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Overhaul of Locomotive Axles

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About This Standard

This standards has been based on TRS 1552.

Version History

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Table of Contents

About This Standard	3
Version History	3
1 Purpose	7
2 Terminology	7
3 Repair	7
4 Storage and Handling	7
5 Non Destructive Testing	8
6 Visual Inspection	8
6.1 Repair	8
7 Machining	8
8 Wheelseat	8
9 Axle Limits on Reconditioning	9
10 Gearseat	9
10.1 Repair.	9
11 Run Out	10
11.1 Repair	10
12 Splines or Drives	10
12.1 Repair	10
13 Bearing Journals	10
13.1 Diameter Bearing Seat Areas	10
13.2 Repair	11
13.3 Measuring for Upset Journal Ends	11
13.4 Repair	11
13.5 Dust Guard Diameter	12

14	Fillet radius	12
14.1	Repair	12
15	Axle Journal Damage	13
15.1	General	13
15.2	Repair	14
16	Rework	14
17	Threaded Holes	14
17.1	Repair	14
18	Plain Suspension Bearing Journals	14
18.1	Colour Coding on Axles	15
19	Roller Suspension Bearing Journals	15
20	Condemning of Axles	16
21	Fillet Gauge	16
22	Referenced Documents	17
22.1	RIC Standards	17
22.2	RIC Drawings	17

1 Purpose

This standard details the requirements for the overhaul of locomotive axles.

2 Terminology

The axle is described using terms as shown in Figure 1 and Table 1.

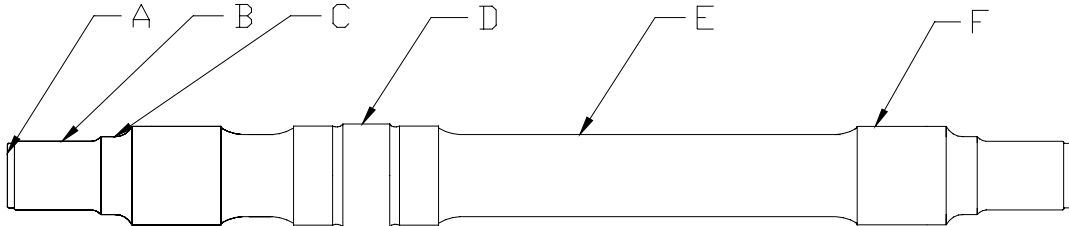


Figure 1

Stepped end or tapered end	A
Bearing journal	B
Dust guard seat	C
Gearseat	D
Axle Barrel	E
Wheelseat	F

Table 1

3 Repair

Welding of axles or any other method not specified in this specification, is not permitted under any circumstances and any axle showing welding or cutting torch damage is to be scrapped.

4 Storage and Handling

Axles shall be stored and handled in accordance with RSS 0039.

5 Non Destructive Testing

The axle shall be non destructive tested according to specification RSS 0033.

6 Visual Inspection

The axle barrel shall be inspected for damage according to RSS 0031.

6.1 Repair

As per RSS 0031.

7 Machining

All axles shall be machined and finished strictly in accordance with the relevant drawings unless detailed otherwise in this specification.

8 Wheelseat

All axles shall be closely examined to identify any surface defects. Any axle with a wheelseat defect that cannot be removed either by machining within the prescribed tolerance (i.e. not below the condemning diameter of the axle at the point where the defect was detected) or by precision grinding out all sharp edges and surface discontinuities without reducing the minimum surface contact between the axle wheelseat and wheel bore below 95%, then the axle shall be scrapped. Axles that are to be machined must be segregated with respect to the axles awaiting wheelset assembly. Wheelseats shall not be reclaimed when beyond their condemning diameter, as discussed in Section 9 of this Specification.

