TECHNICAL PROCEDURE

TRAILER AIR SUSPENSION SYSTEMS

SUBJECT: Concepts and Functions

LIT NO: T15001
DATE: September 2013

TABLE OF CONTENTS

Introduction ......................................................................................................................... 2
Hendrickson Trailer Suspension Types ............................................................................... 2
Hendrickson Suspension Features ..................................................................................... 3
Ride Height ........................................................................................................................ 5
Lift Axles ........................................................................................................................... 8
Air Control System ........................................................................................................... 9
Brakes ............................................................................................................................... 13
Trailer Alignment ............................................................................................................ 13
Appendix A: Glossary of Terms ....................................................................................... 14
CONCEPTS AND FUNCTIONS

INTRODUCTION
Hendrickson Trailer suspensions:

- Are designed to provide low-maintenance while operating for a long and safe life. 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.
- Are manufactured in modern, quality-oriented facilities. Great care is taken to ensure our customers receive the best product value for their purchasing dollar.
- 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.

RELATIVE LITERATURE
This document includes a detailed description of concepts and functions of Hendrickson trailer suspension systems. For a complete listing of Hendrickson products and product literature, contact your Hendrickson representative or go online at:

www.hendrickson-intl.com

Available Hendrickson documentation can be viewed or downloaded from this site.

All Hendrickson online documentation are PDF files that require Adobe Acrobat Reader to open. This is a free application downloadable from Adobe’s home page (http://get.adobe.com/reader/).

Other relative literature may include:

<table>
<thead>
<tr>
<th>NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>L578</td>
<td>Inspection and Lubrication</td>
</tr>
<tr>
<td>L707</td>
<td>Application Guide</td>
</tr>
<tr>
<td>L761</td>
<td>Understanding Air</td>
</tr>
<tr>
<td>L843</td>
<td>Air vs. Spring</td>
</tr>
</tbody>
</table>

Relative literature is also included with various topics presented in this document.

CONTACTING HENDRICKSON
Contact Hendrickson Trailer Technical Services for technical assistance as needed. Contact options include.

EMAIL
For Hendrickson Trailer Technical Services, use the following e-mail address:

htts@hendrickson-intl.com

PHONE
Contact Hendrickson in the United States and Canada at 866-RIDEAIR (743-3247). From the voice menu, for technical information, select Technical Services/Warranty.

HENDRICKSON TRAILER SUSPENSION TYPES
Hendrickson, and most other, trailer suspensions fall under two basic categories: spring or air. To compare the two, refer to L843 Air vs. Spring Trailer Suspension Systems. Hendrickson trailer suspension offerings can be found online at

www.hendrickson-intl.com
HENDRICKSON SUSPENSION FEATURES

Hendrickson supplies a wide variety of trailer suspension designs to meet your application needs. Each suspension is intended for use in specific applications with maximum load capacities. Each can include a wide variety of standard and custom features, many of which are discussed below.

TRI-FUNCTIONAL® BUSHINGS

Hendrickson’s TRI-FUNCTIONAL Bushings provide 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 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 as the problem.

For more information, refer to:

<table>
<thead>
<tr>
<th>NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B106</td>
<td>Pivot Bushing Inspection Procedure</td>
</tr>
<tr>
<td>L427</td>
<td>Bushing Replacement Procedure</td>
</tr>
<tr>
<td>L750</td>
<td>Bushing Tube Spacer Inspection/Replacement Procedure</td>
</tr>
<tr>
<td>L1071</td>
<td>Pivot Bushing Inspection/Replacement Information</td>
</tr>
<tr>
<td>T12002</td>
<td>Troubleshooting</td>
</tr>
</tbody>
</table>

For further information, refer to CONTACTING HENDRICKSON on page 2.

RIGID-AXLE CONNECTION

INTRAAX® and VANTRAAX® axle/beam assemblies (sample weldment shown in Figure 3) are welded by robots, along with some HT axles.
CONCEPTS AND FUNCTIONS

The INTRAAX® and VANTRAAX® series axle connection is integrated into the suspension beams with a patented axle wrap and window weld (Figure 4) for optimal structural integrity. The suspension beam mounting surface is machined and continuously welded to the axle wrap, eliminating axle seats and U-bolts. This rigid-axle connection:

- Provides outstanding roll stability.
- Maintains axle alignment to the beam.
- Contributes to a straighter axle tube and controlled toe alignment.

