

# RECOGNIZING & CORRECTING BRAKING PROBLEMS

The following information deals with brake drum related problems, probable causes and possible solutions. This information is intended as a guide to help truck operators and service persons recognize brake drum and brake drum related problems. It offers suggestions to help correct those problems. It is not intended as a complete service guide. The information is based on reasonable probabilities. The described corrections are those most frequently used by Motor Wheel service engineers. The solutions/corrections given are those commonly used successfully. All brake system service work should be performed by a qualified brake mechanic.

## 1.0 Excessive Fade

### 1.1 Symptoms:

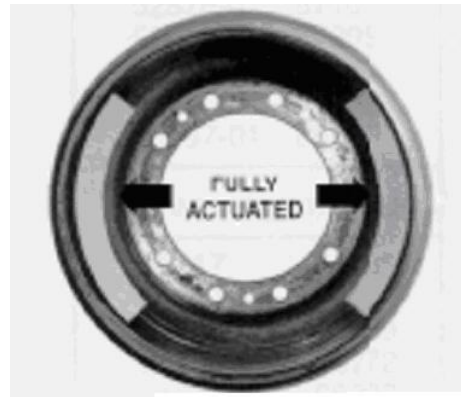
Braking power is lost or seriously reduced during extended brake use (particularly in severe braking situations).

### 1.2 Cause:

Excessive heat build-up in the drum and lining lead to "fade".

Heat build-up can change the friction quality of the brake lining and the drum. The friction coefficient between the lining and drum is reduced causing too much slip- not enough grip.

There can also be mechanical deflection in the system. Excessive heat build-up can also cause drums to expand past the point of maximum brake shoe travel. Linings will no longer properly contact the braking surface and "fade" may be the result.



### 1.3 Possible Solutions:

1. Check the air pressure delivery system to be certain the system is in balance. Each brake on the vehicle must be doing its appropriate share of the work.
2. Look for the problems in the foundation brake. Inspect for proper brake adjustment.
3. Inspect drums. Look for the following conditions:
  - a. Out-of-round braking surface
  - b. Bell mouth
  - c. Heat spots
  - d. Polished braking surface

4. Measure inside diameter to be certain drums have not been over machined (working surface diameter re-machined beyond manufacturer's recommendation), or worn beyond usable limits. (See BRAKE DRUM MACHINING section)

## 2.0 Uneven Brake Pull

### 2.1 Symptoms:

Vehicle swerves to right or left when brakes are applied.

### 2.2 Cause:

This can be caused by one or more of several conditions. Uneven brake pull can be caused by a defective or damaged brake drum, by mismatched drums and/or linings; by improper functioning of other components of the brake system; or by oil or grease on the braking surfaces.

### 2.3 Possible Solutions:

Check for the following conditions:

1. Make certain all mechanical parts are functioning equally at each brake location. Check all drums to be certain none have worn beyond "discard" diameter. Also be certain that no drum is damaged beyond usefulness (see DRUM PROBLEMS section)
2. Make certain both drums on each axle are equal in braking surface diameter (see BRAKE DRUM MACHINING)
3. Check to see that there is no system imbalance from one side of the vehicle to the other and that all drums are doing their expected share of the work.
4. Use same lining on both ends of a given axle. Make sure there is sufficient lining thickness remaining (consult lining manufacturer).
5. Clean all foreign matter from the drum, linings and brake parts. If oil seal is leaking, replace. Be sure to follow seal manufacturer's removal and installation instructions. Avoid over-greasing camshaft.

## 3.0 Noisy Braking Action

### 3.1 Symptoms:

Brakes are noisy (squeal, growl, or chatter). When brakes are applied, vehicle might also vibrate.

### 3.2 Cause:

Any of the following conditions may be the cause:

- Polished drums Worn or damaged braking system parts
- Foreign matter on drums
- Glazed lining
- High friction lining
- Improper lining to drum contact
- Stretched brake shoes

### 3.3 Possible Solutions:

Pull drums and inspect for above conditions (see DRUM PROBLEMS section)

## 4.0 Vehicle Vibration

### 4.1 Symptoms:

While in motion, vehicle pulsates or vibrates when brakes are not applied.

### 4.2 Cause:

a) Unrelated to spindle end assembly:

Problem may be fault of one or a combination of any of the following:

- Suspension
- Steering
- Fifth wheel location
- Wheel base
- Cab mounting
- Drive train

b) Spindle end assembly related:

Problem may also be in one or more spindle end components:

- Out-of-round tire and/or wheel
- Out-of-balance tire and/or wheel
- Out-of-balance drum
- Improper installation of any spindle end component.

