

Heil Trailer International, Co.



ISO 9001, ISO 14001, OSHAS 18001 - Certified

Petroleum Trailer Owner's/Operator's Manual





DANGER

This manual is intended to help ensure the safe and efficient operation of your Heil Trailer and products. IF INCORRECTLY USED, OPERATED, MAINTAINED OR REPAIRED, THIS EQUIPMENT CAN CAUSE SEVERE INJURY, DEATH AND PROPERTY DAMAGE. THOSE WHO USE, OPERATE, MAINTAIN AND REPAIR THE EQUIPMENT SHOULD BE TRAINED IN ITS PROPER USE, OPERATION, MAINTENANCE AND REPAIR, WARNED OF ITS DANGERS, AND SHOULD READ THIS ENTIRE MANUAL BEFORE ATTEMPTING TO USE, OPERATE, MAINTAIN, SET UP, ADJUST, SERVICE OR REPAIR THE TRAILER OR PRODUCT. Recommended operating practices furnished in this manual are general practices. HEIL Trailer International, Co. cannot possibly know, evaluate, or advise anyone of all conceivable ways a Heil trailer or product might be used, operated, maintained, set up, adjusted, repaired or of all possible consequences of each way. ALL PERSONS WHO PERFORM ANY OF THESE TASKS MUST FIRST SATISFY THEMSELVES THOROUGHLY THAT NEITHER THEIR SAFETY OR THE SAFETY OF THE GENERAL PUBLIC WILL BE JEOPARDIZED BY ANY METHOD THEY SELECT. KEEP THIS MANUAL FOR FUTURE REFERENCE.

Image Disclaimer

The pictures and images contained in this manual portray both standard and non-standard (optional) equipment to meet specific customer needs. These pictures are used for referencing components and general nomenclature of a Heil petroleum transport tank. Your trailer may or may not have the components shown in this manual.

WARRANTY STATEMENT

Heil Trailer International, Co. warrants trailers sold by us to be free from defects in material and workmanship. This coverage is subject to and limited to coverage periods listed in the Heil Trailer International Limited Silver Warranty Sub Part A - Limitations document and as defined in the Heil Trailer International Limited Warranty Sub Part B – Definitions document. Our obligation and liability under this Warranty is expressly limited to repairing or replacing, at our option, within the coverage time limitations listed in the Heil Trailer International Limited Silver Warranty Sub Part A - Limitations document, from the date of shipment any defective product except for maintenance items, tires, and purchased items which are warranted separately by the original manufacturer. Any repair(s) determined by Heil Trailer International, Co. at our sole discretion, to be major or critical to the structural integrity of any trailer at any time whatsoever during the warranty period must be performed at a Heil Trailer Certified Service Center as determined by Heil Trailer International, Co. Repairs not performed in a Certified Service Center once directed by Heil Trailer International, Co. will void this warranty. A failure that is determined by Heil Trailer International, Co., at our sole discretion, to be caused by wear and tear or misuse as opposed to product defect is not covered at any time in the warranty period. **WE MAKE NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND MAKE NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.** Our obligation under this warranty shall not include any transportation charges, or any liability for direct, indirect or consequential damage, loss of profits or delay. Any Improper use, operation beyond rated capacity, substitution of parts not approved by us, or any alteration or repair by others in such manner as in our judgment affects the product materially and adversely shall void this warranty. **NO EMPLOYEE OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY WITHOUT THE WRITTEN AUTHORIZATION OF AN OFFICER OF HEIL TRAILER INTERNATIONAL, CO.**

Heil Trailer International, Co. warrants that this trailer is manufactured in accordance with the specifications of the order. Heil Trailer International, Co. does not warrant this piece of equipment for use in hauling any specific product. Heil Trailer International, Co. accepts no responsibility for damage to the equipment, or for cargo losses due to an adverse affect on the equipment, caused by the incompatibility of the product being hauled in the trailer. Where Tanks are prepared for lining, all agreements, billing included, that concern the tank barrel lining will be the responsibility of the customer and the lining company. In this connection, Heil Trailer International, Co. makes no warranty of products, including lining manufactured and /or installed by others, the same being subject to warranties, if any, of their respective manufacturers or installers. The customer shall bear the risk for damage or loss to the tank or injury to property or persons while the tank is either at or in transit to or from the lining company.

Warranty will be paid only if Heil Trailer International, Co. procedures for filing warranty claims are followed. **Pre-approval** prior to any repairs is a mandatory requirement for receiving payment along with strict adherence to all other conditions of the procedures. Warranty repairs will only be permitted at Heil Trailer International, Co. approved, authorized, or certified service centers.

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Publication Disclaimer

The information and specifications included in this publication were in effect at the time of approval for printing. Heil Trailer International, Co. Athens, TN USA reserves the right, however, to discontinue or change specifications or design at any time without notice and without incurring any obligation whatsoever. Revision 6/2012.

INTRODUCTION

This manual is designed to help ensure safe and efficient operation of the Heil Trailer Petroleum Transport.

The book is divided into three sections. Part 1 will familiarize you with the unit. Part 2 gives operating procedures and tips. Part 3 covers the maintenance necessary to keep the unit in safe operating condition.

TO THE OWNER

We at the Heil Trailer International, Co. take pride in the products we manufacture. We trust you will be well satisfied with your purchase. Properly operated and maintained, the Petroleum Transport will provide many years of low-cost, trouble-free service.

WARRANTY CLAIMS & INQUIRIES

The Heil Trailer Standard Warranty is included in this manual. In the unlikely event you need warranty service on your tank equipment purchased from Heil Trailer International, Co. or its distributors, contact the distributor or Heil Trailer International, Co. (800-400-6913) directly, for service and repair procedures.

For all parts, claims or inquiries refer to the model and serial number of your unit. This information is found on the identification plate (see Figure 1).

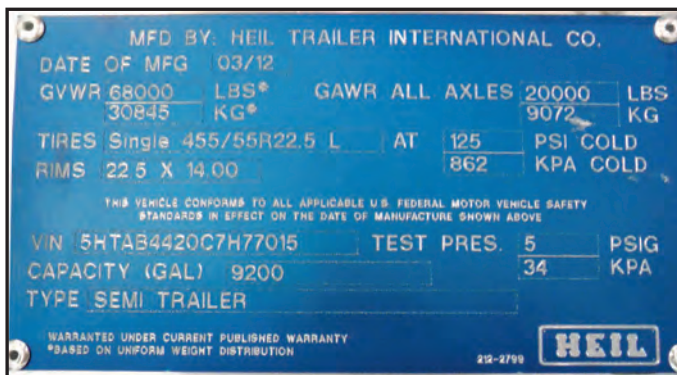


Figure 1. Example Identification Plate

DIRECTIONAL REFERENCE

For your reference the sides of the tank transport are determined by facing in the direction of forward travel. The right side is the "Curbside"; the left side is the "Roadside or Streetside".

IMPORTANT SAFETY MESSAGES



⚠ DANGER

⚠ WARNING

⚠ CAUTION

ⓘ NOTICE

THESE SAFETY ALERT SYMBOLS INDICATE IMPORTANT SAFETY MESSAGES THROUGHOUT THIS MANUAL.

WHEN YOU SEE THESE SYMBOLS, CAREFULLY READ THE MESSAGES THAT FOLLOW AND BE ALERT TO THE POSSIBILITY OF **ENVIRONMENTAL AND/OR PROPERTY DAMAGE**, PERSONAL INJURY OR DEATH TO YOURSELF OR OTHERS.

IMPORTANT SAFETY MESSAGES



CAUTION

Inspection of equipment, safety devices, and working areas must be performed before each trip to ensure personal and operational safety and to correct potential or actual hazards.



DANGER

Do not alter or modify any of the equipment or components provided with the tank trailer. Use of non-Heil parts or non-OEM component parts may cause serious injury, including death.



WARNING

Before moving the tank trailer inside a building, the tank must be free of product and checked with an approved gas analyzer to ensure it is free of hazardous and/or flammable vapors.



DANGER

Do not enter the tank trailer until each of the following conditions has been completed.

- The pressure in the vessel has been completely relieved.
- The tank has been thoroughly purged and ventilated.
- The tank has been degassed and cleaned by an authorized cleaning facility.
- The MSDS for the last product(s) hauled has been reviewed.
- The OSHA 1910.126 Confined Space Entrance Requirements are strictly complied with.

Failure to follow any one of these instructions may result in serious personal injury, including death.

IMPORTANT SAFETY MESSAGES



CAUTION

Decals are posted on the tank trailer to alert the operator or to give important safety instructions. Decals should be repaired if they are torn, damaged or if they become illegible.



CAUTION

After cleaning the tank, keep manhole open until the tank has cooled.



CAUTION

The tank trailer shall not be operated if any of the following conditions exists:

- Damage to the lighting fixtures, wiring, electrical conduits, or inoperative lights.
- Leaking or malfunctioning equipment.
- Damage to the tractor or the tank trailer, including, but not limited to, interior damage.
- Inoperative brake systems (primary or parking).
- Vents or valves plugged, inoperative, or removed.

Failure to correct or repair any of these conditions may result in extensive property damage and/or serious personal injury, including death.



WARNING

Proper operation of the tank trailer primary brake system is essential for safe operation of the vehicle. A functional system check is necessary each time the tank trailer is put into service.



CAUTION

Like any other vehicle, tank trailers can tip or slide out of control if turns are negotiated at too high a speed or when making violent maneuvers such as abrupt lane changes. Such unsafe and improper operation may cause serious personal injury, including death, to the operator, handlers, and bystanders.

IMPORTANT SAFETY MESSAGES

WARNING

If the tank trailer is to be uncoupled in mud, snow, or sand, use extra shoring to provide an adequate base for the landing gear support pads.

WARNING

Never set a loaded tank trailer on landing legs that are not intended for the purpose. Never set a multiple compartment tank trailer with only the front compartment loaded on landing legs.

DANGER

Mechanical uncaging of the spring brakes is not recommended. Under no circumstances should a trailer with a mechanically uncaged spring brake be pulled in transit. Such unsafe and improper operation may cause serious personal injury, including death, to the operator, handlers, and bystanders.

CAUTION

All Loading and unloading operations must be performed outside.

CAUTION

Ensure grounding connections are made properly and firmly before any loading operation begins.

IMPORTANT SAFETY MESSAGES



DANGER

Operators must always be alert for leaking or malfunctioning equipment. Stop all operations immediately at the first sign of a leak or malfunction. Failure to do so may result in extensive property damage and/or serious personal injury, including death.



DANGER

The top of the tank trailer is not intended for use as a heavy work area. Observe the following procedures when the ladder or walkway must be used.

- The use of the ladder and walkway area is recommended **ONLY** when the other access is unavailable.
- When the top of the tank must be used as a work area, a stationary platform with guard rails should be used, a safety harness should be worn, and the abrasive surface at the top of the tank should be kept free of oil, grease and/or product.
- If the abrasive surface is worn or missing, replace it immediately.

Failure to follow these procedures may cause serious personal injury, including death.



DANGER

Check all vents daily to ensure their proper operation. Consult the individual manufacturers data for proper maintenance. Failure to do so may result in severe damage to the tank trailer, including buckled (reversed) bulkheads.



DANGER

Do not introduce pressure into void area between double bulkheads. This can cause severe damage to the tank trailer, including buckled (reversed) bulkheads, and personal injury, including death.

IMPORTANT SAFETY MESSAGES



WARNING

The tractor engine should not be running during loading and/or unloading operations.



DANGER

Most tank trailers are equipped with a Pressure Actuated Fill (P.A.F.) cover incorporated into the manhole cover. When bottom loading or any other time the internal pressure of any compartment reaches 3 psi, this P.A.F. functions as a relief vent. Test this vent/fill daily to ensure it opens at 3 psi. A malfunctioning or improperly maintained P.A.F. may cause extensive shell damage, bulk head damage, and/or serious personal injury, including death.



WARNING

Most substances being loaded or unloaded are hazardous. Know what you are dealing with and know where to acquire first aid in case of an emergency.



DANGER

Failure to relieve the internal pressure through a positive vent or an open manhole cover when loading can result in over pressurizing and cause severe damage to the tank and serious personal injury, including death.

IMPORTANT SAFETY MESSAGES

WARNING

Be prepared to stop the supply of product at the loading facility in the event of a high level shutoff malfunction or if an apparent leak or other unusual condition is noticed.

WARNING

If the unit is equipped for bottom loading, it usually will have a positive vent for each compartment that opens automatically when the emergency valve is opened. If so equipped, make sure the vent is operating properly. Note that the vent will be concealed under the vapor collector if the unit is equipped for a vapor recovery hood.

CAUTION

The tank trailer should be loaded through the top only when bottom loading is not possible. Bottom loading minimizes the level of static electricity build-up.

CAUTION

When top loading through a fill cover, the automatic shutdown device on the tank trailer is not utilized. Use the capacity indicator located in each compartment to determine when it is full.

DANGER

On tanks without vapor recovery systems or without top vents, open the manhole before opening the outlet valve. Failure to do so will cause a vacuum to be created in the tank which will result in extensive damage to the vessel and could cause serious personal injury, including death.

IMPORTANT SAFETY MESSAGES



CAUTION

Replace gaskets when they are broken, crushed, swollen, or no longer provide an adequate seal. Use only genuine HEIL or OEM replacement parts.



DANGER

When using a two piece rim, always deflate the tire prior to removal from the tank trailer. The rim and ring may come apart with explosive force, causing serious personal injury, including death.



WARNING

Insufficient mounting torque can cause rim slippage, resulting in broken valves, worn parts, and damaged tires. Excessive mounting torque can cause damage by stripping studs, collapsing spacer bands, or forcing rims into an out of round condition.



