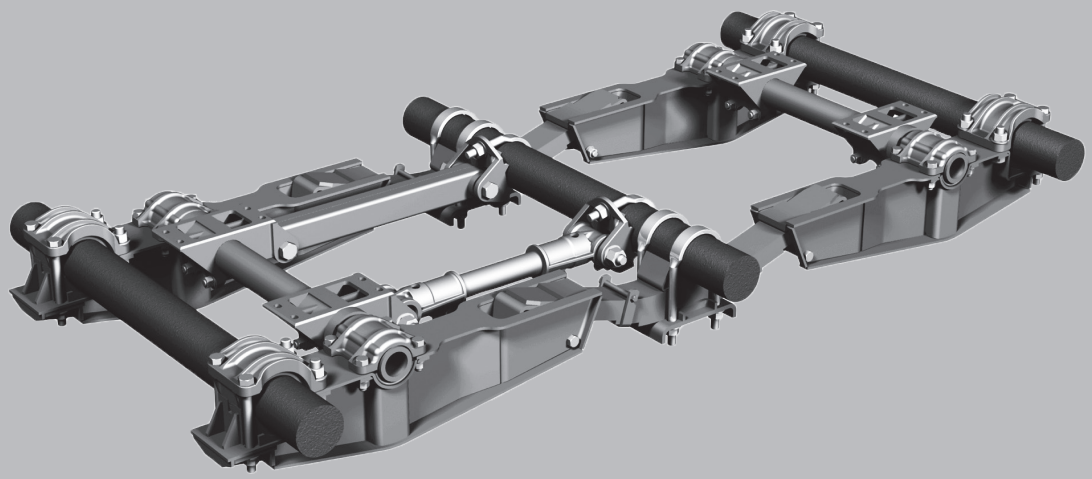
SAF-HOLLAND Group

# Maintenance Manual

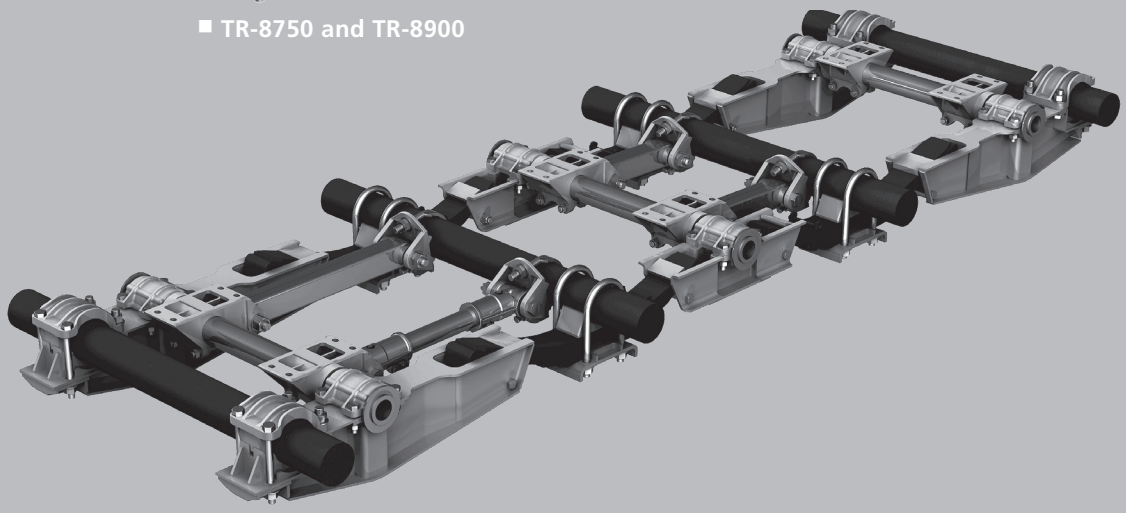
## TR Series Mechanical Suspensions

- Models: TR-8750/8900, TR-4100/4120
- Trailer Mechanical Suspension

Capacity 75,000, 90,000, 100,000 and 120,000 Lbs. GAWR



■ TR-8750 and TR-8900



■ TR-4100 and TR-4120

XL-MS195 Rev E

SAF holland

## Introduction

This manual provides the necessary information for the installation, adjustment, inspection, and operation of the SAF® TR Series Mechanical Suspensions.

Read this manual before using or servicing this product and keep it in a safe location for future reference. Updates to this manual, which are published as necessary, are available on the internet at www.safholland.us.

Use only SAF-HOLLAND® Original Parts to service your TR Series Mechanical Suspension. A list of technical support locations that supply SAF-HOLLAND Original Parts and an Aftermarket Parts Catalog are available on the internet at www.safholland.us or contact Customer Service at 888-396-6501.

## Warranty

Refer to the complete warranty for the country in which the product will be used. A copy of the written warranty is included with the product or available on the internet at www.safholland.com.

## Notes, Cautions, and Warnings

Before starting any work on the unit, read and understand all the safety procedures presented in this manual. This manual contains the terms "NOTE", "IMPORTANT", "CAUTION", and "WARNING" followed by important product information. These terms are defined as follows:

**NOTE:** Includes additional information to enable accurate and easy performance of procedures.

**IMPORTANT:** Includes additional information that if NOT followed could lead to hindered product performance.

**CAUTION** Used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, could result in property damage.

**⚠CAUTION** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

**⚠WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

# 1. General Safety Instructions

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

**⚠WARNING** Failure to properly support the vehicle and axles prior to commencing work could create a crush hazard which, if not avoided, could result in death or serious injury.

**NOTE:** Several maintenance procedures in this manual require pre-positioning of the brake chamber, slack adjuster and/or ABS system. Consult the manufacturer's manual for procedures on the proper operation of brake chamber, slack adjuster and/or ABS system.

**IMPORTANT:** Key components on each axle's braking system, including friction material, rotors and drums, are intended to wear over time. Worn parts should be replaced in sets on both the driver and curbside of an axle.

**⚠WARNING** Failure to follow manufacturer's instructions regarding spring pressure or air pressure control may allow uncontrolled release of energy which, if not avoided, could result in death or serious injury.

Please observe the following safety instructions in order to maintain the operational and road safety of the suspension:

1. The wheel contact surfaces between the wheel and hub MUST NOT be additionally painted. The contact surfaces MUST be clean, smooth and free from grease.

**⚠WARNING** Failure to keep wheel and hub contact surfaces clean and clear of foreign material could result in wheel/hub separations which, if not avoided, could result in death or serious injury.

2. Only the wheel and tire sizes approved by the trailer builder may be used on this suspension.
3. Before operating vehicle, ensure that the maximum permissible axle load is NOT exceeded and that the load is distributed equally and uniformly.
4. Ensure that the brakes are NOT overheated by continuous operation.

**⚠WARNING** Failure to minimize the use of brakes during overheating conditions could result in deterioration of brake efficiency which, if not avoided, could result in death or serious injury.

5. The parking brake MUST NOT be immediately applied when the brakes are overheated, as the brake drums or discs may be damaged by different stress fields during cooling.
6. Observe the operating recommendation of the trailer manufacturer for off-road operation of the installed axles.

