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# TRAILER AIR SUSPENSIONS

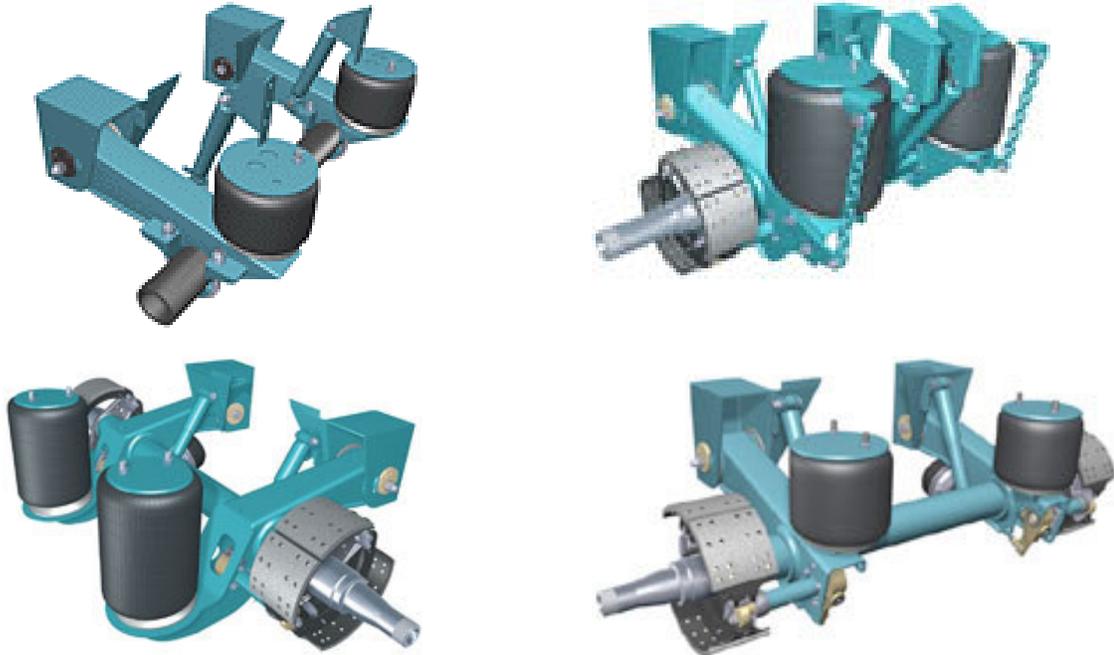
# H TECHNICAL BULLETIN

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## TRAILER SUSPENSION MAINTENANCE



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*Information contained in this literature was accurate at the time of publication, Product changes may have been made after the publication date that are not reflected here*



### INTRODUCTION

Hendrickson Trailer Suspension Systems (Hendrickson) designs its suspension systems to safely provide a long life and low-maintenance operation. The suspensions exhibit excellent ride characteristics under all legal load conditions.

Your suspension was chosen to give your trailer the best ride, the correct load-carrying capability, and the required amount of roll control for your vehicle.

Hendrickson trailer air suspensions are manufactured in modern, quality-oriented facilities. Great care is taken to ensure that our customers receive the best product value for their purchasing dollar.

Hendrickson trailer air suspension systems deliver durability with a light-weight, simple, and trouble-free design.

The suspensions will cushion the trailer, cargo and the driver with a quality ride not attainable without a Hendrickson air-suspension system. Hendrickson supplies a wide variety of trailer suspension designs to meet your application needs.

Each suspension system is intended for use in specific applications with maximum load capacities. For a complete listing of Hendrickson products, contact your Hendrickson representative.

### HENDRICKSON SUSPENSION FEATURES

#### TRI-FUNCTIONAL<sup>®</sup> BUSHING

The TRI-FUNCTIONAL BUSHING (*located at the suspension pivot*) controls vehicle roll- and axle-alignment, yet allows easy up-and-down travel. It also controls forces generated by braking, accelerating and irregular road surfaces.

Cavities located at top and bottom absorb vertical movement.

Solid rubber is moulded around steel centre sleeve and absorbs horizontal and lateral movement.

The cavities elongate to absorb forces as the vehicle turns and increase roll stability. The bushing and suspension pivot are virtually maintenance free.

#### RIGID-AXLE CONNECTION

The trailer axle is welded directly to the suspension beam.

This design has no flexible connections, which may lead to maintenance or replacement due to instability.

The HT series axle connection is also U-bolted.

The INTRAAX<sup>®</sup> axle connection is integrated to the suspension beams with a patented "axle wrap"; circular welded to neutral axis.

