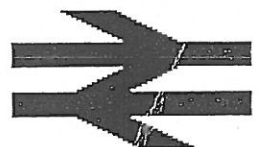


MT/288

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WHEELSET TREAD STANDARDS & GAUGING



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MT 288 "WHEELSET TREAD STANDARDS AND GAUGING"

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September 1996

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ISSUE & REVISION RECORD

This Standard will be updated when necessary by the distribution of revised pages, which shall show the Revision letter, and an update of this page which must also be replaced.

The amended or additional part of revised pages will be marked by a vertical black line in the adjacent margin.

When any future changes justify the distribution of a complete replacement, the next Issue number will be used, and this document must be withdrawn.

Issue	Revision	Date	Page(s) Affected	Revised by
1	A	Jan 1991	Whole Document	-
2	A	Sep 1996	Whole Document	M A G Jacob

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1. INTRODUCTION & PURPOSE

This document defines the standards to be maintained for wheel and tyre tread profiles applied to rail vehicles in service on Railtrack lines, and the gauges and methods to be employed, in particular:-

- i) The wheel tread profiles to be used.
- ii) The standards to be applied during wheel profiling.
- iii) The standards to be applied in service.
- iv) The tread gauges to be used and their methods of use.
- v) Permissible tread damage - (By reference to MT 162 and PO/CL 478).
- vi) Actions to be taken for overheated wheels and derailed wheelsets.

Since the last issue of MT288 there have been major re-organisational changes to the railway industry, including the introduction of Railway Group Standards, and a new issue of BS 5892 Pt 6 (1992). This latest issue of MT288 encompasses these changes and places the document in the category of a Business Standard. These standards are intended to comply with the relevant requirements of Group Standard GM/RT2020 "Policy for the Engineering of Wheelsets used on Railtrack Lines" and its subsidiary standards, in particular GM/RT2026 "Wheelsets : In Service Safety and Maintenance Attention."

This issue retains the dual feature of MT288 in comprising sections on standards, which are essentially for Operators and Owners to determine, and sections on procedures for gauging and examination, which are for Users at depots and workshops to carry out. The content has been modified to fully cover new and re-wheeled wheelsets, to allow wheelset assembly procedures to refer to MT288 for profiling and gauging. The Tables have also been updated to reflect rolling stock changes and new gauges available.

2. SCOPE

This document is applicable to the wheelsets of rail vehicles which run on Railtrack lines, including all British registered RIV vehicles, and foreign registered RIV vehicles running internally on Railtrack. Foreign registered RIV vehicles and EPS vehicles running in international traffic are outside the scope of this document, (refer to Group Standard GM/RT2020 and the applicable RIV or RIC Regulations, and EPS specifications.)

The requirements of this document shall apply to Owners or Operators of rail vehicles, and organisations engaged in the inspection, maintenance, repair and assembly of wheelsets, hereinafter referred to as Users.

The calibration of gauges is outside the scope of this document, but is covered by TM/TT0017 "Wheel Tread Calibration Standard" for approved gauges with BR Catalogue Numbers.

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3. POLICY FOR THE OWNER OR OPERATOR

- 3.1 In order to assure the safe operation of all vehicles on Railtrack lines, the Owner or Operator may specify this document, in part or whole, as a mandatory standard applying to their rail vehicles for compliance by their appointed Users, who may be part of the same organisation or a contracted organisation. The requirements to be met by Users are specified in Section 10. A vehicle registering body may also require an Owner or Operator to comply with this document as a condition of registration.
- 3.2 The Owner or Operator shall ensure compliance with this standard by issuing procedures and instructions as necessary, including frequencies and occasions when relevant examinations shall be made. These may be incorporated into maintenance and overhaul schedules and contracts which call up this document.
- 3.3 In some circumstances, the Owner or Operator may need to establish particular limits of wear to be applied at maintenance examination, to ensure minimum standards are not infringed before reaching the next examination. The Owner or Operator may also wish to establish tighter limits of wear for benefits such as ride performance or optimised wheel wear, if not already specified in this Standard. The Owner or Operator shall specify such additional limits in a separate standard or instruction.
- 3.4 The Owner or Operator shall state the requirements for special movement of vehicles with non-conforming wheel treads to a point of repair. This must be agreed with the authorities controlling the infrastructure, and shall comply with any applicable restrictions specified in Group Standard GM/TT0089.
- 3.5 The Owner or Operator is entirely responsible for the application of this standard and any supporting procedures and instructions, and for determining whether there is any requirement for their validation or certification by an authorised Certification Body to comply with external regulations.
- 3.6 When a supply chain exists between the Owner or Operator and User, all intermediary organisations shall ensure that the relevant requirements of this Standard are transferred without alteration unless approved by the Owner or Operator receiving the wheelset(s) for service. All parties in a supply chain shall promptly relay safety related information arising from the performance of this Standard (see also Group Standard GM/RT 2250).