DANGER

Always clean a tank before loading a different type of product. When a tank trailer is emptied of fuel, a mixture of vapor and air remains that is within flammable range. Refilling the trailer with a type of product other than what was just emptied may not mix and may cause an explosion, which may cause extensive property damage and/or serious personal injury, including death.

SAFETY DECALS

EMERGENCY SHUTOFF

9222-0353

CAUTION

AFTER CLEANING, KEEP MANHOLE OPEN UNTIL TANK HAS COOLED.

9222-0136

DANGER

PRODUCT DISCHARGE VALVE

9222-0067

DANGER

ALWAYS DEFLATE TIRE BEFORE WORKING ON TIRE AND RIM ASSEMBLY. NEVER INFLATE UNMOUNTED TIRE UNLESS TIRE IS PLACED IN A PROTECTIVE CAGE. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY CAUSE SERIOUS INJURY OR DEATH.

9222-0154

CAUTION

AFTER FIRST TRIP TIGHTEN WHEEL NUTS TO RECOMMENDED TORQUE. TO AVOID LOOSE OR MALFUNCTIONING WHEELS MAINTAIN TORQUE LEVELS AT THE PROPER VALUES THROUGH PLANNED PERIODIC CHECKS.

9222-0172

SAFETY DECALS

DANGER

**LOADING CARGO TANKS TO LESS THAN 85%
OF NOMINAL CAPACITY BY VOLUME WILL
ADVERSELY AFFECT THE VEHICLE STABILITY**

9222-0096

CAUTION

PRIOR TO OPERATION!

**Ensure that the vapor system is working properly.
If the vapor system is not working, manholes must be
open to prevent collapse of tank.**

9222-0072

NOTICE

The air lines between the manifold and the Emergency Valves on this trailer were color coded to aid in maintenance trouble shooting. The color code is as follows:

| Compartment # | COLOR |
|---------------|--------|
| 1 | Tan |
| 2 | Purple |
| 3 | Silver |
| 4 | White |
| 5 | Brown |
| 6 | Black |

HEIL

Going the extra mile for you!
9222-0469

NOTICE

**THIS VEHICLE EQUIPPED WITH
75W90 SYNTHETIC
GEAR OIL
FOR WHEEL-END LUBRICATION**

**FOR BEST RESULTS AND WHEEL-END LIFE USE ONLY COMPATIBLE
LUBRICANT PRODUCTS.**

9222-0468

SAFETY DECALS



OVER-FILL CONTROL SYSTEMS POWER
WIRE (+12v) IS FUSED AT CONTROLLER
REFERENCE OVER-FILL MANUFACTURERS
SPECIFICATIONS FOR FUSE
REPLACEMENT

9222-0077

**PULL CABLE TO BLEED
AIR RESERVOIR**

9222-0145

**PULL-NORMAL
PUSH-EMERGENCY**

NOTICE:

**ABS CONSTANT POWER
PROVIDED ON #7 (BLUE)
PIN OF SAE #J560 PLUG.**

9222-0114

GENERAL NOMENCLATURE

REAR VIEW

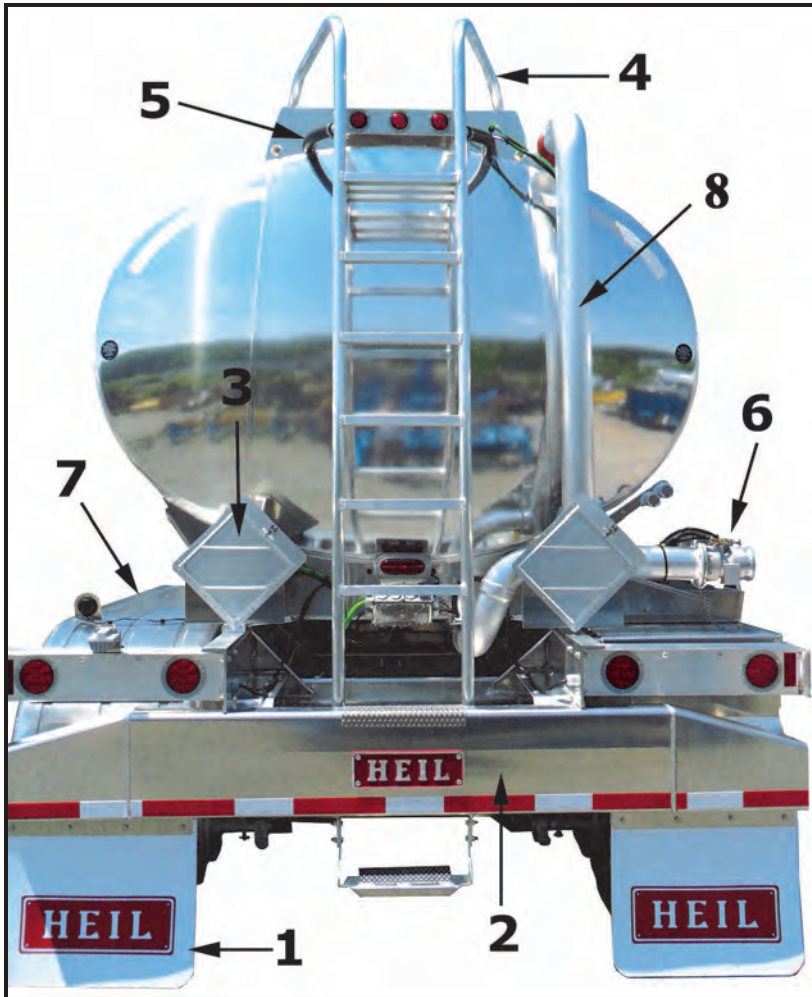


Figure 2.

1. MUDFLAP
2. REAR BUMPER
3. PLACARD HOLDER
4. LADDER
5. DRAIN HOSE
6. VAPOR RECOVERY LINE
7. FENDER
8. VAPOR DOWN LINE

GENERAL NOMENCLATURE

TOP VIEW

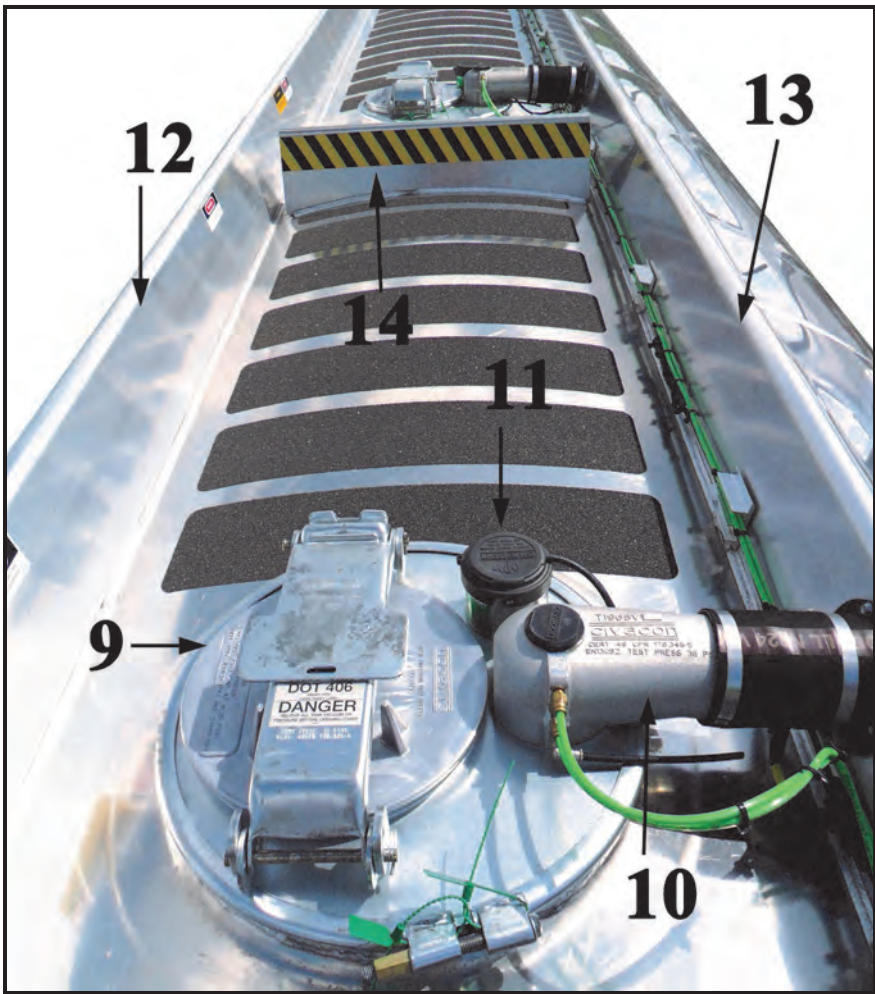


Figure 3.

- 9. PRESSURE ACTUATED FILL (PAF) (See Page 27)
- 10. VAPOR RECOVERY VENT
- 11. OVERFILL PROBE
- 12. OVERTURN RAIL
- 13. VAPOR RECOVERY/OVERTURN RAIL
- 14. TRANSVERSE OVERTURN RAIL

GENERAL NOMENCLATURE

FRONT VIEW

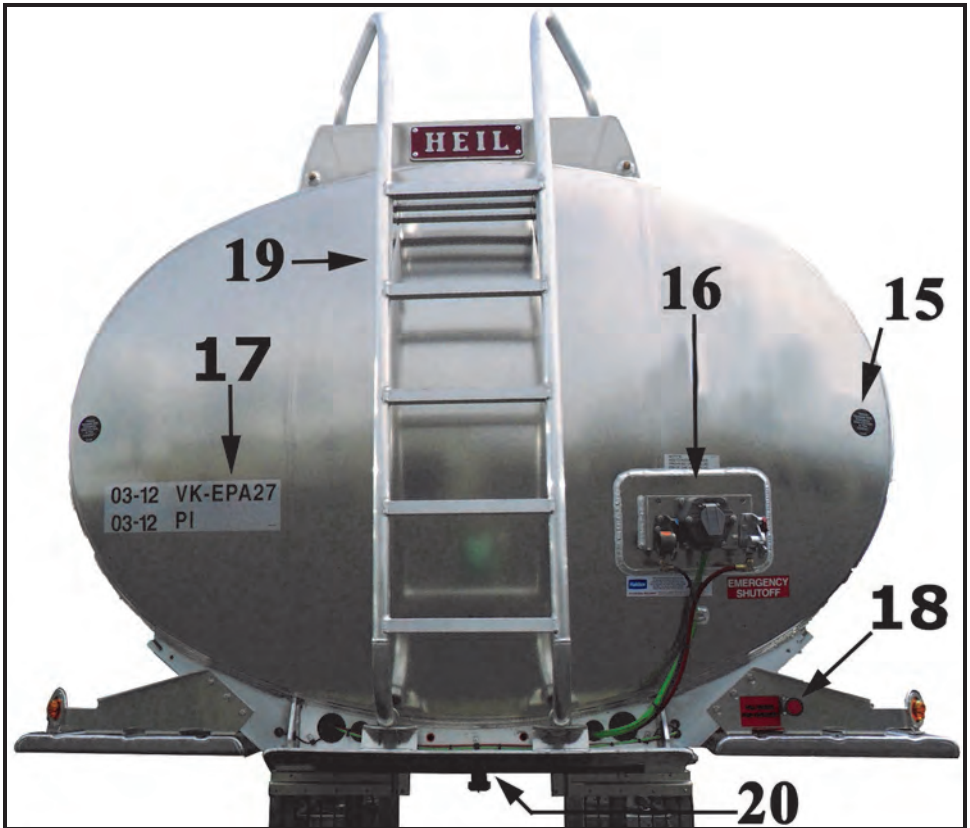


Figure 4.

15. EMERGENCY DRAIN LOCATION DECAL

16. NOSE BOX/GLADHANDS

17. INSPECTION DECAL

18. EMERGENCY SHUT-OFF VALVE

19. FRONT LADDER

20. 5th WHEEL PLATE & KINGPIN



GENERAL NOMENCLATURE

PRODUCT LINE VIEW

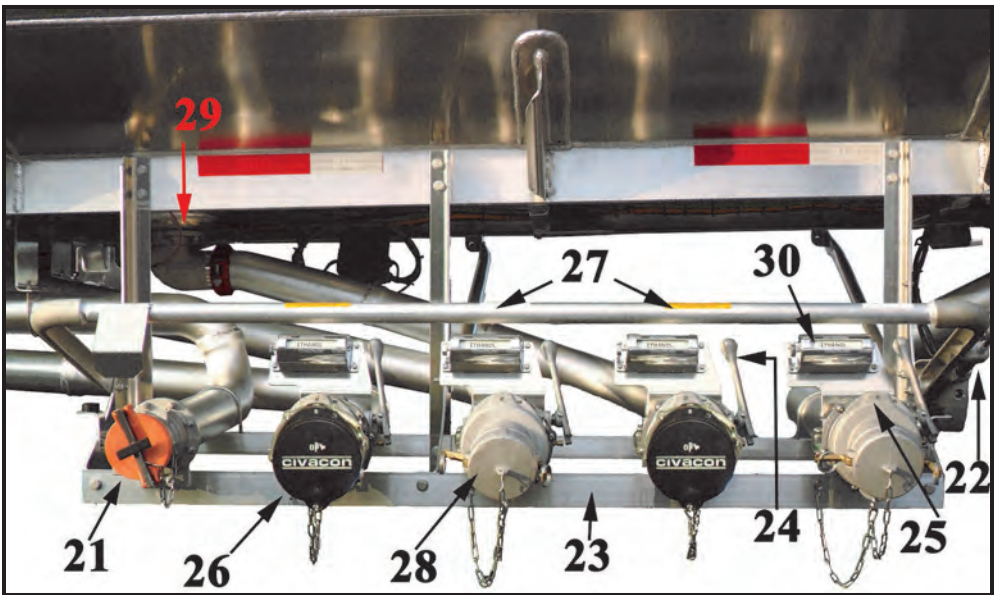
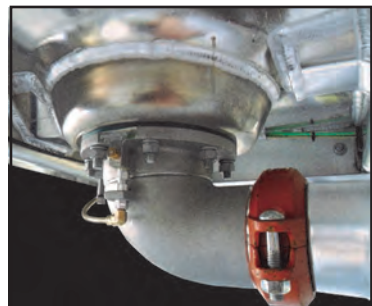
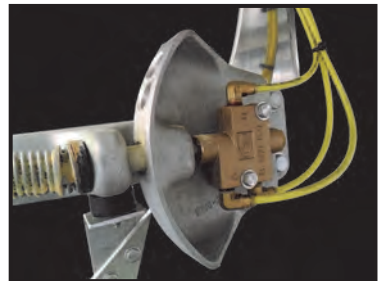


Figure 5.

