



Inspection

Inspecting Commercial Vehicle Foundation Cam Brake Systems

Wheels On and Wheels Off the Vehicle

Hazard Alert Messages

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

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

About This Inspection Bulletin

Commercial vehicle foundation cam brake inspection always has been an important part of helping to ensure a vehicle is safe to operate. In an effort to further improve commercial truck and bus safety, the U.S. Department of Transportation's Federal Motor Carrier Safety Administration (FMCSA) launched the Compliance, Safety, and Accountability (CSA) program in December 2010. Together with State Partners and industry, the FMCSA is working to help prevent commercial motor vehicle crashes, injuries and fatalities on our nation's highways.

As the leading manufacturer of foundation cam brake systems in North America, Meritor developed this Inspection bulletin to provide fleets, dealers, owner-operators and repair facilities with preventive maintenance inspection guidelines for commercial vehicle foundation cam brake systems. Included are the mechanical – or foundation – portion of the brake system for wheels-on/wheels-off the vehicle inspections.

Although inspecting the air supply system is not included in this bulletin, it must be performed during a preventive maintenance inspection.

Only a Qualified Brake Inspector Can Perform Brake Inspections on a Commercial Motor Vehicle

Any person who performs inspection, maintenance, service or repairs to the brakes of a commercial motor vehicle must be qualified as a brake inspector as outlined in the U.S. Department of Transportation (DOT) Federal Motor Carrier Safety Administration (FMCSA) guidelines listed under section 49 CFR §396.25. For complete information on brake inspector qualifications required to meet federal standards, visit fmcsa.dot.gov.

Important Information About Meritor Automatic Slack Adjusters

Meritor automatic slack adjusters should not need to be manually adjusted in service to correct excessive push rod stroke. Excessive stroke may be an indication that a problem exists with the foundation brake, slack adjuster, brake actuator or other system components. Meritor recommends troubleshooting the problem, replacing suspect components, and then confirming proper brake operation prior to returning the vehicle into service.

In the event that a manual adjustment must be made (although not a common practice), schedule a service appointment as soon as possible to perform a full foundation brake, automatic slack adjuster, and other system component inspection to ensure the integrity of the overall brake system.

Inspection

Wheels On the Vehicle

NOTE: Perform these procedures in addition to those included in the Wheels Off the Vehicle inspection that follows. If all of the inspection criteria is not met, correct all issues before returning the vehicle to service.

Brake Free Stroke

If measured free stroke is greater than 5/8-inch, or if free stroke is not available, find the causes and determine if further repairs are required.

Brake Chamber Applied Stroke

1. Determine the chamber size (20, 24, 30, etc.) and the chamber type — either standard or long-stroke. Determine the brake adjustment limit in inches for that particular chamber size and type.
2. With the brakes released, verify each brake shoe, slack adjuster and chamber push rod returns to the “at rest” position.
3. Compute the chamber stroke dimension and verify it complies with Commercial Vehicle Safety Alliance (CVSA) guidelines. If you find one of the following conditions, inspect the brake to determine the cause.
 - A. Measured push rod stroke is at — or greater than — the maximum adjustment limit for the chamber size and type.
 - B. You can see the red- or orange-colored band on the push rod (excessive stroke indicator) when the brake is fully-applied.

Brake Chamber

1. Check the brake chamber for damage or looseness. Ensure the retaining nuts are tightened to specification. Check the clevis retaining nut for the correct torque, if equipped.
2. Verify the chamber size (20, 24, 30, etc.) and the chamber type — either standard or long-stroke — are the same on each side of an axle.
3. Verify the push rod is exiting the chamber at a 90 degree angle, and it returns completely after each brake application.
4. Verify the caging bolt, nut and washer are installed, and the caging bolt cover is secure.

Clevis and Clevis Pins

1. Check clevis pins for excessive wear and damage.

2. Verify clevis pin lockwires/pins are installed, and the clevis pins rotate in the automatic slack adjuster and clevis.

Automatic Slack Adjuster

1. Inspect the automatic slack adjuster and adjustment brackets (if equipped) for wear or damage. Check the boot (if equipped) for tears or cuts.
2. Verify the retaining bolt or snap ring is correctly secured in the camshaft. Verify the automatic slack adjuster size (5”, 5.5”, 6”, etc.) is the same on each side of an axle.
3. Clean the lubrication fitting (if equipped). Lubricate the slack adjuster according to the manufacturer’s instructions.

