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RAILINFRASTRUCTURE CORPORATION

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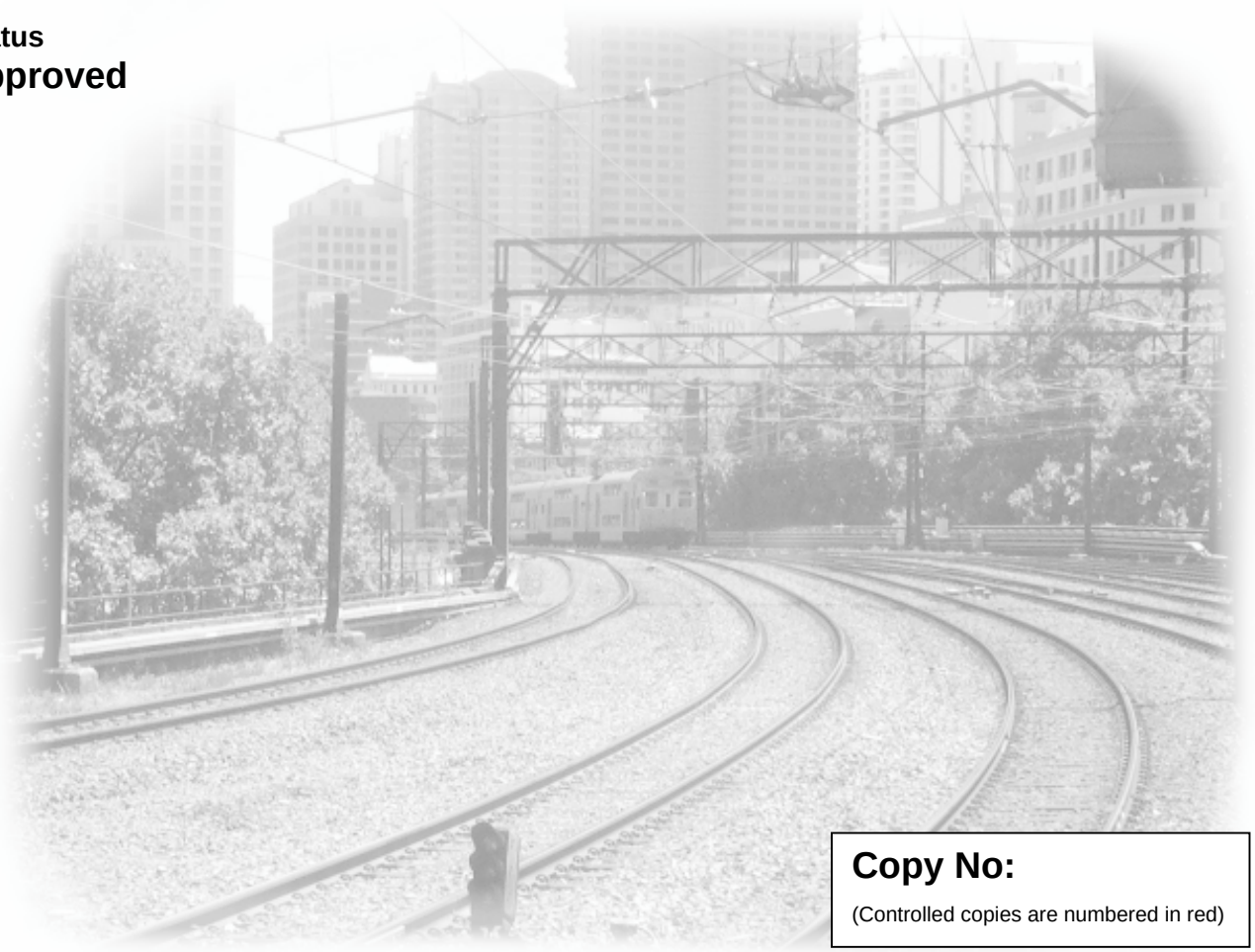

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About This Standard

This standard combines the requirements and information contained in the following TRS standards:

TRS 0141 Wheelset disassembly and assembly for locomotives and rolling stock.

TRS 1055 Measurement of rolling stock wheels.

TRS1195 Valid bogie to wheel & bogie to wheelset type combinations.

TRS 1249 WMIS data, tables for identifying codes on wheels and axles.

TRS 1251 Details of deciphering identification codes on wheels & axles.

TRS 1402 Universal wheel tread measuring gauge.

TRS 1403 Freight wheel tread no go gauge.

TRS 1405 Wheel lathe operators gauge.

TRS 1406 Freight vehicle wheel data table.

TRS 1407 Passenger vehicle wheel data table.

TRS 1408 Locomotive wheel data table.

TRS 1428 Wheel machining requirements for rolling stock.

TRS 1429 Locomotive wheel measurement requirements.

TRS 1430 Passenger vehicle wheel measurement requirements.

TRS 1431 Freight wheel measurement requirements.

TRS 1444 Wheel diameter measuring gauge.

TRS 1447 Inspection criteria for the exposed surfaces of axles.

TRS 1454 Wheel flange witness mark gauge.

TRS 1536 Wheelset assembly requirements

TRS 1538 Wheelset assembly tolerances for freight wheelsets

TRS 1554 Wheel boring requirements

TRS 1560 Temporary corrosion preventative for wheelsets

TRS 1618 Wheelset inspection and attention when reprofiling for freight wheelsets.

TRS 1630 Wheelset back to back check.

TRS 1961 Gear reprofiling

TRS 1977 Wheelset locomotive assembly tolerances

TRS 2054 Wheel tread hollow no go gauge

Version History

Version 1.0

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Draft 2 renumbered as RSS 0031

Table of Contents

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1 Scope

This standard covers the identification, application and measurement of wheels on freight rolling stock.

Wheel defects are covered in RSS 0030 Wheel defect manual.

2 Wheels

2.1 Wheel Identification

All wheels are hot stamped with coded information on the rim face of the wheel. The code will contain the following details:-

- year of manufacture.
- serial number.
- manufacturer's identification code.
- batch heat number.
- material type/class.
- drawing number or the designation code of the wheel design. (Example 303-246 or W33)

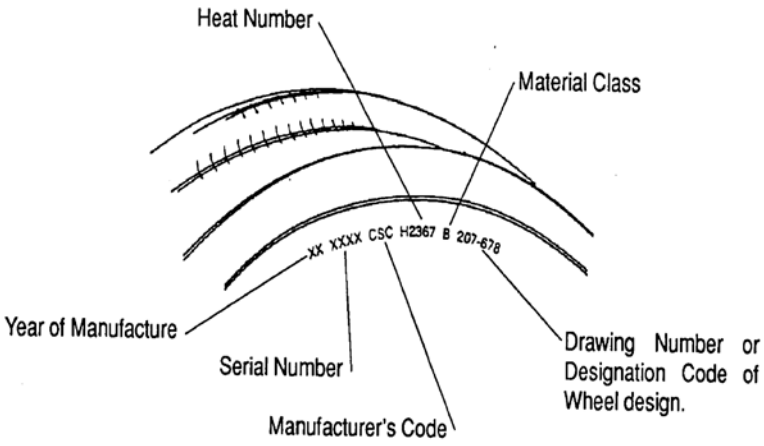


Figure 1: Typical stamping found on integral steel wheels

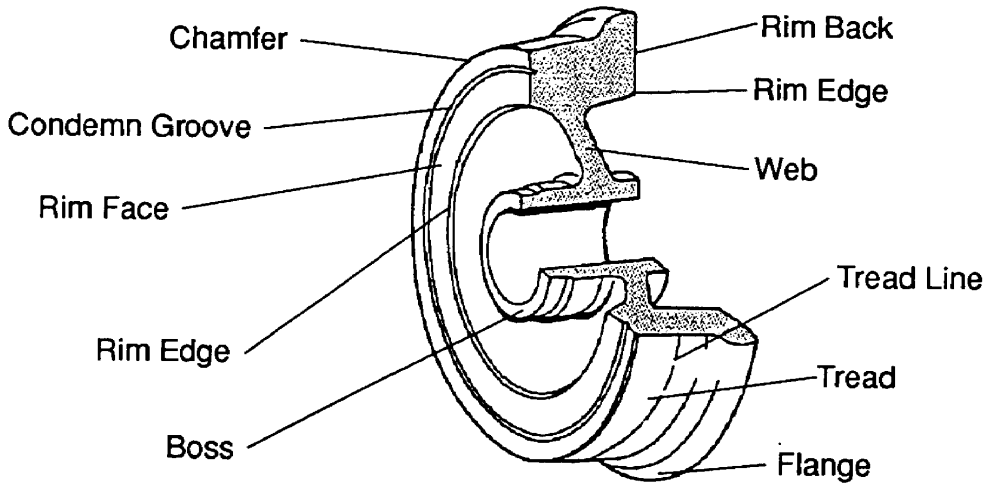


Figure 2: standard terminology for wheels

2.2 Freight Vehicle Wheel Data Table

All dimensions in mm

Bogie	Wheel type	Wheel dia new	Wheel dia condemn See note	Thickness of rim at condemn	Thickness of tread at condemn to condemn groove	Minimum flange width	Maximum flange height	Maximum tread hollowing	Wheel width	Wheel drawing number	Remarks
CQA, CQB, CQC, XBA, XGA, XGB, XGC, XGL, XLA, XLB, XLC, XLD	W54	920	850	20	0	19	35	3	130	305-614	
As for W54	W37	920	850	20	0	19	35	3	130	303-243	Superseded by W54
CEA, XFA, XHA, XHB, XHC, XHD, CFB, CFC	W38	840	770	20	0	19	35	3	130	303-239	
ASA	W41	920	850	20	0	19	35	3	130	303-247	Rarely used

Table 1 Freight vehicle wheel data table

Note: Condemn diameters are for wheels in service. See Section 7.3 for last turn diameters.

2.3 Locomotive Wheel Data Table

All dimensions in mm

	48 Class Locomotives
Wheel type	W61, W63, W64
New wheel diameter (mm)	1016
Condemn wheel diameter (mm)	930
Thickness of Rim at Condemn on Back Flange (mm)	38
Thickness of Tread at Condemn on Back Flange (mm)	6
Minimum flange width (mm)	19
Maximum flange height (mm)	35
Maximum tread hollowing (mm)	3
Wheel width (mm)	130
Wheel drawing	W61 – 206-328/1 W63 – 206-328/3 W64 – 206-328/4
Clearance to structure gauge (mm)	40

Table 2 Locomotive wheel data table

NOTE: condemn diameters are for wheels in service. For turning diameters See Section 7.3.

2.3.1 Maximum Tread Thickness Variation Between Wheelsets in Turning

Loco class	**Between wheels on the same axle – in service**	**Wheels on the same bogie - in service**	**Wheels on the same vehicle – in service**
48	3	13	13

Table 3 Maximum tread thickness variation table

2.4 Passenger Car Wheel Data Table

All dimensions in mm

	Passenger Cars
Wheel type	
New wheel diameter (mm)	
Condemn wheel diameter (mm)	
Thickness of Rim at Condemn on Back Flange (mm)	
Thickness of Tread at Condemn on Back Flange (mm)	
Minimum flange width (mm)	
Maximum flange height (mm)	
Maximum tread hollowing (mm)	
Wheel width (mm)	
Wheel drawing	
Clearance to structure gauge (mm)	

Table 4 Passenger car wheel data table

NOTE: condemn diameters are for wheels in service. For turning diameters See Section 7.3.

2.5 Measurement of Wheels

2.5.1 Scope

This specification details the gauges and procedures used to measure rolling stock wheels using standard wheel gauges.

The gauges specified herein determine tread wear, flange wear, rim and tread thickness as well as condemning limits for different applications.

The gauges enable examiners, tradesmen or other staff to assess the critical dimensions of a wheel. The dimensional assessment of rolling stock wheels may result in them being passed, condemned or subjected to corrective action.

2.5.2 Wheel Profile Measurement Gauges

The following gauges are designated by a drawing number. These gauges are used to monitor the acceptable wheel condition of vehicles.

Description	Drawing Number	Use	Section of this standard
Freight wheel tread 'no go ' gauge	207-668	Freight Vehicles	10.43
Universal Measuring gauge	207- 661	Locomotives	10.6
Witness groove gauge	306- 381	All Vehicles	10.9
Metal removal gauge	306-357	All vehicles at wheel turning	10.7

Table 5

All wheel profile gauges used throughout the Rail Infrastructure Corporation must conform to the relevant drawing number shown in Table 5.

2.5.3 Wheel Measurement Requirements

2.5.3.1 Freight Vehicles

2.5.3.1.1 Inspection periods

Freight wheels shall be measured whenever they are at a one spot location or other repair locations for attention.

At any other time, such as walk by examinations or train maintenance, when the wheel profile appears through observation to be suspect.

2.5.3.1.2 Measurement Requirements

The flange height is to be checked using the method and gauge as specified in Section 10.6. (Universal "no go" gauge).

The flange width is to be checked using the gauge and method specified in Section 10.6.

The rim thickness is to be measured using the gauge and method specified in Section 10.6. and shall not be smaller than the limit specified in Table 1. (Freight vehicle wheel data table).

The tread hollowing shall be checked using the gauge specified in Section 10.4. and shall not exceed the limit specified in Section 2.2.

The wheel profile is to be checked for a steep flange using the gauge and method specified in Section 10.6.

The measurements are to be taken at any 3 points around the wheel but not in the direct vicinity of any localised defects. The worst condition measurement is to be used as the indicator for the condition of the wheel.

2.5.3.2 Locomotives

2.5.3.2.1 Inspection Period

This specification shall be followed as listed in the appropriate locomotive inspection schedule.

This specification is also to be adhered to if, at any time through observation, any limit set in this specification appears to have been exceeded.

2.5.3.2.2 Measurement Requirements

The measurements are to be taken at any 3 points around the wheel but not in the direct vicinity of any localised defects. The locomotive does not have to be moved. The worst condition measurement is to be used as the indicator for the condition of the wheel.

Wheel Check

The wheel flange height shall be checked using the gauge and method specified in Section 10.6 (Universal measuring gauge) and not to exceed the limit specified in Section 2.3 (Locomotive wheel data table).

The flange width shall be checked using the gauge and method specified in Section 10.6 and not to be less than the limit specified in Section 2.3.

Tread hollowing shall be checked using the gauge specified in Section 10.6 and shall not exceed the limit specified in Section 2.3.

Full Measure

Conduct wheel check (as above) and the following:-

The wheel diameter shall be checked using the gauge and method specified in Section 10.6 (Universal Wheel Tread Measuring Gauge) and shall not be smaller than the wheel diameter at condemn specified in Section 2.3.

2.5.3.3 Passenger

2.5.3.3.1 Inspection Period

Passenger wheels shall be measured whenever they are at a workshop location or other repair location for attention.

At any other time, such as walk by examinations, when the wheel profile appears through observation to be suspect.

2.5.3.3.2 Measurement Requirements

The measurements are to be taken in accordance with Clause 2.5.3.1.2.

2.5.3.4 Actions

2.5.3.4.1 High Flange

If the flange is high the vehicle must be green carded for repairs. At the repair location the wheelset must be changed out and /or reprofiled.

No speed restriction applies.

2.5.3.4.2 Thin Flange

If found pre trip or at a repair facility the vehicle is not to enter service.

If the defect is found en-route or at a location with no repair facility, the vehicle may be transferred to the nearest repair facility or through to its scheduled destination, at a speed of not more than 40 km/h.

Once at a suitable repair facility the wheelset is to be changed out.

2.5.3.4.3 Rim thickness

If the rim thickness is less than that specified in Sections 2.2, 2.3 or 2.4 the vehicle is to be green carded for repairs.