Depression, circumferential score or damage or injury to the surface metal of the wheelseat must be removed. Such defects if allowed to remain may result in a broken axle. Any longitudinal channel-way or crack in the wheelseat must also be removed. If a circumferential check or crack is found in the wheelseat the axle must be scrapped unless the checks or cracks can be machined by turning or grinding without going below the axle's serviceable limit.

Each axle wheelseat must be checked in not less than three points equispaced along its length and on two different diameters at each of these points to ensure that it is cylindrical. The variation for any two of these measurements must not exceed 0.05mm (0.002"). Where taper exists within allowable limits (ie: 0.05mm) the small diameter must be on the journal end of the wheelseat.

Wheelseats may be hand polished with a light abrasive material for rust removal and minor surface defect removal. It is preferable that a machine cut, ground or rolled surface be provided to give satisfactory results.

A taper must be turned on the journal end of the wheelseat extending to a maximum of 12 mm (0.5") towards the centre of the axle. This taper shall be started at 0.8 mm (0.032") less than the wheelseat diameter and is intended to ensure true entry of the axle into the wheel bore.

9 Axle Limits on Reconditioning

The wheelseat shall not be machined to a diameter less than that shown as the condemning limit in Table 2

AXLE	CONDEMN DIAMETER WHEELSEAT	CONDEMN DIAMETER GEAR SEAT
86510	204.8	216.662

Table 2

Where provided, or required by modification shown on drawing, stress relief grooves shall be maintained when reducing gear or wheelseat diameters.

Abutment radii need not be corrected when reducing gearseat or wheelseat diameters except in the area of suspension bearing flanges which shall be restored to the original radius or chamfer dimensions.

10 Gearseat

Gears are not required to be removed unless they are to be replaced because of a gear defect.

10.1 Repair.

The gear seat shall be checked in no less than 3 points equally spaced along its length and on two different diameters (a minimum of six measurements) to ensure that it is cylindrical. The variation between any of the measurements shall not exceed 0.04 mm.

Gears and axles shall be matched so that the minimum amount of material is removed from and axle/gear combination.

11 Run Out

Run out between axle centre, bearing journals, suspension bearing seat and wheel must be measured and shall not exceed 0.13 mm.

If the runout increase towards the centre of the axle it is likely that the axle is bent and should be scrapped.

11.1 Repair

The lathe centre on the axle may in some cases need to be trued to verify that the runout is between the relative surfaces and not due to the centre.

Bent axles should not be attempted to be straightened.

12 Splines or Drives

Splines or drives in the end of axles should be visibly inspected to check for teeth that are broken, chipped, cracked or have round edges.

12.1 Repair

Replace if damaged.

13 Bearing Journals

13.1 Diameter Bearing Seat Areas

The journal diameter shall be measured in critical areas at least in the area of the bearing seat locations, as shown in Figure 2. These dimensions shall not vary more than 0.038 mm (0.0015") and there shall be no abrupt changes or steps over the length of the journal

A dial or digital snap gauge shall be rotated around the journal diameter at least 180 degrees within the bearing seat locations to obtain the maximum and minimum journal diameters.

The average diameter of each bearing seat shall be within tolerances specified on the applicable drawing.

Care shall be taken when using temperature compensating snap gauges that rotation speed does not create sufficient heat , due to friction, to effect the readings.

There shall be no abrupt changes or steps over the length of the journal, including the tapered or stepped end, except journal grooving from inboard seal wear ring is permissible when repaired as specified in Section 0.

13.2 Repair

Undersized bearing journals may be repaired according to RSS 0032.