- 21. VAPOR RECOVERY OUTLET
- 22. AIR-BRAKE INTERLOCK →
- 23. PIPING RACK
- 24. API VALVE HANDLE
- 25. API DISCHARGE VALVE
- 26. DUST CAP
- 27. BRAKE INTERLOCK BAR
- 28. OFF LOADING DUST CAP ADAPTOR
- 29. EMERGENCY VALVE →
- 30. COMMODITY TAGS



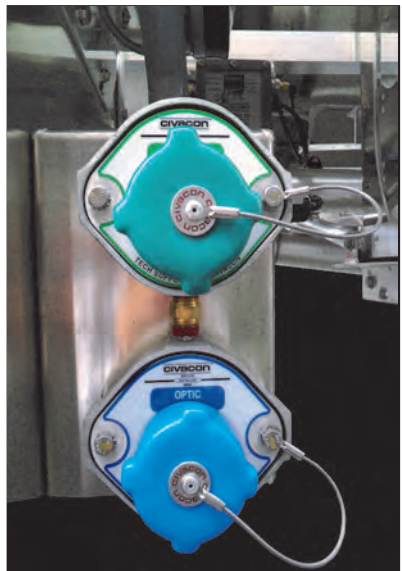
GENERAL NOMENCLATURE

SIDE VIEW



Figure 6.

- 31. AXLE/HUBS/WHEEL SEALS/DRUM/TIRES
- 32. HOSE TROUGH
- 33. STORAGE CABINET
- 34. OVERFILL SYSTEM SOCKETS →
- 35. TANK VESSEL
- 36. PIPING RACK
- 37. LANDING LEGS
- 38. EVO CABINET
- 39. DIP STICK TUBE



OPERATING INSTRUCTIONS

PRE-TRIP INSPECTION

Before each trip, for your safety and that of the motoring public, your petroleum transport tank should be inspected by a person trained and familiar with the operations and functions of the tank and, to ensure proper and safe operation, proper corrective action should be taken in all of the following areas:



1. TIRES - Check for cuts, bruises, tread wear, and improper air pressure.
2. RIMS AND WHEELS - Check for cracks and deformation.
3. BRAKE SYSTEMS - Check for air leakage with and without service brakes applied. Check for damaged, worn or cracked brake hoses and drums.
4. LANDING GEAR - Ensure all braces are intact and the gear is operable in the event it is needed due to a breakdown en route.
5. EQUIPMENT SECURITY - Ensure the spare tire, hoses, tools, fittings, and emergency equipment are properly secured in their respective compartments with chains, latches, etc., in good restraining condition.
6. LADDER AND WALKWAY - Ensure all ladder bolts are tight. See Torque Chart on page 64. Ensure non skid material is present and in good shape.
7. LIGHTING SYSTEM - Ensure all lights perform their proper function and are clearly visible.
8. UPPER 5TH WHEEL - Ensure the 5th wheel plate is properly lubricated and is free of measurable thinning, gouges, or unusual distortion. Ensure tightness of the bolts fastening the plate assembly to the frame.
9. KINGPIN - Check the kingpin for wear. Do not exceed allowable wear.
10. TRACTOR ELECTRICAL CABLE AND AIR HOSES - Ensure electrical cable and air hosts are free of cuts and abrasions
11. ELECTRICAL RECEPTACLE - Check tractor cable receptacle for good electrical contact and mechanical security.
12. TRACTOR WIRING - Ensure the tractor is wired per TTMA TB No. 119.

OPERATING INSTRUCTIONS

HOOKING TRACTOR TO TRAILER

Prior to backing the tractor under the trailer, check the following items:

1. Trailer brakes are set or wheels blocked to prevent trailer from rolling.
2. Upper 5th wheel is at approximate height of lower 5th wheel.
3. Latch on lower 5th wheel is on the FULLY OPEN position.
4. Adequate clearance exists between the tractor frame and all parts of the tank.
5. All personnel are clear of the area.



Then proceed as follows:

1. Back the tractor under the trailer, aligning the king pin with the slot in the lower 5th wheel. When the latch locks around the king pin, check the hookup by attempting to pull forward.
2. Shut down the engine and apply the parking brake. Ensure its proper operation.
3. Double check the latch on the 5th wheel to ensure it is fully engaged.
4. Connect the tractor supply and control brake hoses to the glad hands on the trailer (the glad hands are marked for correct installation).
5. Connect the electrical connector to the receptacle on the trailer.
6. Raise the landing gear legs (see page 36).
7. Check the brakes and lights for proper operation.

NOTICE

All operating and loading procedures outlined in this manual are general practices. Heil does not know, evaluate or advise anyone of all conceivable methods to load, unload or operate a petroleum transport, or the possible consequences of each way.

OPERATING INSTRUCTIONS

OPERATING TRACTOR WITH TANK TRAILER ATTACHED

OVER-THE-ROAD SAFE HANDLING INFORMATION

Petroleum tank trailers are used to carry products that are hazardous and flammable. Only properly licensed and qualified drivers are permitted to operate a tractor trailer combination. When operating a tank trailer loaded with a hazardous material, you have a double obligation to yourself and to the public to drive safely.

Traffic accidents that cause a spill can turn into disasters including explosions and environmental damage. YOU - THE OPERATOR - have control over the most important factors that affect vehicle stability. The tank trailer is an important tool in our transportation industry, and, like any tool, is safe in the hands of a qualified operator.

HANDLING PARTIALLY LOADED TANKS



It is an accepted fact that liquid tanks filled to their normal capacity (with 5% outage or less) handle essentially the same as a similar vehicle with a solid load. However, as the tanks are partially loaded due to product density or legal requirements, mobility of the load or "sloshing" can be detected and must be taken into account when establishing safe driving practices. In general, a partially loaded tank will be less stable under cornering and braking conditions than an ordinary liquid tank loaded to its normal capacity. This factor must be given full consideration when determining the handling characteristics of the unit and establishing the knowledge required for safe driving of the unit. A specific suggestion is that the driver of a downloaded tank should learn the characteristics of the load and handle his/her braking efforts accordingly for smoothest stopping. It is also a good practice to keep the brakes on full for a few moments after coming to a stop to avoid vehicle movement in the event that the braking sequence has developed a wave action inside of the tank.

OPERATING INSTRUCTIONS

OPERATING TRACTOR WITH TANK TRAILER ATTACHED

DRIVING INSTRUCTIONS

When driving a tractor and tank trailer, the overall length of the unit must be kept in mind while passing other vehicles and while turning. Because the unit is "hinged in the middle", turning, parking, and sight range are affected.

TURNING INSTRUCTIONS

When turning corners, remember that the tank trailer has a larger turning radius than the tractor. To make a right turn at a road intersection, it is necessary for the tractor to continue forward to about the center of the crossroads and then turn sharply to the right to allow for the larger turning radius of the tank trailer. If the tank trailer is to be backed to the right, the steering wheel of the tractor should be turned to the left or counterclockwise. The front of the tank trailer will be pushed to the left and the tank trailer wheels will steer to the right.

STOPPING INSTRUCTIONS

In normal operation, the brakes of the tractor and those of the tank trailer are applied at the same time. Brake pressure should be applied gradually and smoothly.

PARKING INSTRUCTIONS

When the tractor-with-trailer combination is to be parked and left unattended, set the parking brake on the tractor firmly. Tractors equipped with an air suspension dump valve should release air bags to prevent trailer from moving.

UNHOOKING TANK TRAILER FROM TRACTOR

1. Disconnect the tractor supply and control brake hoses from the glad-hands on the tank trailer. The tank trailer spring brakes will set automatically when the supply (emergency) air brake hose is uncoupled.
2. Drain any water from the air reservoir by pulling the cord attached to the drain valve at the bottom of the air reservoir.
3. Disconnect the electrical cable from the receptacle on the tank trailer.
4. Lower the landing gear legs (See Page 36).
5. Release the tank trailer kingpin from the tractors 5th wheel latch.
6. Pull the tractor out from under the tank trailer, allowing the trailer to lower slowly until the landing gear shoes are firmly on the ground.

OPERATING PRESSURE

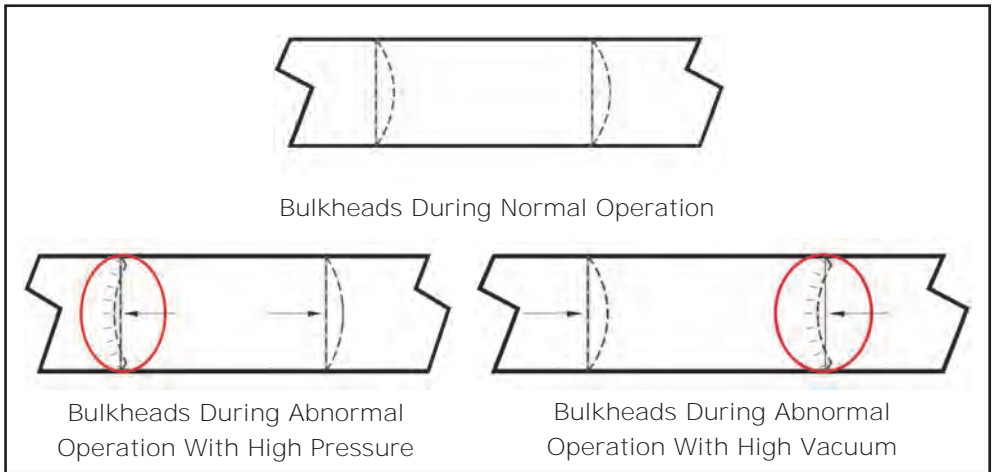


Figure 7. Pressure Effect on Bulkheads

Your Petroleum Transport is designed to operate between -1 psi and 3.63 psi. In the recommended configuration the vents on your trailer work in sequence with each other and will not permit a load signal unless all vents are open. Furthermore, the venting system is designed to support operations within the allowable operating pressures. All vents and vent system components should be maintained and tested to ensure proper operation. In the event of an accident or an extreme condition, internal pressure is relieved via a Pressure Actuated Fill (PAF). The PAF will open and relieve pressure at 3.63 psi. The PAF and its components should be maintained and tested to ensure proper operation. Also, be certain to remove all caps and open all manual valves that would create a pressure outside of the allowable operating pressures.

Failure to follow this procedure will result in pressures that are outside the allowable pressures of the tank and will produce an unsafe work environment. Failure to do so may result in severe damage to the tank, including buckled (reversed) bulkheads. Your trailer is equipped with the following warning label to highlight the danger of the situation.



VENTING

All specification petroleum transport tanks are equipped with a pressure vacuum vent that is designed to operate between -1 psi to 3.63 psi. Vent exhausts to the atmosphere.

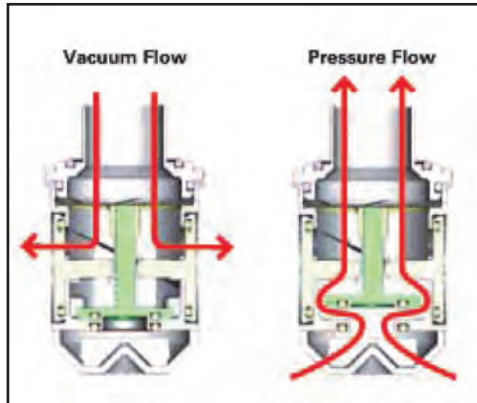


Figure 8. Pressure Vacuum Vent Operation

All specification petroleum transport tanks are equipped with a PAF as a safety device. In the event of an accident or an extreme condition, excessive internal pressure will be released by the PAF. The PAF will open and relieve pressure at 3.63 psi.