**IMPORTANT:** The definition of OFF-ROAD means driving on non-asphalt/non-concrete routes, e.g. gravel roads, agricultural and forestry tracks, on construction sites and in gravel pits.

**IMPORTANT:** Off-road operation of axles beyond the approved application design may result in damage and impair suspension system performance.

7. All suspension and axles systems require routine service, inspection and maintenance in order to maintain optimum performance and operational safety as well as an opportunity to recognize wear.
8. In the event of suspension air pressure loss, quickly reduce speed as safely as possible and remove the vehicle from traffic. If unable to remove vehicle from traffic, follow DOT safety requirements regarding emergency situations.
9. Contact a qualified towing and/or service company to assist in repairing vehicle or to move it to a qualified repair facility. DO NOT operate the vehicle in the absence of suspension air pressure.

**⚠WARNING** Operating the vehicle without proper air pressure can cause tire failure, fire, or loss of vehicle control which, if not avoided, could result in death or serious injury.

We highly recommend the use of only SAF-HOLLAND Original Parts.

A list of SAF-HOLLAND technical support locations to supply SAF-HOLLAND Original Parts can be found at www.safholland.us or contact SAF-HOLLAND Customer Service at 888-396-6501.

Updates to this manual will be published as necessary online at www.safholland.us.

## 2. Model Identification

The TR Series suspension serial tag is located on the spring saddle ***(Figure 1)***.

**NOTE:** This manual applies to the suspension series or the models listed on the front cover. However, we urge you to determine your specific model number, write that information below and refer to it when obtaining information or replacement parts.

**NOTE:** Refer to the serial number tag attached to the equalizing beam.

## 3. TR Series Nomenclature

The sample tag shown will help you interpret the information on the SAF-HOLLAND®, Inc. serial number tag. The model number is on the first line along with the suspension capacity. The second line contains the part number and the serial number ***(Figure 2)***.

Record the tag numbers below for future quick reference.

**Model Number:** _____

**Part Number:** _____

**Serial Number:** _____

**Capacity:** _____

**In Service Date:** _____

***Figure 1***

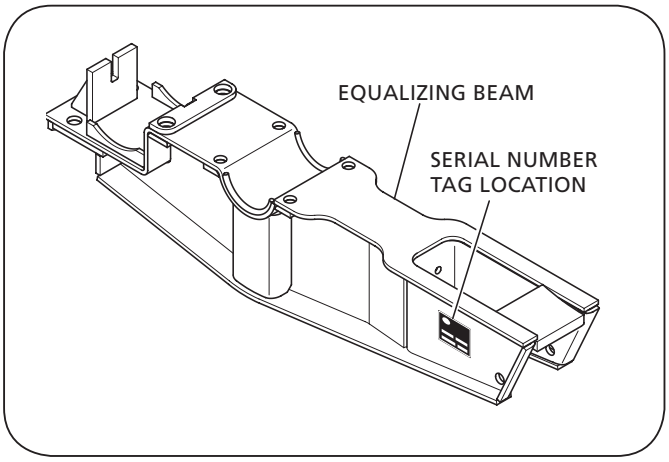
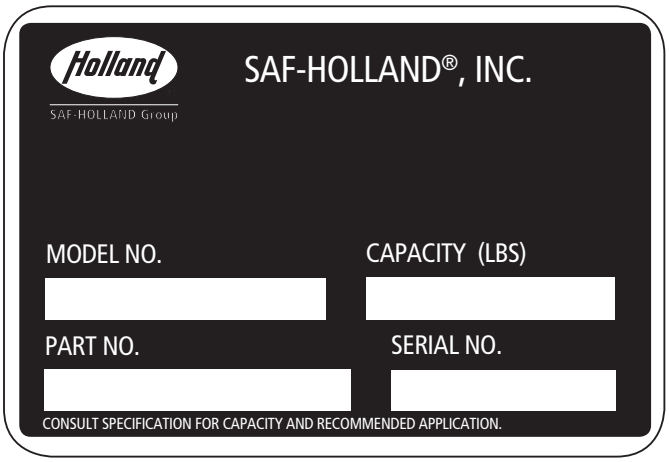



***Figure 2***




**TR 8900**

- Suspension Model
  - 8750
  - 8900
  - 4100
  - 4120
- TR/TRM

# 4. Welding Standards

## 4.1 Scope

When welding is required for the suspension repairs, observe the requirements below. This specification applies to all components supplied by SAF-HOLLAND®, and its products. The customer assumes all responsibility for weld integrity if weld material and procedure differ from those listed below.

## 4.2 Workmanship

All welding on SAF-HOLLAND products MUST be performed by a welder qualified according to the appropriate AWS standard for the weld being made or an equivalent standard. It is the responsibility of the customer to provide good workmanship when welding on SAF-HOLLAND products.

## 4.3 Material

Items to be welded that are made from low carbon or high-strength alloy steel are to be welded with AWS filler metal specification AWS A5.18, filler metal classification ER-70S-3, ER-70S-6 or equivalent unless specified on the installation drawing.

**NOTE:** Any substitution for filler material from the above standard MUST comply, as a minimum, with the following mechanical properties:

Tensile Strength - 72k psi (496 MPa)
Yield Strength - 60k psi (414 MPa)
Charpy V Notch - 20 ft.-lbs. (27 N•m) at 0° F (-17.7° C)
% Elongation - 22%

The recommended welding gas for gas metal arc welding (GMAW) is 90% Argon / 10% CO2. If a different gas is used, welds MUST comply with penetration requirements illustrated ***(Figure 3)***. Where the installation drawing specifies different than above, the drawing shall prevail.