The beam mounting surface is machined and is continuously welded to the axle wrap, eliminating axle seats and U-bolts.

The INTRAAX<sup>®</sup> rigid-axle connection provides outstanding roll stability, maintains axle alignment to beam, and contributes to a straighter axle tube and controlled toe alignment.

#### ROLL STABILITY

The TRI-FUNCTIONAL BUSHING and rigid-axle connection result in a roll-stable installation.

The trailer floor remains level, even when offset loading occurs, while using only one height control valve per trailer.

#### SOFT RIDING

The air springs and TRI-FUNCTIONAL<sup>®</sup> BUSHINGS support the trailer load, while absorbing road shocks.

This softer ride protects the driver, cargo and vehicle; it also provides longer vehicle life and greater driver comfort.

#### LOAD CONTROL

The single height control valve assures an evenly distributed load across all air-ride axles when properly installed.

With the exception of tyre deflection, the trailer's ride height remains constant whether loaded or unloaded.

## TRAILER SUSPENSION SYSTEM MAINTENANCE

### DURABILITY

Hendrickson air suspensions and their components have been thoroughly tested to provide a long life that is virtually maintenance free.

The sturdy construction of Hendrickson trailer air suspensions has a history of proven durability.

### RIDE HEIGHT

Ride height is the measurement from the suspension mounting surface to the centre of the axle.

All Hendrickson trailer air suspensions are designed to operate at a specific ride height.

Care must be taken to ensure the correct loaded suspension ride height is maintained throughout the trailer's usage.

To determine the ride height of your Hendrickson trailer suspension, consult Technical Bulletin No: 97117-151

Changes in ride height affect the air spring height, which in turn, changes the suspension's load carrying capabilities.

To provide an equal loading of the axles, Hendrickson trailer suspensions are intended to be used at ride heights which maintain equal air spring heights throughout the application.

### NOTE

**Operating a suspension at an incorrect ride height can result in improper loading and can shorten the service life of the suspension.**