In addition to being welded, the HT series axle connection (Figure 5) is also bolted in place.

**ROLL STABILITY**
The TRI-FUNCTIONAL Bushing and rigid-axle connection result in a roll-stable installation. With only one HCV per trailer, the trailer floor remains level, even when the trailer is offset loaded.

**SOFT RIDING**
The air springs and TRI-FUNCTIONAL bushings support the trailer load while simultaneously absorbing road shocks. This produces a softer, smoother ride that protects the driver, cargo and vehicle. It also provides longer vehicle life and greater driver comfort.

**LOAD CONTROL**
When properly installed, the single Height Control Valve (HCV) helps to maintain an evenly distributed load across all axles. With the exception of tire deflection, the trailer’s ride height remains constant whether loaded or unloaded.

**DURABILITY**
Hendrickson air suspensions and their components have been thoroughly tested to provide a long, virtually maintenance free life. Their sturdy construction has a history of proven durability.
RIDE HEIGHT

Ride height (Figure 6) is measured from the suspension mounting surface to the center of the axle. All Hendrickson 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 while the trailer is in use. To determine your Hendrickson suspension ride height, locate the suspension identification tag, Table 1 or refer to L977 Trailer Suspension System Identification Guide.

**Table 1: Suspension system tag locations**

<table>
<thead>
<tr>
<th>SUSPENSION SYSTEM</th>
<th>TAG LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>T Primary Suspensions</td>
<td>Front of roadside frame bracket.</td>
</tr>
<tr>
<td>HT Primary Suspensions</td>
<td>Front of roadside frame bracket or inside of curbside beam.</td>
</tr>
<tr>
<td>INTRAAX® Primary Suspensions</td>
<td>Inside of curbside beam.</td>
</tr>
<tr>
<td>HS Slider with HT Suspensions</td>
<td>Front cross member on HS box.</td>
</tr>
<tr>
<td>HIS Slider with INTRAAX Suspensions</td>
<td>Front cross member on HS box.</td>
</tr>
<tr>
<td>VANTRAAX® (K-2) Slider with HT Suspensions</td>
<td>On roadside slider box side rail above front frame bracket.</td>
</tr>
<tr>
<td>VANTRAAX (K-2) Slider with INTRAAX Suspensions</td>
<td>On roadside slider box side rail above front frame bracket. Also has blank INTRAAX tag on inside of curbside beam.</td>
</tr>
</tbody>
</table>

For further assistance to determine the ride height, refer to CONTACTING HENDRICKSON on page 2.

Changes in ride height affect air spring height, which in turn changes the suspension’s load carrying capabilities. To help maintain load equalization among the axles, Hendrickson trailer suspensions are intended to be used at ride heights which maintain equal air spring heights throughout the application.

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

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

More information on ride height, inspection and maintenance is available online: L388 Ride Height Settings, L459 Checking Trailer Ride Height.

**FACTORS AFFECTING RIDE HEIGHT**

The following features should be considered relative to ride height and air suspensions:

- The HCV controls the ride height on the suspension on which it is mounted. Additional axles equalize to match the axle with the HCV.
- The fifth wheel height, trailer frame flex and frame shape will control the ride height of the other suspensions.

The following sections describe the impact of these factors in more detail.
FRAME-TO-GROUND HEIGHT
This dimension (Figure 7) is the height from the bottom of the trailer frame (or suspension mounting surface) to the ground and must be determined at each suspension location. The suspension ride height (Figure 8) is then calculated by subtracting the LOADED tire radius from the LOADED frame-to-ground height. The radius of the tire will decrease as the trailer is loaded due to tire deflection, which in turn, affects the trailer deck height.

FIFTH WHEEL HEIGHT
The tractor fifth wheel (Figure 9) 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 in the frame-to-ground height, which will impact the suspension ride heights. The correct suspension ride height must be determined at each suspension location.
Many flatbed trailers are designed with an arch (Figure 10) which causes variations in frame-to-ground height when under load. In all load cases, suspension ride height must not exceed suspension specifications.

When ride height variations are required, refer to CONTACTING HENDRICKSON on page 2 to evaluate load equalization capabilities.

