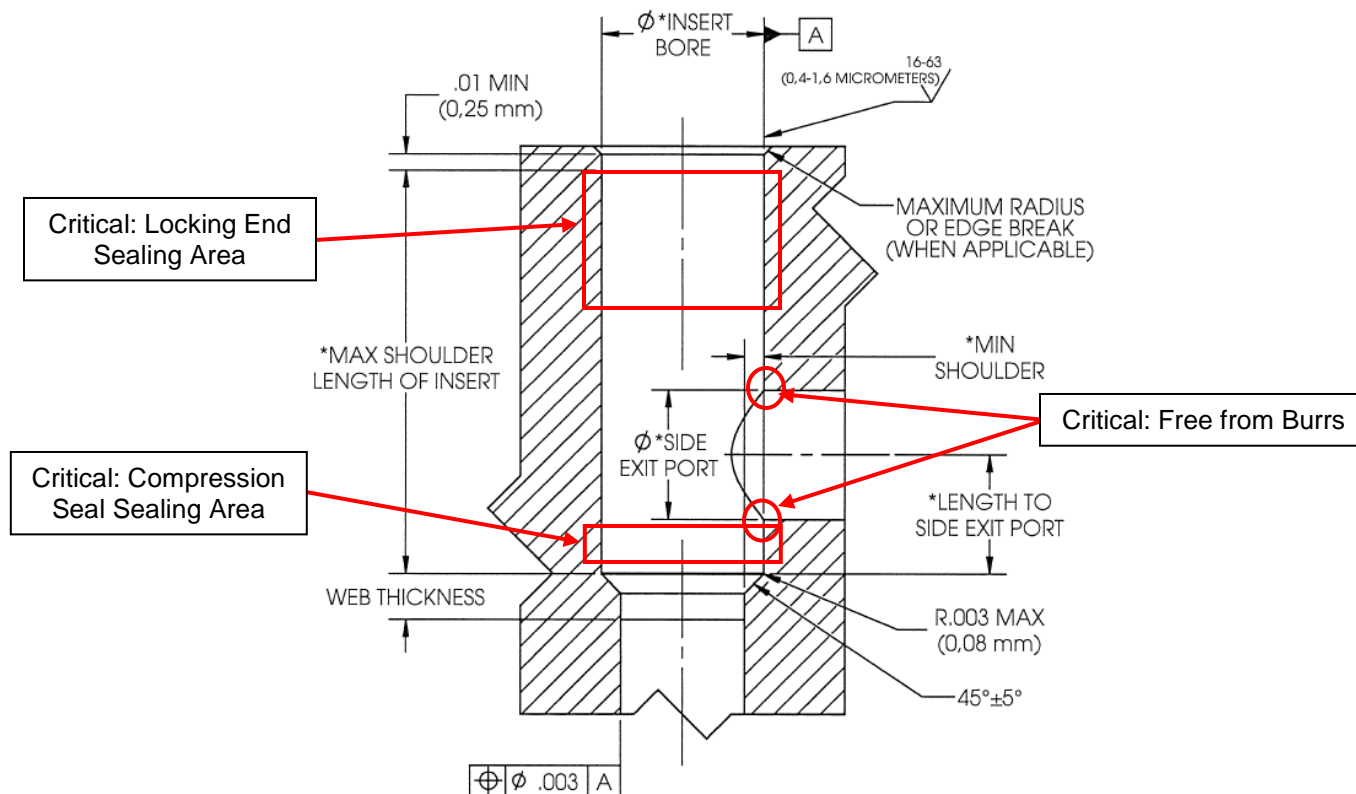
The purpose of this specification is to provide instructions for the installation and extraction of Lee 3-port inserts.

2.0 Applicable Documents

Refer to Lee Process Specification 187 for recommendations on installation hole design and preparation as well as additional, general installation information.

3.0 Compression Seals

Prior to installation of the valve, the installation hole should be verified to meet the requirements specified per the appropriate Lee drawing. Specifically, in the critical areas identified (Figure 1). If the installation hole does not meet the specified requirements, it can negatively affect valve performance or prevent the valve from being successfully installed.



*SEE APPROPRIATE INSPECTION DRAWING FOR DIMENSIONS.