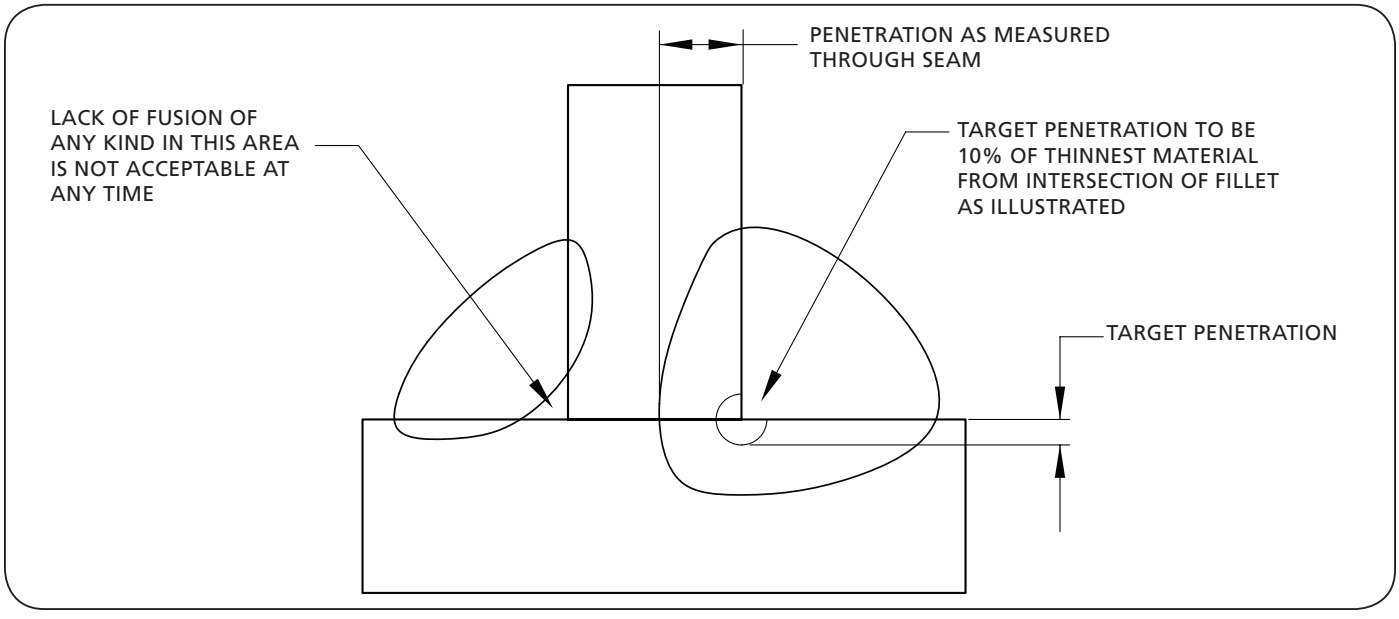
## 4.4 Procedures

Tack welds used for positioning components are to be located in the center of the final weld, where practical. Tack weld should be completely fused to the finish weld. DO NOT break arc at the end of the weld. Back up all finish welds at least 1/2" (12.7 mm) or a sufficient amount to prevent craters at the end of the weld. Where weld is illustrated to go around corners, it is assumed the corner represents a stress concentration area. DO NOT start or stop weld within 1" (25.4 mm) of the corner. Particular care should be taken to prevent undercutting in this area.

## 4.5 Weld Size

If weld size is NOT specified, the effective throat of the weld MUST be no smaller than the thinnest material being welded ***(Figure 3)***.

***Figure 3***



## 5. Pre-Operation

Before vehicle is put into service, inspect the suspension for proper installation. Check all nuts and bolts for proper torque, refer to Section 11.

**NOTE:** In the United States, workshop safety requirements are defined by federal and/or state Occupational Safety and Health Act. Equivalent laws could exist in other countries. This manual is written based on the assumption that OSHA or other applicable employee safety regulations are followed by the location where work is performed.

1. Check weld integrity from the trunnion clamp to the frame bracket ***(Figure 4).***
2. Verify that the frame bracket bracing is in place and properly welded ***(Figure 4).***
3. Make sure guide channels are in place and welded ***(Figure 5).***

***Figure 4***

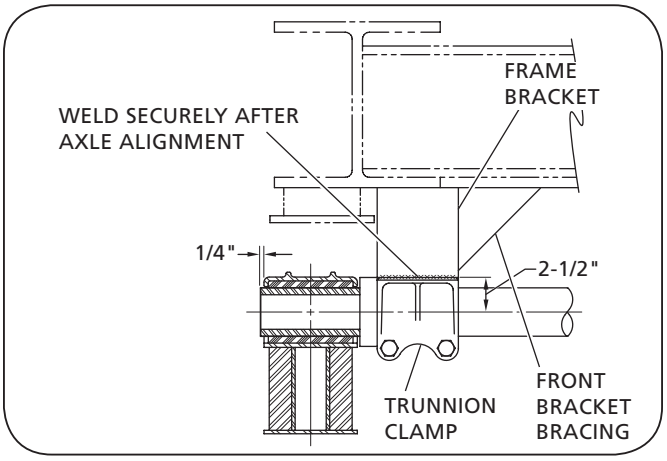



***Figure 5***

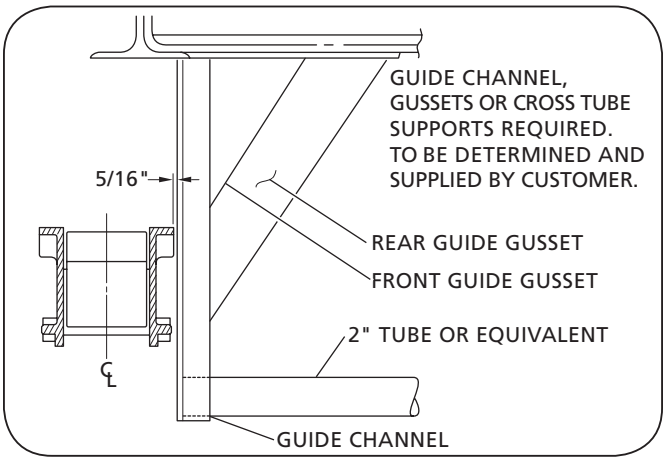
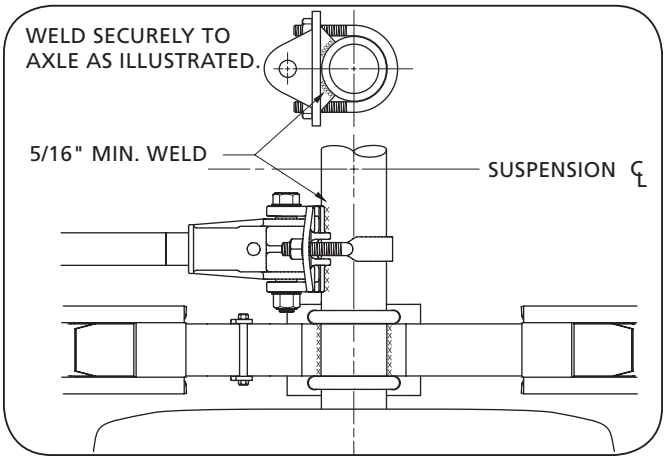



***Figure 6***



4. Check the axle connection welding. Axle adapter welding ***(Figure 6 and 7)*** MUST be in accordance with steps 6 through 8 as illustrated below ***(Figure 8).***
5. Make sure all nuts have been torqued to specifications, refer to Section 11.
6. The axle tube and adapter MUST be 70° F minimum and be free from dirt, scale and grease.
7. The electrode or wire selected MUST conform to one of the following specifications:

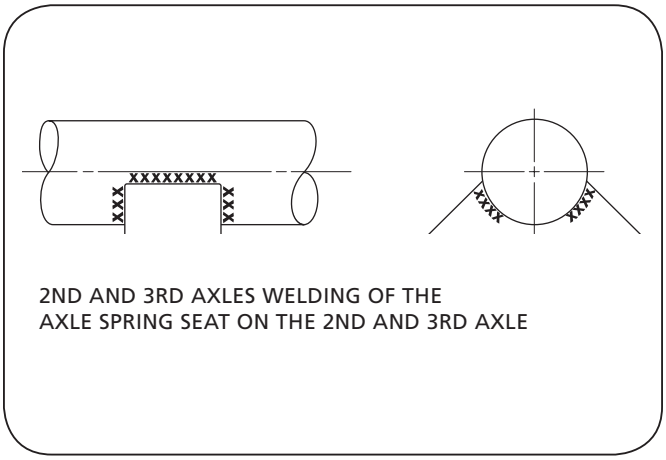
   a. Electrode AWS E-7018 (Oven-Dried)
   5/32" Dia. 120-190 Amps D.C. + 135-225 Amps A.C.
   3/16" Dia. 170-280 Amps D.C. + 20 0-300 Amps A.C.

| b. Wire | AWS E-70S-3 | AWS E-70T-1 |
|---|---|---|
| Gas | C-25CO2 | CO2 |
| Volts | 19-20 | 21-23 |
| Amps | 180-200 | 200-220 |
| Wire Dia. | .045" | .062" Flux Cored |

8. Apply welds in the sizes and sequence shown. Fill the crater at the end of the weld and clean the weld between passes.

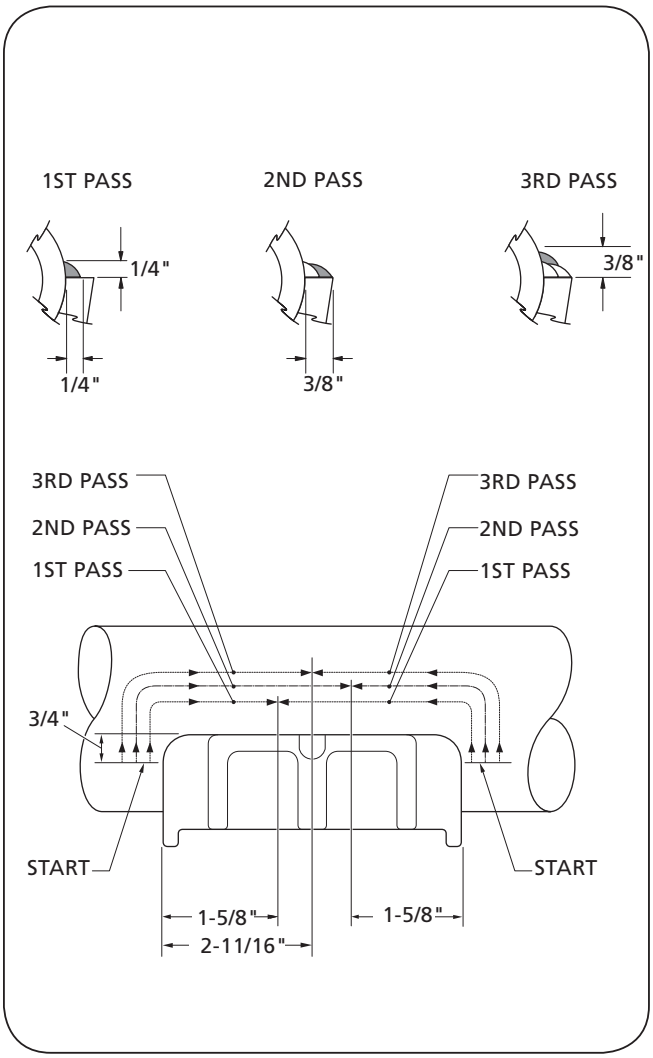
**NOTE:** Each weld pass is to be completed in two segments.

***Figure 7***




2ND AND 3RD AXLES WELDING OF THE
AXLE SPRING SEAT ON THE 2ND AND 3RD AXLE

***Figure 8***



## 6. Trunnion Bushing Replacement

**IMPORTANT:** The trailer MUST be unloaded before beginning service procedures.

1. On a level surface, support the front of the trailer with either a kingpin stand, landing gear, or while coupled to a tractor ***(Figure 9)***.
2. Place multiple jack stands under the vehicle's frame per OEM specified locations.

**⚠WARNING** Failure to properly support the suspension during maintenance could create a crush hazard which, if not avoided, could result in death or serious injury.

3. Chock the tires.

**⚠WARNING** Failure to chock the tires prior to beginning maintenance could allow vehicle movement which, if not avoided, could result in death or serious injury.

4. Remove the nuts, bolts, washers and discard. Remove trunnion cap casting, and trunnion tube from the equalizing beam and retain for later use ***(Figure 10).***

**NOTE:** For quad-axle suspension, carefully remove washer at the end of trunnion tube.

5. Rotate the beam to gain unrestricted access to the trunnion assembly.
6. Remove trunnion bushing.
7. Prior to re-assembly, inspect all parts for excessive wear. If excessive wear exists, replace the worn part(s). For replacement or service parts refer to the SAF-HOLLAND Aftermarket Parts Catalog at www.safholland.us.
8. Re-assemble with the new trunnion bushing. Place the trunnion bushing into the saddle of the equalizing beam with the trunnion cap spacer and use new nuts, bolts and washers to secure the trunnion cap casting onto the equalizing beam. Make sure the trunnion bushing is centered in the trunnion cap and spring saddle, then tighten the connection ***(Figure 10).***
9. Torque to specifications listed in Section 11. For the quad axle suspensions re-install removed washer.

**NOTE:** When replacing rubber part, make sure the rubber is NOT pinched. Metal parts MUST be metal-to-metal when applying torque.

10. Remove wheel chocks from tires and remove jack stands from trailer frame.

***Figure 9***

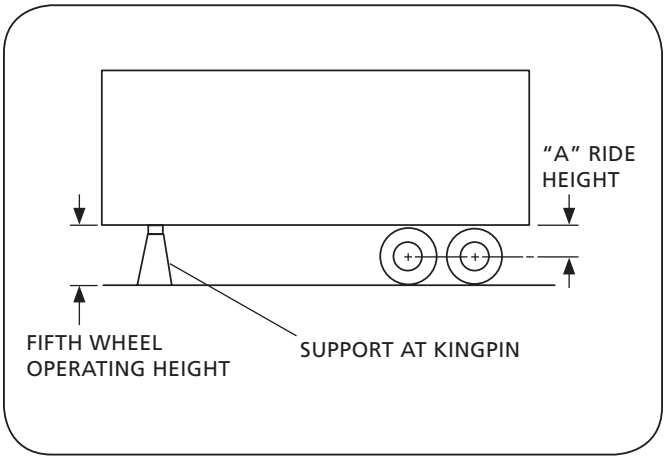
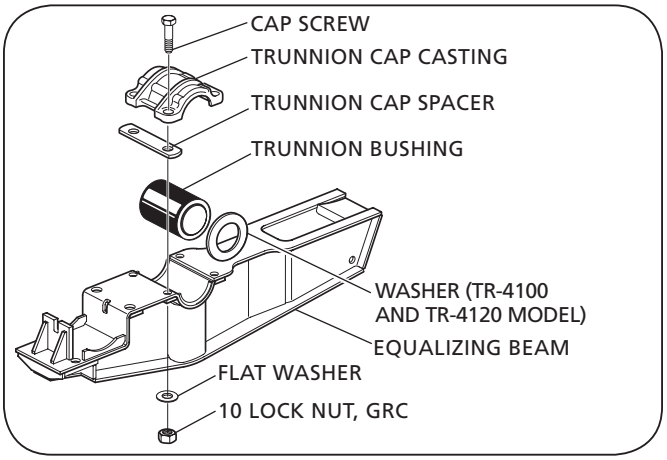



***Figure 10***



## 7. Axle Rubber Pad and Wrapper Replacement

**IMPORTANT:** The trailer MUST be unloaded before beginning service procedures.

1. On a level surface, support the front of the trailer with either a kingpin stand, landing gear, or while coupled to a tractor ***(Figure 11).***
2. Place multiple jack stands under the vehicle's frame per OEM specified locations.