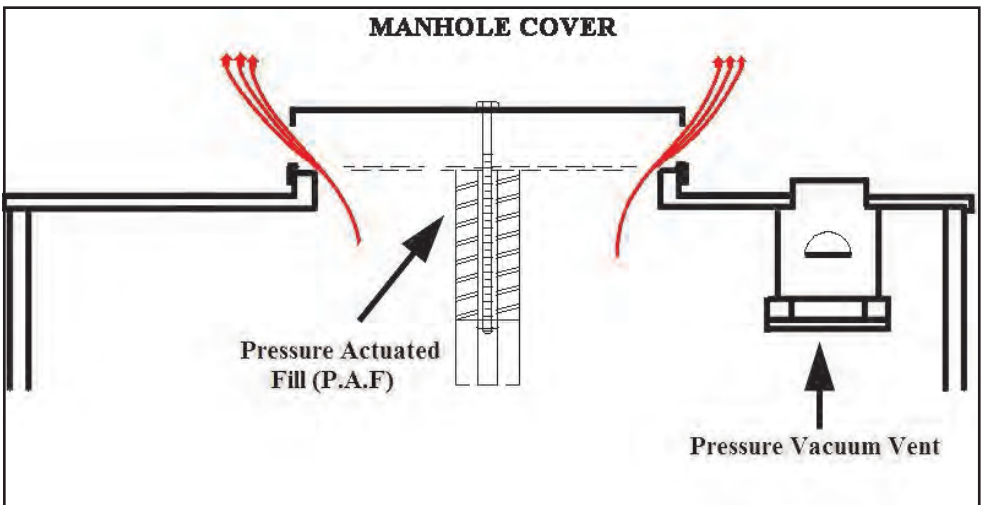


Figure 9. Manhole Cover Venting

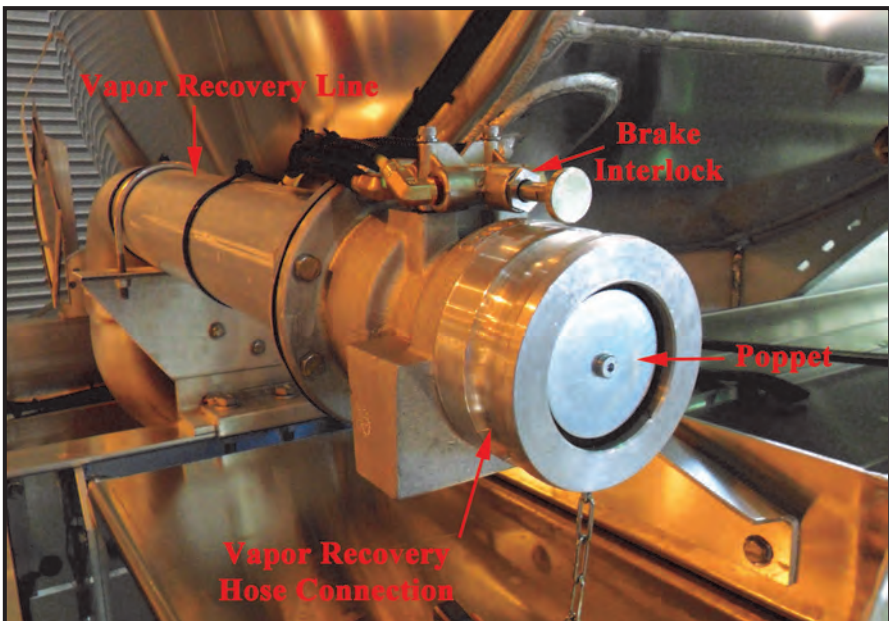
VAPOR RECOVERY



DANGER

Failure to relieve the internal pressure through a positive vent or an open manhole cover when loading can result in over pressurizing and cause severe damage to the tank and serious personal injury, including death.

The vapor recovery system allows the exchange of vapor between the petroleum tank and the underground storage tank(s) therefore limiting the volume of vapor that is released into the atmosphere. In the recommended configuration, all sequential vents on top of the petroleum tank will open. While filling the tank, vapor will flow from the petroleum tank into the vapor recovery system. The overturn rail doubles as a vapor tunnel, delivering the vapors to the vapor piping and ultimately to the onsite storage. While emptying the tank, vapor from the onsite storage will flow into the petroleum tank. Be certain to remove all caps and open all valves that would create a blockage or otherwise restrict the flow of the vapor. Be aware of the types of fittings on the vapor line, as some (such as optional dry brake) may need a special tool at the rack to open. In the recommended configuration, the vapor recovery lines hose adapter is equipped with a brake interlock. This automatically applies the brakes while the vapor recovery hose is connected to the tanks vapor recovery line.



PRE-LOADING INSTRUCTIONS

PRECAUTIONS TO OBSERVE BEFORE LOADING



1. Ensure all product discharge valves and emergency valves are in operating order and are closed. The remote emergency valve control (usually located at the front of the tank) should be functional and the fusible link in the emergency valve operator should be in place.
2. Ensure the correct commodity placards are in place.
3. Ensure the manhole cover gasket is intact and the closing mechanism functions properly to secure the lid tightly.
4. Ensure the unit is equipped with spring loaded emergency venting.
5. Ensure the tank is clean, since some products can react violently when mixed.
6. Know the nominal capacity of the compartment and the commodity capacity of the tank to avoid spillage due to overfilling.
7. CFR 173.24b requires that there be enough outage to allow for expansion due to any rise in product temperature during transit. In no case is this to be less than 1% for flammable liquids.
8. If the unit is to be bottom loaded and is not equipped with a positive vent or PAF, open the top fill cover or the manhole before loading.
9. Always set parking brake before loading.
10. Ground/Bind tank to the loading rack.
11. Do not load the vehicle beyond the maximum product load specified on the metal specification plate or on the vehicle vin plate which specifies the Gross Vehicle Weight Rating (GVWR). The GVWR is the maximum allowable total weight of the vehicle, payload, fuel, driver and equipment on the vehicle(s).

LOADING INSTRUCTIONS

NOTICE

The operating and loading instructions in this manual do not supersede specific loading rack instructions or company instructions or policies.

BOTTOM LOADING INSTRUCTIONS

1. Turn tractor engine off and ground the tank trailer.
2. Make sure all compartments to be loaded are empty and know their nominal capacity.
3. Connect the vapor recovery piping to the loading rack vapor receiver.
4. Ensure all valves are open and there is no restriction in any line. If the loading rack is not equipped with a vapor receiver, Ensure the vapor line on the tank trailer is connected to hoses or lines which conduct vapors away from the unit to a safe venting area, or open the manhole.
5. Make sure the secondary shutdown devices (if so equipped) are connected from the loading rack to the tank trailer, are compatible, and are functional.
6. Know the location of the fire extinguisher. Remove it and bring it to the point of operation. Read the instructions on the fire extinguisher and be prepared to use it.
7. Ensure the meter on the loading rack is set at a quantity equal to or less than the nominal capacity of the compartment being loaded.
8. Connect the product hose from the loading rack to the bottom load fitting for the particular compartment being loaded.
9. Open the necessary valves on the tank trailer and the loading rack.
10. After loading the tank, make sure the product hose, the vapor hose, and the overfill protection devices are disconnected.
11. Disconnect the grounding wire.

NOTICE

The standard air control kit will not allow you to over pressurize a tank. It will not allow you to get a permit signal to load until all vents are opened.

LOADING INSTRUCTIONS

TOP LOADING INSTRUCTIONS

NOTE: Fall protection should be worn at all times when on top of trailer.

1. Ground the tank trailer.
 - a) When loading at a rack or stand, connect the grounding cable of the loading rack or stand to the tank trailer before opening the fill cover.
 - b) When loading with a hose at a storage facility, the hose may have a metal fitting on the free end but the other end may not be bonded internally. Such a fitting is installed and could become statically charged. Connect a grounding cable to the tank trailer and to some part of the permanent piping of the load facility before opening the fill cover.
2. Ensure all compartments to be loaded are empty and all of the valves on the tank trailer are closed before filling the tank. Know the nominal capacity of each compartment before to be filled.
3. Know the location of the fire extinguisher. Remove it and bring it to the point of operation. Read the instructions on the fire extinguisher and be prepared to use it.
4. Ensure the meter on the loading rack is set at a quantity equal to or less than the nominal capacity of the compartment being loaded.



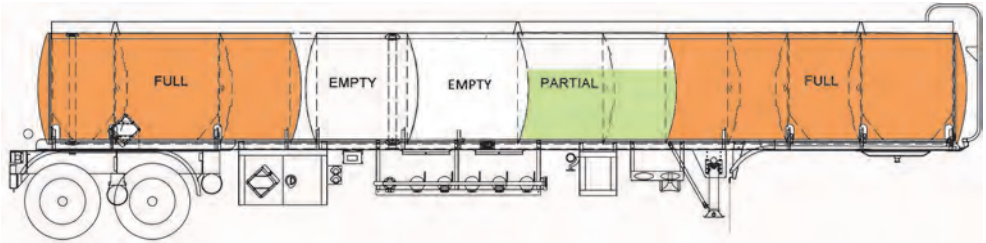
WARNING

Most substances being loaded or unloaded are hazardous. Know what you are dealing with and know where to acquire first aid in case of an emergency.

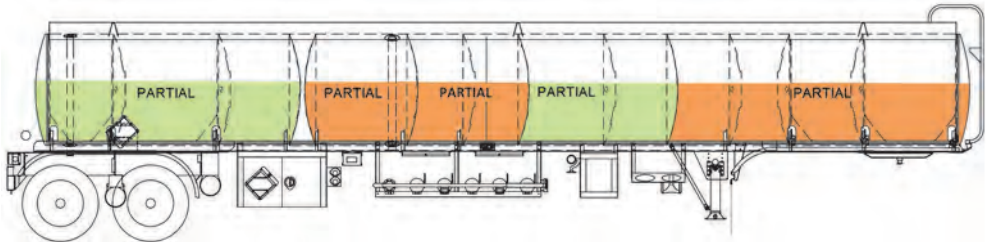
5. Slowly open the fill cover on the compartment to be loaded and insert the fill pipe far enough to keep the end near the bottom of the tank. Slowly fill the compartment until the end of the fill pipe is submerged to reduce turbulence and static electricity build-up.
6. Fill the compartment no further than to the bottom of the highest marker on the capacity indicator rod.
7. When the compartment is full, shut off the supply, remove the fill pipe, and close and secure the fill opening.
8. Fill the other compartments using the above instructions.
9. When loading is completed, remove the grounding wire(s).

PARTIAL LOADING

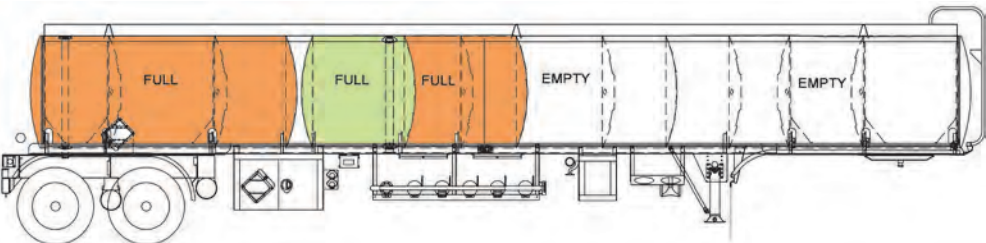
The recommendations concerning the partial loading of compartmented tanks are illustrated below. These procedures are intended to minimize surging of product and to maximize traction of the tractor trailer combination.



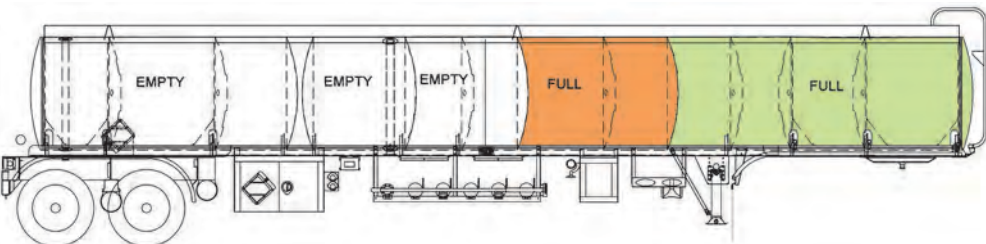
Recommended



Not Recommended < 85% Of Nominal Capacity



Not Recommended



Not Recommended

UNLOADING INSTRUCTIONS

PRECAUTIONS BEFORE UNLOADING

1. Always set the parking brakes before unloading.
2. See that discharge lines, valves, and transfer hoses are empty and clean. Ensure all hoses are compatible with the product to be unloaded.
3. Remain clear of rotating drives if the product is to be pumped off, to prevent entanglement in machinery. When pumping off product, run the pump for several minutes after the suction breaks air. Then close the valve and open the small air intake valve, if provided, to purge the hose.
4. In case of an emergency, product flow must be stopped by the remote emergency valve control. **KNOW ITS LOCATION**
5. Use only hoses rated for flammable liquids.

Tank Compartment Unloading Sequence

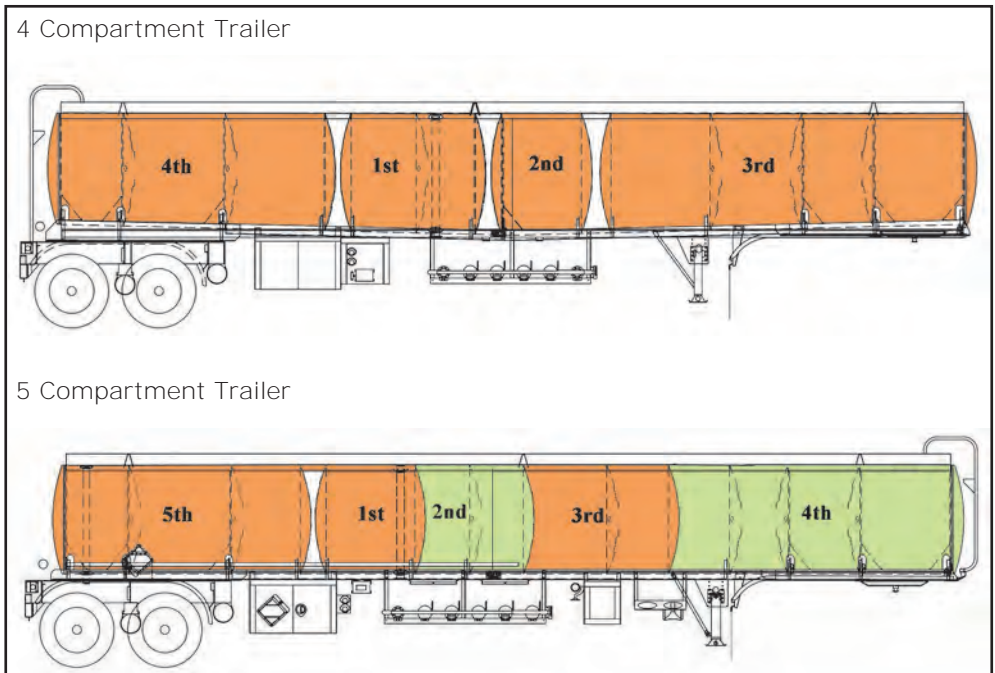


Figure 10. Unloading Sequence

UNLOADING INSTRUCTIONS



NOTICE

During unloading use only hoses rated for flammable liquids.