Figure 1: Installation Hole Critical Sealing Areas

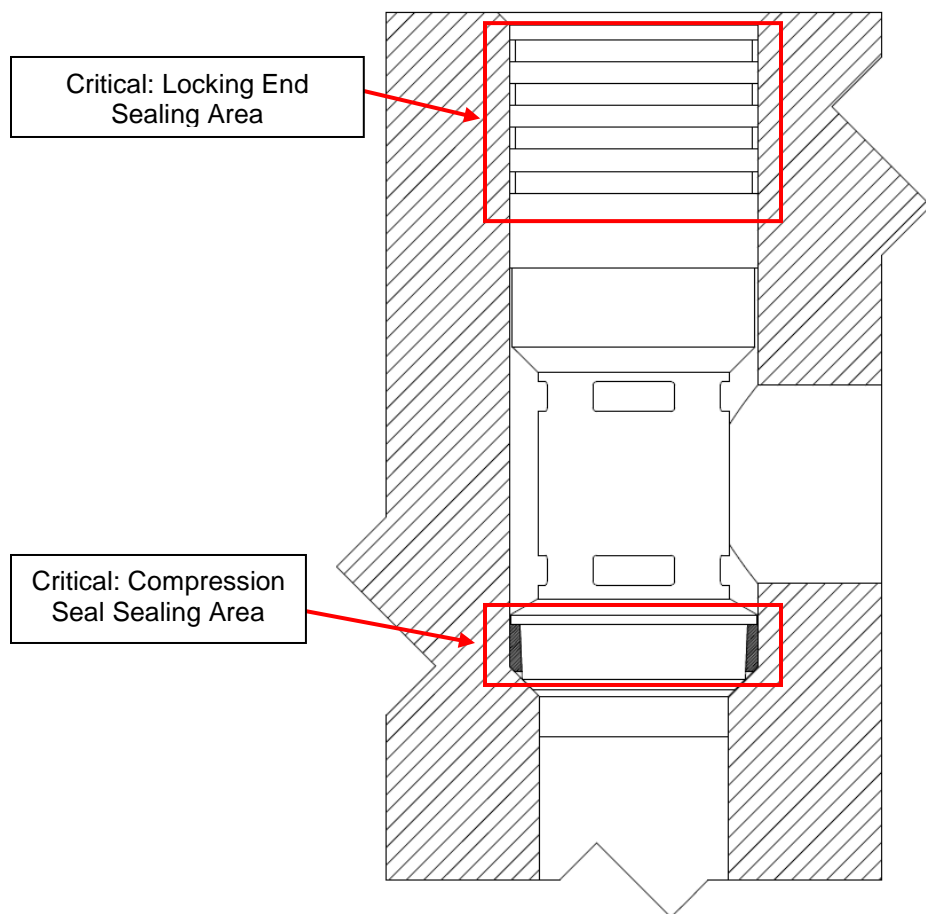


Figure 2: Valve Installed in Installation Hole

3.1 Installation of an Insert that uses a Compression Seal

- 3.1.1 After removing the valve from the packaging, verify the compression seal is appropriately orientated on the insert nose. The 45° chamfer of the compression seal should be facing out (Figure 3).

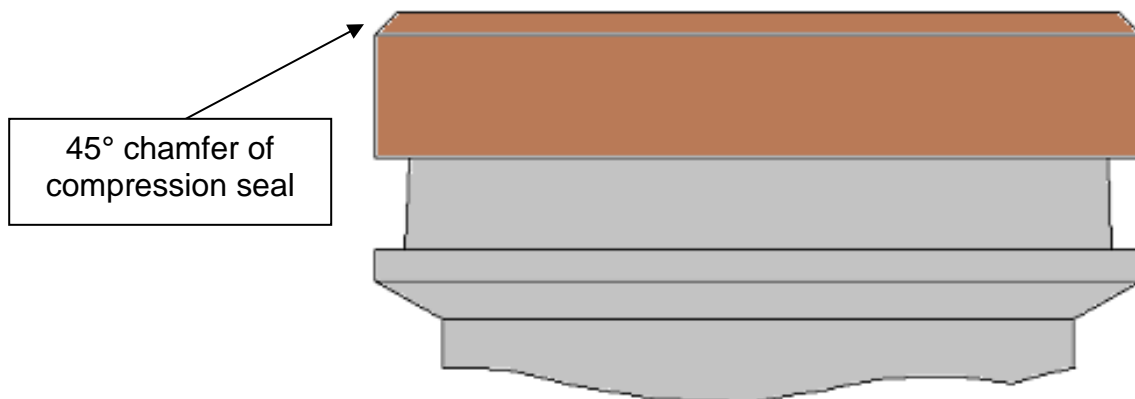


Figure 3: Compression Seal Placement

- 3.1.2 The insert can now be placed into the installation hole. Care should be taken to avoid damaging the compression seal while handling and placing the valve insert into the installation hole.
- 3.1.3 Care should be taken so the compression seal **is not** pressed up the insert nose while handling. If pressed up the insert nose taper the compression seal may be over expanded beyond the allowable outer diameter called out on the Lee drawing and not fit properly into the installation hole.