**⚠WARNING** Failure to properly support the suspension during maintenance could create a crush hazard which, if not avoided, could result in death or serious injury.

3. Chock the tires.

**⚠WARNING** Failure to chock the tires prior to beginning maintenance could allow vehicle movement which, if not avoided, could result in death or serious injury.

5. Remove the nuts, bolts and washers that attach the axle to the equalizing beam and discard. Raise the axle to easily remove the rubber pad and wrapper ***(Figure 12).***
6. Inspect the axle adapter for excessive wear. If excessive wear exists, replace the worn part(s). For replacement or service parts refer to the SAF-HOLLAND Aftermarket Parts Catalog at www.safholland.us.
7. Inspect axle adapter welds. If welds are cracked, repair as necessary. Refer to welding procedure in Section 8, Axle Adapter Replacement.
8. Re-assemble the axle connection ***(Figure 12).*** Place the rubber pad onto the equalizing beam with the axle adapter, rubber wrapper, and axle cap using new nuts, bolts and washers to secure in place. Torque to proper specification, refer to Section 11.

**NOTE:** When replacing rubber part, make sure the rubber is NOT pinched. Metal parts MUST be metal-to-metal when applying torque.

9. Remove wheel chocks from tires and remove jack stands from trailer frame.

***Figure 11***

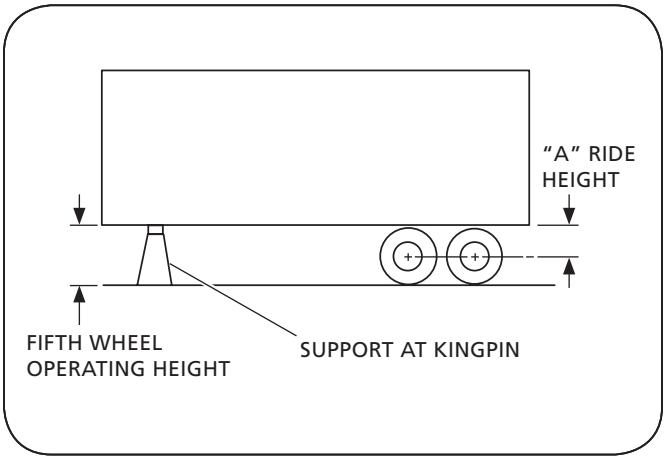
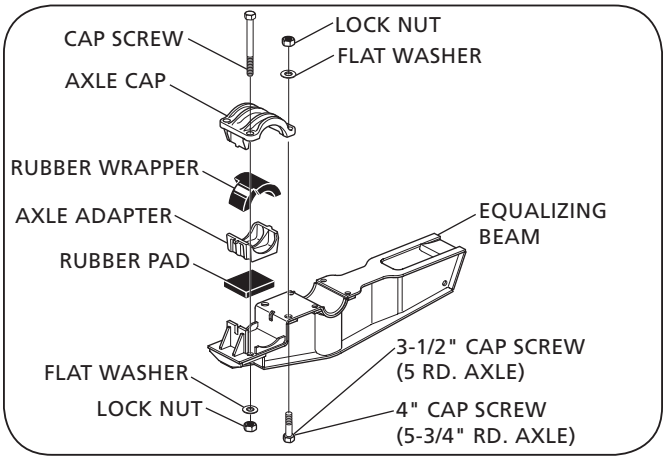



***Figure 12***



## 8. Axle Adapter Replacement

**IMPORTANT:** The trailer MUST be unloaded before beginning service procedures.

1. On a level surface, support the front of the trailer with either a kingpin stand, landing gear, or while coupled to a tractor ***(Figure 13).***
2. Place multiple jack stands under the vehicle's frame per OEM specified locations.

**⚠WARNING** Failure to properly support the suspension during maintenance could create a crush hazard which, if not avoided, could result in death or serious injury.

3. Chock the tires.

**⚠WARNING** Failure to chock the tires prior to beginning maintenance could allow vehicle movement which, if not avoided, could result in death or serious injury.

4. Remove the nuts, bolts and washers that attach the axle to the equalizing beam and discard. Raise the axle to easily remove the rubber pad and wrapper. Inspect and replace any worn parts. Replacing pads and wrapper is recommended. ***(Figure 14).***
5. Carefully remove the axle adapter from the axle and clean any excess weld from the axle.

**NOTE:** DO NOT damage axle while grinding smooth.

**NOTE:** Make sure the replacement axle adapter is in the same location and has the same orientation as the removed adapter.

7. Clamp axle adapter to axle to ensure no gap exists between each axle adapter and its associated axle. Axle adapters MUST be parallel to each other.

**NOTE:** Cam shaft and brake chamber locations in ***(Figures 16)*** TR-8750/8900 and ***(Figures 17)*** TR-4100/4120. Ensure that the orientation of these items are correct prior to welding.

