

TIMKEN

Where You Turn



Trackside Inspection of Roller Bearings





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Produced as a service to the railroad
industry by The Timken Company

Foreword

A major contributing factor to improved performance of roller bearings is the ability of rail car inspectors and repair personnel to recognize damaged roller bearings and worn or damaged associated parts. This booklet is a guide to assist in this effort. Rules and regulations of the Federal Railroad Administration (FRA) and of the Association of American Railroads (AAR) take precedence over the information in this booklet for roller-bearing-equipped freight cars operating under their jurisdiction.

Warning

Proper bearing maintenance and handling practices are critical. Failure to follow installation instructions and to maintain proper lubrication can result in equipment failure, creating a risk of bodily harm.

Visual Inspection

A visual inspection should be made of all roller bearings in accordance with FRA and AAR inspection requirements.

Inspectors should be alert to defects visually detectable when cars are in yards, on repair tracks or in the shop for any reason.

The inspection should include the following:

- 1) Check the axle end cap for missing lubricant fittings or plugs.



Figure 1

- 2) Check for loose and/or missing cap screws.



Figure 2

- 3) Be sure that all tabs of the locking plate are properly bent up against the flats of the cap screw heads.



Figure 3

- 4) Inspect for damage or wear to the end cap from a displaced (cocked) adapter.

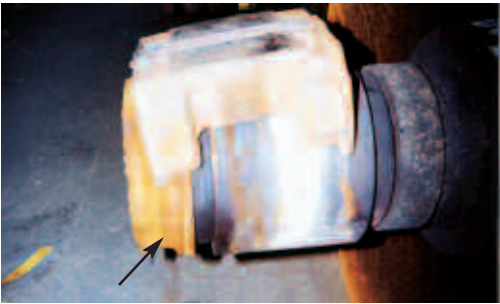


Figure 4

- 5) Inspect for loose or damaged seals.
Excessive accumulation of fresh grease around a seal *may* indicate a loose, damaged or defective seal.

Remove a bearing from service if you observe *any* of the following conditions:



Figure 5

- 5A) A seal that can be moved laterally (back and forth) or rotated by hand using a suitable probe, such as a screwdriver.



Figure 5A

5B) A seal that is cocked out of position in the bearing outer ring.



Figure 5B

5C) A seal case that is damaged (bent) from an external source



Figure 5C

5D) Seal lips that are damaged.



Figure 5D

(Bearing shown without end cap for illustration.)

6) Check for cracked or broken outer rings (also called bearing cups).



Figure 6

7) Inspect for a loose backing ring. If a backing ring can be moved or rotated by hand, remove the bearing from service.



Figure 7

- 8) Check the backing ring for damage or wear from a displaced (cocked) adapter.



Figure 8

- 9) Note that the bearing assembly size matches the frame and adapter size (for example, a 100-ton bearing in a 100-ton truck).



Figure 9

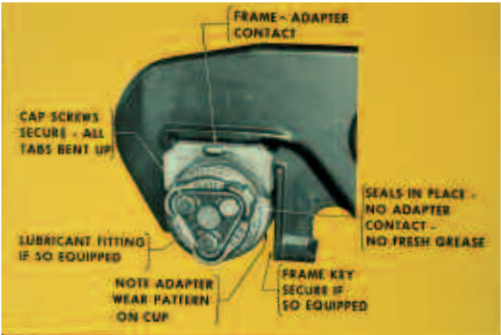


Figure 10
Key Inspection Points
on a Timken® AP™ Bearing
in a Narrow Pedestal Frame

Adapters

The adapter is an intermediate component necessary to fit Timken AP™ bearings to the truck side frame and is designed to distribute the load properly on the bearing.

The standard freight car narrow adapter is shown in Figures 11 and 12. This is the most common style in service today. There

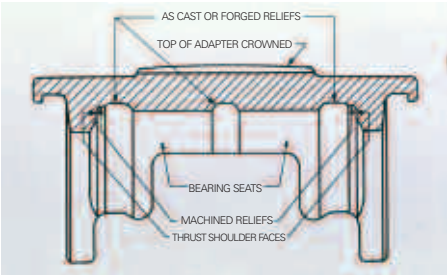


Figure 11
Narrow Adapter Half Section



Figure 12
Narrow Adapter

are other designs of adapters for railroad bearing applications, but the internal configuration of most adapters is very similar to the basic narrow adapter.