When at the appropriate repair facility the wheelset is to be changed out.

No speed restriction applies.

2.5.3.4.4 Hollow tread

If excessive tread hollowing is found the vehicle must be green carded for repairs.

When at the appropriate repair facility the wheelset is to be changed out.

No speed restriction applies.

2.5.3.4.5 Steep flange

If a steep flange is found the vehicle must be green carded for repairs. Refer to RSS 0021

When at the appropriate repair facility the wheelset is to be changed out.

Steep flanges that are near vertical can in some cases indicate the bogie and/or wheelset is not tracking correctly.

If a steep flange is found the bogie shall also be examined for the possible causes of the steep flange.

These include

- If one steep flange only on a bogie check the wheel diameter variation across the axle.
- If two steep flanges across a bogie check for sideframe misalignment.
- If four steep flanges on a bogie check for worn friction wedges or side bearers.

No speed restriction applies for a steep flange on its own.

A steep flange in conjunction with a Class 3 arris shall be classified as a class 4 arris. See RSS 0030 Wheel Defect Manual.

3 Axles

3.1 Axle Identification

All axles are stamped with the following information on each end face. The code will contain the:-

- year the axle was last non-destructively tested (NDT).
- serial number.
- manufacturer's identification code.
- heat number.
- letter 'R' or 'L' to signify either the right or left hand end of the axle.

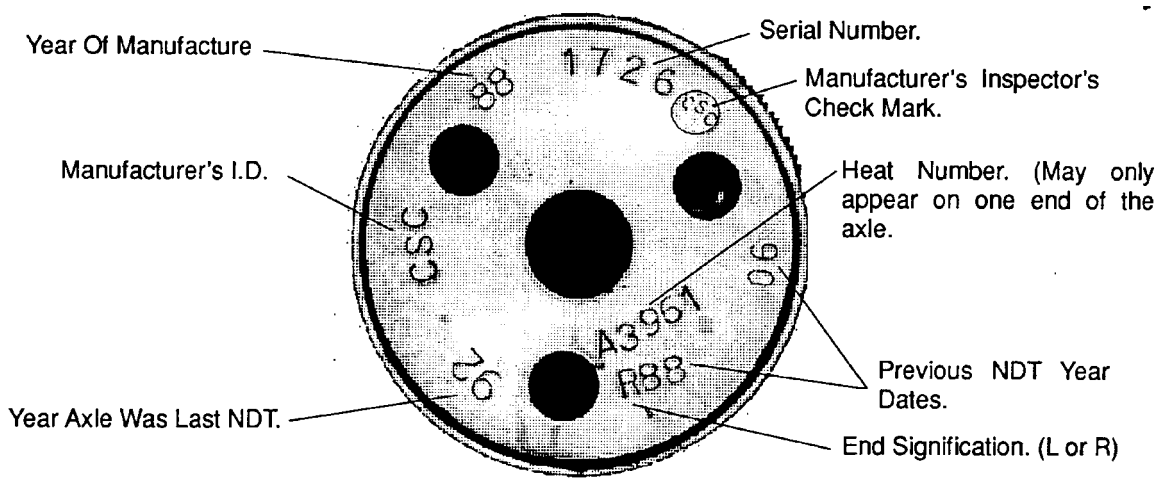


Figure 3: Typical stamping found on axle ends.

It is not uncommon to find an axle with a multitude of NDT dates stamped on the end which will identify when the axle has been in workshops for re-working.

For further information on non-destructive testing of axles refer to RSS 0033.

The ends of the axle shall be the only surfaces to be branded.

3.2 Inspection Criteria for the Exposed Surfaces of Axles

3.2.1 Description:

This specification tables various levels of surface damage to axle barrels which has caused indentation imperfections and explains suitable rectification of those defects.

3.2.2 procedure for the inspection of surface imperfections on the barrels of freight axles

3.2.2.1 Introduction

Surface damage to axles causing indentation imperfections can lead to cracking, even in the barrel. A sharp imperfection can cause a fatigue crack to initiate, leading eventually to complete axle failure.

The likelihood of fatigue crack formation increases with the sharpness of the surface imperfection. Imperfections with smooth, radiused contours are generally not harmful, but those with very sharp discontinuity's have a strong likelihood of crack formation.

3.2.2.2 Procedure

The following inspection procedure is based on identifying those imperfections which could lead to crack formation, followed by magnetic particle inspection (MPI) to detect cracks and remedial grinding where required.

If an imperfection exhibits one or more of the following characteristics (see attached diagrams for examples) then the axle shall, invariably, be tested for cracks by MPI and the appropriate action taken (as shown on the diagrams).

1) No radius evident on either side of or at the base of the imperfection.

2) A pronounced raised surface (ie: lip) adjacent to the imperfection.

3) Any imperfection greater than 3mm deep. If in any doubt as to the actual depth, the axle shall be tested by MPI in any case.

Any axle detected with a crack shall be scrapped and the appropriate details entered on the 'Notification of Condemned Axle' form as per the requirements of RSS 0033.

3.2.2.3 Grinding

All grinding is to be carried out only in the axle centreline direction. It should be noted that there are two distinct types of remedial grinding, namely, *full depth grinding* to completely remove the imperfection and *touch-up grinding* to remove edge lips and rollovers.

3.2.2.4 Qualification of Defects

a) A surface imperfection can be a groove, gouge, indentation, scratch, mark, ridge, rip, tear or any other discontinuity detectable by the naked eye.

b) Well radiused grooves that cover the entire circumference of the axle (due to persistent contact with brake rigging components) are not necessarily cause for concern provided none of the above imperfections in Clause 3.2.2.2 are evident.

c) If doubt exists about the structural integrity of the damaged axle then the axle shall be tested by MPI using test bench or portable magnet procedures. If the axle is then found to be crack free, then MPI shall be repeated after remedial grinding has been completed.

d) Accordingly, this procedure shall be incorporated in the Wheelset Change (WS) sheets, and the relevant bogie overhaul manuals.

e) All relevant details pertaining to axles detected with cracks are to be entered on current computer database system and shall include the axle number and all other stamping on both ends of the axle, bogie number and code and the approximate location of the fracture.

f) Small imperfections can be assessed in part by slowly scratching the axle surface with a fingernail. Any imperfection where the fingernail catches on an edge or sharp change in direction probably requires remedial grinding. However, this process may not be suitable for detecting imperfections with a sharp discontinuity in the base.

g) Axles with circumferential grooves greater than 3mm deep may be suitable for reuse provided the minimum diameter after remedial grinding has not exceeded the axle condemn diameter and the grinding procedure conforms to Clause 3.2.2.3.

3.2.3 Examples - Full Depth Grinding:

3.2.3.1 Full Depth Grinding - Isolated Imperfections From Localised Damage

Grinding to be performed in this direction only. (ie: parallel to the axle's longitudinal axis.)

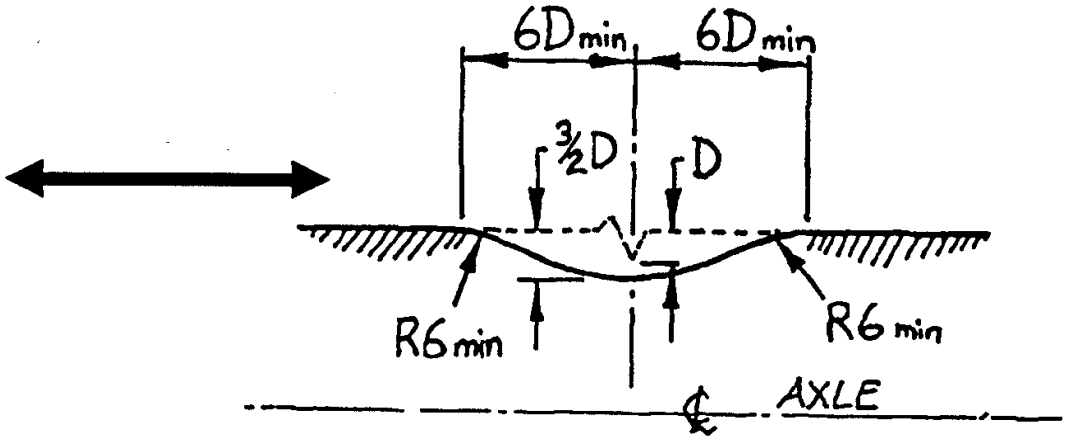


Figure 4: 'D' = depth of imperfection, Dmax = 3mm

Any imperfection greater than 3mm deep caused by localised damage may be removed by full depth grinding as shown in figure 1 but must comply with the requirements of Clause 3.2.2.4 g).

Details relating to the defect location, size etc to be recorded as per Clause 3.2.2.4 e).

3.2.3.2 Full Depth Grinding - Narrow Imperfections

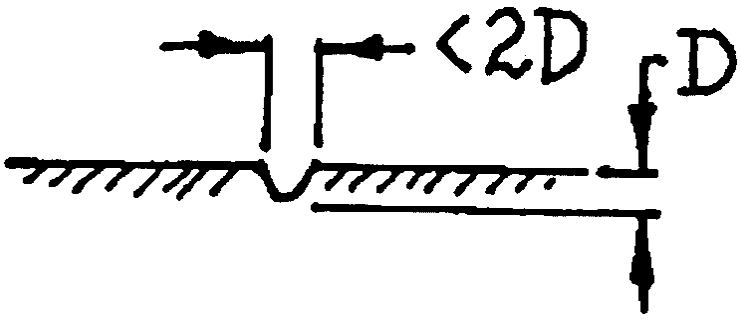


Figure: 5 Example of Narrow Imperfection

Defects with widths less than twice the imperfection depth (ie: <2D) shall be magnetic particle tested (MPI), followed by remedial grinding then post MPI.

Details relating to the defect location, size, etc to be recorded as per Clause 3.2.2.4 e).

3.2.4 Examples - Touch-up Grinding

3.2.4.1 General

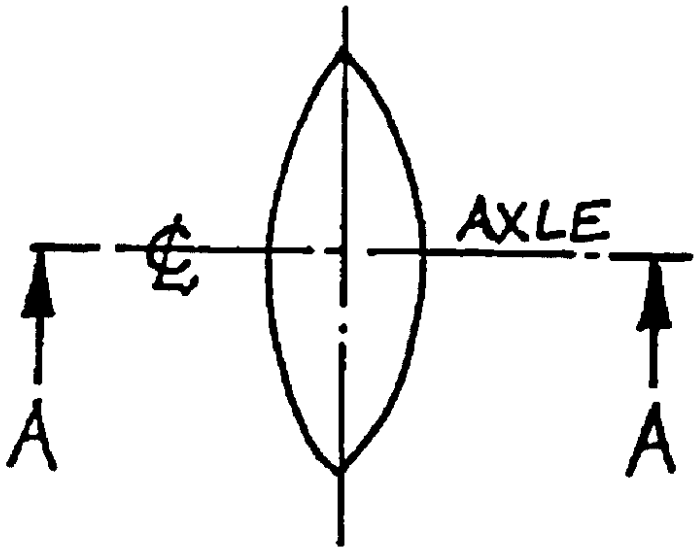


Figure 6: Diagram depicting the point, (across the major axis), where the cross-section of the defect is taken.

If the cross-section of the defect is smooth and radiused, then the imperfection may be rectified in accordance with this Section.

3.2.4.2 Touch - Up Grinding Of Lips & Roll-Overs

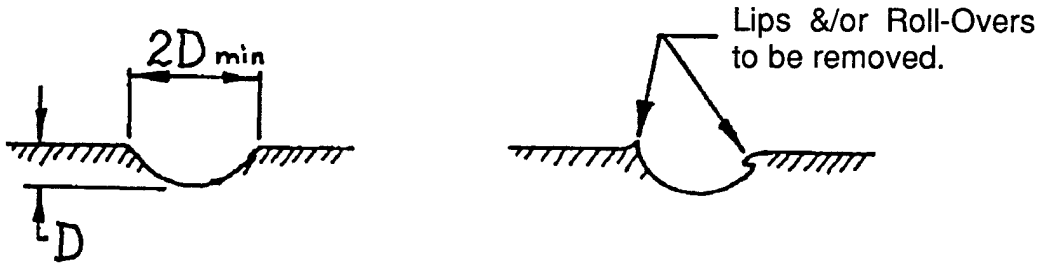


Figure 7: (i) No Action Required. (ii) Lips & Roll-Overs must be removed.

Smooth, well radiused imperfections which are 2D or greater do not require attention.

Defects which are smooth and well radiused which are 2D or greater in width, but have additional surface imperfections such lips or roll-overs, shall be ground to obtain the required contour.

3.2.5 Touch - Up Grinding Of Isolated Pitting

Imperfections caused by isolated pitting and/or ballast induced damage shall be repaired by remedial grinding to remove all raised lips. No further action is required.

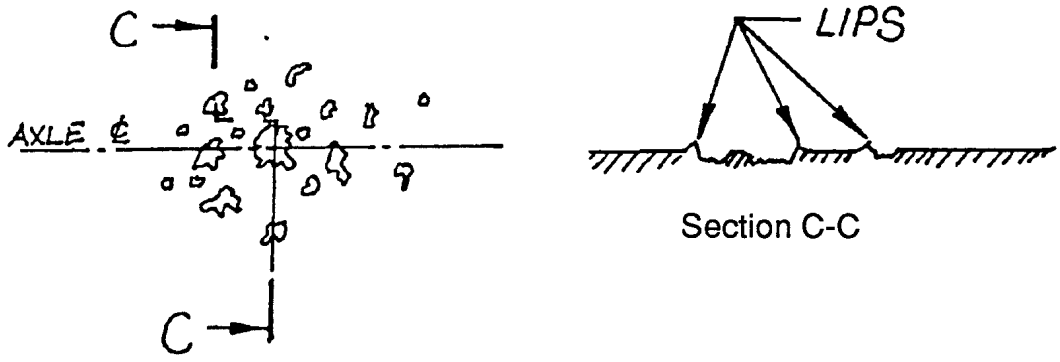


Figure 8: Isolated Pitting Damage.

3.2.6 Circumferential Grooves From Rotating And/Or Rubbing Damage

Imperfections of this sort are permissible providing that the minimum diameter after remedial grinding does not exceed the axle condemning diameter and all lips and ridges have been removed from the damaged area.

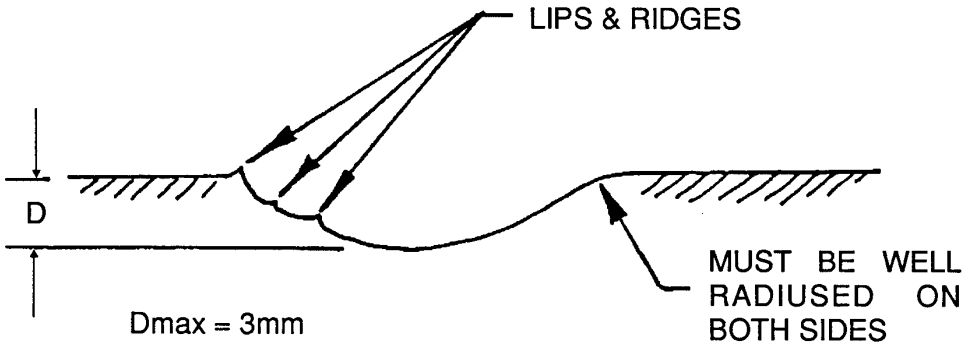


Figure 9: Circumferential Grooving

4 Wheelsets

4.1 Maximum Wheel Diameter Variation Between Wheels

Vehicle	Wheels on the same axle		Wheels on the same bogie.	Wheels on the same locomotive.
	In service (mm)	After turning (mm)	In service and after turning (mm)	In service and after turning (mm)
All freight	3	1	15	50
48 Class	3	1	20	20
Passenger	2	2	12	25

Table 6 Maximum wheel diameter variation

4.2 Wheelset Back to Back Measurement

The purpose of this measurement is to check for bent axles and/or wheels that have moved on the axle.