**NOTE:** Weld as indicated in ***(Figure 15)***.

***Figure 13***

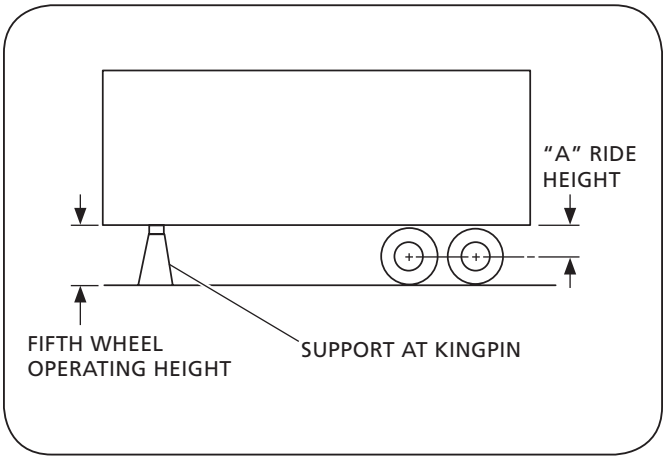



***Figure 14***

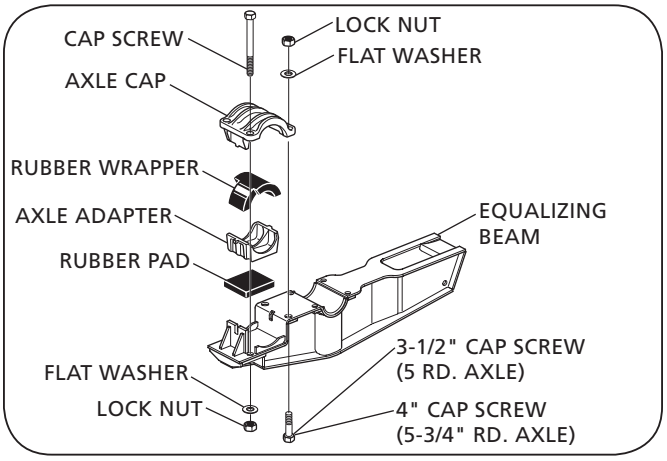



***Figure 15***

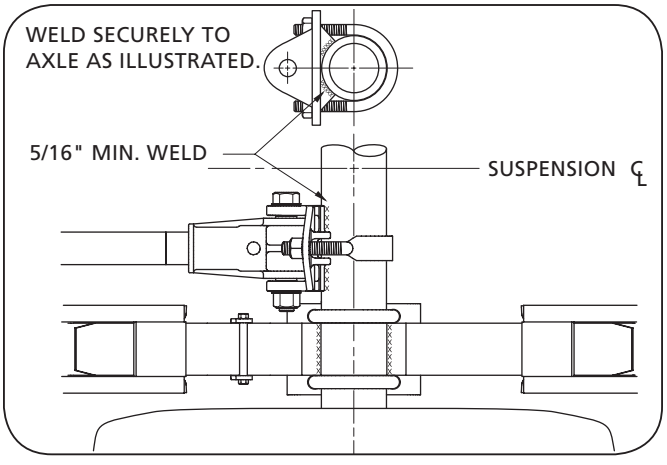
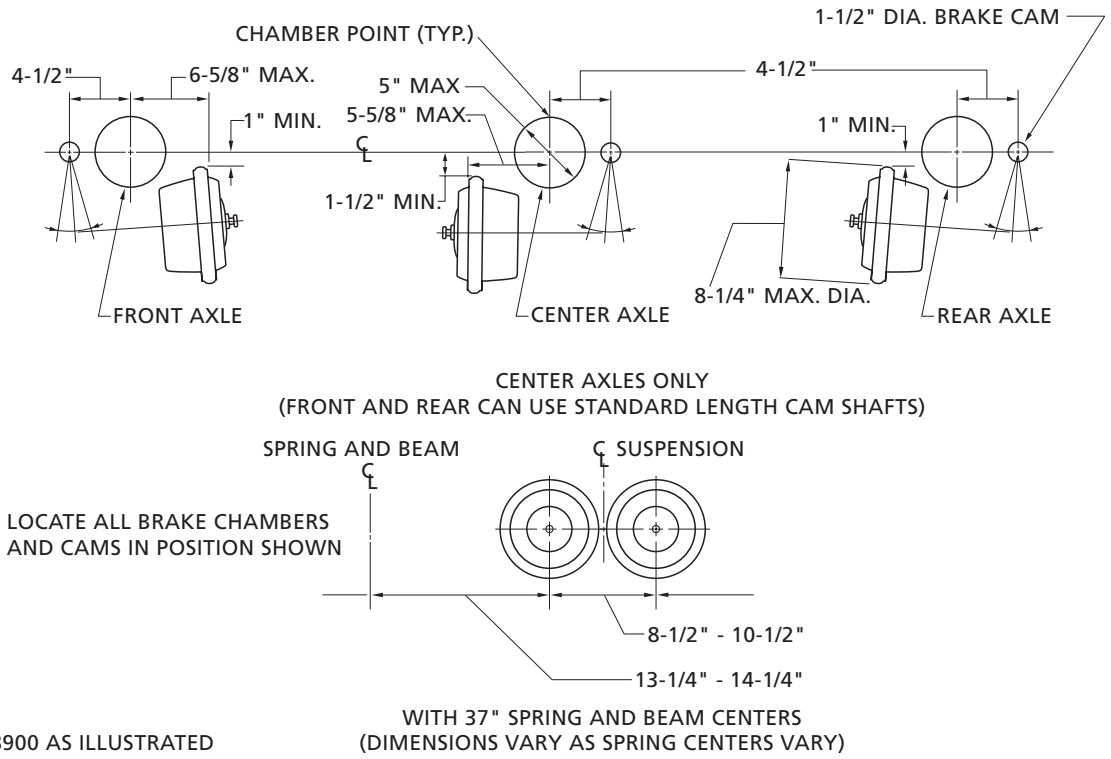
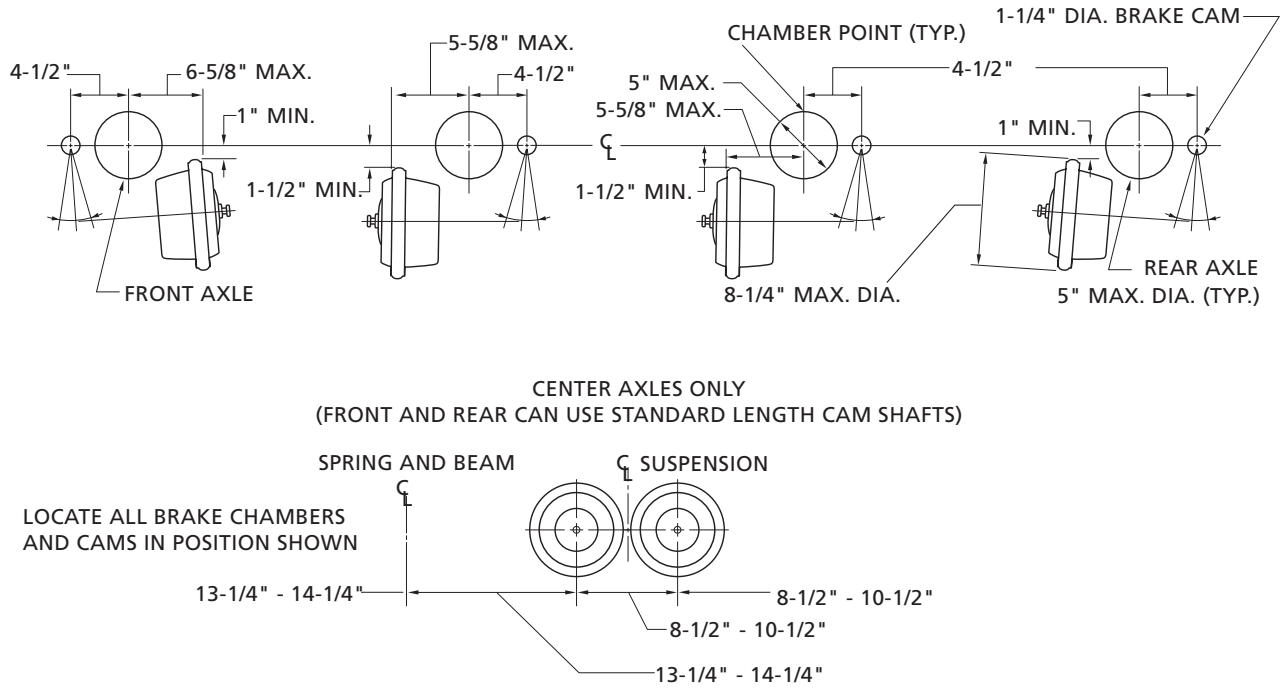


***Figure 16***




TR-8750/8900 AS ILLUSTRATED

***Figure 17***




TR-4100/4120 AS ILLUSTRATED

## 9. Trunnion Clamp Replacement

**IMPORTANT:** The trailer MUST be unloaded before beginning service procedures.

1. On a level surface, support the front of the trailer with either a kingpin stand, landing gear, or while coupled to a tractor ***(Figure 18)***.
2. Place multiple jack stands under the vehicle's frame per OEM specified locations.