For more information, refer to:

<table>
<thead>
<tr>
<th>LIT #</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L388</td>
<td>Recommended Ride Height Settings</td>
</tr>
<tr>
<td>L707</td>
<td>Application Guide</td>
</tr>
</tbody>
</table>

Hendrickson Trailer Suspension Systems use these terms to define suspension travel:

**JOUNCE:** The maximum amount of upward axle travel, from ride height toward the frame, allowed by the suspension (Figure 11).

**REBOUND:** Maximum amount of downward axle travel, from ride height toward the ground, allowed by the suspension (Figure 11).

When selecting a suspension, the trailer’s tire clearance (Figure 12) must be used to determine the maximum suspension Jounce permitted by the trailer design. Hendrickson specifies the tire clearance above Jounce requirement must include one inch for all HT™ Series, INTRAAX® and VANTRAAX® models. T series models require two inches of tire clearance above the specified Jounce requirement.

A two inch clearance is also specified between the trailer frame and tire inboard sidewall. This will provide sufficient clearance to allow for tire distortion and Trailer Drop.

Tire clearance example:

<table>
<thead>
<tr>
<th>Jounce</th>
<th>Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>(HT, INTRAAX and VANTRAAX models)</td>
</tr>
<tr>
<td>+1&quot;</td>
<td>4&quot; Clearance required above tire at ride height</td>
</tr>
</tbody>
</table>
**LIFT AXLES**

The use of multiple axles can result in difficult maneuverability, excessive tire wear and frame deflection for some trailers. Making select axles liftable avoids these issues any time additional load bearing axles are not in use.

**FRAME-TO-GROUND HEIGHT**

The height of the bottom of the trailer frame (or suspension mounting surface) from the ground (Figure 13) must be determined at each suspension location. This dimension must provide the desired LOADED deck height when lift axles are used (Refer to L707 Application Guide for details).

A leaf spring suspension's ride height will change under various loads. When mixing liftable air with leaf spring suspensions, the auxiliary air suspension's ride height must be specified to match the LOADED leaf spring suspension's ride height.

**NOTE:** The top dimensions are for 35 in. suspension beam centers (96 in. wide trailers). The bottom dimensions (in parentheses) are for 41 in. suspension beam centers (102 in. wide trailers).

![Diagram of lift axles and frame-to-ground height](image)

Table 3: Inside-to-inside tire measurements

<table>
<thead>
<tr>
<th>Area of pivot bolt</th>
<th>Minimum inside-to-inside tire clearance</th>
<th>Varies by suspension model</th>
</tr>
</thead>
<tbody>
<tr>
<td>49 ″ (55 ″)</td>
<td>46½ ″ (56½ ″)</td>
<td></td>
</tr>
</tbody>
</table>

If the potential exists for tire interference, the QUICK-ALIGN shear-type bolt can be installed from the outboard side of the frame bracket. Refer to L579 Alignment Procedures for details.
Hendrickson suspension lift kits include hardware that, when added, provide an axle lifting capability (Figure 14). A lift controller must be installed to raise and lower the lift axle. Refer to T91001 UBL Hardware Kit Information and Requirements.

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. Use the suspension bumper contact dimension to determine the amount of axle lift.

The suspension bumper contact indicates the amount of axle lift. The resulting clearance under the tire will be less than the axle lift depending on both frame and tire deflection.

The HCV (Figure 16) on the Hendrickson trailer air suspension automatically responds to the relative position of the axle and vehicle frame. It meters air into or out of the air springs. Variations in load result in the adding or exhausting of air in order to maintain constant ride height.
Since the Hendrickson trailer air suspension is a mechanically stable suspension, only one HCV is necessary. This system is less complex, less expensive and less troublesome. In addition, should an air spring malfunction occur, it provides a safer system. A leak in the system will allow the trailer to remain stable.

Notice that only one HCV is used per semi-trailer. A single HCV can control two, three, four or more axles.

**PLACEMENT**

For close-spaced axle arrangements, the height control valve can be placed on any of the suspensions without impacting the operation of the system. For wide spread axle arrangements or on semi-trailers that deflect under load, Hendrickson recommends the HCV be placed on the rear most axle. The HCV should not be installed on a liftable suspension.