4.2.1 Limits

The back to back dimension shall be checked at a point 40 mm from the top of the flange at not less than 3 locations equally spaced around the wheel and shall be within the range of 1363.6 mm to 1355.8 mm.

The method of measurement, if different from this standard, shall be documented and if any gauges are used, drawings shall be kept.

Equipment used shall be kept in good order and be regularly calibrated.

4.2.2 Action

Any vehicle with a wheelset that fails to meet the requirements of the maximum and minimum dimensions shall be red carded and the wheelset shall be replaced.

Any wheelset that fails to meet the requirements of the maximum and minimum dimensions shall be overhauled.

Refer to Section 10.8 for details of the back to back gauge.

4.3 Freight Wheelset Inspection and Attention when Reprofiling

This section details the requirements for the servicing of freight wheelsets that require reprofiling.

4.3.1 Axles

Inspect the axle barrel for damage according to Section 3.2.

Check the axle using non destructive testing according to RSS 0033

Wheel back to back shall be checked in accordance with Section 4.2.

4.3.2 Wheels

Inspect the wheels for defects according to RSS 0030.

Reprofile the wheels according to Section 7.

If there is insufficient material remaining on the wheels for reprofiling the wheelset shall be overhauled according to **section 5**.

4.3.3 Bearings

Bearings shall be inspected at the intervals and to the requirements specified in RSS 32

Where one bearing is found to be defective, both bearings on the wheelset shall be replaced.

Bearings that need to be replaced shall be fitted according to RSS 0032.

When reprofiling the wheel tread the bearings shall be protected from the swarf generated in the machining process.

Bearings shall be greased in accordance with RSS 0032.

Grease nipples in endcaps may remain in place or be removed and replaced with a blank plug.

When endcaps on package unit bearings are removed they shall be re-installed according to the requirements of RSS 0032

New locking plates shall be used and all details on the locking plate shall be restamped onto the new locking plate in accordance with the requirements of RSS 0032 In addition the bearing inspection date shall be added (BI XX/XX) indicating month and date.

Axlebox bearings shall have the bearing inspection date (BI XX/XX) stencilled on the axle barrel in white 40 mm high lettering

Axlebox gas plugs shall be re-installed according to RSS 0032.

5 Assembly of Wheelsets

5.1 Correct Wheelset Components

This section details the components to be used when assembling wheelsets.

5.1.1 Axles

New axles shall comply with RSS 0092 or RSS 0096.

Reconditioned axles shall comply with RSS 0036 or RSS 0037.

5.1.2 Wheels

New wheels shall comply with RSS 0094.

Wheels shall be machined as follows before pressing onto the axle.

Note: Boring the wheel is a very important operation in wheelset assembly. If the bore is not perpendicular to the plane of the wheel, the wheel will not run true, causing uneven flange wear which may result in damage to track and associated equipment. If the bore is not concentric with the tread, the resulting eccentric wheel will also cause damage to the track. If the surface of the finish bore is not true, smooth and of proper diameter, it may tear the axle wheelseat during mounting or have insufficient grip of the wheelseat, which may lead to an axle failure or a loose wheel

5.1.2.1 Wheel Boring Requirements

5.1.2.1.1 Size

The wheel bore shall be machined to suit the finished relevant axle. The wheel bore must be sufficiently smaller than the wheelseat diameter to enable the required mounting pressure to be obtained The wheel bore shall be machined to a diameter that will ensure a minimum interference allowance of 0.0009 mm per mm of wheelseat diameter and a maximum interference allowance of 0.0015 mm per mm of wheelseat diameter. Tolerances may need to be tighter than these ranges to achieve the required press on force.

Wheel bores must be checked at not less than three points in their length, 2 locations 15 mm from each hub end and one halfway along the seat, and on two different diameters 90 degrees apart as shown in Figure 10.

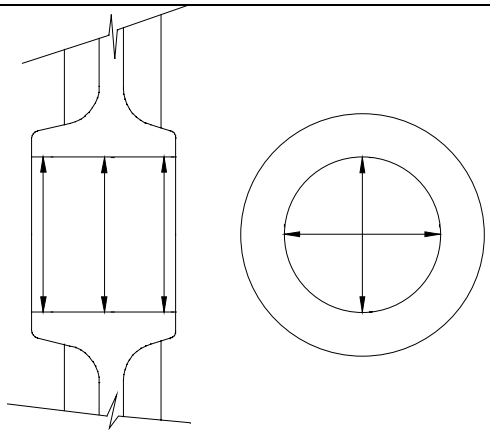


Figure 10

Ovality and taper of the wheel bore shall not exceed 0.025 mm. If taper does exist then the small diameter shall be on the tread side of the wheel bore.

If more than 6 mm thickness is to be removed, two roughing cuts must be taken. If separate roughing and finishing cuts are carried out simultaneously on the boring bar they must be separated by a distance greater than the length of the wheel hub being bored.

5.1.2.1.2 Finish

The bore of the wheel shall be machined by turning and the surface roughness of the wheel bore shall be maintained within a minimum of 3.2 micrometres (125 microinches) and a maximum of 6.3 micrometres (250 microinches).

5.1.2.1.3 Alignment

The wheel must be properly aligned in position on the machine with regard to concentricity and plane.

The wheel bore shall be square to the wheel back with a tolerance (t) of 0.4 mm per metre.

Concentricity of bore to tread to be within (q) 0.2 mm maximum.

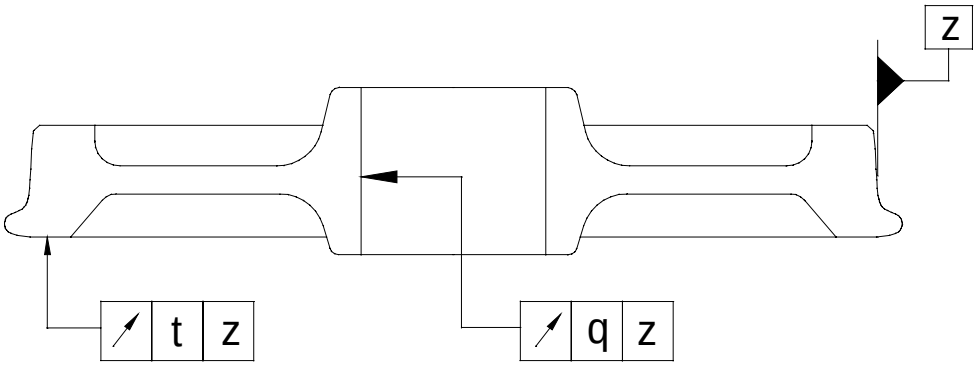


Figure 11

5.1.2.1.4 Finishing

A suitable radius or chamfer must be provided at the entry (back end of the wheel boss bore) to prevent scoring of the wheelseat during mounting. Refer to the relevant wheel drawing for details or alternately a 3 mm radius or 3 to 10 mm chamfer is acceptable.

Refer to the relevant wheel drawing to obtain specific details for the oil injection groove in the wheel bore. Sharp edges shall be removed and blended out.

5.1.2.2 Machine requirements

Chuck jaws must be properly aligned radially and vertically. The bearing points of the chuck must be maintained to achieve the required tolerances. Test wheels or other suitable means must be available to test boring mills for radial and plane error. Shops using boring mills with independent chuck jaws must use alternate method.

5.1.3 Bearings

New or reconditioned bearings may be fitted to a wheelset.

Refer to RSS 0032 for correct bearing types.

Refer to RSS 0032 for installation of bearings.

5.1.4 Gears

Gear teeth shall be hardened in accordance with RSS 0095.

Gears may be inspected and reprofiled as detailed in Section 9.1.

5.2 Wheelset Assembly

This section details the requirements for the assembly of wheels onto axles.

The quality of wheel mounting operations is dependent upon the skill and care with which the axle lathe and boring mill operations are performed. However good workmanship on wheels and axles would be lost if the mounting operation were not performed properly.

5.2.1 Press Requirements

The end of the press ram, mounting press sleeves, horse shoes and all auxiliary contacting parts should be maintained in good condition to ensure that all surfaces involved contribute to the correct alignment for wheel press operations.

The press shall be fitted with calibrated recording equipment making it possible to draw the diagram of the fitting pressure as a function of the position of the component in relation to the seat on the axle throughout the pressing operation. The diagram shall be drawn with indelible ink and to be sufficiently large scale to permit precise measurement of the fitting on pressure at any point on the curve.

Mounting presses shall be fitted with dual dial pressure gauges. The pressure/ram travel recording equipment must agree with these dial pressure gauges, which shall be checked with an accurate master gauge or by other approved methods, at least every six months of service. Gauges and calibration shall conform with AS 1349.

A tag must be securely attached to each gauge showing the last calibration date.

Both dial gauges must be fully operative during the whole of the pressing cycle, but shall be shut off during the demounting cycle to prevent damage to each dial or recording gauge.

5.2.2 De-mounting of Components

Components having provision shall be removed from the axle with the aid of oil injection.

A minimum line pressure of 65 MPa must be maintained for the oil injection to be considered effective.

The bearing journals shall be protected with a guard that is of a softer material than the axle (preferably a non-metallic material such as UHMW industrial plastic) so that there is no danger of nicking or scratching the highly polished journal surfaces during the de-mounting process.

A suitable method must be used to prevent upset ends and high spots on roller bearing journals.

5.2.3 Wheel Mount Lubricant

Rocol Wheelmount Compound (in its pure form) is the only approved product for this application.

The wheel mount compound shall be continuously stirred whilst the wheel press is in operation. If the compound is left to stand for any time it must be stirred continuously for 30 minutes prior to use.

The lubricant shall be stored in a container that ensures it will be free of contaminants.

5.2.4 Assembly General

The bearing journals shall be protected with a guard that is of a softer material than the axle (preferably non-metallic material such as UHMW industrial plastic) so that there is no danger of nicking or scratching the highly polished journal surfaces.

The exterior of the guard shall guide the component as it is pressed onto the axle reducing the possibility of the component starting on the axle on an angle, which may result in damage to the bore or the axle and improper mounting of the component.

The axles and bores must be cleaned carefully to remove rust, grit, machining swarf and grease. Both the axle and bore must be coated with a mounting lubricant as specified in Section 5.2.3. To avoid scoring of the mounting surfaces it is particularly important that the leading edges of the axle and component be thoroughly coated with the approved wheel mount lubricant.

The pressing on force chart should comply with the requirements of Section 5.2.5.

On completion of the wheelset assembly, all wheel oil injection holes shall have their correct plugs fitted to ensure the ingress of foreign matter is excluded during service.

5.2.4.1 Gear assembly

Where gears are fitted, the gear shall be fitted at the location shown on the drawing.

5.2.4.2 Ancillary components

Where ancillary components are fitted, they shall be fitted in accordance with the requirements shown on the drawing.

5.2.4.3 Wheel Assembly

The wheels shall be mounted on the axle equidistant from the centre of the axle which is first located and marked by the use of a suitable gauge. After the wheels have been mounted on the axle the back-to-back dimension is to be checked with a suitable gauge at three or more points equidistant around the circumference to ensure that the correct wheel position has been achieved and that the wheel is mounted squarely on the axle.

The end of the axle is to be stamped with the last two letters of the year the wheels were pressed onto the axle in 5 to 10 mm high letters. The new markings to be legible, indelible and should not obliterate the existing markings.

5.2.4.3.1 Pressing on force

All wheels shall be mounted within the pressure limits, P max and P min, shown in the relevant standard unless where the wheel mount pressure is not detailed (i.e new designs) the wheel mount pressure needs to be considered.

Taking into account the service conditions of the wheelset, the pressing on conditions and the design of the wheel the total range shall lie between:-

$$2.5D < P_f < 7.0D$$

Where P_f is the pressing on force in kilonewtons (measured during the last 25 mm of displacement)

D is the wheelseat diameter in mm.

The final value selected shall be agreed by the Principal before assembly.

5.2.4.4 Protection of recesses

Where a recess results from overhang e.g the wheel or gear wheel over a stress relieving groove or wheelseat, the recess shall be filled with a rust preventative complying with Section 6.

5.2.5 Interpretation of pressure diagrams

The pressure shall begin to rise before the movement on the seat has reached 20 mm.

The fitting-on pressure shall increase steadily and continuously in relation to the movement.

A decrease in fitting-on pressure in the vicinity of an oil relief groove is permitted.

The fitting-on pressure shall not be less than 60% of the value of the minimum fitting on pressure Pmin.

If the fitting on pressure is greater than 90% of P min and less than P min a back pressure test as described in Section 5.2.6 shall be conducted.

If the fitting on pressure is greater than P max but less than 110% P max a back pressure test as described in Section 5.2.6 shall be conducted.

The fitting on pressure shall not be greater than 110% of the value of the maximum fitting pressure P max.

A reduction of the fitting-on pressure by up to 5 tonnes is permitted in the last 25 mm of movement.

All wheelset misfits shall be recorded.

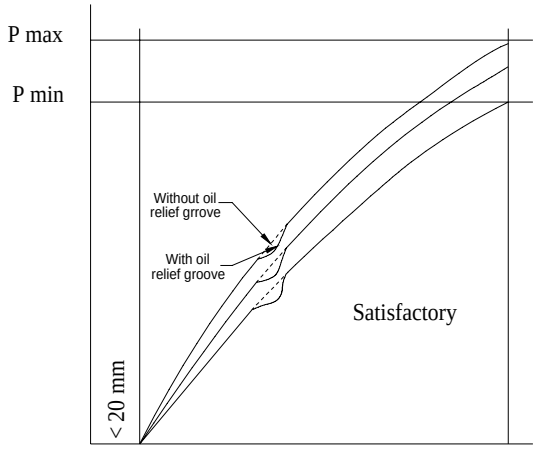
5.2.6 Back Pressure Testing Of Wheelsets

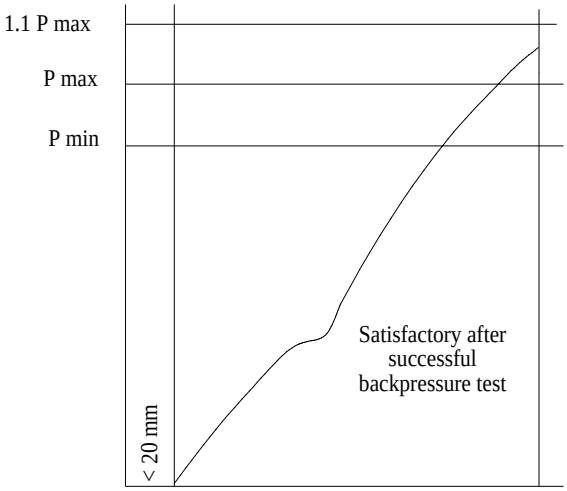
Where required wheelsets shall be subjected to a back pressure test.

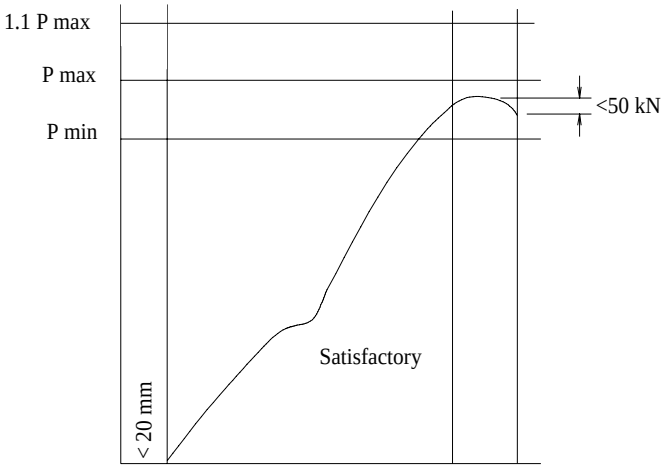
Check the pre-assembly data to ensure it conforms with the relevant standards.