UNLOADING INSTRUCTIONS

1. Before unloading any compartment, refer to (Figure 10) for the recommended unloading sequence of compartments. If traction is a problem during transportation, reverse the order of the last two compartments.
2. Set the parking brakes on both the tractor and the tank trailer.
3. Connect a ground cable(s) to the trailer if needed.
4. Connect the vapor hose from the trailer to the vapor connection on the receiving tank. Make sure all valves in this line are open.
5. Make sure all vent valves in the top of the trailer are operating correctly. If vapor is not to be recovered, open the valves or **remove the caps on the trailer's vapor line. If the trailer is not equipped with a vapor recovery or vent valve, open the manhole cover.** Failure to provide vacuum relief by one of the above methods may result in tank collapse.
6. Connect the product hose from the trailer to the receiving tank.
7. After both ends of the product hose are secured, open the emergency valve. Open the product discharge valve slowly and check for leakage before leaving the valve.
8. After the load is discharged, ensure the piping is completely drained and there is no product in the vapor recovery system.
9. Close the emergency valves, product discharge valves, and manhole covers, and return all hoses to their proper places.
10. Disconnect the ground cable(s).

OVERFILL PROTECTION

INTRODUCTION

Typical petroleum transport trailers may be equipped with 2 different kinds of overfill protection systems, straight systems and on board monitor systems (OBM). Straight systems are 2 Wire Optic ("Thermistor") and 5 Wire Optic, which is typical for the West Coast. In a 5 wire optic the sensors MUST MATCH the racks monitor's signals. OBM systems have an "onboard Monitor" (sensor controller) to run sensors and provide for auxiliary inputs. Heil Trailer International, Co. uses several different models and manufacturers of overfill protection systems to meet customer needs. We recommend that you contact the manufacture of your system for operation and troubleshooting information.

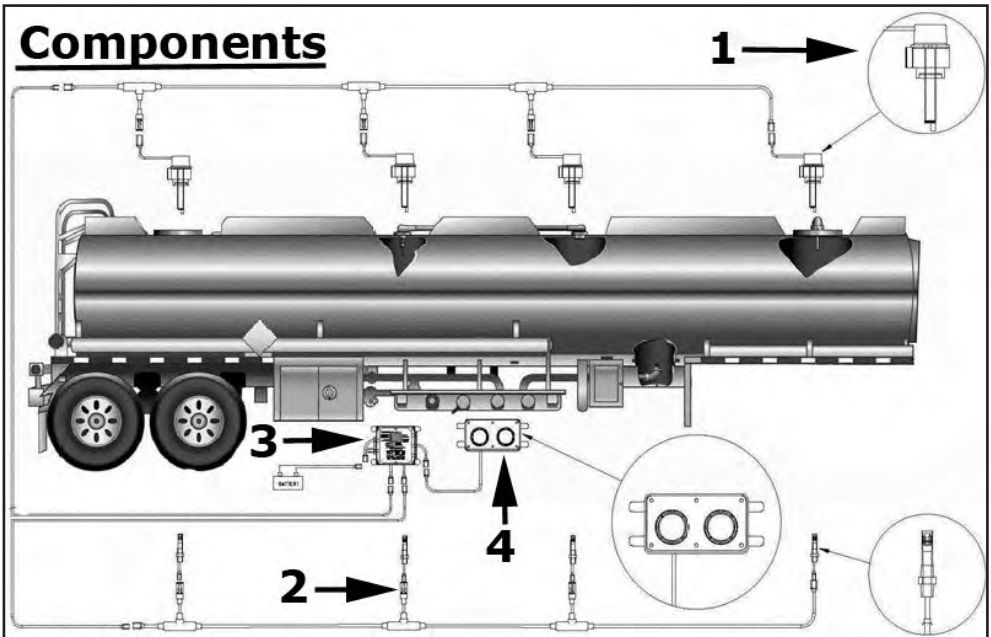


Figure 11. Overfill System Components

1. Top Sensor
2. Bottom Sensor
3. Overfill Monitor
4. Loading Rack Sockets (Optic/Thermistor/Dual)

Landing Gear Operating Instructions

WARNING: Before attempting to operate the landing gear, you must read and understand the following procedures.

1. Perform all procedures in lighted area clear of obstacles and other personnel.
2. Always grip the crank handle securely with both hands.
3. Maintain proper footing at all times.
4. Never attempt to shift the landing gear while under load.
5. Lifting and lowering of the trailer must always be done in LOW GEAR.
6. DO NOT ATTEMPT TO LIFT OR LOWER TRAILER WITH LANDING GEAR IN HIGH GEAR, AS SERIOUS PERSONAL INJURY COULD OCCUR.
7. Always secure the crank handle when not in use.

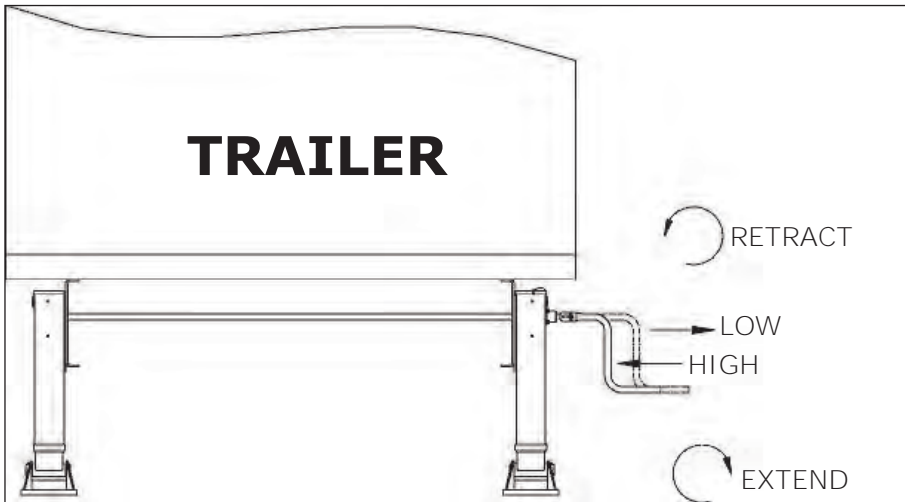


Figure 12. Landing Gear

- > Push crank handle **in** for **high** gear.
- > Pull crank handle **out** for **low** gear.
- > Turn crank: Counterclockwise to Retract, Clockwise to Extend.

PREVENTIVE MAINTENANCE

INTRODUCTION

Lubrication and service performed at regular intervals will keep the petroleum transport in top operating condition for the longest period of time. The importance of regular inspection cannot be over-emphasized. Making necessary adjustments, tightening nuts and bolts, checking air lines, lights and wiring connections will help prevent serious trouble and delays on the road.

The driver should be the first line of defense in Preventive Maintenance. A conscientious and alert operator will promptly report all need for adjustment or repair. A vehicle safety check should be performed daily prior to operation.

LUBRICANTS

It is not the policy of the Heil Trailer International, Co. to guarantee lubricant performance. The responsibility for the quality of any lubricant rests solely with the distributor or manufacturer of the lubricant.

DELIVERY INSPECTION

All units are thoroughly tested and inspected at the factory. As an added precaution, the following items should be double checked upon delivery.

- Axles..... Check king pin alignment
- Wheels.....Check wheel lug torque
- Brakes.....Check for proper operation and adjustment
- Lights and Wiring.....Check lights for proper operation
- Air Spring Bolts.....Check for proper torque
- Shock Absorber Bolts.....Check for proper torque
- Suspension Pivot Connection Bolts.....Check for proper torque
- Piping.....Check for leaks
- Manhole Cover.....Check clamping device for proper cover closure
- Landing Leg Support Bolts.....Check for proper torque
- Front and Rear Structure Bolts.....Check for proper torque

PREVENTIVE MAINTENANCE SCHEDULE

DAILY

- Anti-Lock Brake System.....Check for proper operation
- Lights and Wiring.....Check all lights for proper operation
- All Bolts.....Visually check for tightness
- Air Reservoirs.....Drain at the end of each shift
- Tires.....Check for proper inflation and inflate

WEEKLY

- Wheel Seals.....Check for oil leakage and oil level
- Wheel Lugs.....Check for proper torque
- Wiring.....Check all connections
- Suspension Bolts.....Check for proper torque
- Piping.....Check for leaks and damage
- Manhole.....Check clamping device for proper cover closure and check gasket for damage
- Front and Rear Structure Bolts.....Check for proper torque

MONTHLY

- Manhole.....Clean manhole and oil clamps
- General Inspection.....Perform inspection (see page 37)
- Supports.....Lubricate; check mounting bolts for proper torque
- Axle Camshafts.....Lubricate all grease fittings

90 DAYS

- Relief Valve.....Remove and inspect relief valve for clogs of hardened material. Bench test relief valve to ensure proper operation.

PREVENTIVE MAINTENANCE SCHEDULE

EVERY 5000 MILES

- King Pin Alignment.....Check for proper alignment
- Brakes.....Adjust as needed
- Wiring.....Check for chafed or broken wires, ground wire Connections, loose wire retaining clips and dielectric grease.
- Upper 5th Wheel.....Lubricate
- Suspension.....Check for proper bolt torque
- Piping.....Check all piping supports-tighten if necessary

EVERY 10,000 TO 25,000 MILES

- Wheel Bearings.....Verify proper end play and adjust as necessary
- Brakes.....Inspect linings, free-up brake shoes and anchor pins



Lubrication and Service Chart

| | | | | | | |
|--|-------|--------|---------|-------------|---------------|----------|
| Ensure proper operation of PAF and other vents | X | | | | | |
| Drain any water from air reservoirs | X | | | | | |
| Check manhole clamps, cover closures and gaskets | | X | | | | |
| Clean manhole and lubricate its clamps | | | X | | | |
| Check the operation of all lights | X | | | | | |
| Check all wiring connections | | X | | | | |
| Check for broken or chafed wires | | | | X | | |
| Check brake operation | X | | | | | |
| Adjust brakes (Pg. 43) | | | | X | | |
| Inspect slack adjusters, brake linings and brake chambers | | | | | X | |
| Free up brake shoes and anchor pins (Pg. 43) | | | | | X | |
| Check condition of walkways and toe rails (Pg. 18) | | X | | | | |
| Check suspension bolt torque (Pg. 64) | | | | X | | |
| Check tires for damage and wear (Pg. 54) | X | | | | | |
| Check axle alignment to king pin (Pg. 57) | | | | X | | |
| Check lubricant level and oil seals on the axles (Pg. 51) | | X | | | | |
| Check ladder bolt tightness | | X | | | | |
| Check the operation of pressure relief device (Pg. 38) | X | | | | | |
| Check the adjustment of emergency valve cables and lubricate | X | | X | | | |
| Lubricate grease fittings on axle camshafts | | | X | | | |
| Check wheel bearings (Pg. 55) | | | | X | | |
| Check lug nut torque (Pg. 54) | | | | | X | |
| Check piping supports and mounting fastener tightness | | X | | | | |
| Check front and rear structure fastener tightness | | X | | | | |
| Check all valves, piping and manholes for leakage | X | | | | | |
| Check landing gear mounting fastener tightness | | X | | | | |
| Check upper coupler fastener torque | X | | | | | |
| Check king pin wear | | | | X | | |
| Lubricate upper coupler plate and king pin | X | | | | | |
| Visually check tightness of all fasteners | X | | | | | |
| Check all supports and braces | | | | X | | |
| Notice | | | | | | |
| Tank trailer should be inspected periodically to ensure it meets D.O.T. requirements. | | | | | | |
| Refer to the <u>D.O.T. Transportation of Hazardous Materials Handbook</u> (paragraph 177.824) if hazardous materials are to be hauled. | | | | | | |
| | Daily | Weekly | Monthly | 5,000 Miles | 10K-25K Miles | Annually |

LUBRICATION & SERVICE

- 1. Manhole Cover-**(Weekly)-check clamping device for proper cover closure; check gasket for damage. (Monthly)-Clean manhole gasket and lubricate clamps.
- 2. Lights and Wiring-**(Daily)-check all lights for proper operation. (Weekly)-Check all connections. (Every 5000 miles)-Check for chafed or broken wires.
- 3. Anti-Lock Brake System-**(Daily)-Check for proper operation. Refer to Anti-Lock System Maintenance Manual. (Every 5000 miles) -Adjust brakes, see page 43. (Every 10,000 to 25,000 miles)- Inspect linings, free-up brake shoes and anchor pins.
- 4. Rear Structure-**(Weekly)-Check bolts for proper torque (150 ft-lbs)
- 5. Suspension-**(Every 5000 miles)-Check for proper bolt torque. See page 64 for torque chart.
- 6. Tires-**(Daily)-Check for proper inflation, cuts or other damage. See page 54.
- 7. Axles-**(Weekly)-Check oil level and for leakage around oil seals, see page 51. Recommended hub oil is **Synthetic 75W-90**. Recommended hub grease is **Mobilith 007** and **Chevron Delo**. Check pivot bolt connections for proper torque. (Every 5000 miles) Check axle alignment to king pin, see page 57. Do not mix oil with grease.
- 8. Wheels-**(Weekly)-Check lug nuts or bolts for proper torque, see page 56. (Every 10,000 to 25,000 miles) Check wheel bearings. Tighten or replace as required. See page 55.
- 9. Discharge Handles -**(Annually) Check API valve handles and lubricate. Fluorosilicone grease is recommended.
- 10. Piping-**Check for loose clamps, damaged hoses or leaks. (Monthly) Perform general inspection.
- 11. Supports-**(Monthly)-Lubricate; check mounting bolts for proper torque (150 ft-lbs).
- 12. Front Structure-**(Weekly)-Check bolts for proper torque (150 ft-lbs).
- 13. Landing Gear -** (At least every 3 months) - Lithium Base 1-2% Moly EP-2. For temperatures less than -50 use Artic-Grade all weather white grease.
- 13. Upper 5th Wheel-**(Every 5000 miles) Lubricate with multipurpose synthetic grease.