Brake Chamber Bracket

1. Inspect the chamber bracket for cracks and damage.
2. Verify the support brackets (if equipped) are secure and not damaged. Verify the bracket retaining bolts are tightened to specification.
3. Clean the lubrication fitting (if equipped). Lubricate the camshaft tube, camshaft and camshaft bushings according to the manufacturer’s instructions. Verify lubricant does not purge from the cam head end of the camshaft.

Brake Linings

1. Wheel ends on the same axle must have the same linings and drums. Lining wear on both the top and bottom brake shoes should be the same dimension.
2. Measure lining wear. Linings must have a greater than 1/4-inch thickness at the center of the brake lining. Inspect linings for cracks, separation from the brake shoe table, and loose rivets. If you find any of these conditions, determine if brake shoe replacement is required.
3. Verify the linings are not contaminated with grease or oil. If you find either of these conditions during inspection, perform brake system diagnostics.
4. Inspect the brake linings to ensure the brakes will have enough available lining life to operate safely until the next scheduled maintenance and service interval.
5. Inspect the dust shields (if equipped) for looseness, cracks or other damage.

Brake Drums

Inspect the brake drum for heavy grooving and cracks that extend to the end of the brake drum edge. Brake drums on the same axle should show similar wear conditions and thickness dimensions.

Brake Shoes and Hardware

1. Inspect the rollers, roller retainers, retainer springs and return springs. Verify they are in the correct position, and not worn or damaged.
2. Inspect the brake shoes for wear at the anchor pin holes or roller slots. Inspect the anchor pins for wear and correct alignment.
3. Inspect the brake shoes for excessive corrosion where the lining blocks attach to the shoe table. Inspect for wear, bent areas or cracks in the shoes.

Brake Spiders

1. Verify the brake spider retaining bolts are secure and not loose.
2. Verify the spider is not cracked or damaged.

Wheels Off the Vehicle

NOTE: Perform these procedures in addition to those included in the Wheels On the Vehicle inspection in the previous section. If all of the inspection criteria is not met, correct all issues before returning the vehicle to service.

Brake Drum

1. Closely inspect wear patterns on the friction surface inside the drum. Inspect for grooving, scoring, bluing and heat checks on the drum surface. If you find any of these conditions, determine if the drum requires replacement.
2. Inspect the mounting flange and drum pilot for excessive wear and cracks.
3. Use a brake drum diameter gauge to check if the drum is out-of-round, worn or damaged.

NOTE: A brake drum can be out-of-round but still within the correct inside diameter specification. The inside diameter of a drum can be worn out-of-specification, but the drum still be concentric (not out-of-round).

4. Inspect the brake drum surface conditions and inside diameter. Check for drum out-of-round. All of these factors must be within specification to operate the vehicle and meet the next scheduled maintenance and service interval.

Brake Linings, Shoes, Hardware and Spiders

NOTE: To perform a closer inspection of the lining, shoe, hardware and spider, remove the brake shoes.

1. Verify the brake spider retaining bolts are secure and not loose. Inspect the spider for cracks or damage.

2. Wheel ends on the same axle must have the same linings and drums. Lining wear on both the top and bottom brake shoes should be the same dimension.
3. Measure lining wear. Linings must have a greater than 1/4-inch thickness at the center of the brake lining. Inspect linings for cracks, separation from the brake shoe table and loose rivets. If you find any of these conditions, determine if brake shoe replacement is required.
4. Verify the linings are not contaminated with grease or oil. Inspect for signs of excessive heat that occurred during operation, such as the lining material is flaking or cracked, or fibers have separated from the lining material. If you find any of these conditions during inspection, perform brake system diagnostics.
5. Inspect the brake linings to ensure the brakes will have enough available lining life to operate safely until the next scheduled maintenance interval.
6. Inspect the rollers, roller retainers, retainer springs and return spring. Verify they are in the correct position and not worn or damaged.
7. Inspect camshafts and camshaft bushings for wear.
8. Inspect brake shoes for wear at the anchor pin holes or roller slots. Inspect the anchor pins for wear. Verify anchor pins are aligned correctly
9. Inspect the brake shoes for excessive corrosion where the lining blocks attach to the shoe table. Inspect for wear, bent areas or cracks.

Before You Return the Vehicle to Service

1. Always replace both the same type of brake drums on an axle to maintain correct brake balance.
2. Consider replacement brake drums for the vehicle duty cycle. An aggressive and harsh duty cycle requires a heavier (higher mass) drum to manage heat energy created during braking. Also note that drums and linings on a front axle can be different from drums and linings on a rear axle due to the size of the brakes between the front steer and rear drive axles.
3. Use the lining material specified by the vehicle manufacturer to help ensure brakes perform correctly and meet Department of Transportation (DOT) regulations.
4. Always reline both wheels of a single axle at the same time. Always install the same type of linings and drums on both wheels of a single axle.