3.2 Pre-load

- 3.2.1 Ensure that the valve, installation hole, and the installation tool that the preload will be applied with, are all properly aligned.
- 3.2.2 Apply an axial pre-load to the installation tool within the range specified per Note 1 on the Lee drawing.

Note: The pre-load is necessary to ensure the compression seal will be expanded up the taper of the insert nose. This expansion creates the stress necessary for an effective seal.

3.3 Pin Installation Using Threaded Tooling

- 3.3.1 Thread the pin onto the pin installation tool so that the chamfered end or smallest diameter of the pin faces away from the tool. Be sure that the pin is threaded until it has bottomed out on the tool. This is to prevent overstress of the pin and tool threads during installation.
- 3.3.2 Firmly support the manifold in which the valve is to be installed into. Place the pin inside the locking end of the insert and ensure the installation tool, valve and installation hole are properly aligned.
- 3.3.3 Apply an axial force to the pin installation tool until the back of the pin (Surface B) is flush within 0,13 mm (0.005 inch) to the back of the insert body (Surface A).
- 3.3.4 Remove the pin installation tool and inspect the pin flushness.

3.4 Pin Installation Using Thread-less Tooling (Alternative to Section 3.3)

In some instances, it may be advantageous to use thread-less installation tooling based on the pin design and/or boss material that the insert is being installed into.

- 3.4.1 Place the pin into the rear of the valve insert so that the chamfered end or smallest diameter of the pin rests in the insert locking end inner diameter.

- 3.4.2 Center and then seat the pin installation tool on the back of the pin. Ensure that the pin has bottomed out on the tool to prevent improper seating which could lead to damage to the pin or improper installation.
- 3.4.3 Apply an axial force to the pin installation tool until the back of the pin (Surface B) is flush within 0.005 inch (0.13mm) to the back of the insert body (Surface A) per Note 1 of the Lee drawing.
- 3.4.4 Remove the pin installation tool and inspect for flushness.

3.5 Removal and Application of the Compression Seals

As indicated on Note 1 of all Lee 3-port insert drawings, the compression seal is a replaceable item. In the event a compression seal is lost, damaged, or has been previously used in an insert installation, a replacement compression seal may be purchased and installed onto the valve insert by the customer. There is no need to return the valve for installation of the replacement compression seal onto the valve insert. To remove a compression seal and apply a new compression seal, follow the procedure identified in this document.

- 3.5.1 If necessary, a compression seal should be removed from the insert by hand by using three fingers to gently pinch the seal and pull away from the tapered nose of the insert. If the compression seal seems to be expanded up the taper of the insert nose, a finger nail or soft instrument can be used to gently pry the compression seal from the nose of the insert. Care should be taken to avoid damaging or deforming the seals when removing them if they are to be reused.

Note: If the seal is damaged or deformed in the process of removal, that seal should be discarded, and a replacement seal should be used. Additionally, any seal that has been installed with a valve or has been exposed to preload forces should be discarded. Metallic tools should not be used to aid in the removal of the compression seal. These tools may damage not only the compression seal but the taper of the insert nose, which is a sealing surface.

- 3.5.2 To apply a new compression seal, take the insert and place the face of the locking end on a level work surface so that the 45° chamfer of the insert faces upward (Figure 4).