OVERFILL MAINTENANCE/TESTING

LOADING

If you are not getting a permit signal to load from the overfill system, one of the vents is blocked or closed. The vents are sequential and will not allow the trailer to be loaded unless all vents are opened and functioning properly.

TESTING

After installing a new overfill detection system, after replacing any system components, as well as during each of the tank vehicle's scheduled preventive maintenance work sessions, we recommend you perform the point outlined in the test below, at a minimum, one time annually.

1. Connect an appropriate Overfill Detection System Tester to the tank vehicle's Thermistor and/or Optic Socket. This tester should have a visual and/or audible indication of the system's permissive and non-permissive status (to stimulate the same connection to the loading rack).
2. Assure the above tester is in proper working order and the operator is properly trained on the tester's use.
3. Each of the tank vehicle's overfill detection sensors should be "dip tested" by immersing the detection end of the sensor in water or an appropriate liquid.
4. A technician at ground level should assure that the tester displays the appropriate non-permissive (wet) status when each sensor is wetted.
5. Repeat the above testing on all Sockets on the tank vehicle.
6. During testing, only the appropriate number of overfill detection sensors (one each) matching the number of compartments on the tank vehicle should be found. For example, if the tank vehicle has 3 compartments, then only 3 sensors should be found and all 3 sensors, when wetted, should result in a non-permissive (wet) tester condition.

AVOID

Do not expose the components to undue mechanical, thermal, chemical or electrical stresses that are outside the normal range of products. During tank cleaning, directing steam at a probe can cause damage and affect its performance. The same risks apply with respect to physical force.

This procedure is non-product, non-manufacturer specific. Feel free to contact any Overfill Detection System manufacturer to assist you with the procedure or if you need equipment or product to facilitate recommended testing.

BRAKES-MAINTENANCE & ADJUSTMENT

NOTICE

For more information reference the manufactures web literature or call their customer support.

The wheel brakes are equipped with slack adjusters for easy brake adjustment to compensate for brake lining wear. It is recommended that slack adjuster arm travel be held to a minimum for most efficient braking action. The brakes should be adjusted when total arm travel reaches 1-1/2".

To adjust brakes, depress lock sleeve on slack adjuster, then turn adjustment screw as required. Make sure lock sleeve returns to lock position when adjustment is complete.

Every 5000 miles, the brake camshafts should be lubricated with approved chassis lubricant. Every 10,000 to 25,000 miles, the brakes should be serviced as follows:

1. Remove wheels and hubs.
2. Inspect brake roller shafts, cam rollers, anchor pins, camshaft support bushings, spider bushings and camshaft for wear and replace if necessary. Lubricate these parts with chassis lubricant upon reassembly.
3. Inspect brake linings for wear, loose rivets and any signs of grease on the braking surface. Oil-soaked linings are not reusable and must be replaced. Check to ensure that the linings have not worn to the point that rivet heads are contacting inside surface of drum. Reline or replace brake shoes if necessary.
4. Check inside surface of drum. Rebooting of drums is not recommended, as the strength of refaced drums is greatly reduced. If drum is worn, replace it.
5. Service the wheel bearings and seals if required. Reassemble hubs and wheels.

DISC BRAKE INSPECTION & PREVENTIVE MAINTENANCE

Basic Inspection w/ wheel mounted

1. For vehicles with electronic wear indicators, use the dash indicator(s) and/or the hand-held diagnostic tool to regularly monitor the pad wear.
2. In all cases, **visually inspect the wear indicator every three months** (or keep track of the results of maintenance inspections to schedule checks 4 to 5 times during the pad lifetime). If indicators line up time to schedule inspection of pads and rotors.
3. A visual check of the mechanical wear indicator every time the tire pressures are checked is recommended. Be alert for any rotor cracks, etc. visible.
4. Follow all industry safety guidelines. On level ground, with the wheels chocked and the parking brake temporarily released, check for movement of the brake caliper. This small movement, less than 0.80" (2 mm) - approximately the thickness of a nickel - in the inboard/outboard direction indicates that the brake is moving properly on its guide pins. If the caliper has no movement or appears to move greater than the distances above, a full wheel-removed inspection will be necessary.

Basic Inspection w/ wheel removed (annually and at pad replacement)

1. Inspect the rotor for cracks, etc.
2. Inspect the running clearance and adjuster function.
3. Inspect the caliper travel.
4. Inspect the tappet and boot assemblies.
5. Inspect all covers, caps, hoses and brake exterior for damage etc.

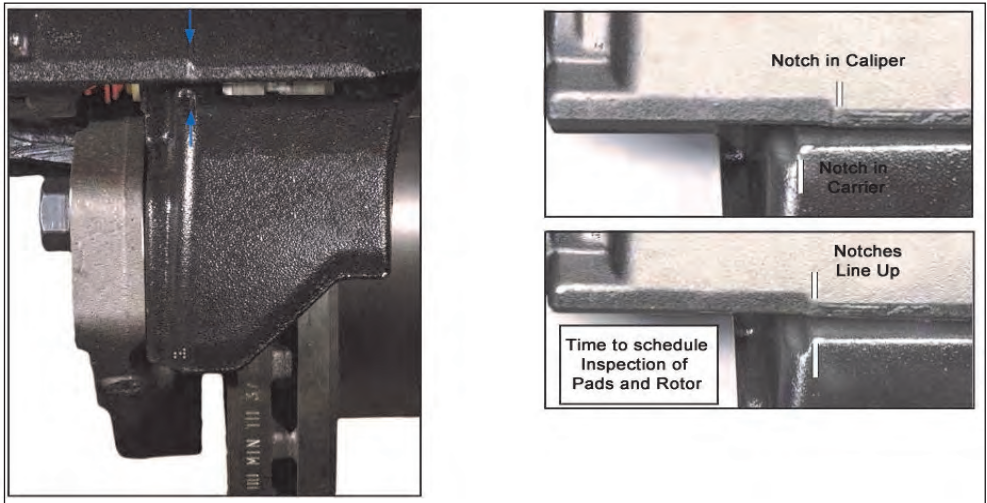


Figure 13. Pad Indicators

ROLLOVER PROTECTION AND ABS

INTRODUCTION

The rollover protection available on Heil trailers is an electronic, self-monitoring system that works with standard air brakes to enhance the safety and reduce the potential of trailer rollover accidents. Electronic rollover protection systems monitor many factors that may cause a rollover accident; vehicles speed, wheel speed, air suspension pressure, and lateral acceleration along the vehicles roll axis. Rollover protection activates when one or more factors exceed safe conditions. The trailers stability is achieved by the rollover device sensing unsafe conditions or speeds and sending a signal to the Electronic Control Unit (ECU), where it reduces the vehicles speed to a "safe" range. All data may be looked up from the information centers or by hooking up a diagnostics tool.

DANGER

IT IS IMPORTANT TO NOTE THAT THE TRAILERS "ROLL STABILITY SYSTEM" IS MERELY A LIMITED ASSIST TO MINIMIZE ROLLOVERS UNDER CERTAIN SITUATIONS AND IS NOT INTENDED TO NOR WILL IT PREVENT ROLLOVERS IN ALL SITUATIONS, AND MORE PARTICULARLY, THOSE RESULTING FROM DRIVER ERROR OR INSUFFICIENT TRAINING OR EXPERIENCE, IMPROPER TRAILER CONDITION AND LOADING, EXCESSIVE SPEED FOR CONDITIONS, ROAD DESIGN INCLUDING EXITS, ROAD DEBRI AND HAZARDS SUCH AS OTHER VEHICLE ACCIDENTS, WEATHER CONDITIONS, IMPROPER ABS, BRAKE COMPONENT AND WHEEL MAINTENANCE, IMPROPER TIRE CONDITION AND REPLACEMENTS AND OTHER CONDITIONS WITHIN OPERATOR CONTROL AND OBSERVATION FOR ASSESSING POTENTIAL ROLLOVER CONDITIONS AND HAZARDS WHICH COULD POSSIBLY LEAD UP TO A POTENTIAL ROLLOVER RESULTING IN, PERSONAL INJURIES, FATALITIES AND ENVIRONMENTAL AND PROPERTY DAMAGE.

INSTALLATION

Refer to CD supplied with tank for installation diagrams, procedures and plumbing schematics. These drawings are trailer specific.

Common Types of Trailer Rollover Protection and ABS

- >Haldex. Trailer Roll Stability (TRS)
- >Meritor WABCO. RSSplus Trailer ABS with Roll Stability
- >Bendix. Bendix ABS with ESP (Electronic Stability System)

ROLLOVER PROTECTION AND ABS

NOTICE

Remove all air pressure and electrical power from the brake system before beginning any work on system.

DIAGNOSTICS/TROUBLESHOOTING

Most ABS or Roll Stability problems are related to:

1. Cut, corroded, or abraded wires.
2. Corroded connectors and terminals.
3. Connector terminal not latched or seated correctly to mating assemblies.
4. Excessive sensor air gap, sensor clip retention.
5. Wheel bearing end play.

Faults, problems and diagnostics are displayed two different ways. When the system detects an issue it alerts the driver/owner by either delivering a Blink Code Count to the ABS indicator lamp located on the rear streetside fender (Figure 15) or by sending a fault code to an information center (Figure 14) located on the rear frame of the trailer.



Figure 14. TRS Info Center 2



Figure 15. ABS indicator Lamp

Note: Data collected when the system detects a fault will be stored and can be retained with proper diagnostic tool.

ROLLOVER PROTECTION AND ABS

DIAGNOSTICS/TROUBLESHOOTING

Diagnostic Trouble Fault Codes List (HALDEX)

| Power Supply Fault Code List | |
|-------------------------------------|--|
| ECU TIME OUT or NO LINK | No supply on ignition switched line. Check truck fuses, 7-way connection, 5-way ABS connection, power cable connections. Check diagnostic cable for corrosion. |
| PWR ISO7638 FAILI | Intermittent power loss. Check all electrical connections as mentioned above. |
| PWR LO VOLT | Supply voltage < 8 volts. Check voltage regulator on tractor, loose connections, and corrosion. |
| PWR HI VOLT | Supply voltage > 17 volts. Same as above. |

| Sensor/Sensor Extension Fault Code List | |
|--|--|
| S1A CONT S1B CONT S2A CONT S2B CONT | Note. The fault code identified which sensor/wheel end needs to be checked. Open or Short Circuit. 1. Disconnect the sensor extension cable from sensor and measure electrical resistance between the two pins in the sensor housing, it should be between 980-2350 ohms. 2. Disconnect sensor extension from ECU and measure continuity. |
| S1A SIGNAL S1B SIGNAL S2A SIGNAL S2B SIGNAL | Intermittent low sensor output occurs when vehicle is moving. Check for broken sensor retaining clip, damaged or misaligned exciter ring, excessive wheel bearing end play, loose/ damaged/corroded sensor connections or a break inside the sensor cabling. |

ROLLOVER PROTECTION AND ABS

DIAGNOSTICS/TROUBLESHOOTING

Sensor/Sensor Extension Fault Code List (cont..)

| | |
|--|---|
| S1A SIGNAL S1B SIGNAL S2A SIGNAL S2B SIGNAL | Low sensor output. 1. Rotate the wheel at 1 rev / 2 sec and measure AC voltage at the sensor plug, it should be > 200 millivolts. 2. Make sure sensors are pushed up against exciter rings. |
|--|---|

Modulators Fault Code List

| | |
|--|---|
| BRK APPLY SC BRK APPLY OC BRK APPLY SC DRIVE BRK APPLY UNSPEC | Internal fault with the brake apply solenoid. Detach ECU and replace modulator. |
| EPRV 21 HOLD SC EPRV 21 DUMP SC EPRV 21 HOLD OC EPRV 21 DUMP OC EPRV 21 HOLD SC DRIVE EPRV 21 DUMP SC DRIVE EPRV 21 HOLD UNSPEC EPRV 21 DUMP UNSPEC | Internal fault with the hold or dump solenoids of modulator 21. Detach ECU and replace modulator. |
| EPRV 22 HOLD SC EPRV 22 DUMP SC EPRV 22 HOLD OC EPRV 22 DUMP OC EPRV 22 HOLD SC DRIVE EPRV 22 DUMP SC DRIVE EPRV 22 HOLD UNSPEC EPRV 22 DUMP UNSPEC | Internal fault with the hold or dump solenoids of modulator 22. Detach ECU and replace modulator. |
| DEMAND SC DEMAND OC | Internal fault with the service/control line pressure transducer. Detach ECU and replace modulator. |
| EPRV 21 DEL SC EPRV 21 DEL OC EPRV 22 DEL SC EPRV 22 DEL OC | Internal fault with the delivery pressure transducer. Detach ECU and replace modulator. |

ROLLOVER PROTECTION AND ABS

DIAGNOSTICS/TROUBLESHOOTING

Modulators Fault Code List (cont..)

| | |
|---|--|
| EPRV 21 SLOW REC EPRV 22 SLOW REC | Wheels are slow to recover after brakes are released. Make sure foundation brakes are operating properly, delivery hoses not pinched, speed sensors not crossed with modulator, correct side-by-side plumbing. |
| RESR SC RESR OC | Internal fault with the reservoir pressure transducer. Detach ECU and replace modulator. |
| SUSP SC SUSP OC SUSP OUT OF RANGE | 1. Check for air leaks on suspension lines 2. Make sure leveling valve is plumbed correctly 3. Internal fault with the suspension pressure transducer. Detach ECU and replace modulator. |

WARNING

The Roll Stability and ABS is an electrical system. When you work on the ABS, take the same precautions that you must take with any electrical system to avoid serious personal injury. As with any electrical system, the danger of electrical shock or sparks exists that can ignite flammable substances. You must always disconnect the battery ground cable before working on the electrical system.