When adapters become worn, the load to the bearing is not distributed properly. Excessively worn adapters may result in premature bearing damage and reduced bearing life. Proper inspection of adapters is critical to obtaining optimal bearing performance.

Inspecting Adapters in Trucks

- 1) When inspecting adapters in trucks, see that they are properly seated on the bearing.
- 2) Look for cracked or broken adapters.
- 3) Look for displaced or cocked adapters.
- 4) Inspect for worn adapters: The outside surface of the outer ring (bearing cup) will indicate the condition of the adapter bearing seats and thrust shoulders.
- 5) Inspect for incorrect size adapter. Seal case or bearing damage can result from an incorrect adapter.

Figure 13 shows a bearing that has been operating in an adapter that was in satisfactory condition. Two definite wear bands are visible on the bearing outer ring. Most freight car bearings will “creep” in service, causing the wear bands to appear. This is a normal condition that also causes wear to the adapter’s seat pads.



Figure 13
Normal Wear Bands on Outer Ring
(Bearing Cup)

The bearing in Figure 14 indicates an adapter wear pattern that extends to the *left edge* of the outer ring. This is wider than the normal wear pattern and indicates the adapter seat pads are worn. If continued in service, these adapters will cause premature bearing damage.



Figure 14
Wear Patterns on Outer Ring (Bearing Cup)
Caused by Excessively Worn Adapter

Another indication of a worn adapter is shown in Figure 14 on the *right side* of the outer ring. Note the narrow wear band (shiny edge) on the extreme end of the outer ring. Adapters worn to this extent must be removed from service.

Top Crown Wear

Check the adapter top for excessive crown wear by observing the frame contact with the adapter, as shown in Figure 15.

If the frame is contacting the reliefs at either end of the adapter or light is not visible through the center relief, the adapter should be removed from service.



Figure 15
Adapter in Truck Frame Pedestal

Inspecting Adapters Removed from Trucks

Any time wheelsets are removed from trucks, the adapters should be inspected for damage and checked using the AAR adapter checking gage as shown in Figures 16, 17 and 19 (unless it is obvious the adapter is excessively worn or damaged).

Bearing Seat Pad Wear

When checking the bearing seat pad wear with the AAR gage, pass the gage over the entire surface of both bearing seat pads; do not check in just one or two places.

Adapters must be scrapped if they do not have 1/32" or greater depth from the bearing seats to the machined reliefs. The edge of the gage indicated by the arrows in Figure 16 must seat on the bearing seat pads. If the bearing seat pads of the adapter are worn to the extent that the toe (A) of the gage prevents the edge (B) from seating, as shown in Figure 17, at any point in the adapter, the adapter must not be returned to service.



Figure 16.
Gaging Adapter Bearing Seat Pad Wear.
Edge of Gage Contacting Bearing Seat Pad
- OK

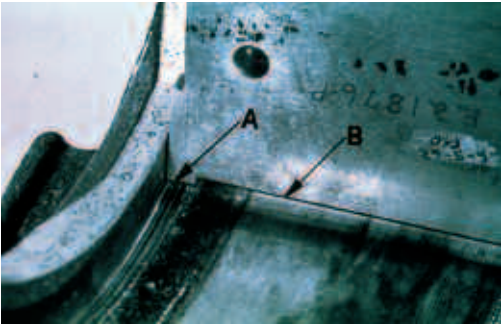


Figure 17.
Gaging Adapter Bearing Seat Pad Wear.
Edge of Gage "B" Not in Contact with
Bearing Seat Pad – Scrap

Thrust Shoulder Wear

As indicated in Figure 11 on page 9, the frame adapter has a thrust shoulder at each end. During operation, the thrust shoulder can be worn or embedded into by either end of the outer ring. If either face of the thrust shoulder is embedded or worn by the outer ring .025" or more, the adapter must be scrapped.

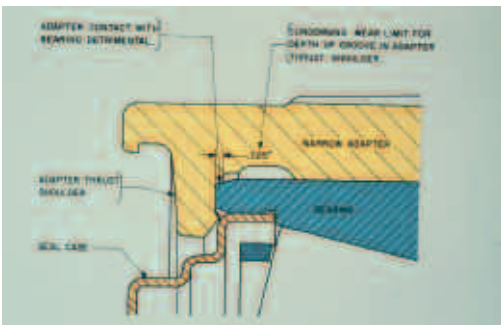


Figure 18.
How Thrust Shoulder Wear Occurs

The nib of the AAR adapter gage is used to determine if the bearing outer ring has embedded into the thrust shoulder of the adapter to the condemning limit, as shown in Figure 19.