**Hendrickson is not responsible for components which fail due to incorrect ride height settings.**

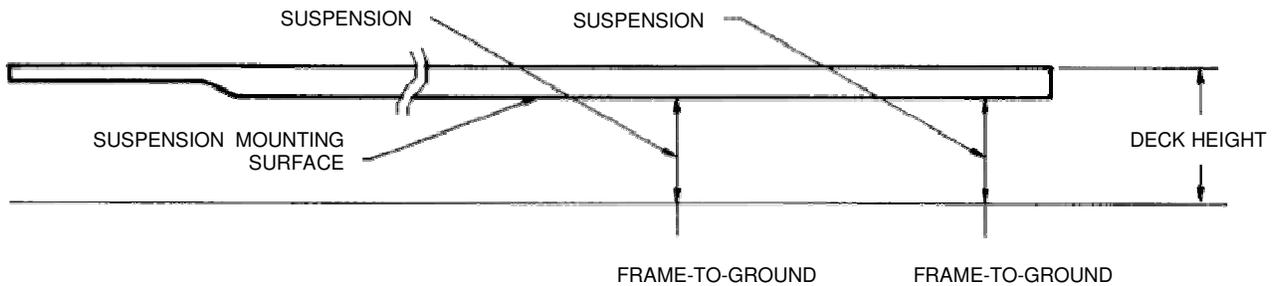


Figure: 1 Frame-to-ground-height

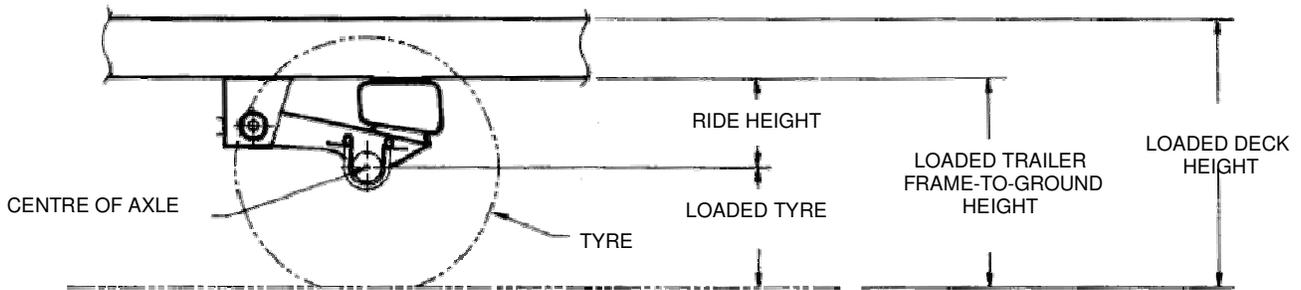


Figure: 2 Trailer Deck Height

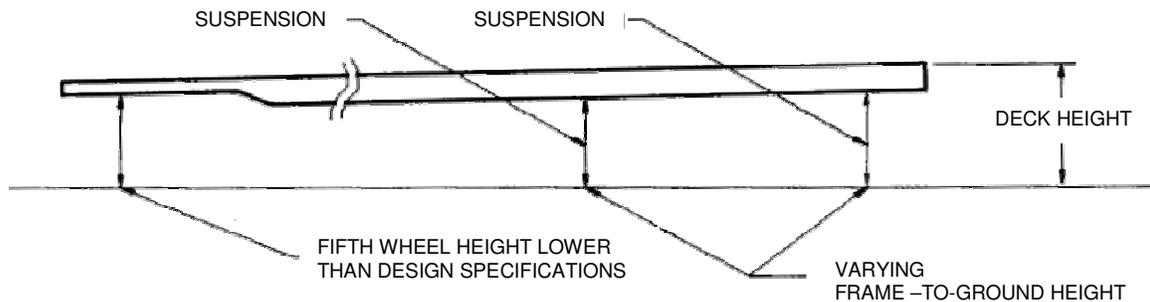


Figure:3 Fifth Wheel Height

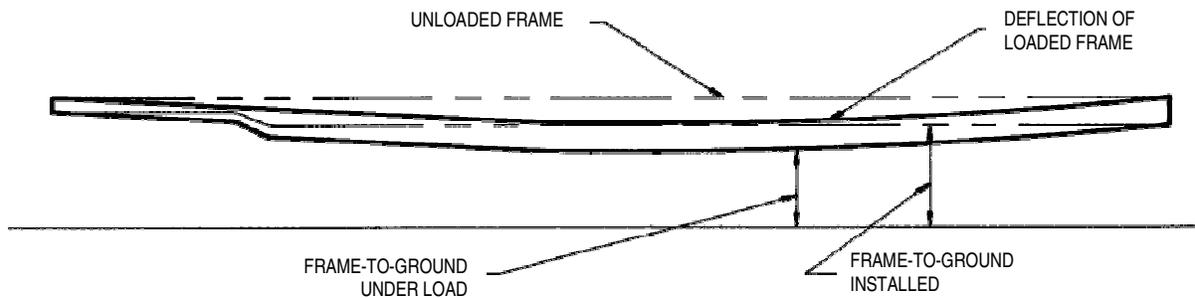


Figure: 4 Frame Deflection

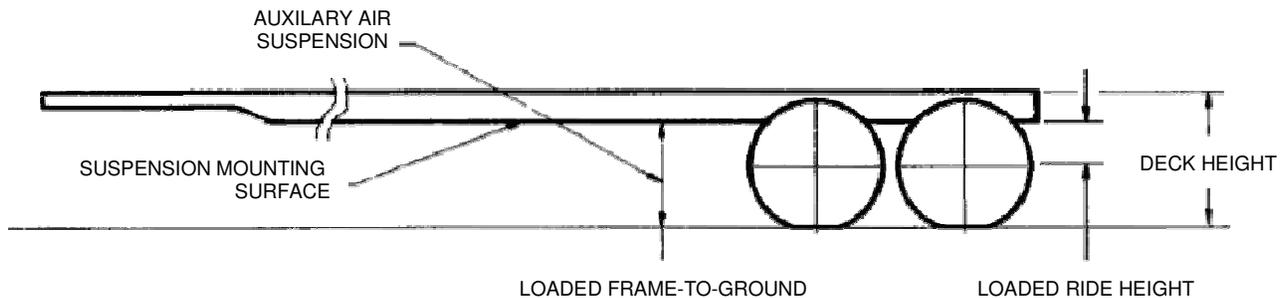


Figure: 5 Frame-to-Ground height

### FACTORS AFFECTING RIDE HEIGHT

The following features need to be considered when determining ride height:

#### FRAME-TO-GROUND HEIGHT

The height from the bottom of the trailer frame (or suspension mounting surface) to the ground must be determined at each suspension location (Figure 1). This dimension provides the desired trailer deck height.

#### TRAILER DECK HEIGHT

The suspension ride height is calculated by subtracting the LOADED tyre radius from the LOADED frame-to-ground height.

The radius of the tyre will decrease as the trailer is loaded due to tyre deflection, which in turn, affects the trailer deck height (Figure 2).

The tractor fifth wheel affects the height of the trailer frame. (For example: a low fifth wheel height would cause the trailer frame to slope downward.)

Variations in the fifth wheel height will result in variations of suspension ride heights.

