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Introduction
This manual provides the necessary information for the installation of SAF® axles.

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 the SAF-HOLLAND® INTEGRAL™ disc brake axle. 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. Safety Instructions

General and Servicing Safety Instructions

- Read and observe all Warning and Caution hazard alert messages. The alerts provide information that can help prevent serious personal injury, damage to components, or both.

**WARNING** Failure to follow the instructions and safety precautions in this manual could result in improper servicing or operation leading to component failure which, if not avoided, could result in death or serious injury.

- All installation should be performed by a properly trained technician using proper/special tools, and safe procedures.

**NOTE:** In the United States, workshop safety requirements are defined by federal and/or state Occupational Safety and Health Act (OSHA). Equivalent laws may 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.

**IMPORTANT:** Use only SAF-HOLLAND® Original Parts to service the SAF-HOLLAND® drum brake axle.

**WARNING** Failure to maintain the SAF-HOLLAND® drum brake axle brake with SAF-HOLLAND® Original Parts can result in brake or wheel bearing failure which, if not avoided, could result in death or serious injury.

- Refer to drum brake axle parts manual XL-TA10058PM-en-US for axle components and service kit part numbers.

- Properly support and secure the vehicle and axles from unexpected movement when servicing the unit.

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

- If possible, unload the trailer before performing any service procedures.

- After re-positioning the brake chamber, slack adjuster and/or ABS system as instructed in this manual, ALWAYS consult the manufacturer’s manual for proper operation.

**IMPORTANT:** Key components on each axle system including but not limited to suspension, slack adjuster, brake chambers, bearings, hubs, and drums require information supplied by the original manufacturer of the components to ensure proper and safe operation of the axle system.

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

Operational and Road Safety Instructions

- The wheel contact surfaces between the wheel and hub MUST NOT receive additional paint.

**IMPORTANT:** The wheel 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 allow wheel/hub separations which, if not avoided, could result in death or serious injury.

- Only the wheel and tire sizes approved by the trailer builder can be used.

- Before operating the vehicle, ensure that the maximum permissible axle load is not exceeded and that the load is distributed equally and uniformly.

- Make sure that the brakes are not overheated from 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.

- The parking brake MUST NOT be immediately applied when the brakes are overheated.

**CAUTION** If the parking brake is immediately applied to the brakes when overheated, the brake drums or discs could be damaged by different stress fields during cooling.

- The definition of OFF-ROAD means driving on non-asphalt/non-concrete routes, such as gravel roads, agricultural and forestry tracks, on construction sites and in gravel pits.

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

- SAF® axles require routine service, inspection and maintenance to maintain optimum performance, operational and road safety, and to recognize natural wear and defects before they become serious. Please refer to the Service Manual for Drum Brake Axles XL-TA10006OM-en-US which can be found at www.safholland.us or contact our customer service group at 888-396-6501.
2. Model Identification

The drum brake axle serial tag is located near the center of the axle tube (Figure 1).

3. Identification Tag

This sample (Figure 2) will help interpret the SAF-HOLLAND® USA, Inc. serial number tag. The tag includes the model number, axle body part number, and serial number.

Record the tag numbers below for future reference.

Axle Body Part Number: _____________________________
Model Number: _____________________________
Capacity: _____________________________
Serial Number: _____________________________

SERIAL NUMBER TAG LOCATED NEAR CENTER OF AXLE TUBE
4. Welding Standards

4.1 Scope
This specification applies to all components supplied by SAF-HOLLAND®, and its products. The customer assumes full responsibility for weld integrity if weld material and procedures 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 in 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 shown 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 a minimum of the thinnest material being welded (Figure 3).

**Figure 3**

- Lack of fusion of any kind in this area is not acceptable at any time.
- Target penetration to be 10% of thinnest material from intersection of fillet as shown.
- Penetration as measured through seam.
5. Axle Inspection

Any axle with shipping or handling damage should be replaced immediately. Weld repair can be detrimental to the structural integrity of the axle beam and is not recommended.