### 4.3 Possible Solution:

- If cause is isolated to spindle end assembly: Check to determine if any of the spindle end running gear assemblies are out of balance or out of round. If so, then isolate the conditions-tire, rim/wheel, brake drum or hub.
- If the problem is with the tire and/or wheel or rim, refer to manufacturer's recommendations to correct the problem
- If the imbalance is in the drum only, replace with a balanced drum.

# DRUM PROBLEMS & CONDITIONS

## 1.0 Heat Checked Drums

### 1.1 Condition:

The braking surface of the drum exhibits a network of fine, hairline cracks, commonly called heat checking.

### 1.2 Cause:

Heat created by brake applications first affects the portion of the braking surface in contact with the lining. This happens because this area begins to expand while the outer part of the drum is relatively cool.

A minute depth of the brake surface expands and buckles due to its high temperature. The brake lining presses more firmly on the high ridges caused by buckling. This action results in greater heat build up along the ridges. When the drum cools, fine cracks appear along the lines of buckling. As the heating and cooling cycles continue, the hairline cracks will enlarge... but usually the growth is gradual and the drum has completed its service life before the cracks become wide enough to be a problem.



### 1.3 Correction:

Hairline cracks or heat checks will usually develop early in a drum's life. This is a normal condition and an indication that the drum is doing its work. Heat checking does not necessarily mean undue or premature wear. Normal drum and lining life can be expected.

## 2.0 Cracked Drum & Large Heat Checks (Progressive Deterioration Type)

### 2.1 Condition:

Exaggerated heat checking and wide cracks over part or the entire drum braking surface.

### 2.2 Cause:

Hairline cracks (described under foregoing heading, HEAT CHECKED DRUMS) continue to grow from the heat created by braking and from the force of the brake shoes against the drum. Excessive force will speed up crack growth and shorten drum life. As the cracks continue to grow, they may reduce the



effectiveness of the drum. At some time, one or two or more large cracks may develop eventually cracking through to the outside surface of the drum.

## 2.3 Correction:

See cause and correction for blue drums and grease stained drums. Check and discard stretched brake shoes. Be sure there is no brake compounding. Eliminate any driver abuse of the trailer control valve. Replace lining that is not maintaining required frictional properties over the temperature range found in your fleet.

## 3.0 Drum Cracking (Parking Brake-Set Caused)

### 3.1 Condition:

Cracked brake drums observed after truck has had parking brakes in set position for a period of time immediately after heavy brake usage.

### 3.2 Cause:

When excessively hot drums are allowed to cool while the brakes are set, the pressure of the shoes against the drum will interfere with the contraction of the cooling drum.

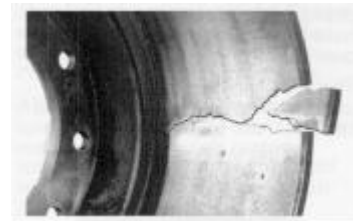
Depending on the amount of contraction, the drum can either distort or crack severely. Severely cracked drums can explode if kept in service.



### 3.3 Correction:

Check vehicle operating procedures. Whenever possible, eliminate instances of vehicle standing with brakes set against overheated drums.

Heat Spotted Drums



### 3.4 Condition:

Hard, slightly raised dark spots on the braking surface.

### 3.5 Cause:

The properties of grey iron can be changed by heating and cooling. Hard spots can result from frequent and excessive heating and cooling cycles. Heat spotting is often a result of a malfunction in the brake system, such as a dragging brake.



### 3.6 Correction:

Check brake system thoroughly to be certain it is functioning properly. Drum surface should be machined to eliminate raised spots and provide an even surface. If spots are too hard for cutting tool, surface can be refurbished by a drum grinder. If hot spots cannot be removed within re-wear and re-bore limits, drums should be replaced (See BRAKE DRUM MACHINING section). Always replace drums in pairs on a common axle to maintain system balance.

## 4.0 Blue Drums

### 4.1 Condition:

A high blue cast on the drum's braking surface. Unlike heat spotted drums, blue drums will generally have a uniform area of blue shading over part or the entire drum. This condition may result in noisy and/or pulling brakes and excessive fade.

### 4.2 Cause:

Blue drums are caused by excessively high temperature build-up during braking. Blue drum condition is an indication that the drum's braking surface has changed. As a result, there may be less friction between lining and the drum surface.