The correct suspension ride height must be determined at each suspension location (Figure 3).

When ride height variations are required, consult the Trailer Manufacturer to evaluate load equalization capabilities.

#### FRAME DEFLECTION

Deflection of the trailer frame when loaded must be considered.

Frame deflection will result in a suspension ride height different from the installed ride height.

The correct suspension ride height must be determined at each suspension location (Figure 4).

#### FRAME-TO-GROUND HEIGHT (LIFT AXLES)

The height of the bottom of the trailer frame (or suspension mounting surface) from the ground must be determined at each suspension location (Figure 5).

This dimension must provide the desired LOADED deck height.

## TRAILER SUSPENSION SYSTEM MAINTENANCE

### SUSPENSION TRAVEL

Hendrickson Trailer Suspension Systems uses these terms to define the suspension travel:

**Jounce** = Maximum amount of upward axle movement allowed by the suspension (Figure 6).

**Rebound** = Maximum amount of downward axle travel allowed by the suspension (Figure 6).

When selecting a suspension, the amount of axle travel must be considered in both the loaded and unloaded conditions.

Unloaded, the suspension rebound must not be less than 2".

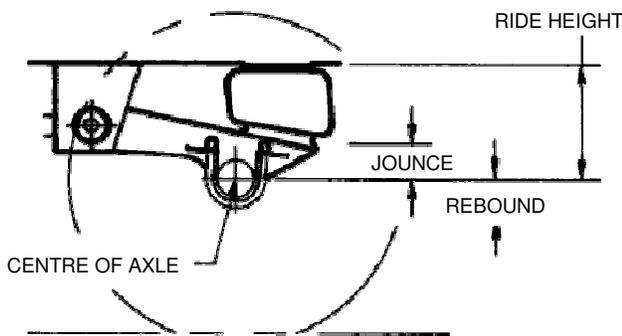


Figure: 6 Suspension Travel

### TYRE CLEARANCE

In selecting a suspension, the trailer's tyre clearance must be used to determine the maximum suspension jounce permitted by the trailer design.

Hendrickson specifies that the tyre clearance above the jounce requirement must include One inch for the "HT" series and INTRAAX® models (Figure 7).

A Two inch clearance is specified between the trailer frame and inside tyre inboard sidewall.

This will provide sufficient clearance to allow for tyre distortion and axle walk.

*Example:*

*3" Jounce +1" Clearance for the "HT" Series and INTRAAX® model and 4" of space required above the tyre at ride height.*

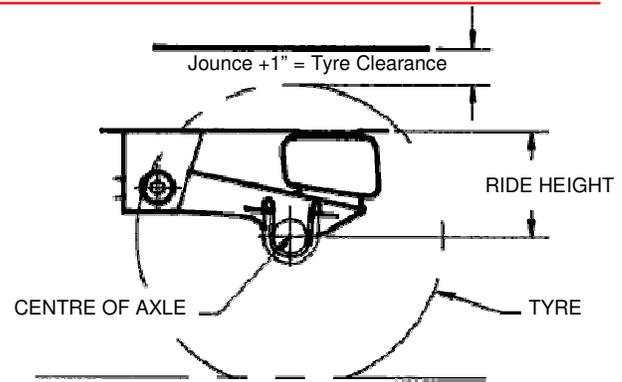


Figure: 7 Tyre Clearance

The top dimensions in Figure 8 are for 35-inch suspension beam centres.

The bottom dimensions (*in parentheses*) are for 41-inch suspension beam centres.

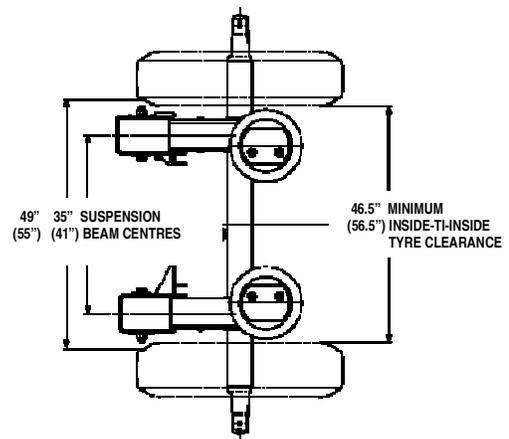


Figure: 8 Inside-to-Inside Tyre Measurements

If the potential exists for tyre interference, install the QUICK-ALIGN shear type pivot bolt from the outboard side of the frame bracket

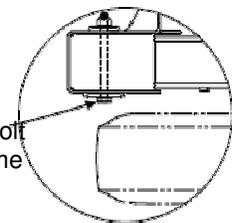


Figure: 9 Alternative Installation of the QUICK-ALIGN Pivot Bolt

## TRAILER SUSPENSION SYSTEM MAINTENANCE

### LIFT SUSPENSIONS

Hendrickson offers lift kits, which when added during a trailer suspension installation, provide a lifting capability (*Figure 10*).