**EXCEPTIONS**

The requirement for one HCV assumes one end of the semi-trailer is attached to a vehicle that is maintaining the height of that end of the trailer. For full trailers or multiple axle dollies that are not rigidly attached to another vehicle, a HCV is required on the front and rear suspension in order to control the height of the entire structure.

**IMPORTANT:** The use of two HCVs is not an approved practice. Continued use will void the warranty, unless approved in writing by the Hendrickson Trailer Suspension Systems Engineering Department.

**NOTE:** For installation instructions, refer to materials provided with the air control kit.

**HOW IT WORKS**

A difference in distance between the axle and frame body causes the actuating arm to vertically move (Figure 17).

The height control valve (Figure 16 and Figure 17) is an integral part of a pneumatic control system. This system, with the Hendrickson HCV, maintains a constant static design height and does not respond to short duration dynamic changes in axle position.

An increase in trailer load will cause the trailer to drop in height, compress the air springs and decrease the distance between the axle and trailer frame. This causes the HCV arm to rotate upward and open the HCV valve to add pressure to the air springs (Figure 17). The valve remains open until the arm is horizontal and the trailer is returned to its designed ride height. At this point, the valve is closed.

As trailer load decreases, current pressure in the air springs act to lift the trailer. As the trailer lifts, the linkage pulls the HCV arm downward and the valve opens to exhaust pressure from the air springs. The valve remains open until the arm is horizontal and the trailer is returned to ride height.

**TRAILER DROP/TRAILER WALK**

During the loading and unloading of cargo, two trailer reactions can occur: trailer drop and trailer walk. Trailers equipped with air suspensions can experience both phenomena.

**TRAILER DROP**

With an air suspension, trailer drop occurs due to the inherently low spring rate that gives the suspension smooth ride. When a significant load is quickly added, such as a loaded lift truck entering the trailer, the trailer deck will drop, sometimes as far as the air springs’ internal bumpers will allow. This lowered deck position is generally temporary; the suspension’s height control valve will open under these conditions sending additional air into the air springs to return the trailer to its original ride height. However, there is an inherent
time delay involved in this action and assistance from the tractor’s air compressor may also be required.

TRAILER WALK
Trailer walk, also known as dock walk, is the repetitive forward movement of the trailer causing it to move away from the loading dock. This movement is a consequence of the downward trailer movement, combined with the resulting rotation of the suspension’s trailing arms, and the corresponding rotation of the tires when the trailer’s parking brakes are applied.

Similarly, a loaded trailer sitting for an extended period of time can lose air spring pressure, allowing the trailer deck to gradually drop. Again, resulting in forward movement that could damage or collapse the trailer’s landing gear.

For example:
If the trailer deck drops three inches, approximately the full jounce travel of the air suspension, the trailing arms will rotate about 9 degrees around the pivot joint. If the parking brakes are engaged when this occurs, the tires will also rotate the same 9 degrees, thus rolling the trailer forward by about three inches, assuming the 20.25 inch loaded rolling radius of an 11 R24.5 tire. Refer to L816 Dock Solutions for more.

All Hendrickson trailer air suspensions rely on a rubber bumper contained within the air spring to limit the suspension up travel (or jounce). When air exhausts from air springs, the air spring bumpers support the trailer and its load. The bumpers are designed to support a load equal to the suspension’s rated capacity. They provide stable support of the trailer during loading or unloading of cargo and while idle.

For more information, refer to:

<table>
<thead>
<tr>
<th>NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B109</td>
<td>Loading Dock Approach Procedure For Trailers Equipped with an Automatic Air Suspension Dump Valve</td>
</tr>
<tr>
<td>L816</td>
<td>Trailer Loading Dock Terms And Solutions</td>
</tr>
</tbody>
</table>

ROLL STABILITY
This references a trailer’s natural tendency to rollover when turning. Hendrickson’s patented design that uses TRI-FUNCTIONAL® Bushings in conjunction with a rigid axle connection, offer improved roll stability over spring design. The axle-beam weldment (INTRAAX® and VANTRAAX®) acts like a stabilizing bar which gives the air suspension greater roll stabilization and performance beyond that of spring suspension systems.

For more information, refer to L761 Understanding Air Ride, Roll Stability.

AIR DUMP VALVES
Air dump (or exhaust) valves increase stability during trailer loading and unloading. The valves can be controlled automatically, manually or by the use of an air-pilot valve.