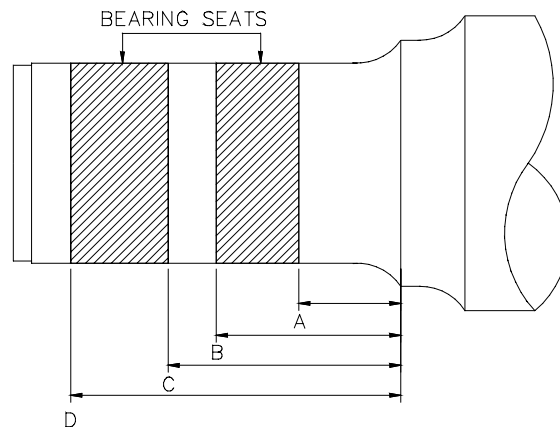


Figure 2

13.3 Measuring for Upset Journal Ends

In order for a journal to be acceptable, the diameter in the area where upset can occur, as shown in Figure 3 in the shaded area, must never exceed 0.076 mm (0.003") above maximum tolerance on the applicable drawing but may be below the minimum tolerance.

A dial or digital snap gauge shall be rotated 180 degrees around where the upsets occur.

13.4 Repair

Upset ends may be corrected as per Section 16.

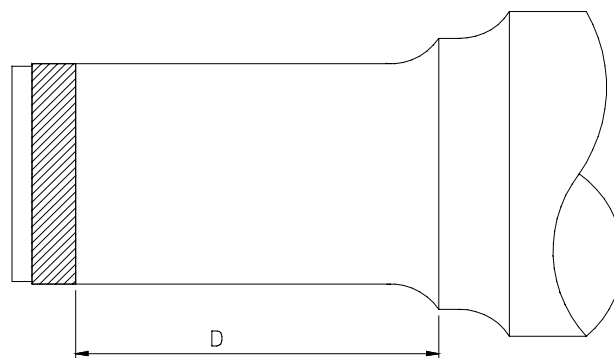


Figure 3

13.5 Dust Guard Diameter

The average diameter of each dust guard seat must be measured on the dust guard diameter as shown in Figure 4 and shall be within the tolerances shown on the applicable drawing.

A dial or digital snap gauge must be rotated around the dust guard diameter at least 180 degrees to obtain the maximum and minimum journal diameters.

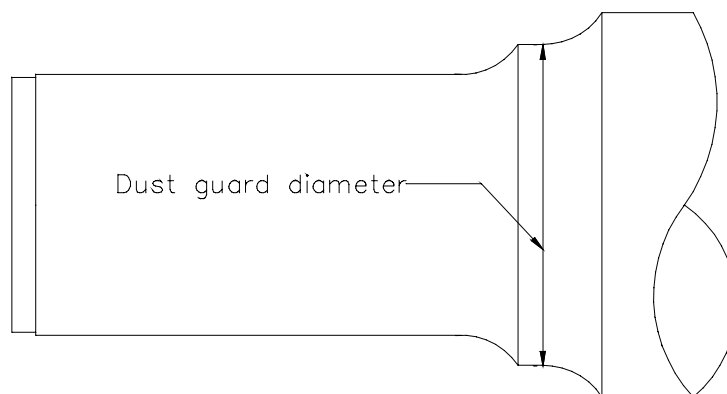


Figure 4

14 Fillet radius

The journal fillet area of a roller bearing is critical. To insure proper fit and proper seating of the backing ring on the axle fillet, the journal fillet gauge, shown in Figure 5 and Figure 7 must be used to check the fillet radius. If a 0.125 mm (0.005") feeler gauge can be inserted more than 10 mm (3/8") down from the dust guard seat, at all points around the periphery, the axle fillet must be corrected.

Indications of fretting on the periphery of the journal fillet, within 10 mm (3/8") of the dust guard seat, need not be removed as long as the fillet is in compliance with the above.

14.1 Repair

Fretting corrosion on the journal fillet may be removed with abrasive cloth, 80 grit or finer.