Only those suspensions with a minimum of 4" of jounce are approved for use with a lift kit.

Hendrickson's suspension jounce dimension includes an allowance for air spring bumper compression.

As a result, the amount of lifted up travel will be less than the jounce.

The suspension lift distance indicates the amount of axle up travel.

The resulting clearance under the tyre will vary depending on both frame and tyre deflection

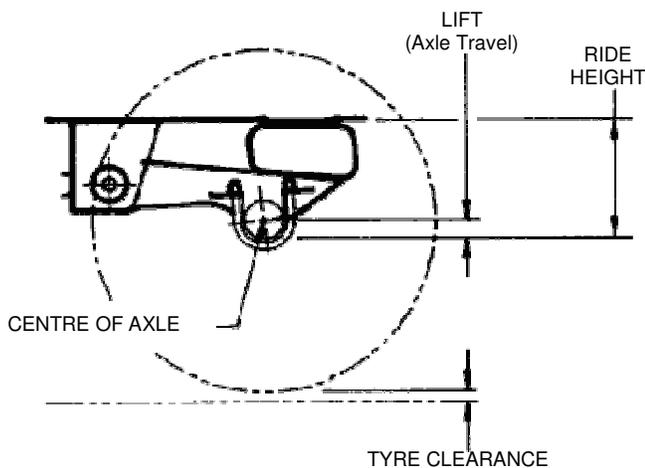


Figure:10 Lift Suspensions

### AIR CONTROL SYSTEM

Many types of air controls are available for Hendrickson trailer air suspensions.

The most common system automatically regulates the designed ride height by controlling the air pressure supplied to air springs.

If using axle lifts or other special features, other air control circuits and components are added.

All systems operate from the compressed air supply of the vehicle.

The pressure in the air springs controls the height or load on the axle.

The diagram (*Figure 11*) illustrates a typical air control arrangement in use with a Hendrickson trailer air suspension.

One height control valve controls any number of primary air suspensions.

Contact the Trailer Manufacturer for specific information about your trailer air control system.

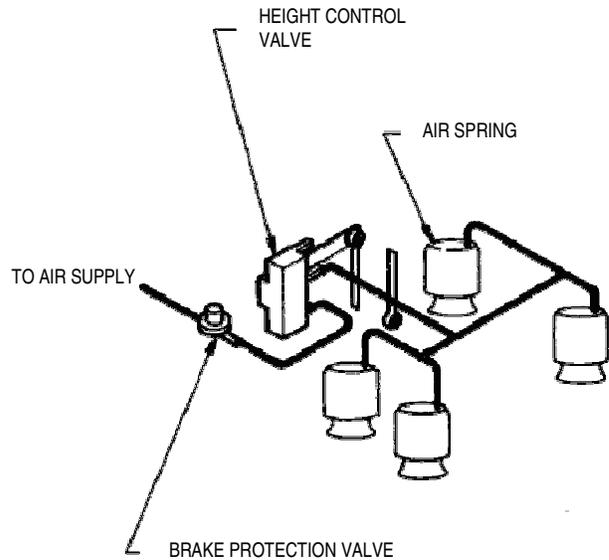


Figure: 11 Height Control Valve

### HEIGHT CONTROL VALVE

The height control valve on the Hendrickson trailer air suspension automatically responds to the relative position of the axle and vehicle frame. It metres air into or out of the air springs.

Variations in load or temperature only affect the adding or exhausting of air.

Since the Hendrickson trailer model air suspension is a mechanically stable suspension, only one height control valve is necessary per trailer; this grouping can include two, three, four or more axles.

This system is less complex, less expensive and less troublesome than competitive systems.

In addition, it provides a safer system should an air spring blow-out occur.

Hendrickson generally recommends that the height control valve be positioned on the rear axle on tandem axle arrangements and on the centre axle of tri-axle arrangements.

When the actuating lever of the height control valve moves up, the valve opens and connects the air supply to the air spring.

## TRAILER SUSPENSION SYSTEM MAINTENANCE

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When the actuating lever moves down, the valve shuts off the air supply and opens the exhaust port to vent excess air from the air springs.

During routine maintenance, make sure the exhaust port is clear of contamination.

A check valve prevents the loss of air brake pressure if the air supply fails.

In the central position, air does not flow in or out of the air springs.