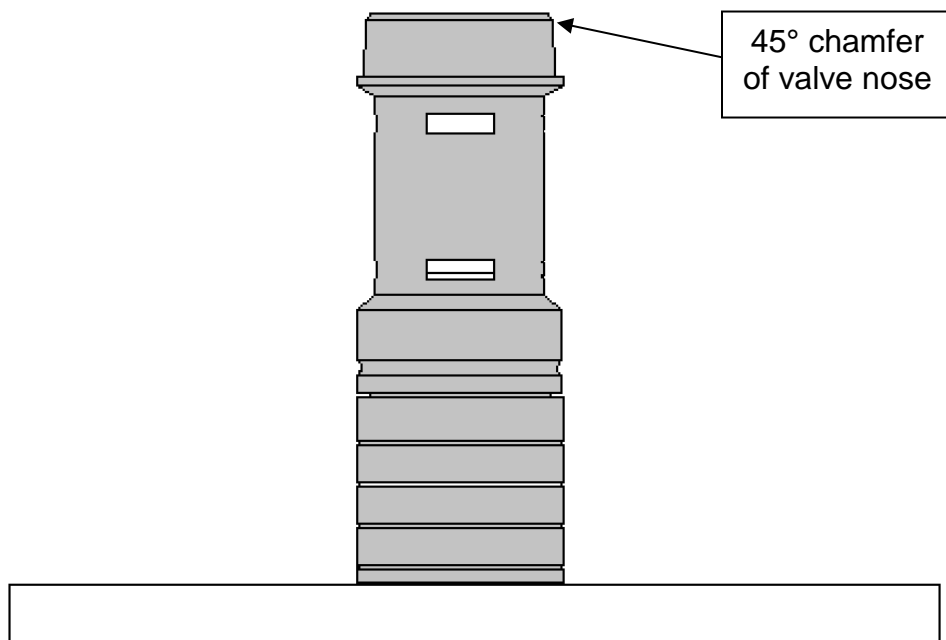


Figure 4: Insert orientation

- 3.5.3 Gently take the replacement compression seal in hand, taking care not to squeeze or deform the seal.
- 3.5.4 Gently place the compression seal on the tapered nose of the insert with the 45° chamfer upward as indicated in Figure 5, so that only a minimal amount of force.

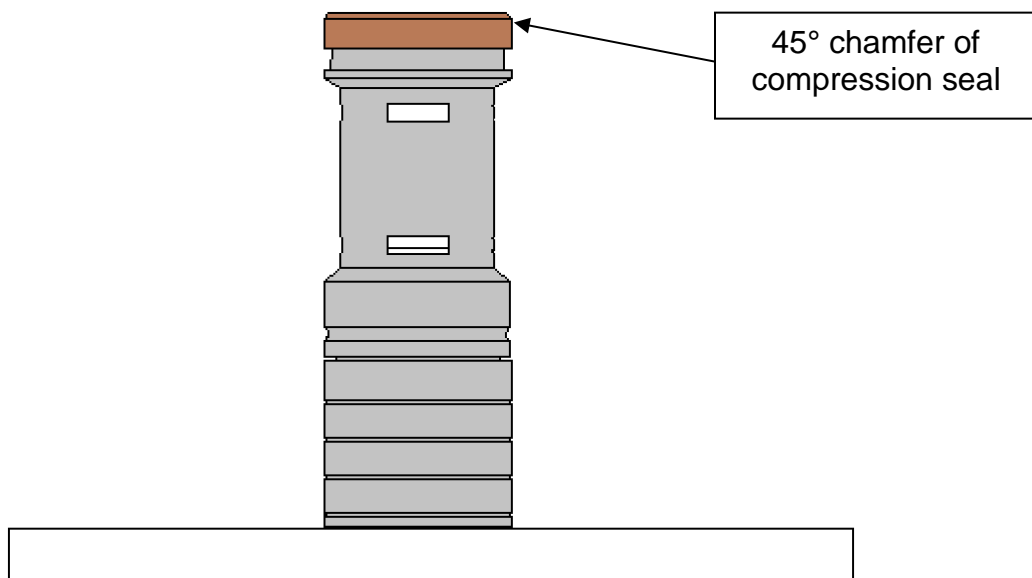


Figure 5: Compression Seal Placement

- 3.5.5 Install the new insert in accordance with section 3.1.

- 3.5.6 If the compression seal has been pushed on the insert nose too far so that the outer diameter of the compression seal is **over** the maximum outer diameter, then the compression seal should be removed as indicated in section 3.5.1 and reapplied as indicated in Steps 3.5.2 – 3.5.6. In most cases the compression seal has only experienced a bit of elastic deformation and gently removing and reapplying the seal will allow the outer diameter to return within tolerance. If the compression seal outer diameter remains over the maximum outer diameter tolerance after repeated attempts to reapply, the compression seal should be discarded, and a replacement compression seal should be used.

3.6 Extraction of the Valve and Compression Seal

- 3.6.1 To remove the valve from the installation hole, thread the appropriate extraction tool into the pin and extract the pin.

Note: There are four methods to remove a Lee Insert Pin. The preferred methods use Lee pin jacking tools, where the extraction forces react against the rear of the insert. The two types of pin jacking tools available are the Rivet Tool and the T-Handle. At times the bolt and striker method may remove the insert with the pin. This may more severely damage the installation hole. The pin jacking tools will prevent the body from being extracted with the pin and therefore leave the installation hole in better condition to receive another insert. For further advice on the best method in any given application contact the cognizant Lee Sales Engineer.

- 3.6.2 Thread the appropriate extraction tool into the insert body. Using a bolt and striker, extract the insert.