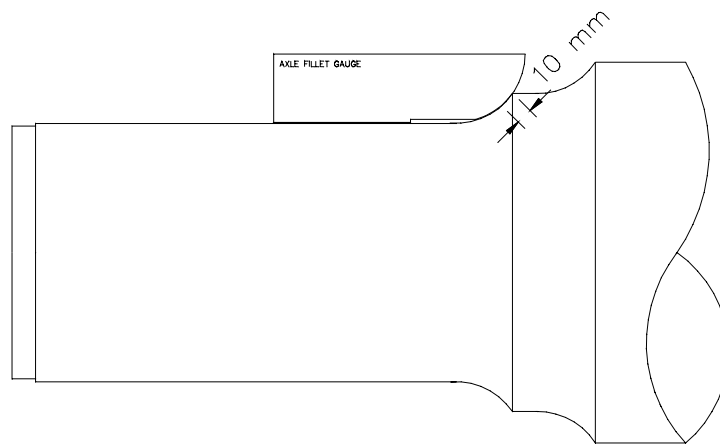


Figure 5

15 Axle Journal Damage

15.1 General

Any journal with depressions, surface defects, high spots or upset ends should be carefully refinished in accordance with section 0 so as to remove them for the circumference and length of the journal providing the journal diameter is not reduced below minimum .

For detailed requirements for journal damage see RSS 0032.

Journal grooving from inboard seal wear ring

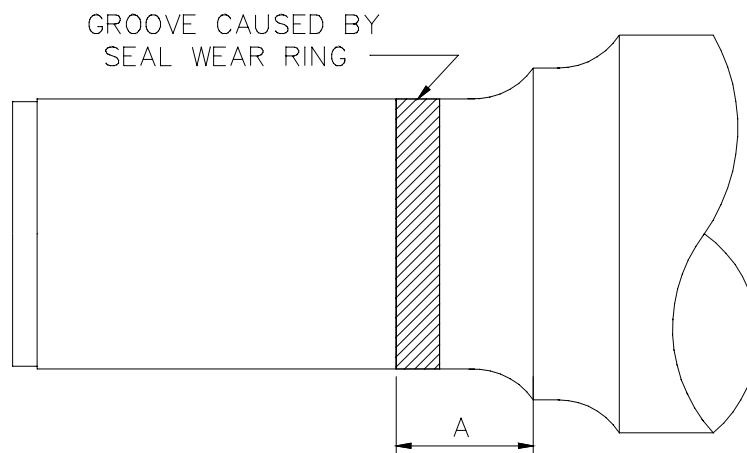


Figure 6

Depth of the seal wear ring groove must be measured using a dial indicator gauge with 0.001 mm (0.0001") graduations. The three measurements may be averaged. Average reading not to exceed 0.05 mm (0.002") with any one reading not to exceed 0.10 mm (0.004"). No abrupt changes or sharp edges are permissible.

15.2 Repair

Polishing with abrasive cloth, 80 grit or finer is permitted.

Seal wear ring grooves not complying may be repaired according to RSS 0032.

16 Rework

Files may only be used to break sharp edges of end collars, dust guard seats, ends of axles and to work down upset ends or surface defects of roller bearing axles providing the bearing seat diameters are not reduced below minimum.

Files must not be used on fillets.

Axle journal, journal fillet and the dust guard seat must be cleaned after using abrasive cloth for cleaning, only 80 grit or finer is permitted.

17 Threaded Holes

Visually inspect tapped holes in the axle ends for thread damage, dirt and corrosion.

Capscrew holes shall be checked with a 2B go no-go thread checking gauge and retapped if necessary.

17.1 Repair

If any of the threads are damaged, they shall be retapped to give a class 2B fit and checked with a thread gauge.

Defective capscrew holes may be repaired by drilling and retapping the holes 60 degrees from their original position provided that this repair has not been done previously.

Plug the old capscrew holes with a capscrew that is of sufficient length for it to bottom in the hole. The capscrew should be torqued to 100 foot/lbs over the maximum specified capscrew torque for installation.

Retap the new holes to the tolerances specified on the drawing for a new axle.

18 Plain Suspension Bearing Journals

Suspension bearing journals shall be machined in accordance with RSS 0098 to the next closest size to those shown in Table 3.