### AIR DUMP VALVES

Air dump (*or exhaust*) valves increase stability during the loading and unloading of the trailer, as well as prolong component life.

The valves can be controlled automatically or manually.

When suspension air is exhausted, Hendrickson trailer air suspensions limit the suspension up travel (*jounce*) by a rubber bumper located inside the air spring.

The air-spring bumpers adequately support the rated suspension capacity with all the suspension air exhausted.

Hendrickson approves using air dump valves only when the control exhausts all the trailer air springs.

Also, use of the air dump control is approved for the following situations:

- *A trailer parked for any length of time, loaded or unloaded, either when connected to the tractor or supported by the landing gear legs.*
- *A trailer being loaded or unloaded, particularly when fork lift trucks are used.*
- *A dump trailer during the dump mode only.*
- *A trailer experiencing a sudden off loading of cargo, such as steel removed with a crane.*

Any variation beyond these conditions must be approved in writing by Hendrickson Engineering Department.

### CAUTION:

**Due to the geometry of all trailing beam air suspensions, the trailer moves forward when air exhausts from the suspension and trailer brakes are locked.**

**When supported by the trailer's landing gear, this movement may damage or collapse the legs.**

**Variations in trailer deck height and, therefore, the suspension ride height will cause the longitudinal movement of the trailer.**

**When loading and unloading the trailer, the changes in the load supported by the suspension will cause the deck height**

**to change, this change results in the trailer moving away from the loading dock.**

**Unless the air is properly exhausted from the air suspension, the above movement can damage or collapse the trailer landing gear, as well as result in a potentially dangerous gap between the trailer and the loading dock.**

### PERIODIC INSPECTION SCHEDULE

The Hendrickson trailer air suspension requires very little attention.

Your air suspension may well last the life of the vehicle by using the information in this Bulletin and other Hendrickson technical Bulletins. (*See also Technical Bulletin No: 49441-295*)

### ORIGINAL INSTALLATION INSPECTIONS

The vehicle manufacturer is responsible for completing the installation to Hendrickson specifications. In your review of the vehicle for the first time, check the following:

- *trailer is level*
- *all welds are of acceptable quality*
- *all bolts are in place and secure*
- *no component interferences exist*

### DAILY INSPECTIONS

A quick look to verify a level trailer that is riding at the correct ride height is suggested.

This inspection will help you find any obvious problems.

A closer inspection can detect broken or loose parts before any serious problems appear.

### 30-DAY INSPECTION

At 30 days, inspect clearances around air springs for abrasion or cracks, shock absorbers for leaks and bush wear, all other moving parts.

Evidence of part interference requires immediate attention by a qualified mechanic.

The 30-day inspection includes the following checks:

- *bolts are secure*
- *axle connections are tight*
- *any sign of wear*

### 90-DAY INSPECTION

At 90 days, thoroughly check all items that were inspected at 30 days. The 90-day inspection also includes these items:

- *all welded connections for signs of deterioration*
- *frame attachment joints, cross member structures and all pivoting and clamping connections for problems*

## TRAILER SUSPENSION SYSTEM MAINTENANCE

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Early detection and correction of problems can save expenses and prolong the life of your trailer.

It is unlikely that you will find any problems with your Hendrickson air suspension during these inspections. However, your careful attention to these periodic inspections can save a great deal of time and expenses by avoiding unexpected difficulties in remote locations.

If you have any questions about the suspension area, call the trailer manufacturer or a Hendrickson Authorised Repairer.

### QUIK-ALIGN® INSPECTION

Inspection of the QUIK-ALIGN occurs at 5,000 Kilometres and at every lining change.

### WHEEL END MAINTENANCE

#### 10,000 Kilometres

Visually inspect seal and hub cap for leakages and hub oil level (if oil bath type).

Further information is available in Technical Bulletin No: L496 and 97117-147

#### 12 MONTHS OR 160,000 Kilometres

At 12 months or 160,000 Kilometres, whichever occurs first, visually inspect seal and R&I hub cap.

Visually inspect for contaminants, check wheel bearing adjustment, install new oil, if oil filled, and replace hub cap gasket and re-torque the hub cap bolts.

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### IMPORTANT:

**Brakes should be released before lubricating the S-Cam & Tube.**

## SUSPENSION SYSTEMS MAINTENANCE

By correcting minor problems when found, your Hendrickson air suspension will provide excellent service throughout your trailer's life.

This section will help you to determine what to expect from your suspension components and the proper maintenance procedures.