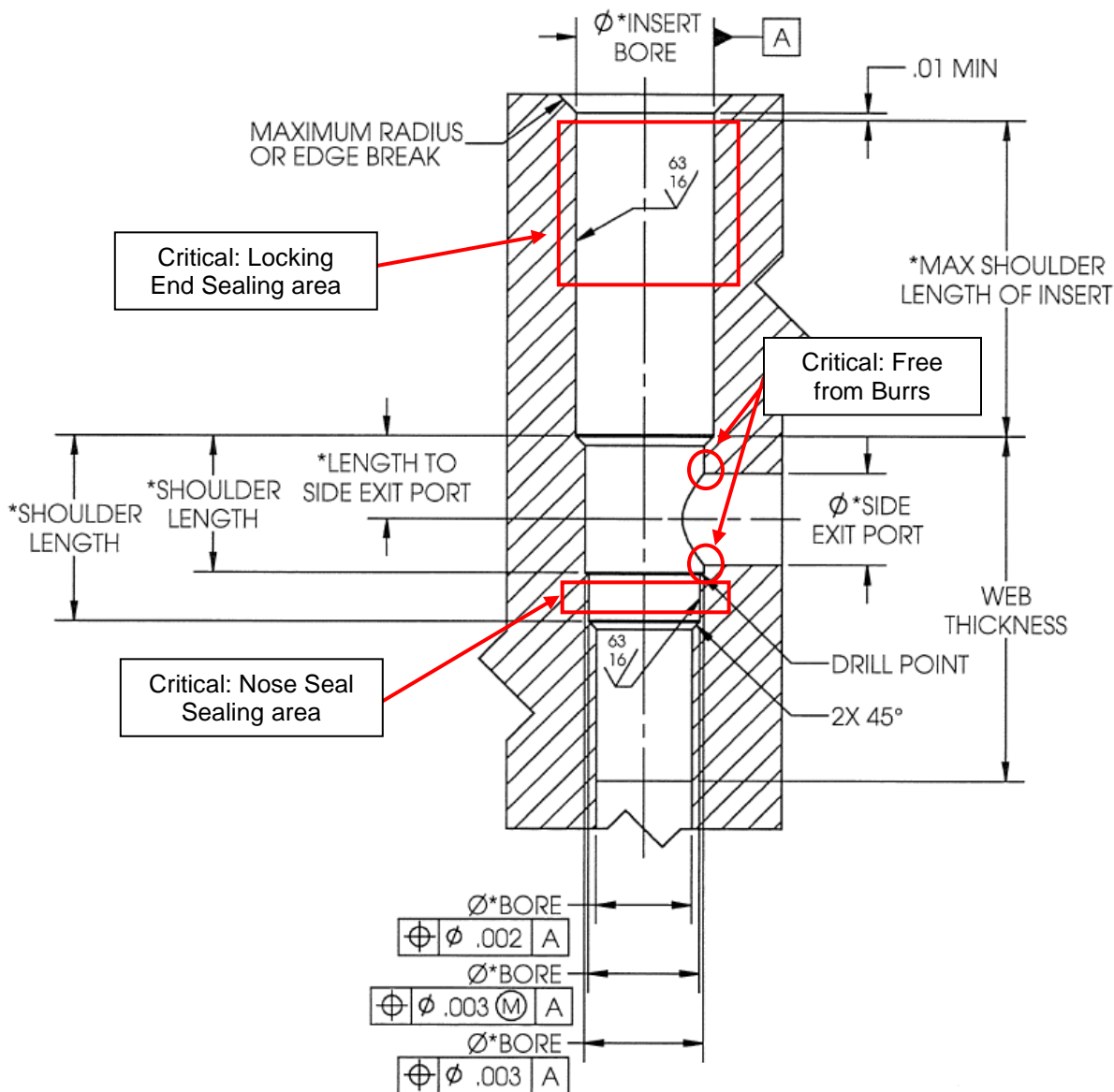
Note: Using the correct tooling will help prevent the installation hole from becoming damaged or contaminated. Installation holes should be inspected after extraction since it is frequently possible to reuse the installation hole directly without machining to the next oversize. A new pin should always be used.

- 3.6.3 Extract the compression seal from the installation hole and discard. The seal may only be used once. If the valve is to be reused, a new compression seal is to be used.

Note: The compression seal may stay installed on the nose of the insert when the valve is extracted but will often remain in its position at the bottom of the installation hole. When extracting the seal, care should be taken to avoid damaging the critical sealing areas of the installation hole, so it can be re-used.

4.0 Nose Seals

Prior to installation of the valve, the installation hole should be verified to meet the requirements specified per the appropriate Lee drawing. Specifically, in the critical areas identified (Figure 6 & 7). If the installation hole does not meet the specified requirements, it can negatively affect valve performance or prevent the valve from being successfully installed.