NOTICE

Refer to Anti-Lock Brake System Maintenance Manual for operational check and service instructions.

ROLLOVER PROTECTION AND ABS

DIAGNOSTICS/TROUBLESHOOTING

Blink Code Diagnostics (WABCO)

There are two kinds of faults: active and stored. Active faults are those currently existing in the system, such as a broken wire. Active faults can be diagnosed through blink codes or TOOLBOX™ Software. Stored faults are faults that have occurred but do not presently exist. Active faults can be cleared only after repairs are completed. Stored faults can only be diagnosed with TOOLBOX™ Software.

The ECU signals a malfunction by lighting both the internal and external indicator lamp when a fault exists. Blink codes are activated through Ignition Power Activation.

Ignition Power Activation

Ignition Power Activation is the process of **using the vehicle's ignition switch** (or interrupting the power on the blue wire by unplugging the J560 plug at the nosebox or by some other means) to display blink codes on the trailer ABS indicator lamp located on the side of the trailer. This method is for constant power vehicles only.

NOTE: For ignition power activation, power is provided by the ignition switch.

To obtain blink codes using ignition power activation, perform the following procedure:

Turn the ignition switch on for no longer than five seconds. The ABS indicator lamp will be on.

- 1) Turn the ignition switch off. The ABS indicator lamp will go out.
- 2) Turn the ignition switch on. The ABS indicator lamp will then come on, then go out.
- 3) The blink code error will be displayed three times by the ABS indicator lamp on the trailer.

| Blink Code Counts | Component Name |
|-------------------|-------------------------------|
| 0 | No failure |
| 3 | Sensor failure c |
| 4 | Sensor failure d |
| 5 | Sensor failure e |
| 6 | Sensor failure f |
| 7 | External modulator failure |
| 9 | Internal modulator failure H2 |
| 10 | Internal modulator failure H1 |
| 11 | No speed failure |
| 12 | Control pressure failure |
| 13 | Supply pressure failure |
| 14 | Power supply failure |
| 15 | ECU internal failure* |
| 16 | SAE J 1708 failure |
| 17 | PLC failure |
| 18 | Generic IO failure |
| 19 | Load sensing failure |
| 20 | Roll stability system failure |

WHEEL BEARINGS & SEALS

The wheel hub revolves around the axle spindle on two roller bearings. The bearings are lubricated and the hub cavity is sealed against leakage by a seal which rides around an axle ring on the spindle shoulder. Figure 16 illustrates the bearing and seal arrangement.

Check oil level and for leaks around the oil seal at least once a week. If low, refill hub to oil level line on hub cap. Heil Trailer International, Co. uses 75W90 Synthetic Gear Oil. For best results and wheel end life, use only compatible lubricant products.

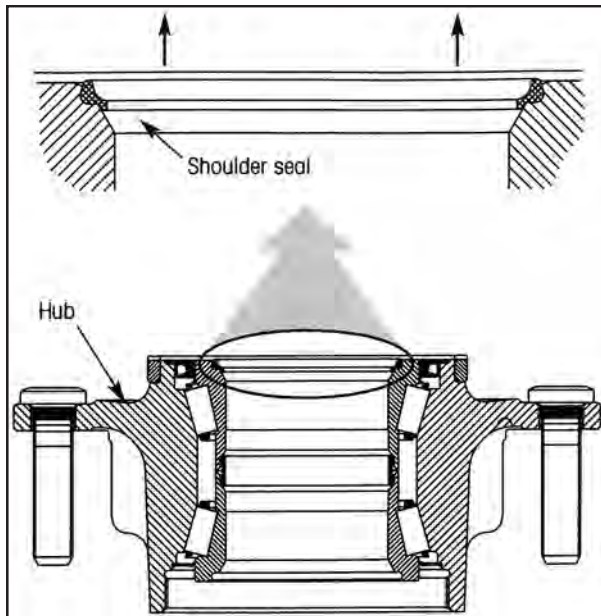


Figure 16. Cross Section View of Wheel Hub

Wheel Bearing Adjustment

Bearing adjustment should be 0.001"-0.005" end play and a minimum of pre-load. Use the following procedure:

1. Tighten inner jam nut (Figure 16) with a 12 inch wrench while turning wheel in both directions until there is a slight bind which indicates all bearing surfaces are in contact.

Wheel Bearing Adjustment (continued)

2. Back off inner jam nut 1/3 turn to allow the wheel to rotate freely.
3. Install washer and tighten outer jam nut.
4. Final bearing adjustment should be with 0.001" to 0.005" end play. Tighten nuts at this position.

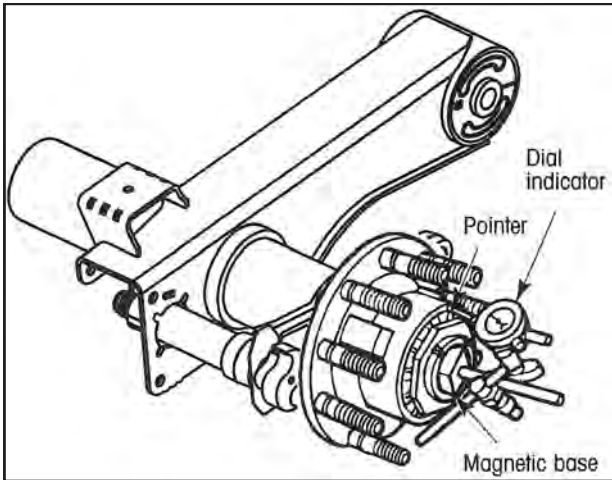


Figure 17. End Play Adjustment

Oil Seal Replacement

If oil leakage around the inner oil seal is noted, replace the oil seal (and axle ring, if required) as follows:

1. Remove wheels and hub
2. Remove and discard old seal.
3. Inspect axle ring. If pitted or worn, replace as follows:
 - a. Remove old ring. Take care not to damage spindle.
 - b. Clean spindle thoroughly. Shoulder area must be smooth and free from weld spatter and burrs.
 - c. If shoulder is not completely smooth apply sealer No. 2 to correct any defects and ensure an oil-tight fit.

Oil Seal Replacement (continued)

- d. Using axle tool, drive the axle ring firmly on shoulder. Edge of axle ring must be parallel and flush with shoulder face. Remove excess sealer, if used.
4. Install oil seal in wheel hub as follows:
 - a. Remove all burrs from inside hub bore.
 - b. If seal is not pre-coated with BLU-SEAL, or if wheel hub bore is not entirely free of nicks or burrs, apply a thin coat of sealer No. 2 to the O.D. perimeter of the oil seal.
 - c. Lay wheel down, brake drum up. Check to ensure that hub cavity is clear of old grease, grit and metal particles-steam clean if possible. Check bearing cones on spindle for proper slip fit. Install inner bearing in hub bore. Place seal in starting position in bore.
 - d. Using hub tool and a hammer, drive seal squarely and evenly into bore. Seal should bottom evenly all around against bearing cup. DO NOT continue to hammer after seal has bottomed evenly, as damage to the seal will result.
 5. Coat seal lip and inside diameter of inner bearing cone, then install wheel on axle. Take care not to damage seal during installation. If wheel does not slip back in place easily, remove and check for burrs or possible component damage.
 6. Install outer bearing, jam nuts and washer. Adjust bearing preload (see Wheel Bearing Adjustment).
 7. Install gasket and hub cap.
 8. Refill hub with recommended oil. See Wheel Bearings and Seals. 1 to 1-1/2 pints are required per hub, depending on wheel well design. A minimum of 1 pint is required for proper lubrication. Allow plenty of time for the oil to seep through the bearings.
 9. Re-install vent plug.



CAUTION

Replace gaskets when they are broken, crushed, swollen, or no longer provide an adequate seal. Use only genuine HEIL or OEM replacement parts.

WHEEL & TIRE MAINTENANCE

Proper tire inflation and correct installation of rims and wheels is essential to safe, economical, trouble-free service.

Check tire pressures daily. Recommended inflation pressure is noted on VIN Data Plate. DO NOT over-inflate tires, as this is a common cause of rim failures and accidents. Never run vehicle on one tire of a dual wheel assembly. Loss of air in one tire of a dual set excessively overloads the other tire if the vehicle is operated in this condition.

When checking tire pressures, visually check studs and rim for looseness, cracks or other damage. Inspect tires for uneven wear, cuts, cracks, etc., which would render the tire unfit for further service. If the least doubt exists as to the tires' serviceability, replace the tire.

DANGER

Be extremely careful when working with tires and wheels. Tires and wheels can come apart with explosive force. Never attempt to disassemble a wheel with an inflated tire mounted on it.

Check wheel lug torques at least once a week. See Page 64 for recommended lug nut torques.

NOTICE

Insufficient mounting torque can cause rim slippage, resulting in broken valves, worn parts and damaged tires. Excessive mounting torque can cause damage by stripping studs, collapsing spacer bands or forcing rims into an out-of-round condition.

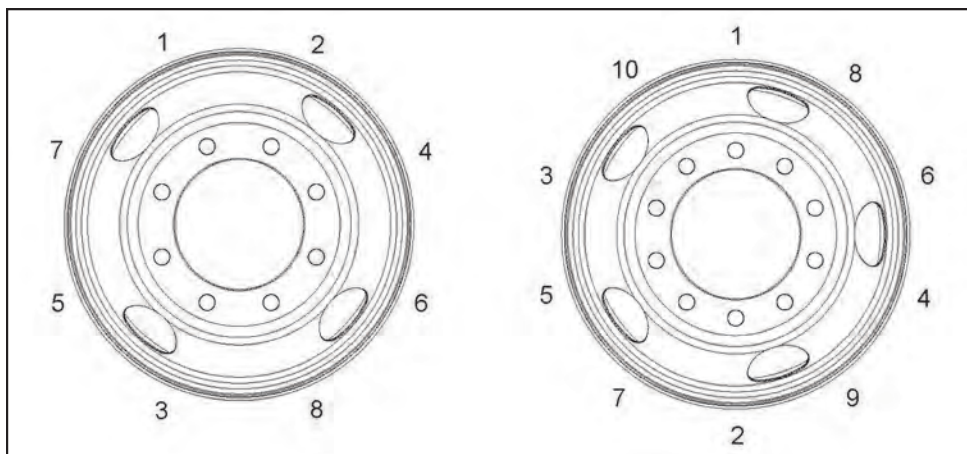


Figure 18. Disc Wheel Installation

Recommended Installation Procedure-Disc Wheels

1. Check all parts for damage, including wheels and rings. Insure that all studs, nuts and mounting faces of hub and wheels are clean and free from grease. Replace any defective parts.
2. Mount inner dual wheel over studs, being careful not to damage stud threads.
3. Mount the outer wheel, being careful not to damage stud threads and hand tighten wheel nuts.
4. Tighten nuts fully, using a crossing pattern as shown above in (Figure 18). Be sure to tighten nuts only to the recommended torque. For correct wheel lug nut torque see page 64.

NOTICE

Insufficient mounting torque can cause wheel shimmy, resulting in damage to parts and extreme tire tread wear. Excessive mounting torque can cause studs to break and discs to crack in the stud hole area.

AXLE ALIGNMENT

Improper axle alignment will cause dog-tracking and excessive tire wear. To check alignment of axles to king pin, use the following procedure:

1. Set empty trailer on level smooth surface, disconnect trailer brakes and bleed air tank.
2. Rock trailer back and forth for a distance of approximately 10 feet to relieve any binding in brakes or suspension bushings.
3. Tow trailer straight forward for a distance of approximately 30 feet. Stop trailer with tractor gears or tractor brakes only.
4. Disconnect tractor from trailer and ensure suspension ride height is properly adjusted.
5. Adjust landing legs to level trailer and set upper coupler to the correct ride height.
6. Do not remove wheels, but remove all hub caps and install axle center extensions. Use suitable kingpin jack or center extension to insure a clear path from the kingpin centerline to the axle center extensions.
7. Measure from kingpin extensions to both front axle center extensions. This distance should be the same on both sides ($A = B$).
8. If not, remove and install new pivot bolts leaving them loose enough to adjust axle to square with the kingpin. Make sure there are no obstacles in front of wheels during alignment.

Notice

Pivot bolts must be replaced during realignment of the suspension.

Axle Alignment (continued)

9. Measure from front axle center extensions to rear axle center extensions. This distance should be the same of both sides ($C = D$). If not, remove and install new pivot bolts leaving them loose enough to adjust rear axle to parallel with front axle. The suspension should now be in proper alignment with the kingpin.