**WARNING** An axle beam weakened by welding could fail resulting in component damage which, if not avoided, could result in death or serious injury.

6. Axle Installation

To assure safe operation and maximum durability of brake linings and tires, the axle assembly should be installed so that the cams rotate in the same direction as the wheels (*Figure 4)*.

When camshaft rotation is opposite of wheel rotation, noisy brakes, chatter or wheel hop can result. The axle should be ordered so air chamber and slack adjuster assemblies provide the correct directional rotation of the cams when the axle is installed. Axle attachment to the suspension should be performed to the suspension manufacturer’s recommendations. If the axle is to be bolted to the suspension be sure to follow the manufacturer’s recommended torque specifications. If the axle is to be welded to the suspension follow the suspension manufacturer’s welding recommendations in addition to the welding guidelines in Section 4.

*Figure 4*
7. General Welding Guidelines

7.1 Tack Welding Bracket To Axle

**NOTE:** DO NOT place tack welds at the ends of the final weld *(Figure 5)*.

**NOTE:** Clamp and tack weld all brackets onto the axle before fusing the tack welds into final welds *(Figure 5)*.

**NOTE:** Thoroughly clean slag from tack welds before applying final welds.

**NOTE:** For maximum strength, the suspension manufacturer’s instruction procedures are recommended. All final welds should be one continuous pass.

**NOTE:** To prevent axle distortion, alternate the welds between the front and rear of the brackets and between the roadside and curbside brackets.

The following welding guidelines pertain to all SAF® tubular axles. Unapproved variation from these procedures will void axle warranty and could result in an unsafe weld. If you are uncertain about any of these directions or have questions concerning these procedures contact SAF-HOLLAND® customer service group at 888-396-6501.

7.2 Final Welding Bracket to Axle

Extreme care should be exercised when welding suspension components to the SAF® trailer axle. Components MUST be in the correct position to ensure the spring-seated load bearing surfaces are parallel to each other. Welding of additional attachments to the axle MUST be approved by SAF-HOLLAND® to maintain warranty coverage.

**CAUTION** Avoid the high stress areas on the tube top (compression zone) and tube bottom (tension zone) when welding. All welds should be made as close to the horizontal centerline as possible which, if not avoided, could result in component damage.

Recommended locations for the welds are illustrated *(Figure 6)*.

Welding should be performed in accordance with the Welding Standards in Section 4.
7.3 Hardware Fit
Avoid excessive welding. Fit the seat/hardware as close as possible to the axle. No gap should exist between the bottom center of the axle and the axle adapter (Figure 7).

7.4 Welding Hardware To Axle
Axle installers should obtain and read a copy of the original suspension manufacturer’s installation instructions. Only use qualified welders.

Axle and mating brackets MUST be at 60° F (15° C) minimum and free of moisture, dirt, scale, paint and grease.

Prevent bearing damage. When grounding welding equipment to the axle, DO NOT allow current to pass through the wheel bearings. A connection that places a wheel bearing between the ground cable connection and the weld area can damage the bearing by electric arcing.

8. Trailer Axle Alignment
The vehicle, tools, equipment and work site should be carefully prepared and maintained for proper axle alignment. Installation should be conducted by a trained technician.

8.1 Vehicle Preparation
1. Inspect the suspension and the axles for any obvious damage.
2. Tighten or replace any parts that DO NOT meet suspension or axle manufacturer criteria for serviceability.
3. Check tires for proper inflation and matching diameters.
4. Park the trailer on a smooth, level surface with the parking brakes released. After backing the trailer in, pull it forward 10’ (3 m) to a gentle stop. This will allow suspension parts to settle in a “forward running” position. Chock tires to prevent injury from accidental movement of the trailer.
5. With the brakes still released, adjust the height control valve for the proper setting (if preparing an air ride suspension) and the kingpin to the designed height by raising or lowering the landing gear legs.
6. DO NOT proceed unless the wheel bearing endplay is known to be in adjustment per TMC RP 618, the bearing manufacturer, or this manual.
8.2 Specifications

Axle alignment specifications may be stated in inches, degrees, minutes of angle (1/60th of a degree). Each format can produce equivalent results. SAF® trailer axles are built to less than ±2.5 minutes of angle run out at each spindle.