* SEE APPROPRIATE INSPECTION DRAWING FOR DIMENSIONS.

Figure 6: Installation Hole Critical Sealing Areas

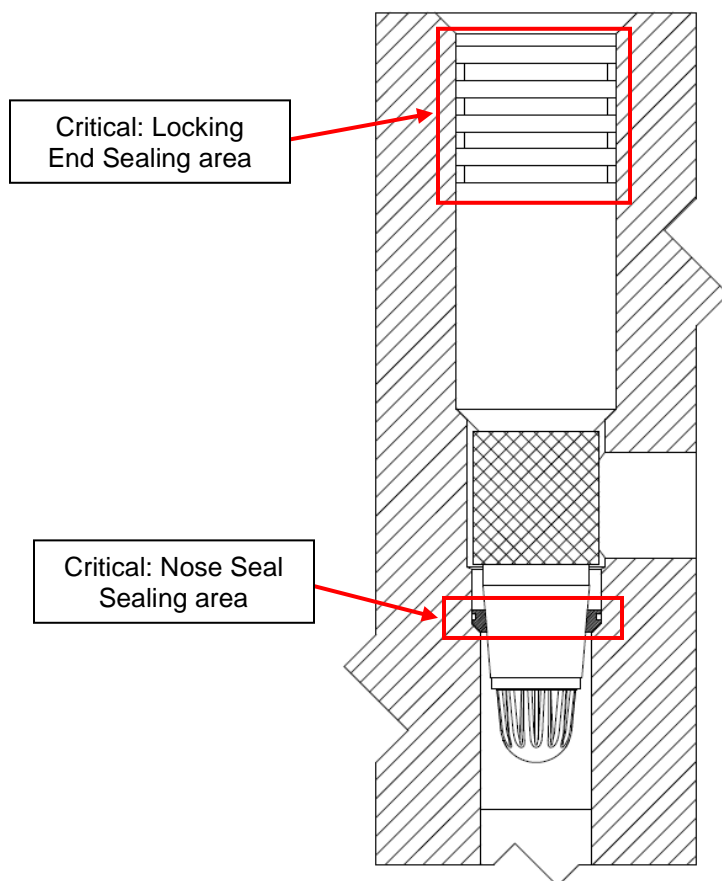


Figure 7: Valve Installed in Installation Hole

4.1 Installation of an Insert that uses a Nose Seal

- 4.1.1 After removing the valve from the packaging, verify the nose seal is appropriately orientated on the insert nose. The 45° chamfer of the nose seal should be facing out (Figure 8).

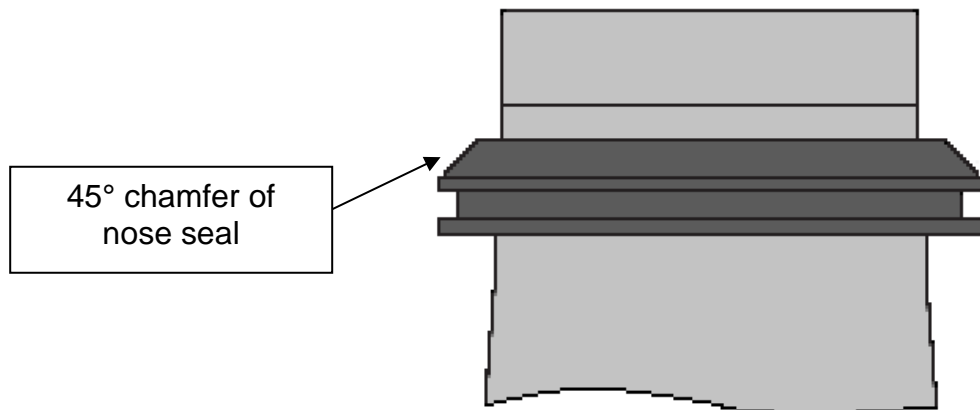


Figure 8: Nose Seal Placement

- 4.1.2 The insert can now be placed into the installation hole. Care should be taken to avoid damaging the nose seal while handling and placing the nose seal into the installation hole.
- 4.1.3 Generally, the nose seal will be firmly placed and fixed on the taper on the nose of the insert. In the event the nose seal has fallen off or is loose after removing the packaging, the nose seal should be placed back on the insert nose. See Section 4.5 for removal and application of nose seals.

4.2 Pre-load

- 4.2.1 Ensure that the valve, installation hole, and installation tool the preload will be applied with, are all properly aligned.
- 4.2.2 Apply an axial preload to the installation tool to the force specified per Note 1 on the Lee drawing.

