The TRI-FUNCTIONAL™ Bush (TFB™) is a key factor in both ride quality and roll stability of Hendrickson INTRAAX® and HT™ suspensions. The bush voids allow articulation that provides exceptional control during turning and roll events. The design of the bush and the void contours enhance the axle’s ability to act as a torsion bar resisting trailer roll forces.

Under no circumstances should a shaker table or extended iron pry bar be used as a method to determine the functionality or serviceability of a TRI-FUNCTIONAL Bush. A Shaker Table is merely demonstrating the ability of the TFB to absorb the primary road forces, whilst an iron bar is compressing the TFB at the void area.

Depending on the age of the suspension, the used bush may experience various states of fatigue that could include surface cracks or cracks forming between voids. However, the pivot bush may still have many years of service life remaining. Therefore, functionality and serviceability of the Hendrickson TFB must be determined through the inspection procedures detailed in this publication.

When inspecting the TRI-FUNCTIONAL pivot bushes it is important not to neglect checking the pivot spacer washers. These spacers are designed to reduce bush movement under lateral loads, which therefore minimises compliance steer and is essential for good ride performance.
The void design and material composition of these unique TRI-FUNCTIONAL™ bushes are critical to controlling the horizontal, vertical and roll forces a trailer generates rolling down the road. A key element of the pivot connection, the bush is contained inside the beam with enough compression to allow it to flex but not rotate. Compression of one bush combined with expansion of the opposing bush helps keep wheels on the road during turns and over irregular surfaces.

**Vertical Forces**
- Voids expand and compress to absorb road induced forces allowing optimum suspension articulation without over stressing the axle.
- Ride quality and payload protection surpass other bush designs.

**Horizontal Movement**
- Solid rubber areas resist forward and backward movement to maintain suspension tracking and alignment during braking and acceleration.

**Roll Stability**
- Voids allow increased articulation to provide exceptional control during turning and roll events.
- The special void shapes enhance the axle’s ability to act as a torsion bar, resisting trailer roll forces.
INSPECTION

Periodic inspections are an important part of your air suspension maintenance routine. Of particular importance is the pivot bush, which is housed within the beam assembly’s bush tube. All such inspections should include an evaluation of all pivot bushes on the trailer.

Hendrickson does not recommend disassembling the pivot connection to inspect the pivot bush. The recommended procedure is to make measurements of the relationship between the beam tube and the frame bracket.

On an unloaded trailer, measure from the bottom of the beam assembly to the bottom of the frame bracket as shown below.

- If the measurement at A is less than or equal to the 19 mm, then the bush is OK.
- If A is greater than 19 mm, then the pivot connection must be disassembled and the beam assembly lowered to more closely inspect the bush.
It is important to take the measurement at the correct position, to get an accurate reading. Place a straight edge or steel ruler across the frame bracket, underneath the pivot bolt, just past where the beam assembly is welded onto the bush tube. (Refer diagram below). A measurement should then be taken between the straight edge and beam assembly.

The pivot bush can be inspected from underneath the trailer without disassembling the pivot connection. With the trailer wheels chocked and the trailer properly supported, look up at the bush tube and inspect the side of the tube that offers more access, or in other words, has the larger gap between the bush tube and the frame bracket. Use a screwdriver to push the bush tube spacer against the frame bracket and out of the way so a portion of the pivot bush can be seen. Use a torch to illuminate and inspect the end of the pivot bush.

During this inspection, look specifically at the bush voids (the "cavities" or "holes" in the end of the rubber bush material). In most cases, it will not be possible to clearly see both top and bottom voids, but enough of the bush can be seen to make an evaluation. By design, the bush voids will be at the 12-o’clock and 6-o’clock positions (±5 degrees) when the suspension is at the designed ride height.

NOTES:

- Trailer Must Be Unloaded before Measuring.
- Check the bush for movement with a large metal bar is not a true gauge of bush serviceability, because the TRI-FUNCTIONAL™ bush is designed to ‘give’ in service.
- Mechanical testing devices, such as shaker tables, cannot be used to check TRI-FUNCTIONAL bushes due to their inherent elasticity.
The pivot bushes will typically "settle" in the vertical direction upon suspension installation. It is normal for the voids to have this "settled" appearance (Figures B & C) due to cargo and the weight of the trailer loading the bush. However, cracks in the rubber extending between the void and the bush's inner metal or an excessive amount of vertical movement (Figures D and E) can indicate that the bush may need to be replaced.

If you do not see an excessive amount of vertical movement (based upon your normal application and experience) or cracks in the rubber extending between the void and the bush’s inner metal, then no further inspection is required at this time. The bushes are in a serviceable condition.

The appearance of smeared blackened rubber or hanging strands of rubber around the bush tube edges or bush tube spacers is a sign the bush is heating up and melting. The source is likely to be continuous rapid vibration induced into the bush through the beam. It is usually caused by an imbalanced wheel-end on the same side as the affected bush. A wheel-end can be out of balance due to a number of reasons that will require further inspections for diagnosis. These reasons may include issues with the tyre(s), improper assembly, dropped or out-of-round drum, mud or debris collected on the rim and non-functioning shock absorber.

**SPACER INSPECTION**

Periodic inspections of the TRI-FUNCTIONAL™ bush tube spacers are an important part of your air suspension maintenance routine. A typical inspection should include an evaluation of all bush tube spacers on the trailer.

Visually verify that the bush tube spacers are intact and that they are not missing, cut, worn through or otherwise deteriorated. Due to the pivoting motion inherent with this connection, some bush tube spacer wear is expected. Bush tube spacer "cupping", where the bush tube spacer forms around the bush tube and resembles a shallow dish, is also normal. If you see these conditions, then no further inspection is required at this time. Your bush tube spacers are in serviceable condition.
However bush tube spacer “wear through”, where the bush tube spacer is completely missing or has been cut or worn-through, is considered abnormal. If these conditions exist, a closer, more detailed inspection is required to prevent more serious or costly problems and to prolong the life of the suspension.

**NORMAL**
Serviceable

An example of a normal bush tube spacer in a good and serviceable condition.

**CUPPED**
Serviceable

An example of a cupped bush tube spacer. Friction-generated heat causes the spacer to form or cup around the bush and tube. This is normal and serviceable provided that the bush tube spacer remains intact and does not become cut or worn-through.

**WORN THOUGH**
Unserviceable

Examples of worn-through bush tube spacers. This spacer is an example of extreme wear. Its circumference has been completely trimmed by the bush tube. The spacer is not in serviceable condition.

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**Revisions Table**

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<td>Rev D</td>
<td>2, 3</td>
<td>Amended point of measurement to between hanger and beam assembly.</td>
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<td>Update text &amp; add spacer inspection and wheel end balance detail.</td>
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