The nib of the gage should contact the thrust shoulder keeping the flat portion of the gage away from the thrust shoulder face.



Figure 19
Gaging Adapter Thrust Shoulder Wear

Adapter Top Crown Wear

If the pads on the top of the adapter are worn so that the remaining depth of relief at the center of the adapter is less than 1/16", the adapter should be scrapped. The adapter reliefs are shown in Figure 20. Look for uneven wear on the top of the adapter. Uneven wear is usually the result of worn, bent or distorted side frame truck parts. Adapters with excessive uneven wear must be scrapped.



Figure 20

Hollow Wear

When adapters are used in truck frames that have had roof liners applied, hollow wear can occur, as shown in Figure 21. Measure the remaining depth of relief. The adapter should be scrapped if it is less than 1/16".



Figure 21
Adapter with Hollow Wear
Caused by Frame Roof Liner

Adapters that are gaged and found satisfactory for further service and have been used in frames with roof liners must always be used in frames with roof liners.

General Inspection

Frame adapters that are cracked, broken, warped, twisted or otherwise distorted should be scrapped.

To check an adapter for distortion, place the adapter on a bearing. It should seat firmly without rocking or pinching when hand pressure is applied on top of the adapter.

Adapters must be removed from service if they are worn to the extent that ridges or grooves prevent proper seating of the frame on the adapter or proper seating of the adapter on the bearing.

Adapters that are worn on one side by the thrust lug from the brake reaction should be reversed when reapplied to the frame so that the worn side will be toward the truck springs. When the wear on the side exceeds 1/8", the adapter must be scrapped.

Welding or Brazing

Cracked or broken adapters must not be repaired by welding or brazing.

Integral-Box Side Frames

(Plain Bearing Box Converted to Roller Bearing)

All integral-box side frames modified for use with journal roller bearings must have roof liners applied.

Excessively worn roof liners *must* be replaced. Concave or vertical wear should not exceed 1/16".

Frame Keys

Frame keys are used to keep the bearing and adapter in place during operation. Frame keys limit the amount of possible vertical separation between the bearing and adapter during unusual operating situations. Inspect to assure proper frame key is applied and secure.

NOTE: The original design objective of the frame key is to act as a retaining device to prevent the bearing from disengaging from the narrow adapter under dynamic operating conditions. Due to manufacturing variations and design tolerances on the various parts, the clearance between the frame key and the bearing outside diameter (O.D.) in one extreme should be small enough that, with the maximum clearance, the frame key still performs its intended function.

Because of the dimensional differences between a standard Class F (6 1/2" x 12") bearing and a standard Class K (6 1/2" x 9")

bearing, a standard frame key normally requires a 1/8" shim under the key for Class K (6 1/2 x 9) applications to ensure proper clearance between the key and the cup O.D. (reference AAR Manual Section H, Standard S-720, latest revision).

Please be aware that a standard pedestal height dimension and tolerance is no longer consistent. This is due to a number of factors including the AAR making frame keys optional and the use of newer adapter designs, pedestal roof liner wear plates and elastomeric pads.

Frame keys should be used on all cars. In the case of the Class K, a 1/8" shim should be used under the frame key to achieve a clearance between the key and the cup O.D. of approximately 1/16" minimum to 3/16" maximum. There should be no contact on the cup O.D. after mounting and securing the key. It should be possible to easily slip a 0.010" minimum "feeler" gauge between the cup O.D. and the frame key after mounting the key and tightening the bolt. When using the shim, if there is any contact or interference between the cup and the key, the shim can be omitted. If a shim is used, it should be flat and free of any raised metal along the edges.

Overheated Bearings

If a wheelset is removed from a truck due to an overheated bearing, the adapter, if condemnable according to AAR Rule 36-11, must be attached to the bearing to help determine the cause of the problem when the wheelset is returned to the shop.

Excessive adapter wear may have caused the bearing to overheat, or the adapter may have been damaged by excessive bearing heat.

Thank You

The Timken Company thanks you for your interest in proper inspection of roller freight. We hope that this booklet will assist rail car inspectors and repair personnel to recognize damaged roller bearings and worn or damaged associated parts. Recognition and removal of these bearings and parts will contribute to improved performance.

Questions, comments and requests for further information are welcome.

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