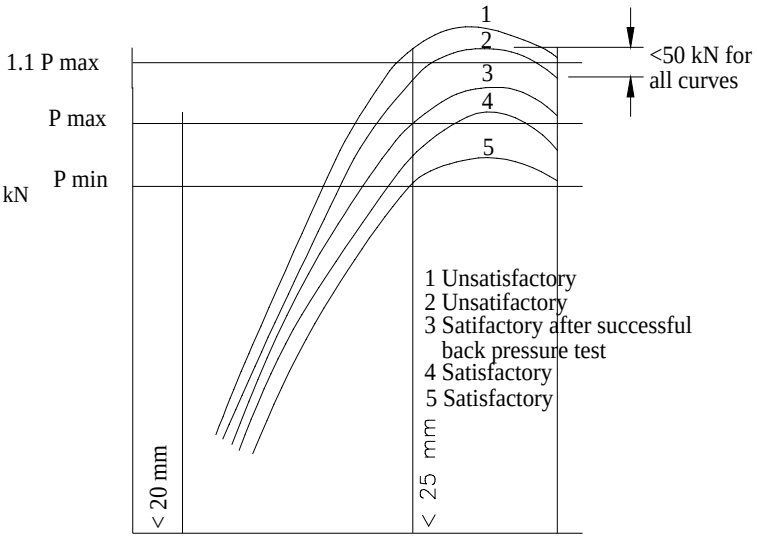
The wheelset shall be subjected to a back-pressure test at a tonnage ten percent (l0 %) greater than the maximum tonnage achieved during pressing on. The 110% back pressure test is to be sustained for a duration of five (5) seconds without any movement of the wheel relative to the axle. If the wheel moves the wheelset shall be rejected. Wheels shall not be proof tested for at least five (5) working days after the wheel was initially pressed onto the axle.

5.2.6.1.1 Chart interpretation









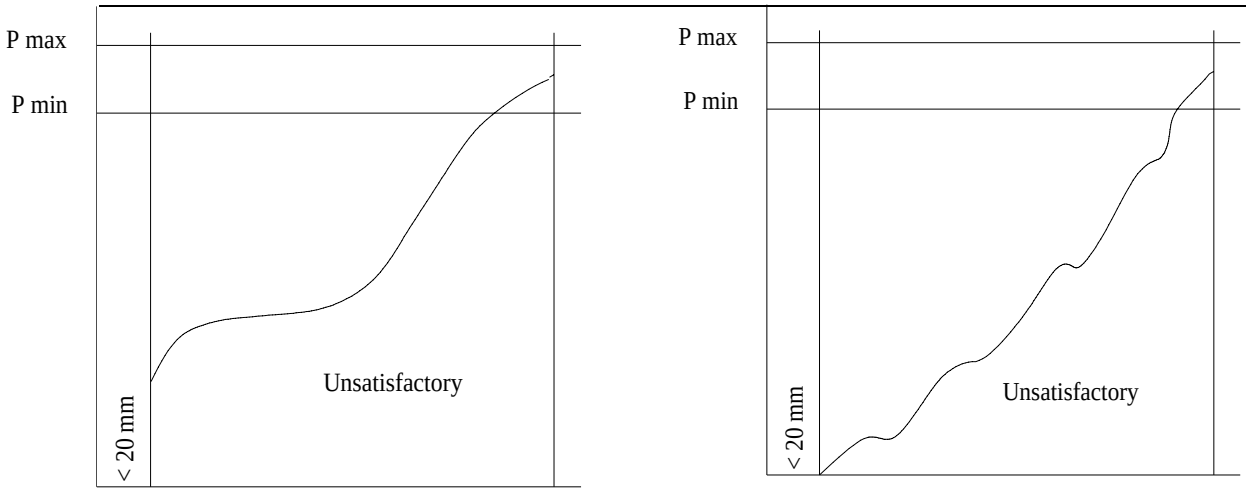


Figure 12

5.2.7 Certificate

A wheel press certificate shall be kept for each wheelset assembled, and shall contain at least the following details:-

- Wheel fit pressure Vs ram displacement.
- Measured Wheel bore for both discs
- Wheel serial and heat numbers
- Axle wheelseat diameters
- Axle number and year of last reworking
- Surface finishes for both wheels and axle
- Wheel mount lubricant used during the wheelset assembly

5.3 Wheelset Assembly Tolerances

5.3.1 Freight Vehicles

5.3.1.1 Mounting Force

The wheel mounting tonnage shall be between the limits shown in Table 7.

Wheelset number	Maximum push on tonnage tonnes	Minimum push on tonnage tonnes
WS38RB	90	72
WS40RB	143	85
WS46RB	121	75
WS47RB	121	75
WS53RB	121	75
WS71RB	143	85
WS75RB	143	85
WS76RB	132	80
WS77RB	132	80
WS94RB	155	90

Table 7

5.3.1.2 Dimensional Tolerances

Dimensional tolerances should be as shown in Table 8.

Measurement	Symbol	Tolerance mm
Back to back	A1	1357.3 to 1359.7
Difference in diameters	L & L1	1
Axial run out	H	1
Radial runout	G	0.5
Difference in position of wheel in relation to journal	C & C1	1

Table 8

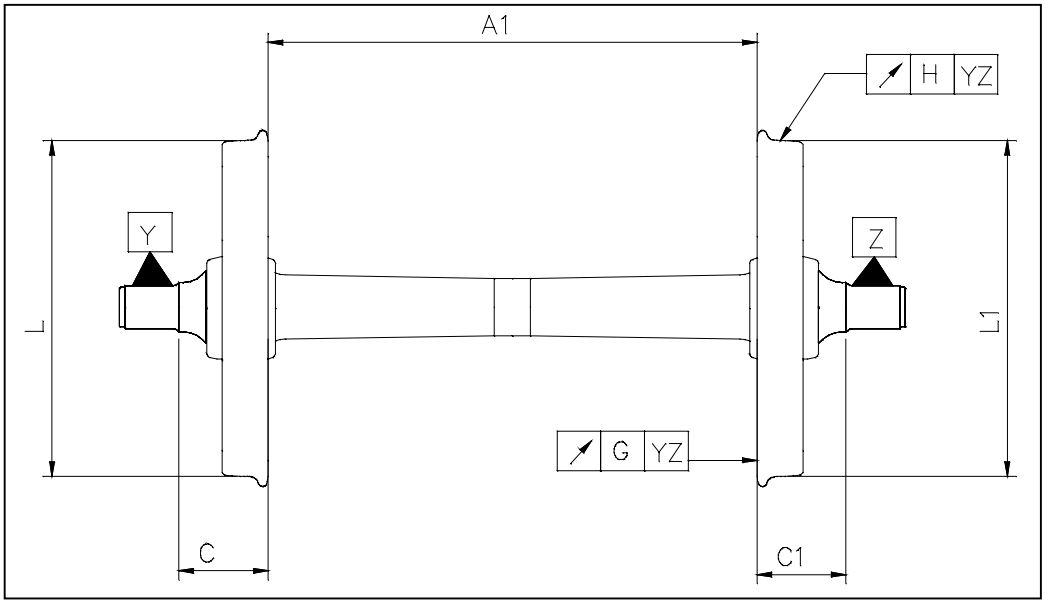


Figure 13

5.3.2 Locomotives

This specification details the tolerances for the assembly of locomotive wheelsets with outboard bearing journals for wheelsets operating up to 120 km/h.

5.3.2.1 Mounting Force

The wheel mounting tonnage shall be between the limits shown in Table 9

Wheelset	Drawing number	Wheel		Gear	
		P max tonnes	P min tonnes	P max tonnes	P min tonnes
48	105-158	127	86	100	60

Table 9

5.3.2.2 Dimensional tolerances

The wheelsets back to back and other dimensions shall be as shown in Table 10. Unless otherwise specified each assembly shall be spun between centres. The following clock gauge out of true deviations are permitted, these being measured by the travel of a pointer on a fixed clock gauge during one complete revolution of the assembly.

Measurement	Symbol	Tolerance mm
Back to back Measured 40 mm from flange tip	A1	1358.1 to 1359.7
Difference in diameters Measured at tread line - 70 mm from rim back	L & L1	0.5
Axial run out Measured 40 mm from flange tip	H	0.8
Radial runout Measured at tread line	G	0.5
Difference in position of wheel in relation to journal	C & C1	1

Table 10

6 Temporary Corrosion Preventative for Wheelsets

This Section describes a temporary corrosion preventative for use on wheelsets to prevent the ingress of moisture to the mating surfaces and their subsequent corrosion

6.1 Composition

The product shall comprise materials which when applied provide a thin, translucent, dry film with the capacity to protect steel from corrosion for 12 months in outdoor weathering environment.

The product shall comply with the requirements of AAR M934 Appendix C Specifications for Sealing Compound.

The product shall be suitable for cold application by brushing, spraying or dipping.

The product shall be readily removed with petroleum solvents.

6.2 Supply

6.2.1 Certificate

Tenderers or users of this compound shall furnish a certificate/product data sheet which describes the nature of the product, its physical properties and its compliance with the aforementioned requirements.

6.2.2 Packing And Marking

The compound shall be packed in clean, dry containers constructed of materials which are inert to the contents and capable of withstanding normal conditions of handling and storage without rupture or leakage.

The container shall be capable of being resealed gastight.

The name of the manufacturer, product name and contents of the container by volume, in litres, shall be legibly and durably marked on each container.

6.3 Currently approved products

Currently approved products are listed. It is the responsibility of the user to check that at the time of use that these products still conform with the requirements of this standard.

- Valvoline Tectyl 506
- Paykel Rust Veto 342.

7 Wheel Machining Requirements

7.1 General

Reference must be made to the Wheel Defect Manual RSS 0030, regarding classification of wheel defects.

A wheel must be scrapped if any sub-surface defects, which cannot be machined out, are found during wheel turning.

7.2 Diameter of Wheels

Diameters of wheels at turning shall be measured with the wheel measurement feature of the wheel lathe, wheel tape, suitable callipers or micrometer. Measurements shall be taken 70 mm from the rim back.

Vehicle	Reference for wheel condemn diameters
Freight	Section 2.2
Locomotive	Section 2.3
Passenger	Section 2.4

Table 11

The eccentricity for the diameter of each wheel on the tread should not exceed the limits as listed in Table 12. Measurements shall be taken 70 mm from the rim back. Measurements shall be taken with a dial indicator or other suitable means.

Vehicle	Eccentricity
Freight	0.35 mm (indicated runout 0.7 mm)
Locomotive	0.2 mm (indicated runout 0.4 mm)
Passenger	0.2 mm (indicated runout 0.4 mm)

Table 12 Maximum eccentricity limits

7.3 Last Turning

Difficulty is sometimes experienced in forming the required flange profile on a heavily worn flange, at the last turning. This may be overcome by the forming of a 'seven-eighths' profile, at the last turning or as otherwise nominated by the vehicle owner.

Where possible the datum diameter of a condemning groove should be kept visible. If possible, the tread chamfer should be made smaller to avoid destroying the condemn groove.

For wheelsets that have to be removed from the vehicle for machining, the wheel tread diameter must be at least 6 mm above the condemning diameter allowed in service, (refer Tables 1, 2 or 4) after turning.

For wheels machined on an underfloor wheel lathe, where the wheelset is not removed from the vehicle for wheel turning, the wheel tread diameter shall be at least 3 mm above the condemn diameter allowed in service, (refer Tables 1, 2 or 4) after turning.

7.4 Witness Groove

If possible a flange witness groove is to be left after re-turning (except in special cases such as thermal cracks or, skidded wheels etc) but shall not be deeper nor located closer to the tread than indicated by the gauge.

The witness groove serves two purposes:

- Its presence in the finished wheel shows that the lathe operator has not wasted service tread metal by turning more off the tread than necessary.
- It permits the saving of about 3 mm of service tread metal each time a wheel is turned when the wheel has a thin or vertical flange.

Refer to Section 10.6 for details on using the witness mark.

7.5 Wheel Profiles

Wheel profiles to be used are shown in Table 13.

Wheel profile	Profile drawing number	List of uses
WPR2000	See RSS 0038	All hauled vehicles
ANZR (std)	305-738	Locomotive
Worn (ANZR) wheels	306-609	Test purposes only

Table 13

7.6 Surface Finish

The surface finish after machining must be 12.5 um (micrometres) RA (Roughness Average) or less, as per the meter reading.

The surface finish reading is measured across the tread and flange, and the surface finish on the machined surface must be free of chatter marks and free of visual waviness.

The cutting tool should not have a tip radius less than 4mm.

The feed rate determines the surface finish achieved. There is no set rate, as each operator needs to assess the capabilities of the machine in use but the feed rate should not leave more than 3 mm wide feed marks at any place on the wheel tread and flange contour.

7.7 Removing Minimum Material

The amount of material removed from each wheelset shall be minimised, in order to achieve the longest service life.

A guide to the method of determining the minimum amount of material to be removed is outlined as follows:

- Measure the diameters of all wheels on the vehicle or on any wheelset.
- Determine the minimum amount of metal to be removed from the wheel to restore the profile.
- Calculate the turned diameter and the wheel variations if the wheelsets are fitted to a vehicle.

An additional amount of material may be needed to be removed to bring the wheels within tolerance over the vehicle. For tolerances, see specifications listed in Table 11.

Remove the minimum amount of material to bring the wheels into tolerance.

In order to minimise any possible rework; check each wheel diameter against the calculated wheel diameter when each wheel turning is completed.

7.8 Alignment of wheel profiles

It is important that the wheel profiles should be machined in correct relationship to each other across the wheelset. The requirements vary for the type of wheel lathe that is used to machine the profiles.

Prior to turning the total lateral indicated runout of the rim back should be less than 1 mm.

7.9 Fixed Position Template Machines

Fixed template machines are considered to be machines that the lathe profile on one wheel cannot be adjusted in relation to the other wheel on the wheelset as part of the normal operation of the lathe between reprofiling of wheels.

Such lathes require the setup of the templates to be adjusted so that the wheel profiles are machined with a set back to back distance of $1358.9\ ^{+0}/_{-0.5}$ mm, measured 40 mm down from the apex of the flange. This dimension may not be able to be measured on every wheelset as the mounted back to back dimension of the wheels varies, but it shall be initially verified on the first wheelset turned after a profile change by selecting an appropriate wheelset where it is possible to measure the machined back to back dimension after reprofiling.

Fixed template machines also require the wheelset to accurately centralise in the wheel lathe; otherwise the flange thickness will vary from side to side. This shall be checked on every wheelset by using the gauge specified in Section 7.5 to measure the flange thickness. The flange thickness from one side of the wheelset to the other shall not vary more than 2 mm.

7.10 Back of Flange Referencing

Back of flange referencing shall be considered to be carried out on a wheel lathe where it is possible to vary the position of the turned profile in relation to the back of the flange independent of the profile on the wheel on the other side of the wheelset, as part of the normal operation of the lathe between reprofiling of wheels.

Wheels reprofiled on such lathes should have the profile machined so that it conforms to the requirements of Section 7.11.

7.11 Profile Checks

The wheel profile should be checked following turning to verify that the correct profile is being achieved on the wheel lathe and should be within the limits as shown in Table 14.