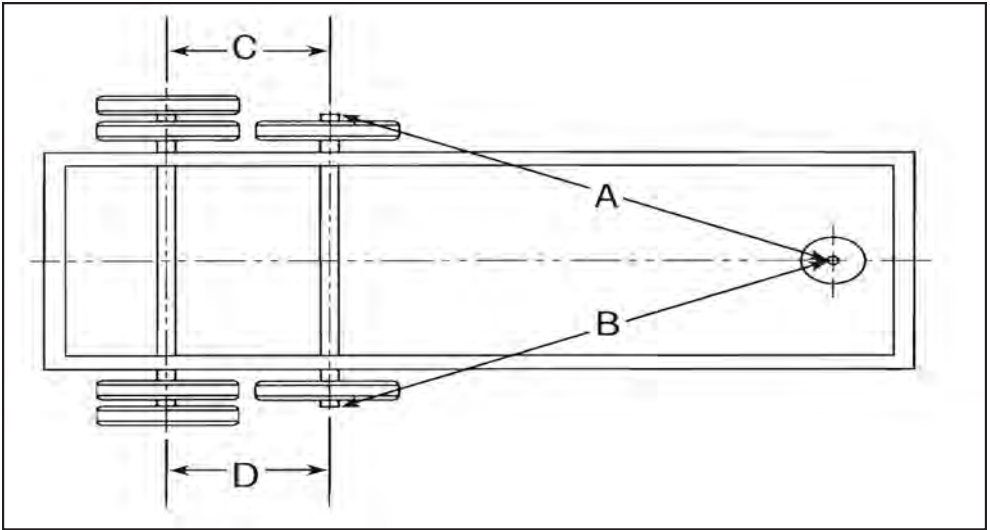


Figure 19. Trailer Alignment

10. The **QUIK-ALIGN®** style pivot connection uses two flanged collars inserted into slots on each side of the frame bracket (Figure 21). The eccentric collar on the outboard side of the frame bracket is used to adjust the position of the axle during an alignment. The alignment guides on the side of the frame bracket limit the eccentric collar to rotational movement in the frame bracket slot. Rotating the eccentric collar clockwise causes the axle to move forward. Rotating the eccentric collar counterclockwise causes the axle to move rearward (Figure 20). The maximum range of adjustment is ± 45 degrees from the 12 o'clock position.

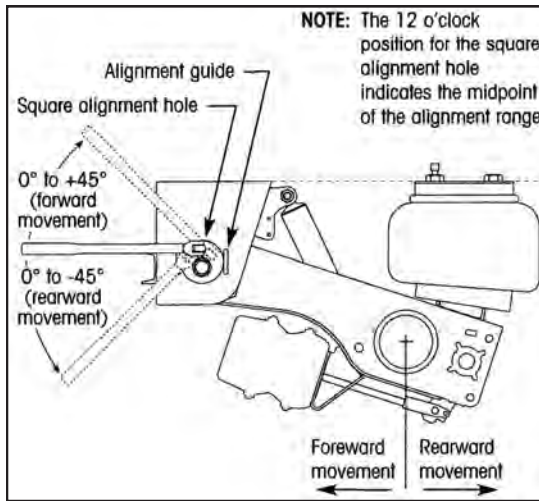


Figure 20. Quick-Align Operation

11. Using an E20 Torx socket, tighten the shear-type bolt axle pivot connection until the Torx head shears off. This ensures the proper torque of 550 ft. lbs. (± 45 ft. lbs.). Pivot bolts must be replaced when trailer is aligned. **DO NOT** attempt to reuse old pivot bolts. Assembly of pivot connection shown below (Figure 21).

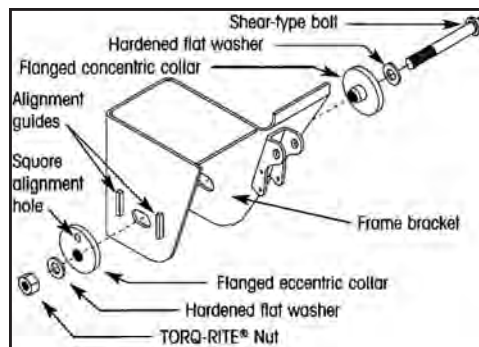


Figure 21. Pivot Connection Assembly

12. Connect tractor to trailer and connect trailer brakes on the lot. Make four or five tight figure eights and an equal number of "panic" brake stops. Bring trailer back into shop and check axle alignment. If axles are not in proper alignment, check for loose or worn bushings and bearings, loose or broken hangers, cross members, side rails or kingpin.

LIFT AXLE ALIGNMENT

LIFT AXLE ALIGNMENT

Following the procedures below will provide the proper axle alignment.

Note: Does not apply to units that are pre-aligned.

1. With chassis on a flat level surface set suspension at the proper ride height with no load. Block tires on truck chassis and release brakes on auxiliary axle. This will allow tire rotation while positioning the suspension fore and aft.
2. Position one beam of the auxiliary suspension so the alignment collar is in the center of the alignment slot and tack weld the alignment collar to frame bracket side plate.
3. Measure from the truck chassis front drive axle (or rear drive axle for tag type axle) to the top of kingpin housing (common point on both sides of axle). Move the free beam fore or aft until both sides are equal distance to drive spindle. A total maximum alignment tolerance of $1/8''$ is considered acceptable. If additional axle movement is required remove tack weld and adjust axle as required.

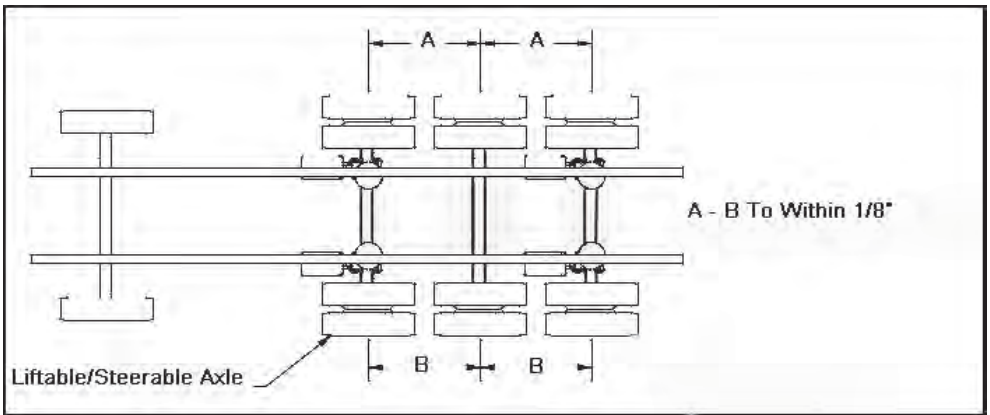


Figure 22. Alignment

NOTE: For more information reference the manufactures web literature or call their customer support.

Trailer Suspension System

Components and General Maintenance Guidelines

HEIGHT CONTROL VALVE - The height control valve on the 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 or temperature only affect the adding or exhausting of air. The trailer air suspension is a mechanically stable suspension, only one height control valve is necessary.

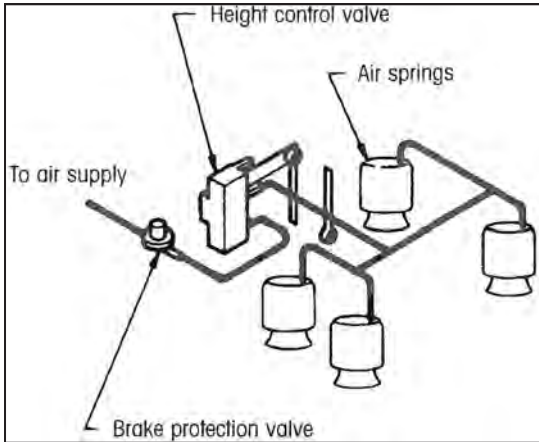


Figure 23. Suspension Height Control Valve

When the actuating lever of the height control valve moves up, the valve opens and connects the air supply to the air spring. 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. A check valve prevents the loss of air spring pressure if the air supply fails. In the central position, air does not flow in or out of the air springs.

Notice

When adjusting the height control valve, block the tires 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.

Trailer Suspension System

Components and General Maintenance Guidelines

The ride height can be found on the suspensions ID tag located on the inside of the curbside beam (Figure 24).



Figure 24. Suspension ID Tag

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 as shown below (Figure 25).
 - b. Add half the diameter of the axle to the measurement.

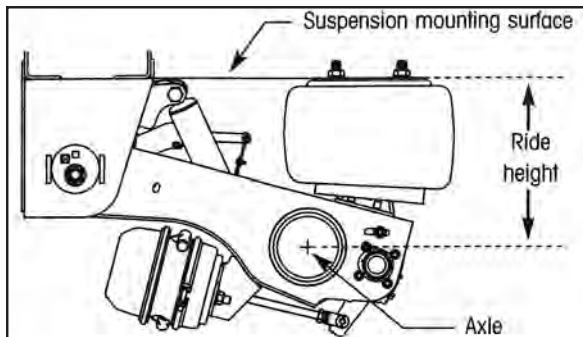


Figure 25. Ride height measurement

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

Trailer Suspension System

Components and General Maintenance Guidelines

6. Adjust the HVC linkage to fit between HVC lever and lower linkage attachment.
7. Once set to the designed ride height, test drive the trailer. After the test drive, check the ride height to assure an accurate adjustment.

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

Air Spring Replacement

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.

SHOCK ABSORBER - Shock absorbers absorb energy to prevent suspension oscillation. Shock absorbers are also 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.

To remove 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.

Trailer Suspension System

Components and General Maintenance Guidelines

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 INTRAAX suspension systems come equipped with QUIK-ALIGN pivot connection hardware. The hardware consists of a specially plated shear bolt to ensure a proper clamp load, (550 ft-lbs, H-45 torque).

NOTICE

Failure to properly torque the pivot bolts may result in loss of warranty coverage.

TRI-FUNCTIONAL BUSHING - have unique properties that will provide years of maintenance-free service. The TRI-FUNCTIONAL BUSHING (located at the suspension pivot connection) 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. Reference Hendrickson service guide L427 for bushing replacement procedures.

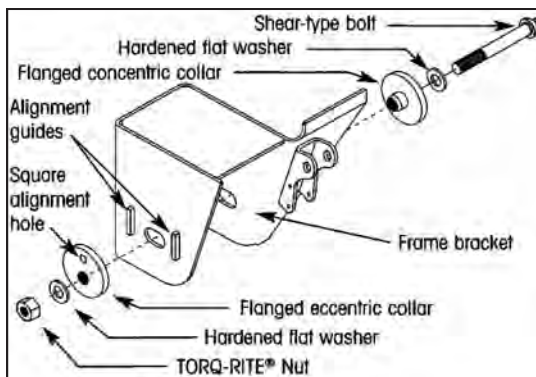


Figure 26. Pivot Connection Assembly

TORQUE SPECIFICATIONS

RECOMMENDED SUSPENSION TORQUE

| COMPONENT DESCRIPTION | FT-LBS | N•m |
|--|------------|--------------|
| QUIK-ALIGN Pivot Connection | 505 to 595 | 685 to 807 |
| Welded Pivot Connection (1 1/8 inches) | 750 to 825 | 1017 to 1119 |
| U-Bolts (HT Series) | 475 to 525 | 644 to 712 |
| Shock 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 47 |
| Brake Chamber Mounting Nut (INTRAAX) | 100 to 110 | 136 to 149 |
| S-Cam Support Bearing Mounting Nut (INTRAAX) | 35 to 45 | 47 to 61 |

| COMPONENT DESCRIPTION | IN-LBS | N•m |
|---------------------------------------|------------|----------|
| ABS Bracket Bolt and Nut (INTRAAX) | 75 to 100 | 8 to 11 |
| Dust Shield, Bolt-to-Spider (INTRAAX) | 160 to 180 | 18 to 20 |
| Dust Shield, Clamp-on (INTRAAX) | 95 to 170 | 11 to 19 |

RECOMMENDED WHEEL TORQUES

| Mount Type | Nut Thread | Torque Level Ft-Lb Lubricated* | Torque Level Ft-Lb Dry* |
|---|--------------|--------------------------------|-------------------------|
| Hub piloted using two-piece flange nut | 1 1/16" - 16 | 300-400 | |
| | 7/8 - 14 | 350-400 | |
| | M20 x 1.5 | 280-330 | |
| | M22 x 1.5 | 450-500 | |
| Stud piloted, double cap nut standard type (7/8" radius) | 3/4" - 16 | | 450-500 |
| | 1-1/8" - 16 | | 450-500 |
| Stud piloted, double cap nut heavy duty type (1-3/16" radius) | 15/16" - 12 | | 750-900 |
| | 1-1/8" - 16 | | 750-900 |
| | 1-5/16" - 12 | | 750-900 |

REPORTING SAFETY DEFECTS

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Heil Trailer International, Co.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer or Heil Trailer International, Co.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at Monday-Friday 8am to 8pm at (888) 327-4236 , TTY: (800) 424-9153, or file an online form at www.nhtsa.gov. You can also obtain other information about motor vehicle safety from the Hotline.

REPORTING SPILLS & ACCIDENTS

The Department of Transportation requires under Title 49 Code of Federal Regulation Section 171.15 the following:

- An immediate telephone notice (800 - 424 - 8802) is required whenever, during the course of transportation (including loading, unloading, and temporary storage), one of the following circumstances or events occurs as the direct result of the hazardous material:
- A person is killed or hospitalized.
- Estimated carrier and/or property damage exceeds \$50,000.
- Evacuation of the general public occurs lasting one or more hours.
- One or more major transportation arteries or facilities are closed or shut down for one or more hours.
- The operational flight plan or routing of an aircraft is altered.
- Fire, breakage, spillage, or suspected contamination occurs involving the shipment of radioactive materials or etiological agents.
- There has been a release of a marine pollutant in a quantity exceeding 450L (119 gallons) for liquids or 400kg (882 lbs.) for solids.
The carrier judges that the situation should be reported even though it does not meet the above criteria.

Heil Trailer International, Co. also requests immediate notification (1-800-400-6913) if any of the previous conditions are met as a direct result of the hazardous material.



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