Single axles should be adjusted to an alignment of no more than 5 minutes of angle scrub with the true center of the trailer. If the trailer has multiple axles, each axle should be adjusted to not more than 2.5 minutes of angle scrub relative to the front (or reference) axle (this adjustment is a difference of NOT more than 1/16” (1.6 mm) between the right and left centers of adjacent axles) “C” and “D” (Figure 8).

**IMPORTANT:** NEVER bend the axle to correct an alignment condition.

**WARNING**

Bending the axle could weaken the axle which, if not avoided, could result in death or serious injury.

9. Axle Alignment Inspection

**NOTE:** Alignment can be achieved using an optical device designed specifically for this purpose. Follow the instructions in the optical device operating instructions to align the axles.

1. To manually align the axles attached to the trailer, first pull the trailer in a straight line for a sufficient distance to release/clear any binds in the suspension.

**NOTE:** A straight, unbound suspension is the position of a suspension during normal operations.

Using the alignment procedures per the suspension manufacturer’s recommendations, align the axles to the following specifications.

2. Measure the distance from the king pin to the centerline of the spindles on each side of the front axle. Dimensions A and B MUST be equal to within 1/8” (4 mm) (*Figure 8, A and B*).

3. Measure the distance from the centerline of the spindles of the front axle to the centerline of the spindles of each additional axle. Dimension C and D MUST be equal to within 1/16” (1 mm) (*Figure 8, C and D*).
10. Hubs, Bearings and Seal Installation

10.1 Spindle Mounted Hub Seal Installation Instructions. (Refer to 10.2 for Hub Mounted Hub Seal Instructions).

1. Before installing the hub seal on the axle spindle, inspect the machined spindle seal surface for nicks, scratches, burrs or marks. If needed, use crocus cloth or emery cloth to repair any damaged areas.

2. Wire brush the threads and keyway thoroughly to avoid false bearing adjustments and to avoid introduction of contaminants into the lubricant cavity.

3. Thoroughly clean the spindle and spindle threads of rust, dirt, grease or any other contaminants that could damage the hub seal and cause it to leak.

**CAUTION** NEVER install a spindle mounted hub seal in the hub and then force it onto the axle spindle by tightening the axle nut. Damage to seal will result.

4. The seal assembly should be placed on the spindle so the words “Oil Bearing Side” are exposed to the oil (Figure 9).

5. Drive the hub seal into place using the seal installation tool and a 3 lb. to 5 lb. hammer. Rotate the hub seal installation tool in 1/4-turn intervals with every hammer tap until the seal is properly seated with the metal face of the seal flush with the inner shoulder of the axle spindle (Figure 10).

6. Apply a thin coat of oil to the O.D. of the seal.

7. Prepare the hub. Remove the old lube and thoroughly clean the hub cavity and hub bore. Inspect the inner hub bore for roughness. If needed, use emery cloth to remove any burrs or old bore sealant.

8. Install the inner and outer bearing cups into hub (Figure 11).
9. Pre-lube the inner bearing with the lubricant that is being used and place it into the hub.

**CAUTION**  Failure to lubricate bearing correctly and maintain proper lubrication could result in bearing damage.

**NOTE:** If using grease and not oil for hub lubrication, the inner and outer bearing and the hub cavity MUST be pre-packed with grease before installation. Lubricate wheel end components with grease specified in the table below.