7.11.1 Limits

Criteria	Measurement
Deviation from true profile. True profile as shown on applicable drawing	0.5 mm maximum

Table 14 Deviation from profile

7.12 Recommended Method

This shall be done using the profile Tread Contour gauges, if possible, listed in Table 15.

Profile	Drawing Number
WPR2000	See RSS 0038
Std ANZR (full & 7/8)	37157
Worn ANZR	306-610

Table 15 Profile overlay gauges

The deviation shall be checked by attempting to insert a 0.5-mm wire type feeler gauge between the gauge and the wheel profile. If the feeler gauge fits beneath the profile it is unacceptable.

It sometimes may not be possible to measure the profile using the overlay gauges because of either a profile having a thicker flange than the opening in the gauge or a profile that is offset outwards in relation to the back of the flange.

7.13 Machining Wheel Tread Defects

7.13.1 Machining Thermal Cracks

Prior to machining, mark the location of the longest thermal cracks in Classes 2, 3 or 4, as specified in RSS 0030 on the wheel rim. The depth of machining is determined by the longest crack.

The wheel must be magnetic particle tested after machining thermal cracks, to ensure that all defects have been removed. Magnetic particle testing should cover an area extending 50 mm on either side of each thermal crack.

7.13.2 Machining of Repaired Wheel Skids

Class 4 or 5 wheel skids are sometimes repaired `on track', refer to RSS 0034, at a location where the critical defect was reported, or where the wheel has failed. The tread surface is restored using weld metal.

When re-profiling, the lathe operator must completely remove the heat affected zone (HAZ) created during the tread face restoration. This may be determined upon consultation with a metallurgist or other appropriately trained specialist. As a guide, this is done by reducing the wheel radius by an amount no less than the skid length divided by eight (8). Advice on the length of the skid should be obtained prior to turning.

7.14 Abrasive Brake Blocks

See RSS 0067 (Use of abrasive brake blocks and cast iron brake shoes to remove minor wheel tread and profile defects), for instructions on the use of abrasive blocks.

8 Application of bogies to vehicles and wheelsets.

8.1 Valid bogie to vehicle combinations

WAGON TYPE	BOGIE TYPE
NDAF	XFA, XHB, CFB, CBF, XHD, CFA, XHA
NDCF	
NDCH	ASA, ASO, CBF, CEA, CFB, CFC, XFA, XHA, ZFA, 2AF, 2CE, 2CF, 2CH,
NDEF	
NDFF	CQB, CQC
NDGF	CEA, CFC, XCF, XHD, ZCO, 2BO, 2CC, 2CF, 2CH, 2CO
NDHF	CEA, CFA, CFC, XHA, XHB, XHD, XLB, ZCO, 2BO,2CO,
NDMX	XBA, XFA, XGA, XGB, XGC, XHA, XHB, XHC, XLA, XLB, XLD
NDPF	CQA
NDRF	CFA, CFB, XBA, XCH, XDC, XFA, XGA, XGB, XGC, XGL, XHA, XHB, XHD, XHG, XLA, XLB, XLD, 2CO, 2CF
NDSF	CFBX, XHA, XHB, XHD,
NDXF	CFB, CFC, XBA, XBL, XCH, XCL, XFA, XGA,XGB, XGC, XGL, XHA, XHB, XHC, XHD, XLA, XLB, XLC, 2CO, 2FC
NFAF	
NFBF	
NFCF	
NFDF	
NFEF	
NDGF	
NFNF	
NFPF	
NHBF	CQB, CQC,
NHSF	CFB, CFC, XFA, XHB, XHD
NHWA	
NHWF	
NLJF	

NOBX	
NQJX	
NVBZ	
NZBF	CQA
NZNY	

Table 16 Freight bogie to vehicle combinations

8.2 Bogie to wheelset combinations

WHEELSET DESIGNATION		**BOGIES FITTED**
Bearing/wheel diameter in inches	Wheelset	
14R37	WS45RB	ATA
9R33	WS47RB	CEA, XHA, XHB, XHC, XHD
DPU33	WS53RB	CFB, CFC, CFD, XFA, XFB, XFAY
9R37	WS76RB	XLA, XLAY, XLB, CQA, CQB, XBA, XGA, XGB, XGC
DPU37	WS77RB	XLC, XLD

Table 17 Freight bogie to wheelset combinations

8.3 Wheelset components

WHEELSET	**WHEEL**	**AXLE**	**AXLEBOX**
WS45RB	W41 (920 mm dia)	A119	14R
WS47RB	W38 (840 mm dia)	A118	9R
WS53RB	W38 (840 mm dia)	A144	DPU package unit
WS76RB	W54 (920 mm dia)	A118	9R, 18R
WS77RB	W54 (920 mm dia)	A153	DPU package unit

Table 18 Wheelset components

9 Axle Gears

New gears shall have case hardened teeth and manufactured in accordance with RSS 0095.

9.1 Gear Reprofiling

This standard details the requirements for the regrinding of gears and pinions

9.1.1 Preparation

Axle gears do not require, and should not, be removed to facilitate regrinding.

If gears or pinions are left in position for regrinding, care shall be taken not to cause any damage to associated equipment.

9.1.2 Standard

The permissible errors and tolerances for both gear wheels and pinions are to be taken from the relevant BS, DIN or AGMA standard. Where not specified gears shall be to BS-235 grade 6 or equivalent (Din grade 7 or AGMA 10).

The gears and pinions shall be free from all sharp edges, made to the dimensions shown on the relevant drawings and, where tolerances are given be within these limits.

Particular care must be taken as to not damage the surface of the teeth as this could lead to premature failure of the teeth through fatigue.

9.1.3 Reprofiling

Gears shall be reprofiled to restore the original tooth profile.

Re ground gears to have 90% minimum clean up after grinding. No untouched or low spot to exceed 35 mm length.

Tooth thickness shall not be less than specified by the locomotive manufacturer.

The teeth shall be magnufluxed and peened after grinding.

9.1.4 Handling protection and transportation

The gear or pinion shall be coated with a suitable rust preventative prior to packing.

The items must be secured in a wooden box and labelled for identification.

10 Gauges

10.1.1 Issuing and Registration of Gauges

Each gauge is identified by a drawing number and a registration number which are both engraved on the gauge.

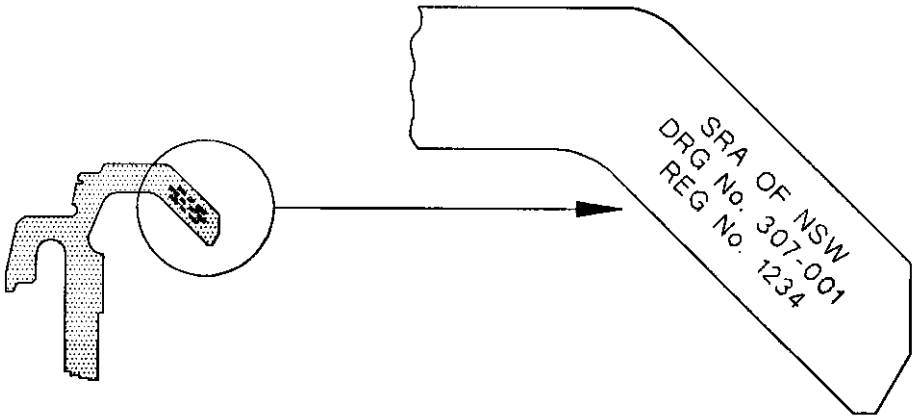


Figure 14 Identification of Wheel Gauge

Wheel gauges are administered by Manager Fleet Management.

These offices shall arrange for the manufacture, issue and maintenance of gauges .

Personnel issued with a gauge must sign for its receipt. A file shall be kept of gauges that have been issued. These details may be inspected as required.

Unregistered gauges for wheel measurements shall not be used. Any unregistered gauges found shall either be destroyed, or given to the designated office for re-calibration and registration.

Every two years registered gauges shall be sent to the designated offices for checking and re-calibration.

10.2 Wheel Diameter Measuring Gauge

10.2.1 Description

The wheel diameter measuring gauge is used to accurately measure the diameter of wheels.

The wheel diameter gauge is normally only used on locomotives.

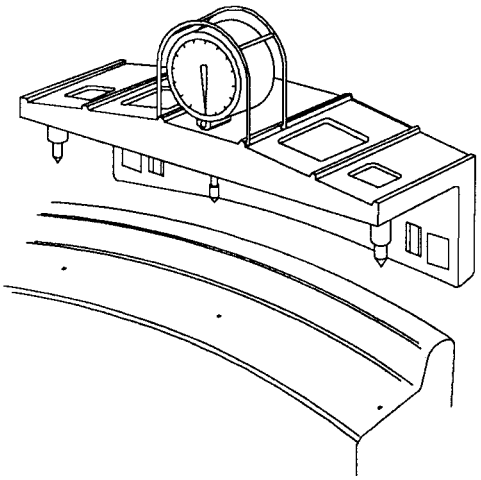


Figure 15: Wheel diameter measuring gauge

10.3 Use of Wheel Diameter Gauge

Place the wheel diameter measuring gauge over the flange on the inside of the wheel.

Magnets hold the gauge secure against the side of the wheel while the two fixed points and one movable point sit on the wheel tread.

Do not obstruct the gauge by any equipment, including gear cases and brake rigging.

When seated, move the gauge slightly to ensure the fixed points are settled correctly on the wheel tread.

Make sure that the contact points are not on any localised defects such as indentations, scale, skids, etc that may effect the reading. Any defect can significantly effect the readings.

Take the reading from the measuring gauge.

Three readings at different locations are required to verify the actual diameter.

Minimum locomotive wheel diameters are tabled in Section 2.3.

10.3.1 Handling

The wheel diameter gauge is to be carefully handled so that it is not dropped or bumped. When not in use the wheel diameter gauge is to be kept in its storage box. These precautions are necessary as the device is easily put out of calibration.

10.4 Universal Wheel Tread NO-GO Gauge

10.4.1 Description

The freight wheel 'no go' gauge 207-668 (see figure 16) is designed to gauge the following dimensions on freight vehicles.

- Tread thickness
- Rim thickness
- Thin flange
- High flange
- Steep flange
- Estimate the depth of defects
- Measure the length of other deformities on a wheel.

10.4.1.1 Limits and Actions

For freight wheel defect limits and actions , see Section 2.2 Freight Vehicle Wheel Data Table and Clause 2.5.3.1 Freight Wheel Measurement Requirements.

10.4.2 Using the Freight wheel `No Go' Gauge

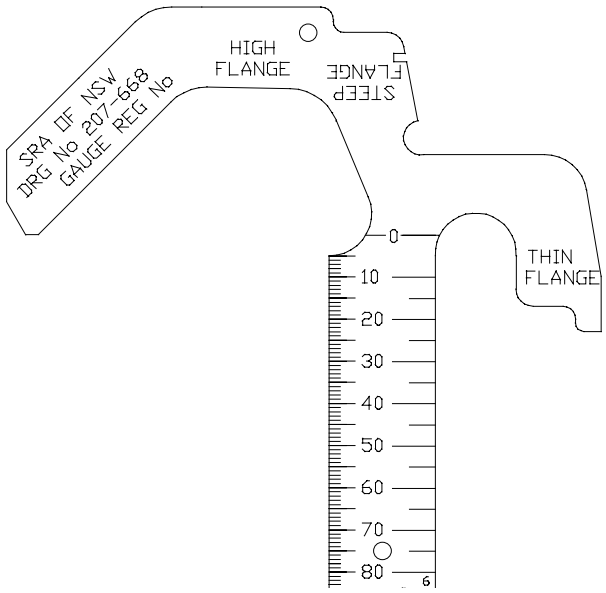


Figure 16: Freight Wheel 'no go' Gauge

10.4.2.1 Flange Height

The `high flange' measurement sets the `no go' limit for the flange height, relative to the tread. The flange height is the vertical distance from the tread line to the highest point on the flange.

10.4.2.2 Checking for a high flange

Hold the gauge against the rim back as shown in figure 17 with the bottom pointing to the centre of the wheel.

The high flange limit, which is the underside of the long arm and marked `high flange', **SHOULD NOT** touch the flange.

If the flange touches the high flange section of the gauge, the flange is high (greater than 35 mm) relative to the tread, as shown in Figure 17

A wheel with an acceptable flange height is shown in Figure 18.

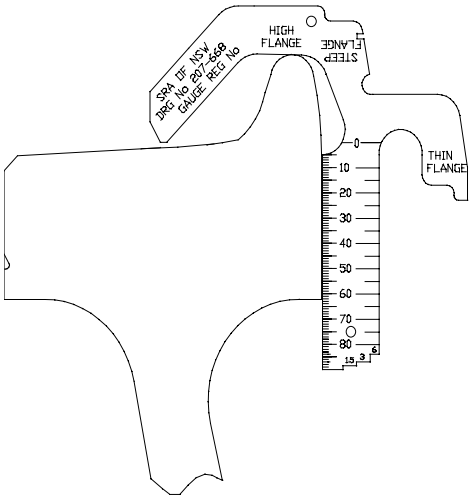


Figure 17 Checking for a high flange. This flange is high

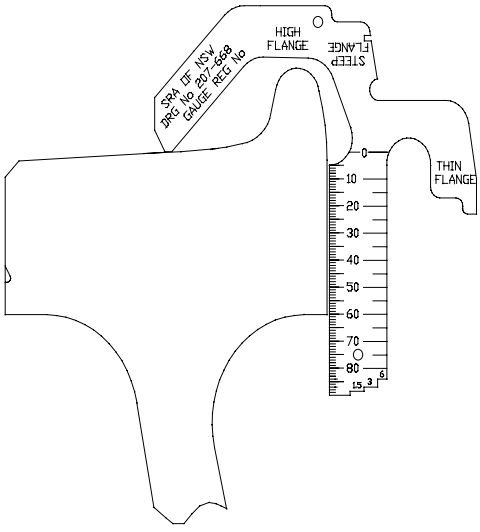


Figure 18.Checking for a high flange. This flange is acceptable

10.4.2.3 Checking for a thin flange

The 'thin flange' part of the gauge measures the `no-go' thickness of the wheel flange.

10.4.2.4 Procedure for checking for a thin flange

Hold the gauge against the rim back, as shown in Figure 19, with the bottom pointing to the centre of the wheel.

If the flange thickness is satisfactory, the gauge short arm, which is marked `thin flange', **SHOULD NOT** be able to fit over the flange and allow the tip to make contact with the tread area.

If the bottom of the short arm touches the tread area the flange is thin (less than 19 mm) as shown in Figure 19.

When wheels are checked during Preventative Maintenance inspections, a thin flange gauge measuring 21 mm across the flange (rather than the normal 19 mm) is to be used.

A wheel with an acceptable flange thickness is shown in Figure 20.

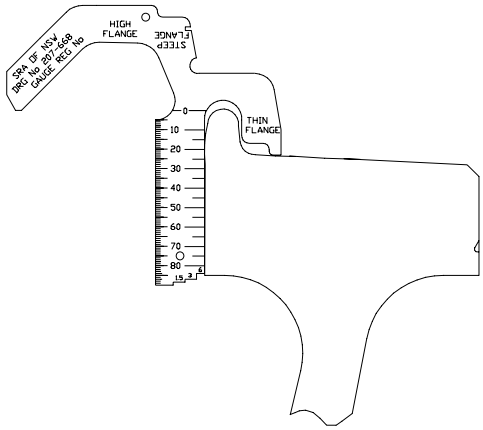


Figure 19. Checking for a thin flange. This flange is thin

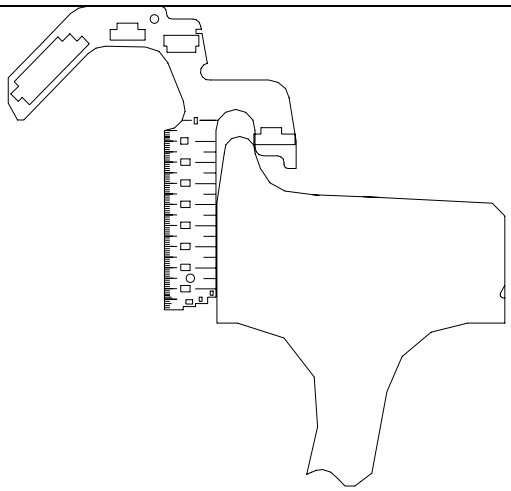


Figure 20. Checking for a thin flange. This flange is acceptable

10.4.2.5 Steep flange

The flange profile must blend smoothly with the tread profile. If the wheel has a steep flange , this can indicate that there is a tracking problem with the bogie.