### 4.3 Correction:

Check for unbalanced braking system; weak brake springs; worn camshaft bushings or broken parts; dragging shoes; over adjustment or out-of-round or distorted drums. Correct faulty system, replace broken or worn parts. If drum is only slightly out-of-round or distorted, it might be possible to correct it by machining the braking surface. If so, machine the drum on the other end of the axles as well. (See BRAKE DRUM MACHINING section.) If drum is not machinable, replace the drum and its companion on the same axle to maintain balanced braking.

## 5.0 Grease Stained Drums

### 5.1 Condition:

Discolored spots on the braking surface; the back and other parts of the drum will usually be covered with oil or grease. Oil or grease soaked brake lining and drum can reduce the amount of stopping friction, causing the other drums on the vehicle to work harder. This situation causes drum overheating, brake fade and, eventually, drum failure.



## 5.2 Cause:

Over greasing the brake camshaft bushing, worn camshaft bushings, or leaking oil seal are usually the causes of this condition.

## 5.3 Correction:

Clean the brake drum and all adjacent metal brake parts with solvent. Replace faulty oil seals and remove excess grease from the camshaft. If brake lining is saturated with oil or grease, replace.

NOTE: Avoid over-greasing of camshaft bushing.

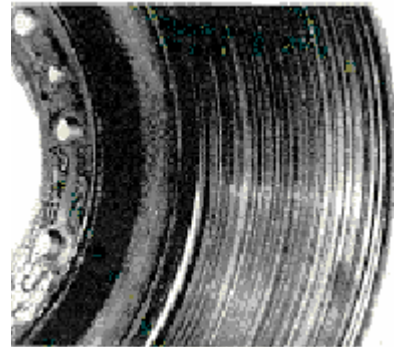
## 6.0 Scored Drums

### 6.1 Condition:

Drum will have medium to deep grooves around the circumference of the braking surface. Brake lining will show a similar wear pattern. Foreign metal particles can usually be found embedded in the lining.

### 6.2 Cause:

Scoring or rapid wear can often be traced to an unbalanced brake system. Incompatibility between the drum and lining can also be a cause. Abrasive material such as sand, grit, metal chips, etc., present in the drum interior or embedded in the lining might be a cause.



### 6.3 Correction:

Consult with drum and lining manufacturers for drum and lining compatibility recommendations. If brake system is out of balance, make necessary corrections and adjustments. Scored drums may be machined within recommended tolerances. (See BRAKE DRUM MACHINING section.)

If road contaminants are present, install dust shield. If dust shield is holding particles in, then remove the lower half of the shield for a trial period.

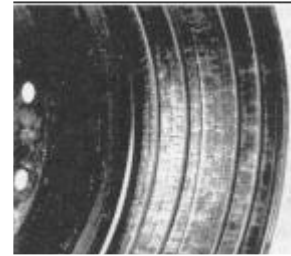
## 7.0 Rivet Hole Damage

### 7.1 Condition:

Grooves or wear which coincide with the rivet hole locations in the linings.

## 7.2 Cause:

Brake surface damage can be caused by abrasive material collecting in the rivet holes or by excessively worn brake blocks which permit the rivets to contact the drum surface.



## 7.3 Correction:

Replace worn lining with bonded lining; or, if riveted lining is used, insert plugs (of same lining material) into rivet holes.

## 8.0 Excessive Drum Edge Wear

### 8.1 Condition:

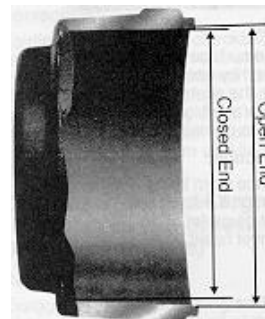
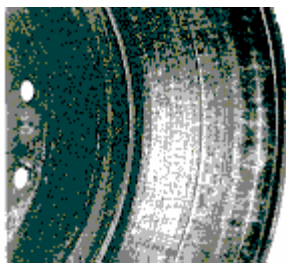
Drum will show significantly greater wear at both edges. A raised edge or lip will form at drum surface open end where the lining does not make contact.

### 8.2 Cause:

Abrasive material is trapped by the "lip" causing excessive drum edge wear.

### 8.3 Correction:

Counter bore or chamfer drum's open end edge just enough to remove lip. If no dust shield is present, install one. If a dust shield is holding in abrasive material, remove the bottom half for a trial period.



## 9.0 Bell Mouth Distortion

### 9.1 Condition:

Drum diameter is greater at the open end of the drum than at the closed end. Brake lining will usually show greater wear on the side next to the closed end of the drum.