**⚠WARNING** Failure to properly support the suspension during maintenance could create a crush hazard which, if not avoided, could result in death or serious injury.

3. Chock the tires.

**⚠WARNING** Failure to chock the tires prior to beginning maintenance could allow vehicle movement which, if not avoided, could result in death or serious injury.

4. Remove the nuts, bolts and washers from the trunnion cap and discard. Remove trunnion cap. Remove equalizing beam from the trunnion tube and retain for later use ***(Figure 19).***

**NOTE:** For quad-axle suspension, carefully remove ring at the end of trunnion tube.

5. Remove trunnion bushing.
6. Remove the bolts that attach to the trunnion clamp. Detach the trunnion tube and radius rods from the trunnion clamp.
7. Carefully remove trunnion clamp to prevent damage to frame bracket. Inspect frame brackets for any cracks, repair or replace if necessary. For replacement or service parts refer to the SAF-HOLLAND Aftermarket Parts Catalog at www.safholland.us.
8. Grind frame bracket smooth for flush mounting of the new trunnion clamp.
9. Assemble the new trunnion clamp to trunnion tube making sure it is in the same location as the one removed.
10. Place trunnion clamp up to the frame bracket; hold in place with the trunnion clamp attaching bolts.

**NOTE:** DO NOT weld at this time.

11. Assemble trunnion clamp to frame brackets. Make sure to securely tighten the clamping bolts.

***Figure 18***

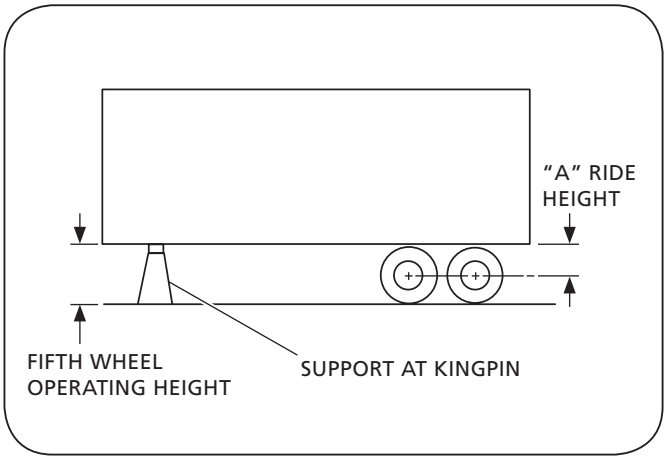
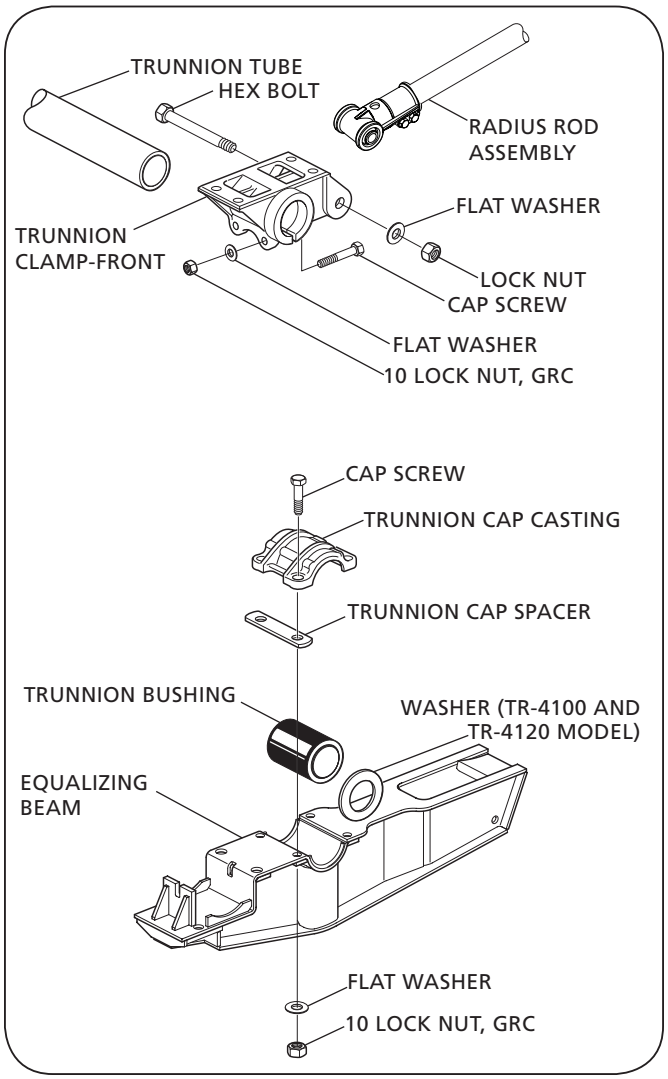



***Figure 19***



12. Re-assemble the trunnion connection making sure the trunnion bushing is centered in the trunnion cap and spring saddle before tightening the connection. Refer to Torque Specifications, Section 11.

**NOTE:** Ensure that rubber parts are NOT pinched between metal components.

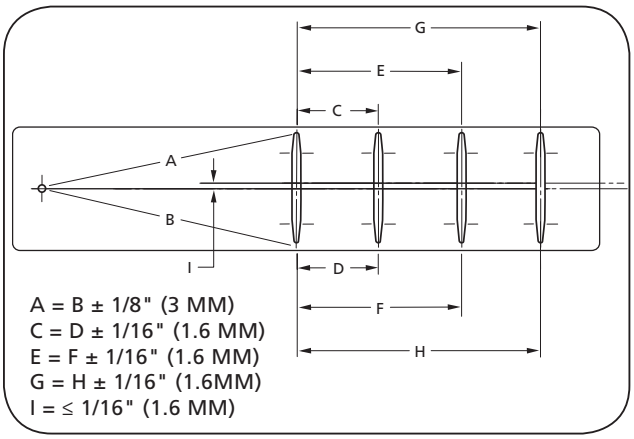
13. Re-align axles to kingpin, refer to Section 10. Weld the trunnion clamp in place following the directions provided.
14. Remove wheel chocks from tires and remove jack stands from trailer frame.