10.4.2.6 Procedure for measuring for a steep flange

Hold the gauge so that the edge opposite the high flange mark is flush with the tread surface as shown in Figure 21. The bottom of the gauge should point away from the centre of the wheel.

Ensure that no part of the gauge above the slot at point `B' is touching the flange surface.

If any part of the gauge above the slot touches the flange surface, this indicates that the wheel has a steep flange .

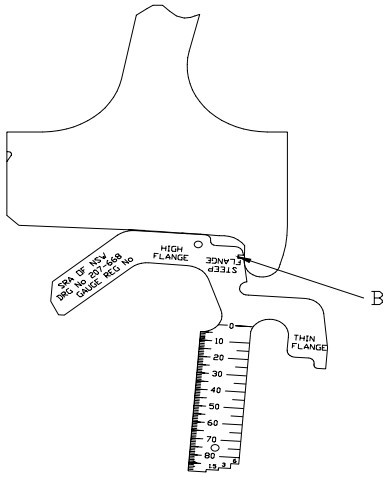


Figure 21 Checking for a steep flange. This flange is steep

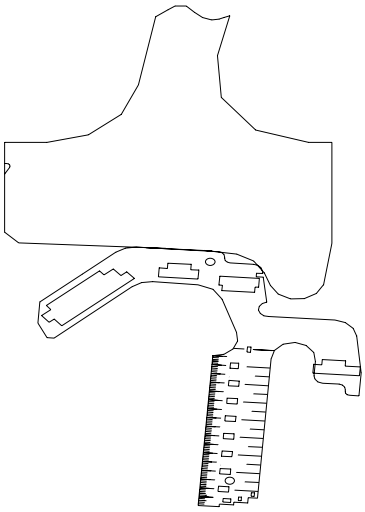


Figure 22 Checking for a steep flange. This flange is acceptable

10.4.2.7 Rim thickness

The rim thickness is the difference in radius between the wheel tread at the tread line (70mm from the rim back) and the rim back edge.

10.4.2.8 Procedure for measuring the rim thickness from the rim back edge.

Hold the gauge on the rim back as shown in Figure 23 with the bottom pointing towards the centre of the wheel.

Ensure that the tip of the gauge long arm is touching the wheel tread area.

The scale reading adjacent to the rim back edge is the rim thickness.

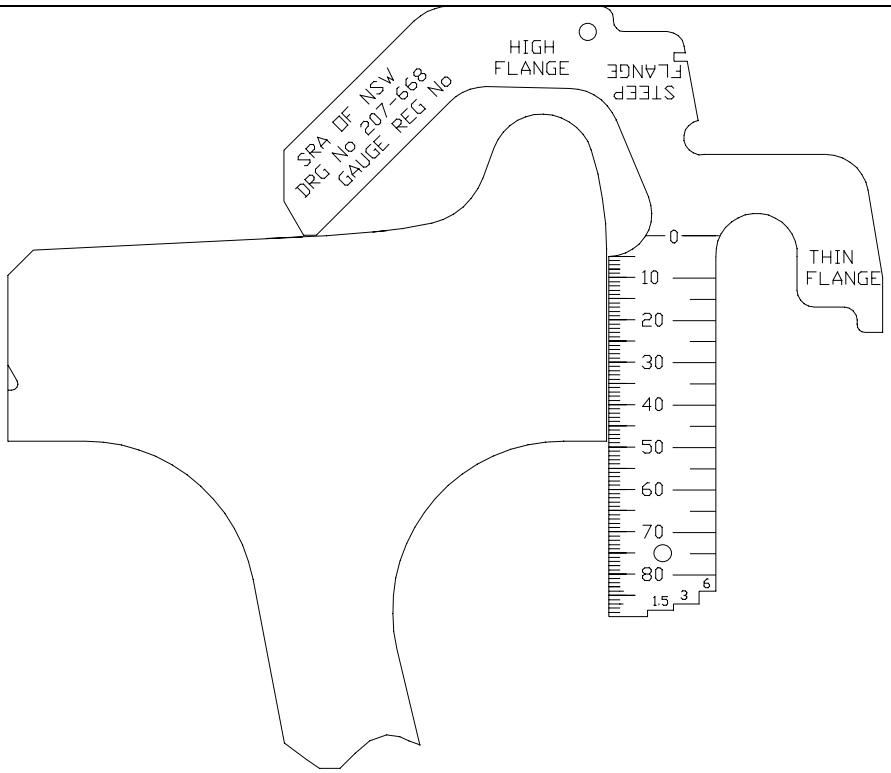


Figure 23. Measuring the rim thickness

10.4.2.9 Defect depth or height

The stepped graduations on the gauge can be used to measure wheel defect depth (such as spalling) or the height of defects (such as arrises or scale).

10.4.2.10 Procedure for measuring defect depth or height

Place the end of the gauge into or next to the defect. See Figure 24 as an example.

From the stepped graduations on the gauge estimate the defect depth or height.

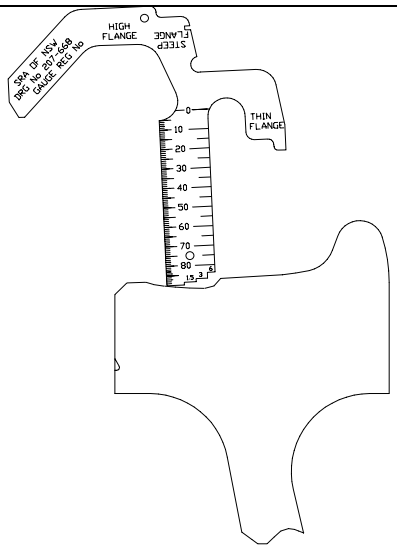


Figure 24. Measuring the depth of a defect

10.5 Tread hollowing

NOTE: Tread hollowing may be measured using the Universal Wheel tread Measuring Gauge or a ruler as detailed in Section 7.5.2.5.

10.5.1 Tread hollowing gauge

The gauge is as shown in Drawing 307-258.

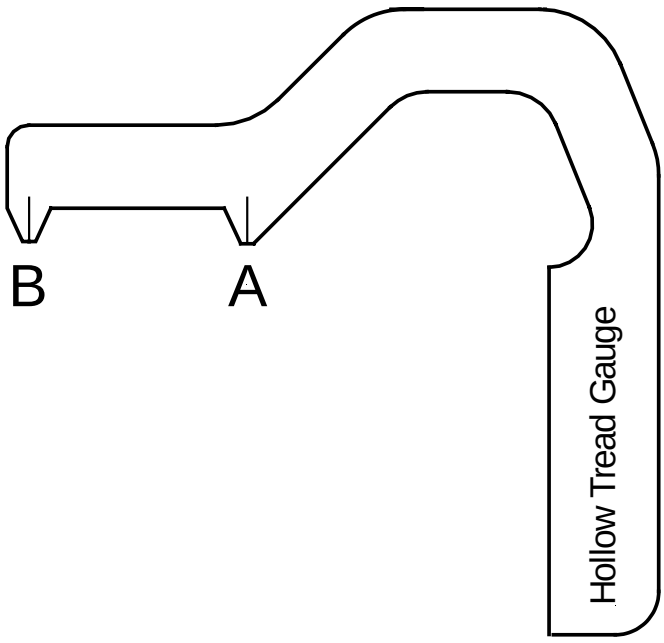


Figure 25. Hollow tread gauge

10.5.2 Use of the tread hollow gauge

Place gauge on back of wheel as shown.

If point “A” touches wheel tread, wheel is ACCEPTABLE (see Figure 26).

If point “B” touches wheel tread, wheel is UNACCEPTABLE (see Figure 27).

See RSS 0030 for action to be taken should gauge fail wheel.

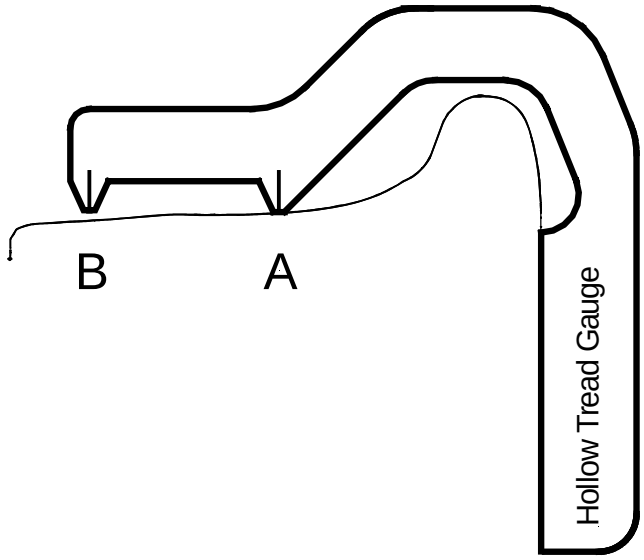


Figure 26 – Acceptable

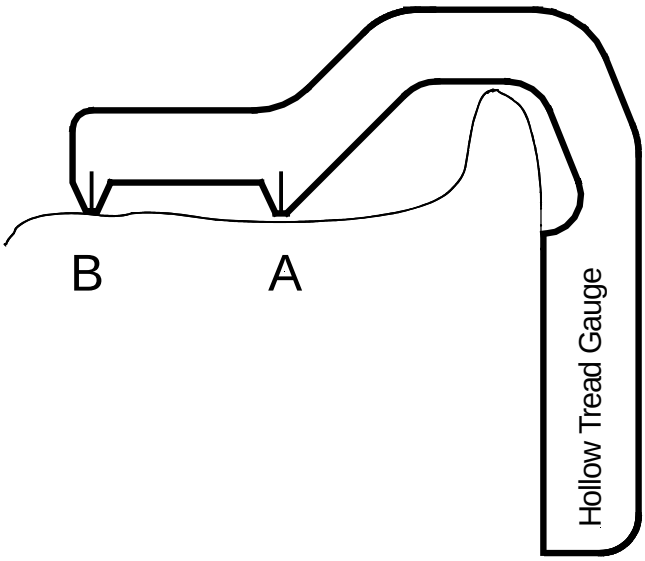


Figure 27 - Unacceptable

10.6 Universal Wheel Tread Measuring Gauge

10.6.1 Description

The universal measuring gauge 207-661 (see figure 26) is designed to gauge and measure the following dimensions:

- tread thickness
- rim thickness
- flange height
- flange width
- depth or height of wheel defects
- length of deformities
- tread hollowing

The Universal measuring gauge is principally used for locomotives.

It may also be used on vehicles where the actual wheel profile measurements are required. e.g. derailments and other investigations.

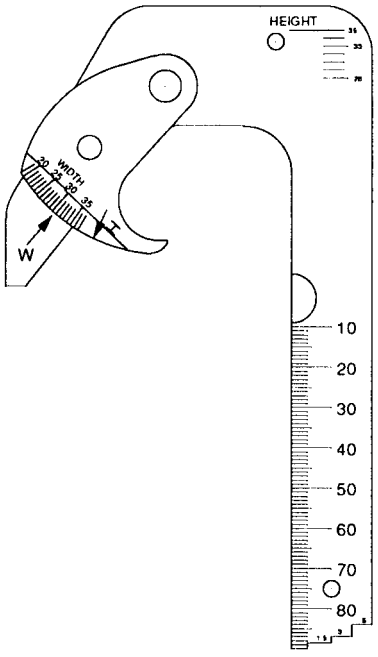


Figure 26 The universal measuring gauge 207-661

10.6.1.1 Limits and action

For limits and actions see Section 2.3 (Locomotive Wheel Data Table) and Clause 2.5.3.2 (Locomotive Wheel Measuring Requirements).

10.6.2 Using the Universal Measuring Gauge

10.6.2.1 Flange Height

The flange height is the vertical distance from the tread line (70 mm from the rim back), to the highest point on the flange.

Procedure for Measuring the Flange Height

Set the gauge so that the line marked 'H' on the moving finger is positioned just below the 28mm mark on the 'height' scale.

Hold the gauge on the rim back, as shown in Figure 27, so that the bottom is pointing to the centre of the wheel and the tip of the arm is above the tread line.

Move the gauge parallel to the rim back towards the centre of the wheel until the tip of the arm touches the tread.

The flange height is the reading adjacent to the ‘H’ arrow on the moving arm.

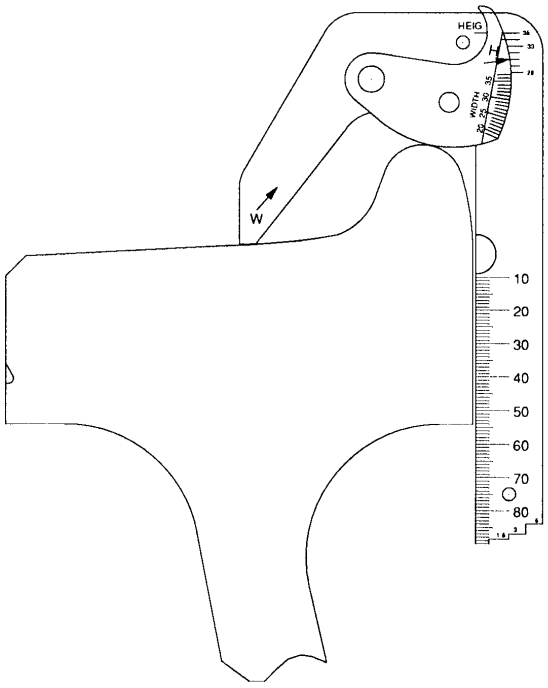


Figure 29 Measuring the flange height.

In this example, the flange height is 30 mm.

10.6.2.1.1 Flange Width

The flange width is the distance across the flange measured at a set distance above the tread line.

Procedure for Measuring the Flange Width

Hold the gauge, as shown in Figure 30, against the rim back so that bottom of the gauge is pointing towards the centre of the wheel and the tip of the arm is touching the wheel tread.

Rotate the moving finger so that the fingertip touches the inside of the flange.

The flange width is the reading adjacent to the ‘W’ arrow on the gauge arm.