### RIDE HEIGHT ADJUSTMENT

1. Connect the vehicle to a compressed air supply with approximately the pressure of the normal supply system.
2. Ensure the inflation of the air springs.
3. Measure the ride height by using this method:
  - a. Measure from the underside of the trailer frame to the top of the axle
  - b. Add 2-1/2" (half the diameter of the axle) to the measurement

**Example:** 11-1/2" to the top of the axle with the 2-1/2" equals a 14" ride height

4. Raise or lower the trailer as necessary, so it is at the designed ride height.
5. Once the trailer is set at the correct designed ride height, set the HCV lever to the neutral (central) position.
6. Adjust the HCV linkage to fit between HCV lever and lower linkage attachment.

### IMPORTANT:

**When adjusting the height control valve, block the tyre and release the trailer brakes. The axle must rotate freely to avoid a false reading.**

**Some height control valves have very small openings and a time delay of as much as 15 seconds.**

**Allow sufficient time for the system to react to the adjustment. The response time will appear to be lengthy, but be patient.**

Once set to the designed ride height, test drive the trailer.

After the test drive, check the ride height to assure an accurate adjustment.

Notice that the use of one height control valve removes the requirement for synchronization found with most other air suspension systems.

This feature will save you time and expense in servicing your air system.

### AIR SPRING

Air springs will last almost indefinitely in most applications.

However, air springs will fail quickly when rubbed, scuffed, or punctured. If an air spring fails, the trailer will settle on the internal rubber bumpers, so you can proceed to the nearest service facility at a lower speed.

## TRAILER SUSPENSION SYSTEM MAINTENANCE

You should try to determine the cause of a failure, so you can avoid a costly repeat of the problem.

To replace an air spring, follow these steps:

1. Exhaust all air from the suspension system
2. Raise and support the vehicle in a safe manner
3. Unbolt the air spring
4. Disconnect air-supply lines
5. Replace the air spring
6. Bolt the air spring in place
7. Connect the air-supply lines
8. Lower the trailer to the ground
9. Supply air to the suspension system

### IMPORTANT:

Hendrickson trailer air suspension design requires the use of specific air springs and shock absorbers. Only components purchased from Hendrickson or a Hendrickson-approved distributor can be used. Replacement with other components may cause premature failures and void the warranty.

### SHOCK ABSORBER

(See also Technical Bulletin No: 97117-160)

Shock absorbers do not absorb shock; they absorb energy to prevent suspension oscillation.

Shock absorbers are also used as rebound stops in most air suspensions.

The shock absorber limits the stroke of an air spring, which prevents the air spring from being pulled apart.

In some severe service applications, a shock strap is added to additionally aid in limiting the stroke of an air spring.

To replace a shock absorber, follow these steps:

1. Remove the end fasteners
2. Insert the new shock absorber
3. Secure with correct size locknut and bolts
4. Torque fasteners to specification

To keep your trailer legal, Use only Hendrickson shock absorbers for replacements.

### CAUTION:

Do not lift the trailer without the shock absorbers in place. If shock absorbers are not in place, overextension of the air springs will occur. Damage may occur to the overextended air springs.

### PIVOT CONNECTION

A correct pivot connection is crucial to the life of the suspension.

The pivot fastener must continually provide a sufficient clamp load through the bushing to prevent premature suspension failure.

Hendrickson trailer air suspension models come equipped with a QUIK-ALIGN pivot connection hardware.

The hardware consists of a specially plated shear bolt to ensure a proper clamp load, (550 ft-lbs).

### CAUTION:

Failure to properly torque the pivot bolt or tack weld the pivot nut to the bolt will result in loss of warranty coverage.

### TRI-FUNCTIONAL® BUSHING

(See also Technical Bulletin No: 97117-135)

Hendrickson's TRI-FUNCTIONAL® BUSHING has unique properties that will provide years of maintenance-free service.

The TRI-FUNCTIONAL® BUSHING (located at the suspension pivot) provides a resilient connection that allows an axle to walk without excessive flexing.

The TRI-FUNCTIONAL® BUSHING, in conjunction with the rigid axle connection, results in a roll-stable suspension design that resists trailer lean independent of the air spring loading.

There are times when a problem seemingly in the area of the suspension is diagnosed as a failed bushing.

Closer inspection typically reveals another component or a faulty installation is the problem.

If a problem is in the area of the suspension, refer to the TROUBLESHOOTING section.

If a failed bushing is present, contact your Trailer Manufacturer or a Hendrickson Authorised Repairer as re-bushing of a suspension requires the use of a special bushing removal/installation tool and bushing kit, containing the required components for re-bushing.

Refer to Technical Bulletin No: L427 for further information

### IMPORTANT:

Re-bush using only approved tool and the lubricant supplied in the bushing kit by Hendrickson Trailer Suspension Systems.