Note: The pre-load is necessary to ensure the nose seal will be expanded up the taper of the insert nose. This expansion creates the stress necessary for an effective seal.

4.3 Pin Installation Using Threaded Tooling

- 4.3.1 Thread the pin onto the pin installation tool so that the chamfered end of the pin faces away from the tool. Be sure that the pin is threaded until it has bottomed out on the tool. This is to prevent overstress of the pin and tool threads during installation.
- 4.3.2 Firmly support the manifold in which the valve is to be installed into. Place the pin inside the locking end of the insert and ensure the installation tool, valve and installation hole are properly aligned.
- 4.3.3 Apply an axial force to the pin installation tool until the back of the pin (Surface B) is flush within 0.005 inch (0,13mm) to the back of the insert body (Surface A).
- 4.3.4 Remove the pin installation tool and inspect the pin flushness.

4.4 Pin Installation Using Thread-less Tooling

In some instances, it may be advantageous to use thread-less installation tooling based on the pin design and/or boss material that the insert is being installed into.

- 4.4.1 Place the pin into the rear of the valve insert so that the chamfered end or smallest diameter of the pin rests in the insert locking end inner diameter.
- 4.4.2 Center and then seat the pin installation tool on the back of the pin. Ensure that the pin has bottomed out on the tool to prevents improper seating which could lead to damage to the pin or improper installation.

4.4.3 Apply an axial force to the pin installation tool until the back of the pin (Surface B) is flush within 0.005 inch (0,13mm) to the back of the insert body (Surface A) per Note 1 on the Lee drawing.

4.4.4 Remove the pin installation tool and inspect for flushness.

4.5 Removal and Application of the Nose Seals

As indicated on Note 1 of all Lee 3-port insert drawings, the nose seal is a replaceable item. In the event a nose seal is lost, damaged, or has been previously used in an insert installation, a replacement nose seal may be purchased and installed onto the valve insert by the customer. There is no need to return the valve for installation of the replacement nose seal onto the valve insert. To remove a nose seal and apply a new nose seal, follow the procedure identified in this document.

4.5.1 If necessary, a nose seal should be removed from the valve by hand by using three fingers to gently pinch the seal and pull away from the tapered nose of the insert. If the nose seal seems to be expanded up the taper of the insert nose, a finger nail or soft instrument can be used to gently pry the nose seal from the nose of the insert. Care should be taken to avoid damaging or deforming the seals when removing them if they are to be reused.

Note: If the seal is damaged or deformed in the process of removal, that seal should be discarded, and a replacement seal should be used. Additionally, any seal that has been installed with a valve or has been exposed to preload forces should be discarded. Metallic tools should not be used to aid in the removal of the nose seal. These tools may damage not only the nose seal but the taper of the insert nose, which is a sealing surface.

4.5.2 To apply a new nose seal, take the insert and place the face of the locking end on a level work surface so that the tapered nose of the insert faces upward (Figure 9).

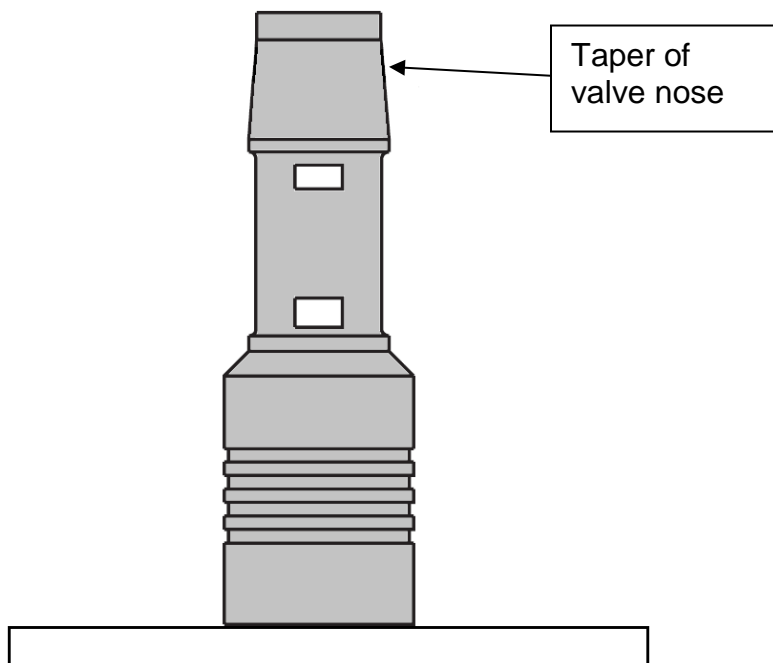


Figure 9: Insert orientation

- 4.5.3 Gently take the replacement nose seal in hand, taking care not to squeeze or deform the seal.
- 4.5.4 Gently place the nose seal on the tapered nose of the insert with the 45° chamfer upward as indicated in Figure 10, so that only a minimal amount of force.