When suspension air is exhausted, Hendrickson Trailer air suspensions limit the suspension up travel (Jounce) by a rubber bumper (Figure 18) located inside the air spring. The air-spring bumpers adequately support the rated suspension capacity while the trailer is idle with 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 parked trailer 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 unloading of cargo, such as steel removed with a crane.

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

AIR SPRINGS
Air suspensions rely on a cushion of air to support trailer load. This cushion of air is created and maintained within the air springs (Figure 1 on page 1 and Figure 18).
NOTICE: Moving an air equipped trailer without air pressure in the air springs can cause damage to suspension components.

If you have questions, refer to CONTACTING HENDRICKSON on page 2.

SHOCK ABSORBER
Shock absorbers (Figure 1 on page 1) absorb energy to prevent suspension oscillation. Shock absorbers are also used as Rebound stops in most Hendrickson air suspensions. The shock absorber limits the downward stroke of the axle, which prevents the air spring from being pulled apart. In some severe service applications, a shock strap or chain down stops are added to additionally aid in limiting the stroke of an air spring.

All Hendrickson shocks are designed to support the weight of the suspension while a trailer is lifted. Use only Hendrickson shock absorbers for replacements.

⚠️ CAUTION: Do not lift the trailer without shock absorbers in place or alternate down stop. If shock absorbers or down stops are not in place, overextension of the air springs will occur and could damage the air springs.

IMPORTANT: Hendrickson trailer air suspensions designed using of specific air springs and shock absorbers. Replacement with other than genuine Hendrickson parts may cause premature failures and possibly void the warranty.

PIVOT CONNECTION
A correctly assembled pivot connection (Figure 19) is crucial to the life of the suspension. The pivot fastener must continually provide a sufficient clamp load to prevent suspension failure.

⚠️ CAUTION: Failure to properly install pivot nut and bolt can result in a loose connection and damage to suspension components. Pivot bolt hardware cannot be reused.

Many suspension failures can be caused by improperly installed pivot connections. These included:
- Misalignment
- Elongated slot in frame brackets
- Bushing failure
- Premature wear to bushing tube spacers and bushing tube
- Bushing tube edge wear

IMPORTANT: Suspensions are generally shipped with loose pivot bolts. Alignment is completed by the OEM during trailer assembly.
Refer to the following pivot connection online service literature:

<table>
<thead>
<tr>
<th>LIT #</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>B106</td>
<td>Pivot Bushing Inspection Procedure</td>
</tr>
<tr>
<td>L578</td>
<td>Suspension Inspection and Lubrication</td>
</tr>
<tr>
<td>L579</td>
<td>Alignment Procedures</td>
</tr>
<tr>
<td>L750</td>
<td>Bushing Tube Spacer Inspection / Replacement Procedure</td>
</tr>
<tr>
<td>L783</td>
<td>VANTRAAX® Pre-aligned Slider Decal</td>
</tr>
<tr>
<td>L1071</td>
<td>Pivot Bushing Inspection / Replacement Information</td>
</tr>
</tbody>
</table>

**BRAKES**

More information about Hendrickson drum brakes can be found in L974, *Drum Brake Maintenance Procedures*.

Detailed information on Air Disc brakes can be found in literature provided by the brake manufacturer. Hendrickson’s literature web page provides links to supplier disc brake manuals.

**TRAILER ALIGNMENT**

Proper alignment and general maintenance of all trailer components is required for smooth operation and longevity of trailer and suspension. Once aligned, unless physical damage has occurred, component alignment is affected only by normal wear of mechanical parts. Detailed information on trailer / suspension alignment can be found in L579, *Alignment Procedures*. 
# Appendix A: Glossary of Terms

The terms list below are common to truck and trailer suspension systems.