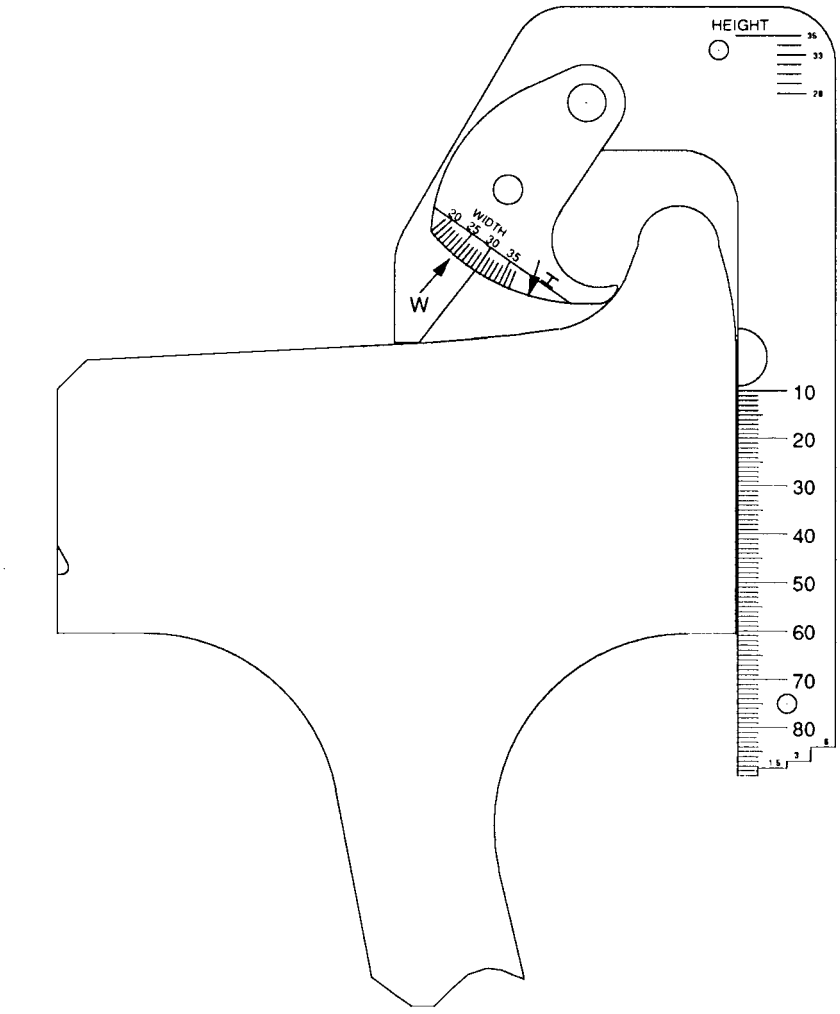


Figure 30 Measuring the flange width.

In this example, the flange width is 25 mm.

10.6.2.2 Rim Thickness

The rim thickness is the amount of material between the wheel rim edge diameter and the measured tread diameter, at the tread line.

Procedure for Measuring the rim thickness from the Rim Edge

Hold the gauge on the rim face or rim back, as shown in Figure 31, so that the bottom of the gauge is pointing towards the centre of the wheel and the tip of the arm is touching the wheel tread.

The point where the rim back edge aligns with the gauge scale is the measured rim thickness.

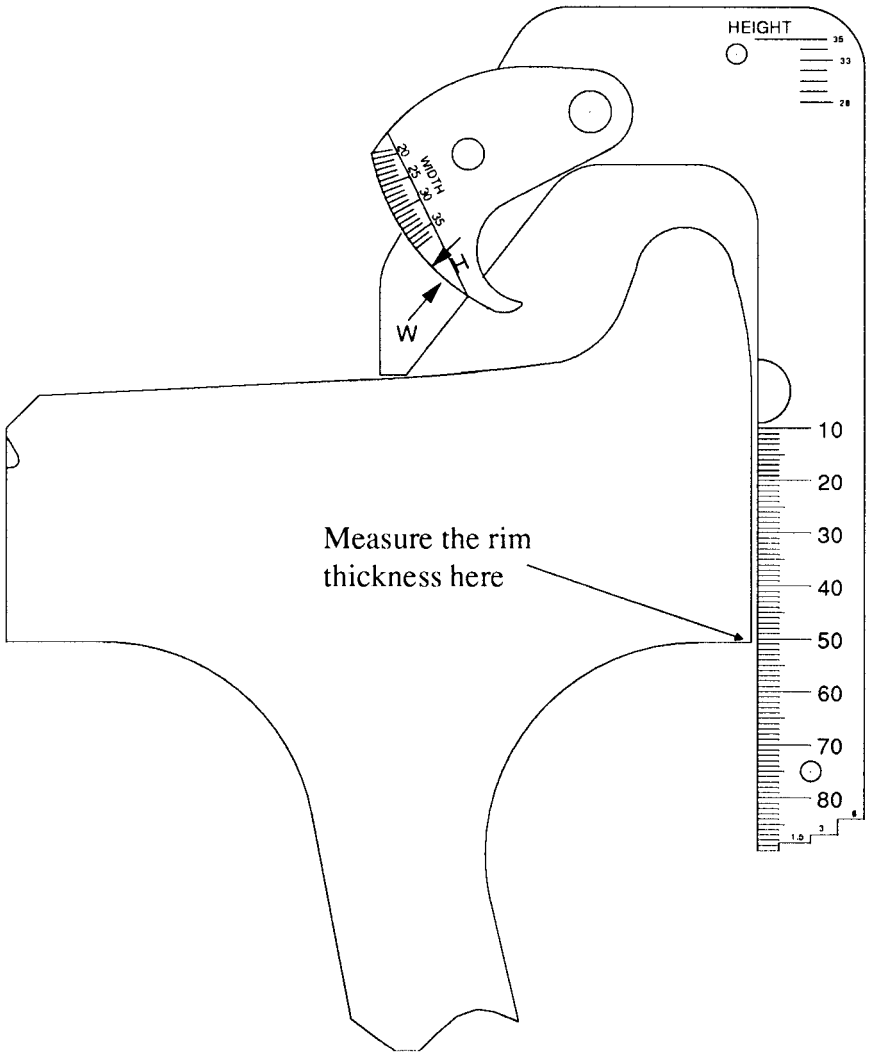


Figure 31 Measuring rim thickness.

In this example, the rim thickness is 51 mm.

10.6.2.3 Tread Thickness

The tread thickness is the amount of material between the bottom of the wheel condemn groove and the tread.

On locomotives and freight wheels, measurements of the condemn groove shall only be taken when no other method of measurement is possible or as a guide only.

10.6.2.3.1 Procedure for Measuring the tread thickness from the condemn groove

Hold the gauge against the rim face, as shown in Figure 32 arm is touching the wheel tread.

The point where the bottom of the condemn groove, point ‘A’ in Figure 30 aligns with the gauge scale is the measured tread thickness.

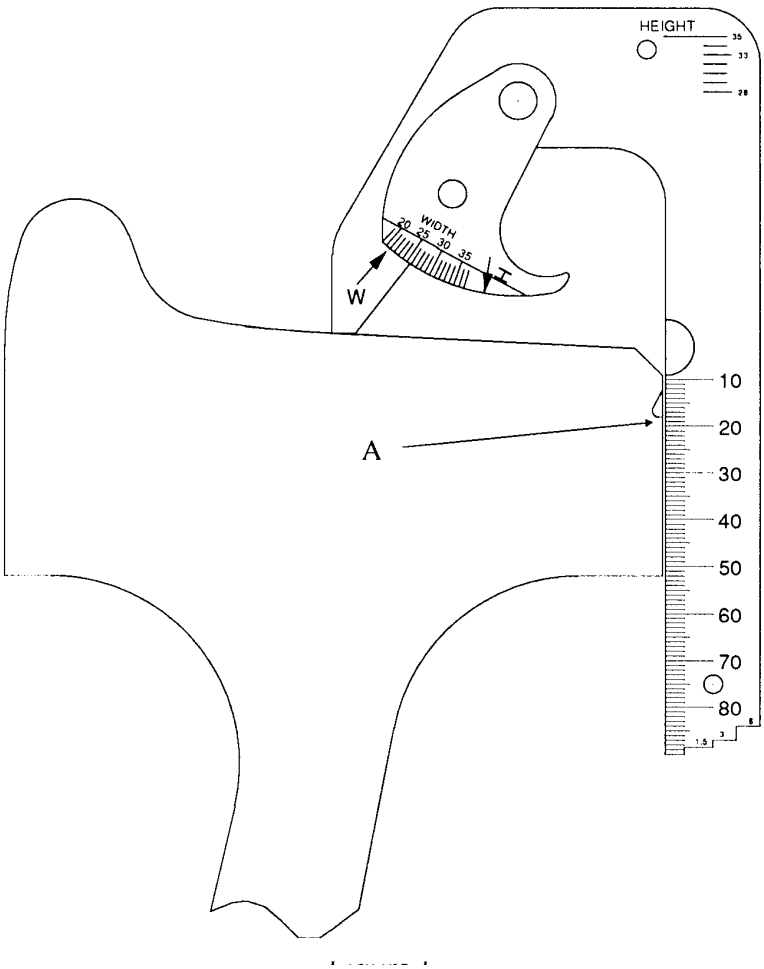


Figure 32 Measuring tread thickness.

In this example, the tread thickness is 18 mm.

10.6.2.4 Defect depth or height

The stepped graduations on the gauge can be used to measure wheel defect depth (such as spalling) or the height of defects (such as arrises or scale).

10.6.2.4.1 Procedure for measuring defect depth or height

Place the end of the gauge into or next to the defect. See Figure 33 as an example.

From the stepped graduations on the gauge estimate the defect depth or height.

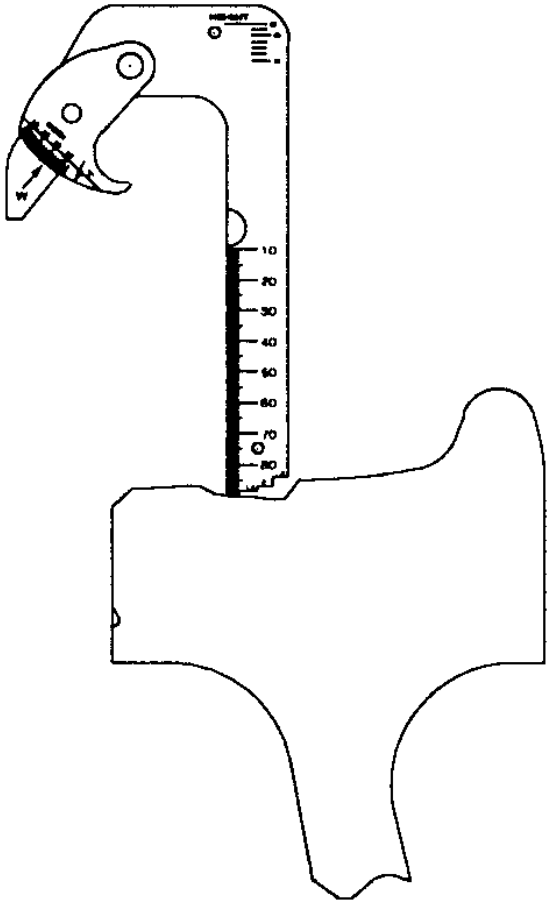


Figure 33 Measuring the depth of a defect

10.6.2.5 Tread hollowing

NOTE: The following method may be used as a guide to the amount of hollowing of a wheel tread, however, refer to Section 10.5 for the wheel tread hollowing go-no go gauge.

Tread hollowing can be measured with the aid of a ruler.

Line up the 90 mm mark on the ruler with the outside edge of the wheel tread as shown in figure 30 and hold the gauge at 90 degrees to the ruler.

Use the stepped graduations to measure the maximum depth of the tread hollowing across the tread.

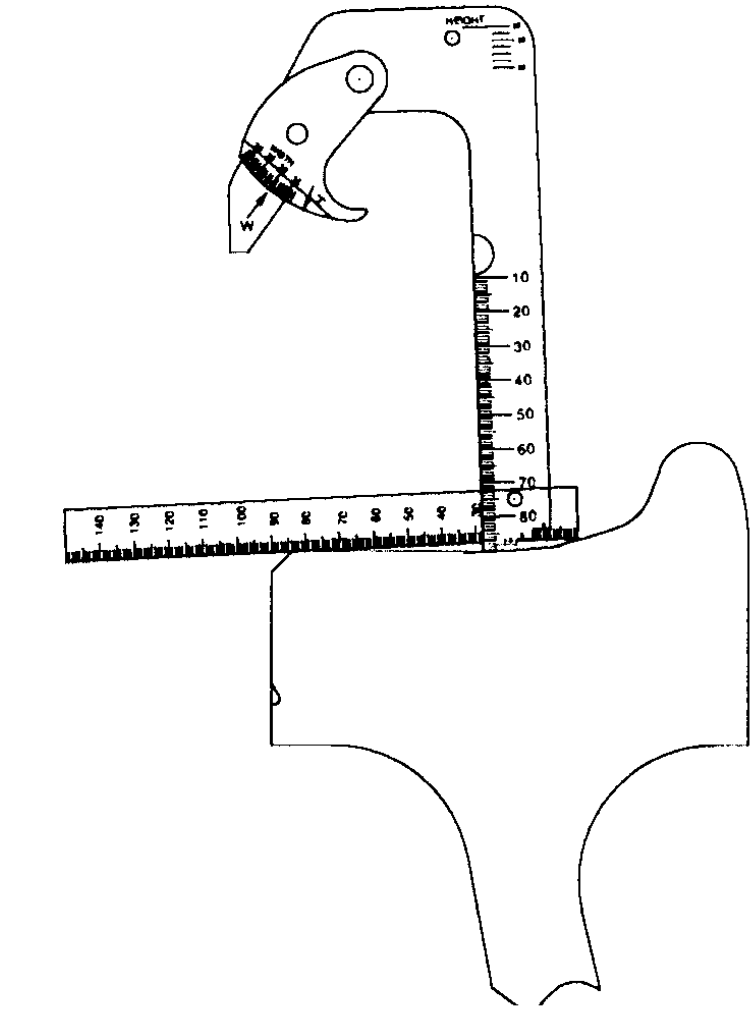


Figure 34 Measuring tread hollowing

10.6.3 Other Wheel Measuring Devices

10.6.3.1 Wheel Diameter Measuring Gauge

Wheel diameter gauge. Supplier Part No Yoshida Seiki Ltd. TY 50.

For use of the wheel diameter gauge see Section 10.3.

The wheel diameter measuring gauge shall be identified by a registered number.

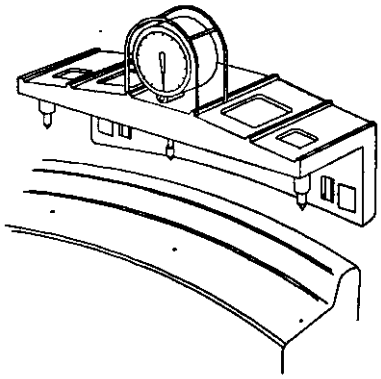


Figure 35 Wheel diameter measuring device

The wheel diameter gauge shall be calibrated at least every six months and a record is to be kept of the calibration date.

10.6.3.2 Manual Wheel Profile Recorder

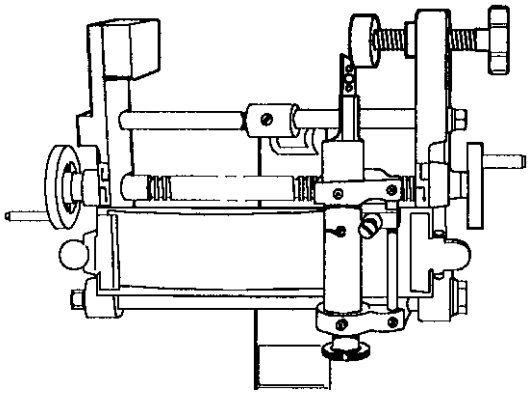


Figure 36 Manual Wheel Profile Recorder

The wheel profile recorder provides an indicative profile drawing of a wheel tread and flange. A spring loaded scriber passes parallel to the axle across the tread and flange. The scriber then traces the profile of the wheel.

The spring loaded scriber is linked to a pen that traces the movement of the scriber, and hence traces the profile of the wheel.

10.6.3.3 Electronic Wheel Profile recorder

A Wheelmate electronic wheel profile recorder is held by the Rail Flaw Detection Section. This unit accurately measures and records wheel profiles on computer for further investigation.