Following machining suspension bearing journals shall be protected with a rust preventative conforming to RSS 0031.

Suspension bearing to wheelseat radius shall be remachined to dimensions shown on original drawing, also not allowing interference with suspension bearing and retaining stress relieving capacity.

All axles shall be colour coded with the applicable colour band adjacent to each suspension bearing journal.

18.1 Colour Coding on Axles

All remnants of previous colour codes are to be removed when examined and newly colour coded following NDT inspection.

All axles shall be colour coded with the applicable colour band adjacent to each suspension bearing journal.

First colour band adjacent to suspension bearing journal will indicate the journal requires processing to achieve sizes shown in Table 3.

A second colour band of white will show that the journal has been machined to the size indicated by the first colour band.

Axle Drawing No.	Axle Size	Suspension Bearing Size Inches	Colour Code
	Standard	184.20	Blue
		183.85	
86510	1st Undersize	182.60	Lemon
		182.25	
94269	2nd Undersize	181.02	Grey
		180.67	
82864	3rd Undersize	179.42	Pink
		179.07	

Table 3 48 Class Axle data

19 Roller Suspension Bearing Journals

Roller suspension bearing seats shall be measured in accordance with the dimensions nominated on the drawing for that axle.

20 Condemning of Axles

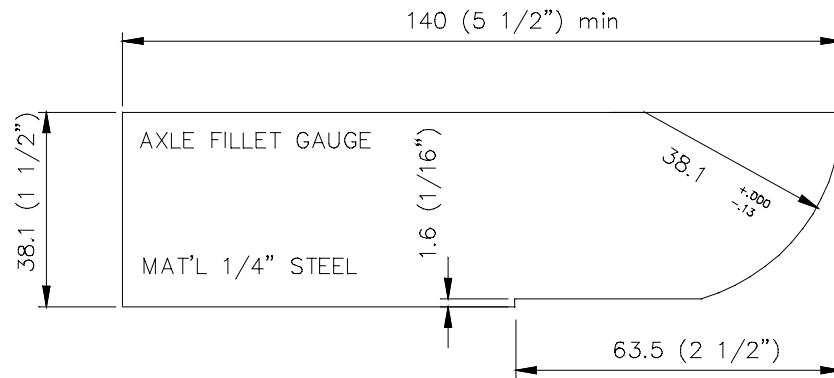


Figure 7

Any axle condemned or rejected shall be reported on the form in RSS 0033.

21 Fillet Gauge

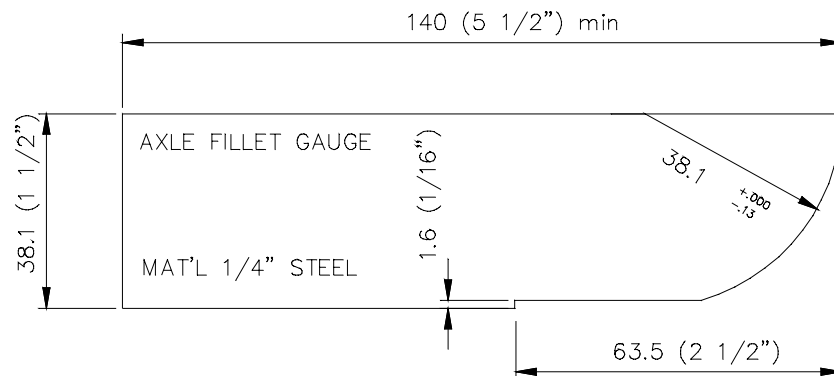


Figure 8

22 Referenced Documents

22.1 RIC Standards

RSS 0031	Wheel & Axle Reference Manual
RSS 0032	Axle Bearing Reference Manual
RSS 0033	Non Destructive Testing of Axles
RSS 0039	Handling, Storage & Transportation of Axles
RSS 0098	Specification for Axle Suspension Bearing Surface Finish

22.2 RIC Drawings

86510	48 Class Axle
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