## List of Terms

<table>
<thead>
<tr>
<th>ABS</th>
<th>Clevis Pin</th>
<th>Jounce</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADB</td>
<td>CMVSS-121</td>
<td>Lifted Axle</td>
</tr>
<tr>
<td>Anchor Pin</td>
<td>DAP</td>
<td>Rebound</td>
</tr>
<tr>
<td>Axle Track</td>
<td>Disc Brakes</td>
<td>Return Springs</td>
</tr>
<tr>
<td>BCCC Dimension</td>
<td>Dock Walk</td>
<td>Static Load Radius (SLR)</td>
</tr>
<tr>
<td>Brake Block</td>
<td>Drum Brake</td>
<td>Tire Inflation Systems (TIS)</td>
</tr>
<tr>
<td>Brake Chamber</td>
<td>DST®</td>
<td>Tire Rolling Radius</td>
</tr>
<tr>
<td>Brake Drum</td>
<td>Dust Shield</td>
<td>TOFC</td>
</tr>
<tr>
<td>Burnish</td>
<td>Duty Cycle</td>
<td>Torque Balance</td>
</tr>
<tr>
<td>Caliper</td>
<td>Duty Cycle “Class Definitions”</td>
<td>Track</td>
</tr>
<tr>
<td>Cam Under Head Length</td>
<td>FC</td>
<td>Trailer Drop</td>
</tr>
</tbody>
</table>

### ABS

Antilock Brake System - electronically monitors wheel speed and prevents wheel lock-up by rapidly cycling the brakes during panic stops and when stopping on low-friction surfaces.

### ADB

Air Disc Brakes

### Anchor Pin

A pin or pins used to retain brake shoes with in the brake assembly.

### ARL

Auxiliary Rebound Limiter - sometimes referred to as “down stop”, is a strap or chain in addition to the shock absorber used to limit suspension beam travel during rebound or when the trailer is lifted for TOFC or other purposes.

### Axle Track

The nominal distance between the center line of the curbside and roadside tires on a dual axle suspension. This distance can vary depending on wheel-end components specified.

### BCCC Dimension

Distance from the center of the brake shoe to the center line of the brake chamber.

### Brake Block

Friction material or lining attached to a brake shoe. Disc brakes use pads with friction material.

### Brake Chamber

Device inside which a diaphragm converts air pressure to mechanical force, via a push rod, for brake actuation. Consists of service chamber or service chamber/spring chamber. For example, a 30/36 chamber consists of a Type 30 service chamber and a Type 36 spring chamber.

### Brake Drum

Attached to the hub. Absorbs kinetic energy from the shoe and lining assembly and transfers heat away from the brake surface to dissipate the heat into the atmosphere over time. The majority of drums are entirely of cast iron. Generally these are divided into three service-rating codes based on application. There is standard duty, heavy duty, and extra heavy duty. In addition, there are inboard mounted drums (with spoke wheels) and outboard mounted drums (with hubs). The other brake drum is the steel jacketed type. This consists of a steel mounting face with a cast iron braking surface insert.

### Burnish

The conditioning or “seasoning” of a brake lining by wear and temperature via a test procedure or in-service operation.

### Caliper

In an air disc brake system, the clamping device containing friction material mounted to pads. When actuated, the caliper applies braking force to both sides of the rotor.

### Cam Under Head Length

On DAP trailer axles, the length as measured from under the brake cam head to the end of the cam.

### Clevis Pin

Pin connecting the arm of a slack adjuster to a brake chamber push rod yoke.
CMVSS-121
Canadian Motor Vehicle Safety Standard-121 for air brakeved vehicles. Copies of the requirements can be obtained from Canadian Transportation Equipment Association, 16 Barrie Blvd., Unit 3B, St. Thomas, Ontario. N5P 4B9 Tel: 519-631-0414, Fax: 519-6311333, E-mail: transportation@ctea.on.ca, WebSite: http://www.ctea.on.ca

DAP
Double Anchor Pin

Disc Brakes
A foundation brake system consisting of a flat disc or rotor on either side of which are friction pads. Equal and opposite forces are applied to these pads to press their working surfaces into contact with the braking path of the rotor.

Dock Walk
Or Trailer DropWalk, the tendency for a trailer to inch forward as the load changes while parked at the dock. Refer to TRAILER DROP/TRAILER WALK on page 10.

Drum Brake
A brake system in which two brake shoes with friction material expand into a rotating drum.

DST®
Dock Stabilizing Technology™ – an integrated system to resolve loading dock trailer walk and drop issues. Refer to L781.

Dust Shield
Plate that’s mounted behind a brake drum to minimize entry of dirt and road splash.

Duty Cycle
Measurement of the amount of time a component is fully utilized, expressed as a percentage of the complete usage of the component. In this application, “Duty Cycle” refers to the average amount of time (ratio) a vehicle is loaded vs. not loaded.