10.6.4 Wheel Profile Overlay Gauges

Wheel profile overlay gauges are used to check the profiles of wheels after turning.

For wheel profile overlay gauges see Table 19.

PROFILE	DRAWING NUMBER
WPR2000	See RSS 0038
Std ANZR (full & 7/8)	37157
Worn ANZR	306-610

Table 19

10.6.5 Reprofiling of Wheels

Reprofiling of wheels shall be carried out to the requirements of Section 7 (rolling stock wheel machining tolerances).

10.7 Wheel Lathe Operator's Gauge

10.7.1 Description

The lathe operator's gauge is used to indicate the amount of metal (depth of cut in millimetres) to be removed from the tread to restore a wheel to either a full flange contour or a seven-eighths flange contour.

This gauge is to be used as a guide only. The actual amount of material to be removed will vary due to the nature of the wear on particular vehicles and differences in the profiles used for different vehicles.

It can also be used to gauge the rim thickness prior to turning to indicate the wheel diameter, but this is normally done with the wheel diameter measuring feature on the wheel lathe if so equipped.

The amount of metal to be removed to restore a full flange is more than is needed to produce a seven-eighths flange. Both measurements are indicated from the pointers on the moving arm.

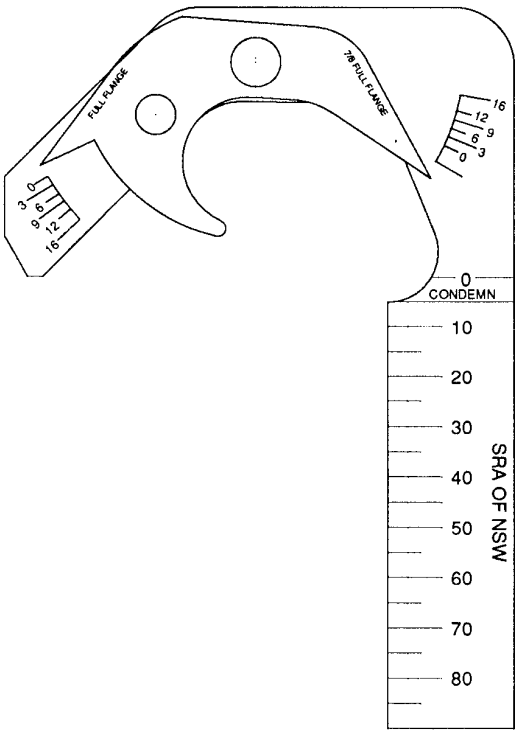


Figure 37Lathe Operator's gauge

10.7.2 Using the Lathe Operator's Gauge

10.7.2.1 Procedure to determine the amount of metal to be removed

Hold the gauge perpendicular against the rim back with the bottom pointing to the centre of the wheel.

Ensure that the swing-arm finger is clear of the flange. The end of the gauge arm should touch the wheel tread at the tread line.

Swivel the swing-arm finger so that the tip touches the inside of the flange.

Check the scale reading, adjacent to the full or seven eights flange as required, to determine the amount of metal to be removed.

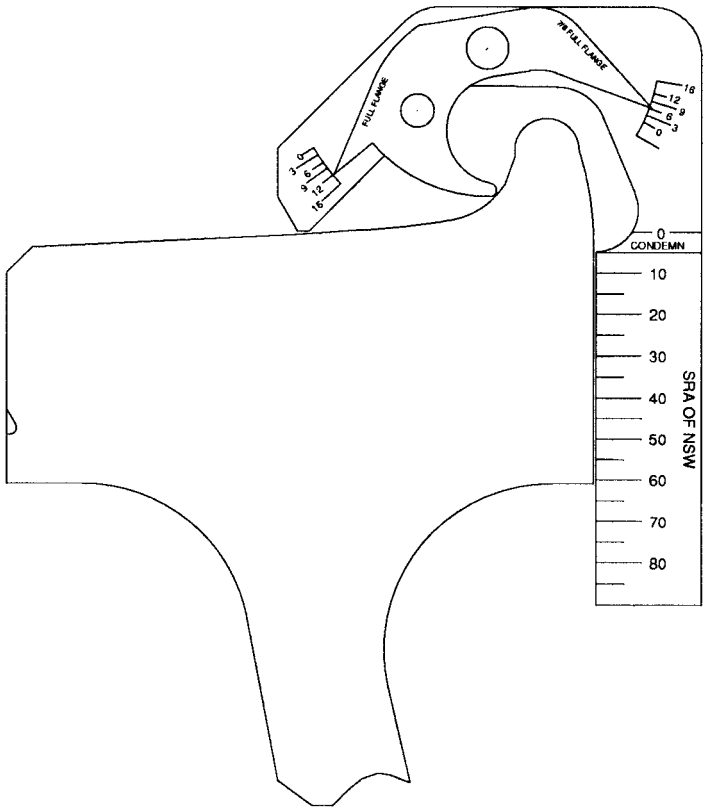


Figure 38

Gauge indicating the amount of metal to be removed. This example shows 12 mm to be removed from the tread to restore it to a full flange profile or 6 mm to restore it to a 7/8 profile.

10.7.2.2 Procedure for Measuring the Rim Thickness

Hold the gauge perpendicular against the rim back with the bottom pointing to the centre of the wheel.

Ensure that the end of the gauge's arm touches the wheel tread.

The reading on the scale on the gauge body at the point of the inner rim edge is the rim thickness.

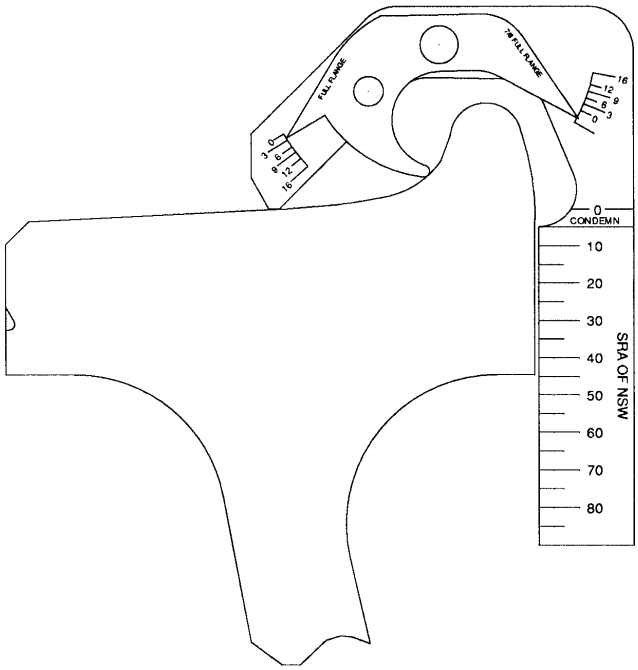


Figure 3

Figure 39. Measuring the rim thickness.

This example shows a rim thickness of 45 mm.

10.8 Back to Back Measurement Gauge

A recommended gauge is that shown on drawing 306-579 as shown in Figure 40.

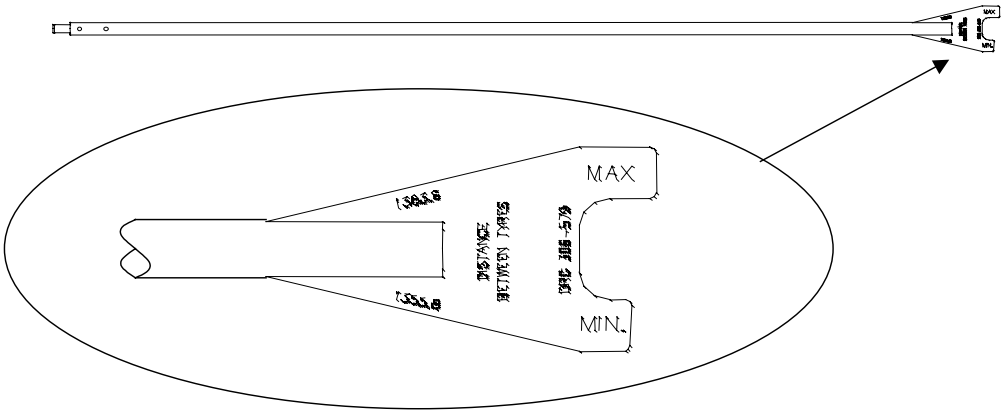


Figure 40 Wheelset back to back gauge

10.8.1 Use

Each measurement shall be checked at three points equally spaced around the wheel. One of the points should be at the top or bottom of the wheelset.

The measuring point is located 40 mm from the top of the flange.

The gauge can be used under loaded or empty vehicles and on freestanding wheelsets and bogies.

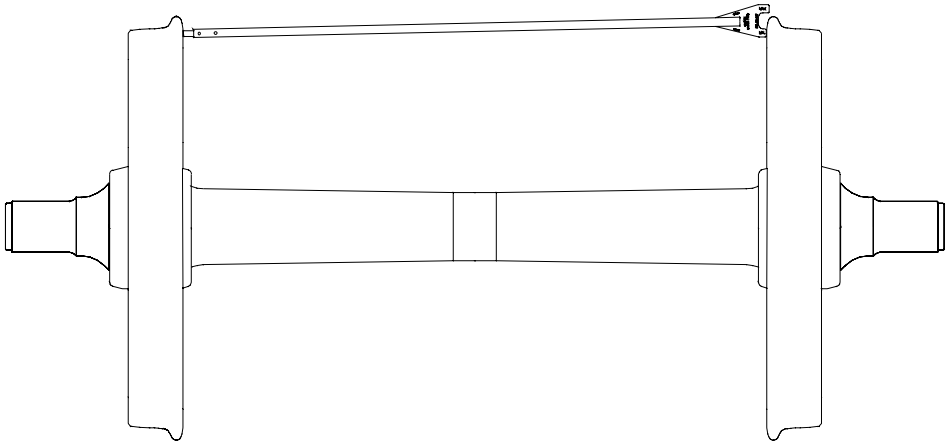


Figure 41 Application of wheelset back to back gauge

10.8.2 Maximum dimension

An attempt shall be made to insert the gauge between the wheels on the side marked **MAX**.

The gauge **should not** be able to be inserted between the wheels.

10.8.3 Minimum dimension

An attempt shall be made to insert the gauge between the wheels on the side marked **MIN**.

The gauge **should** be able to be inserted between the wheels.

10.9 Witness Groove Checking Gauge

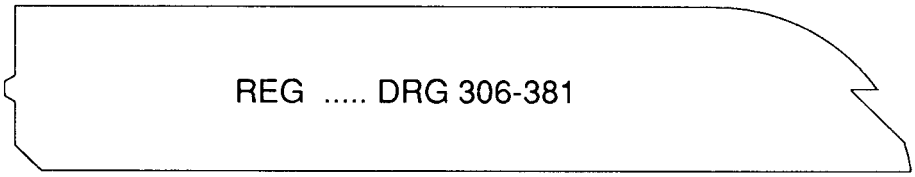


Figure 42 Witness groove checking gauge (Drg No. 306-381)

10.9.1 Using gauge to check size and location

Position the gauge on the wheel tread with the radius towards the tread as shown in Figure 43.

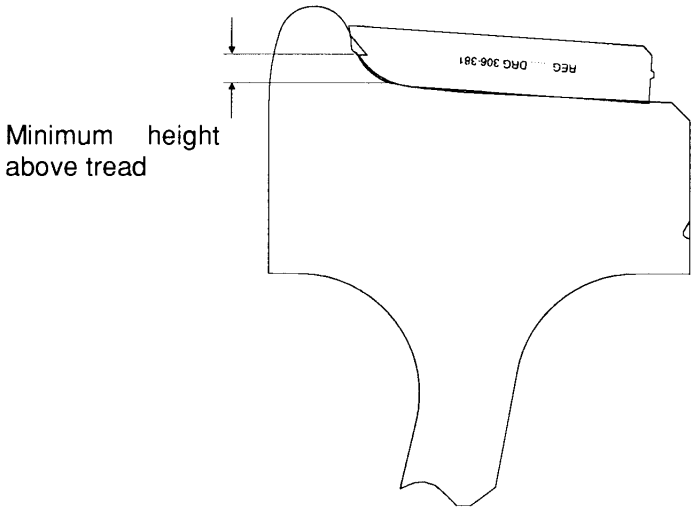


Figure 43 Checking the position of witness mark

The location of the groove shall be above the cutout on the gauge.

The groove depth shall also be checked.

This is done by positioning the gauge as shown in Figure 44.

If the maximum depth indicator does not contact the bottom of the witness mark it is too deep.

If the witness mark extends outside the allowable area, or the witness mark is too deep, an additional cut will need to be made to bring the witness mark within the specified maximum size.

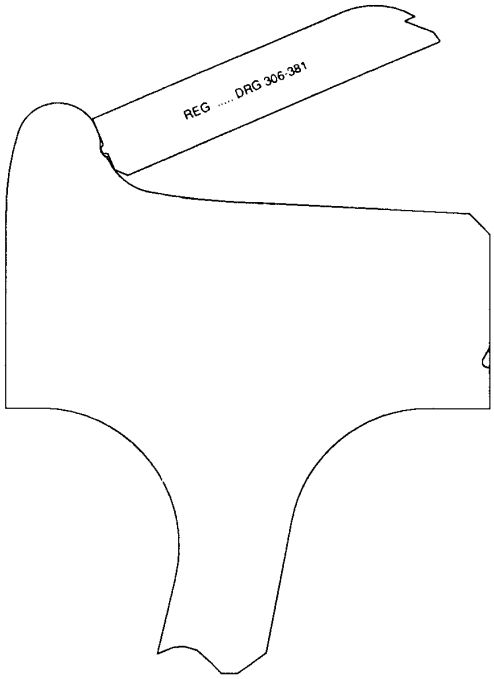


Figure 44 Checking the depth of the witness mark

11 Reference Documents

11.1 RIC Standards

RSS 0021	Carding of Freight Vehicles
RSS 0030	Wheel Defect Manual
RSS 0032	Bearing Reference Manual
RSS 0033	Non Destructive Testing of Axles
RSS 0034	Welding of Skidded Wheels in Situ
RSS 0036	Overhaul of Freight Axles
RSS 0037	Overhaul of Locomotive Axles
RSS 0038	Wheel Profile WRP 2000
RSS 0067	Abrasive Brake Blocks
RSS 0092	Specification for Axles
RSS 0094	Specification for Wrought Steel Wheels
RSS 0095	Specification for Case Hardened Gear Wheels and Pinions
RSS 0096	Specification for High Strength Axles for Locomotives

11.2 Drawings

37157	Contour gauge for (ANZR) full and 7/8 full flanges
206-328	Locomotive wheels – Rolled steel disc wheel 1016 mm diameter
207-661	Universal wheel tread profile measuring gauge
207-668	Freight wheel tread ‘no go’ profile gauge
303-235	920 diameter double wear rolled steel disc wheel
303-239	820 diameter double wear rolled steel wheel for 120 & 130 mm axle
303-243	920 diameter double wear rolled steel disc wheel for 120 mm axle
303-247	920 diameter double wear rolled steel disc wheel for 120 & 140 mm axle
305-614	920 diameter double wear rolled steel disc wheel for 130 mm axle
306-738	Standards ANZR wheel tread profile
306-357	Metal removal gauge
306-381	Gauge for witness groove in flange
306-579	Check gauge for back to back distance between wheels
306-609	Worn wheel profile –ANZR
306-610	Hegenscheidt underfloor wheel lathe test profile template (ANZR)
307-258	Wheel tread hollow ‘no go’ gauge

11.3 Other Standards

AAR M932 Appendix C

AS 1349	Bourdon tube pressure and vacuum gauges