5. Always reline all four wheels of a tandem axle at the same time. Always install the same type of linings and drums on all four wheels of a tandem axle. It is not necessary for the front axle brakes to be the same as the rear drive axle brakes.
 6. Check the complete air system for worn hoses and connectors. With the air pressure at 100 psi (689 kPa), the brakes released and the engine off, tractor air pressure loss must not exceed two psi (13.8 kPa) per minute. Total tractor and trailer loss must not exceed three psi (20.7 kPa) per minute.
 7. Verify the air compressor drive belt, if equipped, is secure. Air system pressure must rise from compressor cut-in to approximately 100 psi (689 kPa) in two minutes.
 8. Inspect the governor to ensure it is set to the vehicle manufacturer's specifications. Verify both the tractor and trailer air systems are within the vehicle manufacturer's specifications.
 9. Always follow the vehicle manufacturer's specifications for brake friction material. Friction material requirements may not be the same for each vehicle.
 10. Verify the return springs retract the shoes completely when the brakes are released. Verify the spring brake retracts completely when it is released. Replace the return springs each time the brakes are relined.
 11. The air chamber area multiplied by the length of the automatic slack adjuster is called the AL factor. This number must be equal for both ends of a single axle and all four ends of a tandem axle.
 12. Before returning the vehicle to service, perform a road test to burnish new brake linings (if required). Then inspect brake components and perform a final brake adjustment.
4. Immediately check the temperature of each brake drum after burnishing to ensure that braking effort was sufficient on each wheel. A drum temperature that is greater than those stated below can be a possible indication of brake imbalance. **Note:** A drum that is approximately 50°F degrees (10°C) cooler side-to-side, or one that is 100°F (38°C) cooler front-to-rear than any of the others, can indicate insufficient braking effort on that wheel. To check for brake imbalance:
 - A. Verify the foundation cam brake system is correct. Refer to Meritor Maintenance Manual 4, and the manufacturer's instructions and specifications.
 - B. Verify the air system is correct. Refer to the manufacturer's instructions and specifications.
 - C. Repair brake imbalance, if found. Refer to Meritor Maintenance Manual 4, and the manufacturer's instructions and specifications.
 - D. Follow the procedure above to reburnish the brakes.
 - E. Allow the brakes to cool to ambient temperature.
 - F. Manually adjust all of the brakes. Refer to Meritor Maintenance Manual 4.

Brake Burnishing Procedure

WARNING

To prevent serious personal injury and damage to components, burnish the brakes in a safe area. After burnishing, immediately check the temperature of each drum to ensure braking effort was sufficient on each wheel, and that the brakes are not imbalanced. Repair brake imbalance, if found.

1. Manually adjust all of the brakes. Refer to Meritor Maintenance Manual 4.
2. While driving the vehicle in a safe area at 20 mph (32 km/h), apply the brakes at approximately 10 feet (3.05 m) per second until the vehicle decelerates to 5 mph (8 km/h) *without stopping the vehicle*. Repeat this procedure 10 times.
3. After 10 brake applications, decelerate from 20 to 0 mph (32 km/h– 0 km/h) and make *one complete stop*.

How to Obtain Additional Maintenance, Service and Product Information

Meritor offers a wide variety of reference materials and tools to support the inspection procedures in this bulletin. Publications contain safety, inspection and repair procedures for foundation cam brakes.

- Literature on Demand (www.meritor.com/customer/northamerica/lod)
- The BullPen (www.meritorbullpen.com)
- Meritor Mobile (www.meritor.com/meritormobile)
- Your DriveForce™ Team Member (www.meritor.com/customer/northamerica/driveforce)

Publications Specific to This Bulletin

Meritor

Visit the Literature on Demand section of meritor.com to obtain the following publications that support inspection procedures in this bulletin.

- Maintenance Manual 1: Preventive Maintenance and Lubrication
- Maintenance Manual 4, Cam Brakes and Automatic Slack Adjusters
- Maintenance Manual MM-99100: Wheel Equipment/Disc Wheel Hubs and Brake Drum Failure Analysis

Meritor WABCO

Visit Meritor WABCO's website at www.meritorwabco.com to obtain publications that support inspection procedures in this bulletin for the following Meritor WABCO products.

- Pneumatic ABS for tractors and trailers
- Air compressors
- Air dryers
- Air brake control valves



Meritor Heavy Vehicle Systems, LLC
2135 West Maple Road
Troy, MI 48084 USA
866-OnTrac1 (668-7221)
meritor.com

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