Class Definition”
“Class Definitions” define the type of vehicle.

On-Highway
(Van or Refrigerated trailer moving different types of freight, include City delivery)
- Operation on road surfaces of good to excellent concrete or asphalt.
- LineHaul - Generally distances are more than 30 miles between starting and stopping.

- City Delivery - Pick up and delivery service within cities and/or suburban areas. Three (3) miles between starts/stops (typical).
- 100% load going /40% or more load return (typical).

Vocational
- Movement of:
  - Petroleum or liquid product, gases, to processing, delivery, or fueling sites.
  - Rock, ore, gravel, and minerals between mine sites and delivery sites.
  - Heavy equipment or materials at legal maximums or special permit loadings.
- Vehicles:
  - Used for residential refuse / recycle pickup.
  - Operated in commercial / industrial pickup.
  - Used in transfer / relocation on a maximum grade of 8%, typically greater than 10 miles per trip.
- 90% of operation time on road surfaces of concrete, or asphalt, and up to (less than) 10% of operation time on maintained gravel, crushed rock, hard packed dirt, landfill, or into sandy or muddy job sites. For vehicles operating less than 90%, refer to Off-Highway.
- 100% load going and typical empty return.
- Maximum grades of 12%.

Off-Highway
- Movement of:
  - Heavy equipment, rock, ore, gravel, and minerals at and between mine sites and property development delivery sites
  - Farm produce, or feed, on farm properties
  - Raw petroleum products; i.e.: Oil Field applications
  - Logs, chips, and pulp between logging sites and / or mills.
- Vehicles:
  - Operating in ice road environments
  - Used for refuse / recycle landfill operations.
- Operation exceeding 10% of the time on maintained gravel, crushed rock, hard packed dirt, landfill, ice roads, unimproved surfaces such as loose dirt, mud, and sand.
**Fast Change** style brake shoes, with standard thickness lining.

**Fast Change XLI** style brake shoes, with extra thick lining.

**Jounce**
The maximum amount of upward axle travel, from ride height toward the frame, allowed by the suspension (Figure 11).

**Liftable Axle**
An axle used to increase the load carrying capacity of the truck or trailer it is used under. When the vehicle is not loaded, and the extra load carrying ability is not needed, the driver can lift the axle. Usually there is a button or lever in the cab of the truck to operate the hydraulic suspension to lift the axle. On trailers there is a push/pull button to serve the same purpose.

**Rebound**
Maximum amount of downward axle travel, from ride height toward the ground, allowed by the suspension (Figure 11).

**Static Load Radius (SLR)**
Distance, expressed in inches, from the center of a tire/wheel assembly to the pavement, measured when mounted on a vehicle and loaded to its maximum rated capacity.

**Tire Inflation Systems (TIS)**
Tire inflation systems replenish air when tire pressure drops below a target pressure. Hendrickson has TIREMAAX TIS systems which can maintain tire inflation and exhaust excess air (deflation) as needed.

**Tire Rolling Radius**
See SLR

**Top of Flat Car or Trailer On Flat Car -** refers to transporting a trailer by rail. When done so, one or two trailers are lifted and placed on a flat bed rail car for continued transport, then lifted off at or near the intended destination.

**Torque Balance**
Achieved when individual brakes exert the degree of braking force required for each brake in the system to do its fair share of the work.

**Track**
The distance between the roadside and curbside dual tire center lines on a dual tire arrangement or the distance between the tire center lines on a single tire arrangement.

**Trailer Drop**
The trailer deck (rear) will drop, when a significant load is quickly added such as a loaded lift truck entering the trailer, sometimes lowering as far as the air springs’ internal bumpers will allow. Refer to TRAILER DROP/TRAILER WALK on page 10.

**Trailer Walk**
Trailer walk is the repetitive forward movement of the trailer, positioned at the loading/unloading dock without a tractor, causing it to move away from the loading dock. This movement is a consequence of the downward trailer movement, (e.g. lift truck moving in and out), combined with the resulting rotation of the suspension’s trailing arms, and the corresponding rotation of the tires when the trailer’s parking brakes are applied. Refer to TRAILER DROP/TRAILER WALK on page 10.

Call your trailer dealer or Hendrickson at 866.RIDEAIR (743.3247) for additional information.