## 9.2 Cause:

Bell mouthing is often caused by pad pressure being diverted due to worn anchor pins and/or anchor pin holes. Since the open end circumference of the drum has less resistance to the pad pressure, it can be stretched by extreme brake force.

## 9.3 Correction:

Bell mouth drums should be replaced. Replace both drums on a common axle to maintain proper brake balance. A full examination of the braking system should be conducted to determine why excessive pressure is being exerted on a given drum. A defective or out-of-balance system should be corrected, and worn or broken parts should be replaced.

## 10.0 Out-of-Round Drums Condition:

Gauge shows varied braking surface diameters when checked at several points around the drum. Drum may also show uneven heat checking.

### 10.1 Cause:

Out-of-round drum can be the result of excessive heat build-up from brake pressure overload due to incompatibility between the drum and lining, or an out-of-balance brake system.

Out-of-round can also be caused by careless handling during shipping, from poor storage conditions or rough handling during installation. It can also be due to improper installation, i.e., foreign material lodged between the drum back and hub or cast spoke wheel, or because drum was not properly positioned on hub pilot.

Out-of-round can also be caused when parking brakes are set while drums are extremely hot.

### 10.2 Correction:

Machine the drum and its companion drum on the same axle if drum thickness is sufficient to eliminate the out-of-round condition within recommended machining limits (see BRAKE DRUM MACHINING section). Otherwise, replace both drums.

NOTE: "Out-of round" condition should not be confused with "Run Out." When drum is out-of-round, gauge will show varied braking surface diameters when checked at several points. "Run Out" is when braking surface of the drum is not concentric with its piloting centre.

A dial indicator measurement on the braking surface is the most accurate method of checking, run-out.

## 11.0 Polished Drums

### 11.1 Condition:

Braking surface has mirror like finish.

### 11.2 Cause:

Glazed lining surface has caused a slick surface to develop on the drum. The coefficient of friction is seriously impeded. This condition can result in' noisy or pulling brakes and longer vehicle stops.



### 11.3 Correction:

To alter glazed lining condition, roughen lining surface with emery cloth or a wire brush. Drum should be machined or sanded to eliminate glazed finish (see BRAKE DRUM MACHINING section).

## BRAKE DRUM MACHINING

The braking surface of centrifuse brake drums may be refurbished by machining (boring, turning or grinding). Drums exceeding recommended wear limits have reduced heat dissipation characteristics. This could result in fade. Drum strength is also reduced.

### WEAR AND RE-BORE LIMITS

Nominal Drum Size	Drum Re-bore Diameter Limit	Permissible Additional Wear	Discard Diameter
15"	15.080	.040	15.120
16-1/2"	16.580	.040	16.620

No drum should be used which exceeds the total discard diameter specified by the manufacturer. (Discard diameter is the total of re-bore and wear limits.) All centrifuse drums have discard diameters marked on the outside of the drum.

**NOTE:** No brake drum should be machined beyond the re-bore limit specified by the drum manufacturer.

**NOTE:** New centrifuse drums do not require machining before installation. They are machined to finish diameter at the factory. A surface finish of 90 to 200 micro inch must be maintained when turning a drum surface.

**IMPORTANT:** For re-machining other makes of drums, follow manufacturer's specification

# TIPS TO INCREASE DRUM LIFE & TO IMPROVE DRUM PERFORMANCE

The outside of all drums should be kept clean. Mud, dirt, grease, rust, scale and other foreign matter trap heat and diminish the drum's performance. The inside of the brake drum and the brake lining should be kept free of grease, oil, dirt and other foreign matter. Drums on the same axle should be matching in size, configuration and weight.

For optimum brake performance, inside diameter (working surface) of drums on the same axle should be within .030". This usually is only possible by machining both drums or by replacing drums in matched pairs.

Turn drums only when necessary. Remove only as much material as necessary (see BRAKE DRUM MACHINING section).

**NOTE:** A corrosion-inhibiting protection is applied to the brake surface of all new centrifuse drums. It is not necessary to remove this coating before installation.

Occasionally, drums are coated more heavily for longer than normal storage time. If a heavy coating is present, wipe off before installation. A surface finish of 90 to 200 micro inch must be maintained when turning a drum surface.

**IMPORTANT:** For re-machining other makes of drums, follow manufacturer's specification.

## **Special Attention:**

**Before installing clean all mounting surfaces to assure a flat, tight assembly. Clean breaking surface of foreign material. Back nuts on inboard mounted drums should be torques to 175/200 ft-lb's. Be sure drums are seated on hub pilot before tightening back nuts or wheel nuts. See manufacture's torque recommendations for wheel nuts.**