## 10. Axle Alignment

1. Pull the trailer in a straight line for a sufficient distance to ensure there are no binds in the suspension.
2. Alignment can be achieved with an optical device designed especially for this purpose or manually by the following manner ***(Figure 20)***:
   a. Measure the distance from the king pin to the center line of the spindles on the front axle. It is recommended that spindle extensions be utilized. Dimensions "A" and "B" MUST be equal within 1/8" (3 mm). Dimension I is equal to the distance between the trailer center line and the axle center line.
   b. Align front axle to the kingpin by shifting the trunnion clamps on the frame bracket and tighten bolts securely.
   c. Align second axle to the front axle using the radius rods. Dim "C" and "D", Dim "E" and "F", Dim "G" and "H", MUST be equal within 1/16".
   d. Align third and fourth axles by shifting the trunnion clamps following the same procedure as the first axle on the frame bracket and tighten bolts securely. Variance in "A" and "B" dimensions would indicate axle alignment discrepancies.
   e. Tighten bolts in radius rod. Re-check alignment and when properly aligned, weld all trunnion clamps securely.

**NOTE:** When re-aligning axle with trunnion clamps that are already securely in place, you may loosen radius rod screws and rotate the rod ends to achieve alignment. Once aligned, tighten radius rod screws to 170 ft.-lbs. (230 N•m). Refer to Torque Specifications Section 11 ***(Table 4).***

**Figure 20**



# 11. Torque Specifications

***Table 4***

| COMPONENT | TORQUE VALUE | FASTENER SIZE |
|---|---|---|
| Axle Connection | 460 ft.-lbs. (690 N•m) | 1" |
| Axle Connection | 190 ft.-lbs. (255 N•m) | 5" SQ. 5/8" |
| Axle Connection | 115 ft.-lbs. (155 N•m) | 5" RND. 5/8" |
| Axle Connection | 190 ft.-lbs. (255 N•m) | 5-3/4" RND. 5/8" |
| Axle Connection | 457 ft.-lbs. (620 N•m) | 7/8" |
| Trunnion Connection | 980 ft.-lbs. (1330 N•m) | 1-1/8" |
| Trunnion Connection | 1400 ft.-lbs. (1900 N•m) | 1-1/2" |
| Trunnion Clamp | 290 ft.-lbs. (390 N•m) | 3/4" |
| Spring End Clamp | 190 ft.-lbs. (255 N•m) | 3/4" |
| Radius Rod End | 170 ft.-lbs. (230 N•m) | 5/8" |
| Radius Rod Clamp | 600 ft.-lbs. (813 N•m) | 1/8" |

All Torque specifications are ± 5%.
Torques specified are for clean, lubricated threads.
Always apply torque to nut if possible.
Required re-torquing at every brake re-lining.

**NOTE:** Torque specifications listed above are with clean lubricated/coated threads ***(Table 4)***. All new SAF-HOLLAND fasteners come pre-coated from the factory. For bolt and lock nut grade markings refer to ***(Figure 21)***.

**IMPORTANT:** The use of special lubricants with friction modifiers, such as Anti-Seize or Never-Seez®, without written approval from SAF-HOLLAND Engineering, will void warranty and could lead to over torquing of fasteners or other component issues.

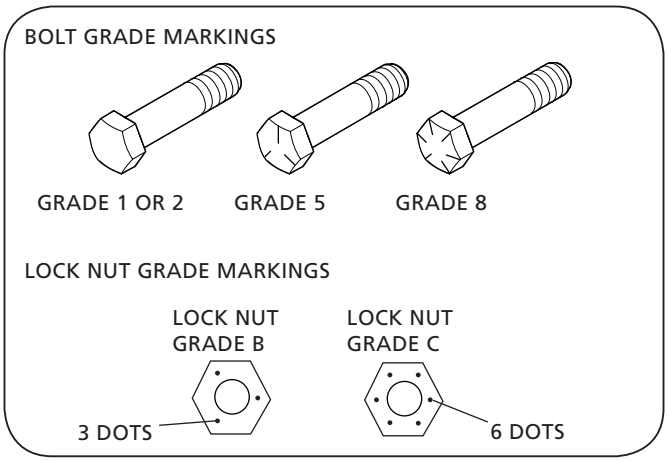
## General Information

1. The torque specifications are applied to the nut and NOT the bolt.

**⚠WARNING** Failure to use the proper fasteners when servicing the suspension could cause component failure which, if not avoided, could result in death or serious injury.

**⚠WARNING** Failure to properly torque all fasteners could result in component failure which, if not avoided, could result in death or serious injury.

**Figure 21**



# 12. Routine Maintenance and Daily Inspection

Daily and before each trip, check the suspension to be sure it is fully operational. Visually inspect for loose, worn, cracked, or missing components and welds. Service as necessary for replacement or service parts refer to the SAF-HOLLAND Aftermarket Parts Catalog at www.safholland.us.

**IMPORTANT:** A schedule for the initial or routine physical and visual inspections should be established by the operator based on severity of operation or damage to the suspension and/or vehicle could occur.

**IMPORTANT:** During each pre-trip and safety inspection of the vehicle, a visual inspection of the suspension should be done or damage to the vehicle could occur.

## 12.1 Initial Service Inspection

1. After initial three (3) months or 5,000 miles (8,000 KM) of service, whichever comes first, inspect bolts and nuts to assure they are properly torqued. Re-torque as necessary thereafter according to suspension torque decal, Part number XL-MS178-01. Refer to Torque Values Section 11 ***(Table 4).***

## 12.2 Routine Inspection

1. Every 50,000 miles or six (6) months, whichever comes first, inspect all suspension parts. Repair or replace cracked, failed and excessively worn parts. All nuts and bolts MUST be torqued. Refer to Torque Specifications Section 11 ***(Table 4).***

ORIGINAL PARTS™

From fifth wheel rebuild kits to suspension bushing repair kits, SAF-HOLLAND Original Parts are the same quality components used in the original component assembly.

SAF-HOLLAND Original Parts are tested and designed to provide maximum performance and durability. Will-fits, look-alikes or, worse yet, counterfeit parts will only limit the performance potential and could possibly void SAF-HOLLAND's warranty. Always be sure to spec SAF-HOLLAND Original Parts when servicing your SAF-HOLLAND product.


**SAF-HOLLAND USA • 888.396.6501 • Fax 800.356.3929**
**www.safholland.us**

**SAF-HOLLAND CANADA • 519.537.3494 • Fax 800.565.7753**
**WESTERN CANADA • 604.574.7491 • Fax 604.574.0244**
**www.safholland.ca**

**SAF-HOLLAND MEXICO • 52.55.5362.8743 • Fax 52.55.5362.8743**
**www.safholland.com.mx**

**info@safholland.com**

SAF-HOLLAND INC.
1950 Industrial Blvd., Muskegon, MI 49442
www.safholland.com


Engineering Your Road to Success