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**LUBRICATION SPECIFICATIONS**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>SURFACE TO BE LUBRICATED</th>
<th>TYPES OF LUBRICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Camshafts</td>
<td>S-Camshaft Bearings (four grease fittings per axle)</td>
<td>Lithium Complex Grease</td>
</tr>
<tr>
<td>S-Camshafts</td>
<td>S-camshaft Spline</td>
<td>Never-Seez®</td>
</tr>
<tr>
<td>Brakes</td>
<td>Brake Shoe Rollers Anchor Pins</td>
<td>Never-Seez®</td>
</tr>
<tr>
<td>Brakes - Slack Adjuster</td>
<td>Slack Adjuster Grease Fitting</td>
<td>Lithium Complex Grease</td>
</tr>
<tr>
<td>Axle</td>
<td>Bearings and Hubs</td>
<td>80/90 Gear Oil or Lithium Complex Grease*</td>
</tr>
</tbody>
</table>

* Oil lubed bearings and hubs should remain lubricated with oil, grease lubed bearings and hubs should remain lubricated with grease.

**NOTE:** Intervals are based upon normal operations. Reduce intervals to compensate for abnormal operations or severe conditions. During inactive periods, sufficient lubrication MUST be performed for equipment preservation.

10. Push the hub onto the spindle until it contacts the seal. Pre-lube the outer bearing with the lubricant that is being used and place it into the hub.

**CAUTION**  Support the hub against the spindle inner shoulder until the outer bearing and adjusting nut are installed. DO NOT ram the hub into the bearing shoulder, which, if not avoided could damage the hub seal.

10.2. Hub Mounted Hub Seal Installation

Instructions (Refer to 10.1 for Spindle Mounted Hub Seal Instructions).

1. Remove all burrs from the hub bore and spindle. Thoroughly clean hub cavity and spindle.

2. Place the hub on a smooth, hard surface in a horizontal position. Pre-lube the inner bearing with the lubricant that is being used and place it into the hub bearing cup (*Figure 12*).

**NOTE:** When using grease, pre-pack the inner bearing before placement into the hub.
3. With the correct head on the hub seal installation tool, place the hub seal on the installation tool, so that the words “Lube Side” face the inner bearing. Place the tool (with the seal correctly mounted in the tool head) into the hub bore. Use a three to five pound hammer to drive against the end of the tool. Drive seal into bore until complete bottoming is assured (Figure 13). Remove installation tool and apply a thin layer of lubricant on the I.D. surface of the seal. Ensure the inner bearing rotates freely. Install a new seal if the seal is crooked or damaged after installation.

**NOTE:** DO NOT apply lubricant to the O.D. of the seal.

4. Align the hub bore to the center of spindle with mechanical supports. Gently push the hub assembly onto the spindle until the seal is seated against the bearing shoulder. Rotate the hub and lightly strike with a 3 lb. to 5 lb. to ensure that the seal is properly seated against bearing shoulder.

5. Pre-lube the outer bearing with the lubricant that is being used and place into the hub.

**NOTE:** When using grease, pre-pack the hub cavity. The grease fill amount should be to a three o’clock and nine o’clock level. This is to ensure a 50% hub cavity fill. Use a template to hold grease in place while filling the hub cavity (Figure 14).

### 11. Hub Bearing Adjustment

#### 11.1 Hub Bearing Adjustment Using 3-Piece Axle Nut

1. Install the bearing inner-axle adjustment nut finger tight against the outer bearing (Figure 15).

2. While rotating the hub assembly, tighten the inner axle adjustment nut to 200 ft.-lbs. (271 N•m).

3. Back off the inner axle adjustment nut one full turn and then re-torque nut to 50 ft.-lbs. (68 N•m) while rotating the hub assembly.

4. Back off inner axle nut approximately 1/4 turn and install the axle lock washer (Figure 16). DO NOT include socket backlash in the 1/4 turn.

5. Install the lock washer. If the hole in the washer is not aligned with the pin on the inner nut, turn the washer around and re-install. If the pin and hole are still not aligned, slightly adjust parts as needed.
6. Install the outer axle nut finger tight against the axle lock washer (Figure 16).

7. Tighten the outer axle nut to 300-400 ft.-lbs. (406-541 N•m).

**IMPORTANT:** Final adjustment should allow the wheel to rotate freely with 0.001" to 0.005" (0.025 mm to 0.0127 mm) end play. If end play is not within specification, re-adjustment is required.