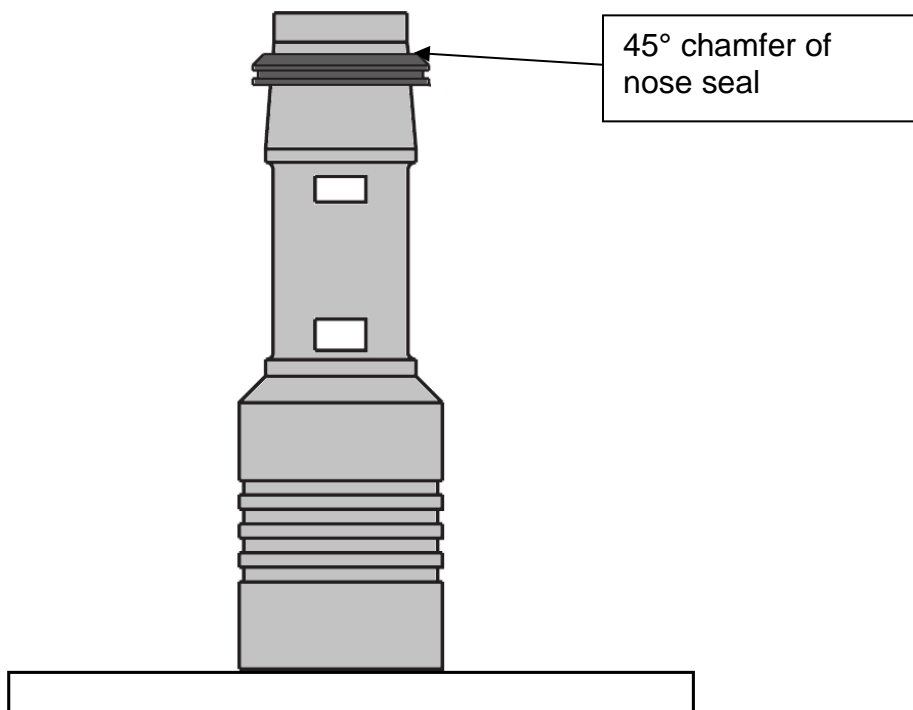


Figure 10: Nose Seal Placement

4.5.5 Install the new insert in accordance with section 4.1.

Note: Although not likely when applying the nose seal to the insert by hand, it is possible to over expand the nose seal. Once the nose seal is applied to the insert, ensure the outer diameter is not expanded beyond the maximum outer diameter noted on the Lee drawing. If the nose seal outer diameter is over the maximum outer diameter tolerance and does not fit into the installation hole, the nose seal should be discarded, and a replacement nose seal should be used.

4.6 Extraction of the Valve and Nose Seal

4.6.1 To remove the valve from the installation hole, thread the appropriate extraction tool into the pin and extract the pin.

Note: There are several methods to remove a Lee Insert Pin. The preferred methods use Lee pin jacking tools, where the extraction forces react against the rear of the insert. The two types of pin jacking tools available are the Rivet Tool and the T-Handle. At times the bolt and striker method may remove the insert with the pin. This tends to severely gall the installation hole. The pin jacking tools will prevent the body from being extracted with the pin and therefore leave the installation hole in better condition to receive another insert. For further advice on the best method in any given application contact the cognizant Lee Sales Engineer.

4.6.2 Thread the appropriate extraction tool into the insert body. Using a bolt and striker, extract the insert.

Note: Using the correct tooling will help prevent the installation hole from becoming damaged and contaminated. Installation holes should be inspected after extraction since it is frequently possible to reuse the installation hole directly without machining to the next oversize. A new pin should always be used.

4.6.3 Having already extracted the insert, extract the nose seal from the installation hole. Thread the nose seal extraction tool assembly such that the sleeve is not expanded by the end of the tool body and the threads are still engaged. Slide the striker onto the tool and insert the tool into the installation hole until the head of the sleeve is through and beyond the nose seal. Thread the tool assembly together expanding the end of the tool sleeve. Lightly tap the nose from the hole with the striker. Reference Lee process specification 187.

Note: The nose seal may stay installed on the nose of the valve when the valve is extracted but will often remain in its position at the bottom of the installation hole. When extracting the seal, care should be taken to avoid damaging the critical sealing areas of the installation hole, so it can be re-used.