**TRUBLE SHOOTING GUIDE ON NEXT PAGE**

## TRAILER SUSPENSION SYSTEM MAINTENANCE

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### TROUBLESHOOTING:

#### TRI-FUNCTIONAL<sup>®</sup> BUSHING - COMMONLY MISDIAGNOSED BUSHING PROBLEMS

While the following problems can result from a failed bushing, most often they are the result of the items listed below.

PROBLEM	CAUSE(S)	SOLUTION(S)
<b>TRAILER LEANS...</b>		
<b>Constantly in one direction</b>	Suspension Beams installed out of parallel	<b>HT Models Only:</b> Determine which beam is out of parallel, cut from axle, reposition and re-weld.
<b>Varies from side to side</b>	Axle welds missing or broken	<b>HT Models Only:</b> Clear away old welds, reposition the beams to parallel and re-weld to axle.
		<b>INTRAAX<sup>®</sup> Models Only:</b> Replace the axle beam with a Half-Traax module
Varies in one direction	Pivot Bush failed	Replace Pivot Bushing
<b>TRAILER "DOG TRACKS"...</b>		
<b>Constantly to one side</b>	Trailer Frame not square, King Pin excessively off centre or high crown highways	Realign suspension as per Hendrickson Trailer Suspension Systems and bias the alignment of the axles equally in the opposite direction of the Dog Tracking
<b>Varies from side to side</b>	<b>HT Models Only:</b> Loose Pivot Bolts	Replace alignment collars, Pivot Bolts, Nuts, TRI-FUNCTIONAL <sup>®</sup> BUSHINGS and any worn suspension components.
	<b>All Models:</b> Alignment Collars loose (Quik-Align Pivot Connection)	Replace and Torque Pivot Bolt Kit, Re-align the trailer
<b>To one side under load</b>	Suspension Not Square to the axle	Contact the Trailer Manufacturer
	Air Springs misaligned	Compare the installation to the suspension drawings (available from the manufacturer or a Hendrickson Authorised Repairer)
	Failed Pivot Bushing (Rare, see TB 97117-135)	Replace the Pivot Bushing using the correct tools and method

## TRAILER SUSPENSION SYSTEM MAINTENANCE

PROBLEM	CAUSE(S)	SOLUTION(S)
<b>BUSHING WALK</b>		
The suspension beams have shifted from the centre of the Pivot Bushings,	Suspension beams are out of parallel (vertically or longitudinally)	<b>HT Models Only:</b> Determine which beams are out of position, cut the affected beams from the axle, reposition and re-weld. Replace the Pivot Bushing using the correct tools and method and realign  <b>INTRAAX® Only:</b> Replace the axle/beam weldment with a HALF-TRAAX module.
	Alignment Collars loose at QUIK-ALIGN Pivot Connection	Inspect the suspension hanger, replace if necessary, re-bush the suspension and realign.
	Use of improper bushing lubricant when changing the TRI-FUNCTIONAL® BUSHING	Re-bush using only the lubricant supplied from Hendrickson.
Pivot can be moved vertically	Normal Travel	No Action is required
Bushing Protrudes from the Bushing Tube	Faulty or worn bushing	Replace the Pivot Bushing using the correct tools and method
Grooving or Deforming of Wear Washers	Excessively dirty environment, (i.e. Farming, Construction, Logging, On-Off Highway or Severe Service Applications.	The wear washers act as filler pieces between the hanger and the bushing tube and bushings. The wear washers will show signs of wear due to the movement of the suspension beam during articulation. Replace the Wear Washers

### TORQUE SPECIFICATIONS

Use these torque specifications when installing the fasteners covered below:

COMPONENT	FT-LBS	N*M
QUIK-ALIGN Pivot Connection	505 to 595	685 to 807
U-Bolts (HT-Series)	750 to 825	1017 to 1119
Shock Absorber Bolts	210 to 235	285 to 319
Upper Air Spring Nuts	80 to 100	108 to 136
Lower Air Spring Nuts (HT-Series)	40 to 50	54 to 68
Lower Air Spring Nuts (INTRAAX®)	25 to 35	34 to 37
Brake Chamber Mounting Nut	100 to 110	136 to 149
S-Cam Tube Mounting Nuts	35 to 45	47 to 61
Dust Shield Clamp	95 to 170	11 to 19

#### IMPORTANT:

Torque values are specified for the fasteners in the condition in which they are supplied by Hendrickson.

**DO NOT APPLY ANY ADDITIONAL LUBRICANTS.**

#### CAUTION:

**Over-torquing could result in fastener failure.**