**WARNING** Failure to maintain proper hub bearing adjustment may result in bearing failure and wheel-end separation which, if not avoided, could result in death or serious injury.

8. Check the wheel bearing end play as follows:
   a. Attach the magnetic base of a dial indicator to spindle. Touch dial indicator stem to hubcap gasket face (Figure 17).
   b. Reading Number One – Slightly rotate wheel-end in both directions while pushing inward until dial indicator does not change. Set the dial indicator to zero (Figure 17).
   c. Reading Number Two – Slightly rotate hub in both directions while pulling outward until dial indicator does not change (Figure 17).
   d. End play is the difference between reading number one and reading number two.

9. Install set screw into an accessible threaded hole in the lock washer. Set screw MUST contact the inner adjusting nut. Tighten to 16-20 in.-lbs. (1.8-2.2 N•m).

**NOTE:** If wheel bearing end play needs adjustment, remove outer nut and lock washer. Tighten or loosen inner nut as needed. Return to Step 6.

11.2 Hub Bearing Adjustment Using Pro-Torq® Axle Nut

The unit may be equipped with a Pro-Torq® spindle nut (Figure 18). Refer to Stemco® Pro-Torq® Installation Instructions (Part No. 09-571-006) which can be found at www.stemco.com for more information.
12. Hub Cap Installation

1. Install the hub cap assembly, making sure the hub cap gasket is in place (Figure 19).

**CAUTION** When installing hub cap, make sure the hub cap gasket is not bent or damaged.

**CAUTION** DO NOT over torque. This can crush the hub cap gasket and cause a leak.

2. Install the six (6) bolts to secure the hub cap assembly (Figure 19). Tighten bolts to 12-16 ft.-lbs. (16-21 N•m).

13. Filling Hub With Lubricant (Oil Based)

**IMPORTANT:** DO NOT mix oil lubricant with grease lubricant. If the bearing assembly has been lubricated with grease DO NOT add oil.

**WARNING** Failure to correctly lubricate bearings may damage bearings which, if not avoided, could result in death or serious injury.

1. Remove plug and fill the hub to the "FULL" mark with the specified lubricant (oil), through the hole in the hub cap (Figure 20).
2. Allow the oil to flow through the bearings and level off.
3. Insert the plug into the hole in the hub cap (Figure 21).

**IMPORTANT:** Axles equipped with a centralized tire inflation system MUST use a vented hub cap.

4. Re-install drum on hub using support device such as a drum dolly jack (Figure 22).

**CAUTION**  
Failure to support weight during installation or removal of brake drum could create a crush hazard which, if not avoided, could result in minor to moderate injury.

### 14. Brake Adjustment Procedure

1. Verify that the spring brakes are caged prior to beginning adjustment procedure.

2. Adjust the slack adjuster until the brake lining contacts the brake drum, then back off 1/2 turn.

3. Apply the brakes using normal operating pressure (average line pressure should be 90 psi, but not less than 80 psi). Check the following while brake pressure is applied.

   - The optimum distance of push rod travel should be approximately 1.5"-1.75" (38-44.5 mm) (Figure 23).

   - Angle between the push rod and the slack adjuster with brake applied, should be 95°-100° (Figure 23).

   - Brake lining to drum contact. A 0.010" feeler gauge should not fit between the lining and the drum contact area.

4. Release the air pressure from the service brake system and check to see that all brakes release to the normal relaxed position. If all brakes do not properly release, refer to Service Manual XL-TA10006OM-en-US Troubleshooting Chart Section 24.

**CAUTION**  
Failure to adjust brakes in accordance with manufacturer’s instructions prior to placing trailer back in service will prohibit proper brake function which, if not avoided, could result in uneven brake system component wear.

5. Uncage the spring brake.

**WARNING**  
Failure to uncage spring brakes, in accordance with manufacturer’s instructions after servicing is complete, will prohibit proper brake function which if not avoided, could result in death or serious injury.
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.