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4. REFERENCED DOCUMENTS

British & International Standards

EN ISO 9000	Quality Management and Quality Assurance Standards
BS 5750	Quality Systems
BS 5892	Railway Rolling Stock Materials
BS 308	Engineering Drawing Practice

Railway Group Standards

GM/RT 2020	Policy for the Engineering of Wheelsets used on Railtrack lines
GM/RT 2026	Wheelsets: In Service Safety and Maintenance Attention
GM/RT 2250	Safety Performance Monitoring and Defect Reporting of Rail Vehicles and Plant & Machinery
GM/RT 2450 (formerly GM/TT 0182)	Qualification of Rail Vehicle Suppliers
GM/TT 0089	Geometric Interfaces Between Railway Wheelsets and Track
GM/RT 2025	Branding of Wheels, Tyres and Axles

Former British Railways Common Domain Specifications

MT162	Identification of Wheel & Tyre Tread Damage Requiring Remedial Action
MT240	Branding of Wheels, Tyres and Axles
MT 276	Examination Schedule for Preserved Steam Locomotives Running on BR Lines.
MT307	Frequency of Non-Destructive Axle Testing
PO/CL 478	Identification of Wheel and Tyre Tread Damage Requiring Remedial Action (Private Owner Vehicles)
TF/TT 0007	Regulations Governing the Examination and Lubrication of BR and Private Owner Freight Revenue and Departmental Rolling Stock
TM/TT 0017	Wheel Tread Gauge Calibration Standard
WOSS 612/10	Wheelset Overhaul Procedures

5. SUPERSEDED DOCUMENTS

MT 11	Tyre Profile and Wheel Gauges for Rolling Stock.
MT288	Issue 1 Wheelset Tread & Gauging Standards
Engineering Instructions -	G/627
	HC/654
	LG/52
	WF/311
	WF/316
	WF/323
	PO/CL 413
	PO/CL 448

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6. DEFINITIONS AND EXPLANATION OF TERMS

6.1 Wheel Profile/ Tread Profile

That part of the surface of a wheel or tyre between the flange back and the outside face of the wheel or tyre. The profile is made up of different sections shown in Fig 1.

6.2 Wheel Tread Rollover

A burr of extruded material forming on the outer rim side of the wheel during service (see Figure 2), generally associated with heavy brake block wear or excessive wheel diameter difference across an axle.

6.3 Profile Tolerance (formerly Form Tolerance)

A geometric tolerance for the newly-turned wheel profile, defined by a band of the stated width, equally disposed about the defined true form, within which the actual profile must lie (see BS 308 Pt3). Profiles which fall outside the Profile Tolerance may result in vehicle instability and unpredictable wear patterns.

6.4 Tread Run-out

The radial variation of position of the tread with respect to a fixed point during one complete revolution about the axle journals (see Appendix 1 Dimension H, and BS 5892 Part 6). Excessive tread run-out tends to increase during service, resulting in wheel imbalance.

6.5 Wheel Wobble/ Axial Run-out/ Back Flange Run-out

The lateral variation of position of the flange back face with respect to a fixed point during one complete revolution about the axle journals (see Appendix 1 Dimension G, and BS 5892 Part 6). Excessive wheel wobble may be an indicator of incorrect wheelset assembly, a loose tyre or a bent axle.

6.6 Witness Mark

An area of unmachined material which can remain after reprofiling a previously worn tread to demonstrate that the minimum of material has been removed (see Figure 3).

6.7 Tread Datum Position

A circle on the tread (around the circumference of the wheel), or a point on the cross-section through the tread, which is 70 mm from the back face of the flange (see Figure 4). Profile dimensions are specified relative to this datum, and many profile gauges use this as the reference point.

Note:- This is the same as the U.I.C. Tread Datum Position.

6.8 Flange Height

The difference between the radius of the wheel at the tip of the flange, and the radius of the wheel at the Tread Datum Position (dimension 'Y', see Figure 4).

6.9 Restricted Flange Height

For some vehicles, a Restricted Flange Height is specified, which is less than the nominal Maximum Worn Flange Height Limit for the profile (as given in Table 5 Dimension Z). This is generally applied to prevent vehicle instability arising if the tread is allowed to wear to a fully worn profile.

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6.10 Flange Thickness

The thickness of the flange at a point 13 mm above the Tread Datum Position (dimension 'W', see Figure 4).

6.11 Wheelset Back-To-Back Dimension

The dimension between the wheelset flange-back faces, measured parallel to the axle centreline, with the wheelset in the free (i.e. unloaded) condition. Wheelset Back-to-Back Dimensions outside the specified limits probably indicate incorrect wheelset assembly, a loose tyre or a bent axle.

6.12 Diameter Differential

The difference in diameter between wheels/tyres on an axle, or between wheelsets, measured at the Tread Datum Position, (see Appendix 1 Dimension L and L₁, and BS 5892 Part 6). The limits specified may depend on a variety of factors such as vehicle stability, suspension height settings, wheel speed sensing equipment, transmission or traction motor coupling between wheelsets.

6.13 Wear Allowance

The Wear Allowance is the amount by which the wheel radius can reduce, after profiling, before the wheel either requires its next reprofiling or scrap size is reached. The Wear Allowance is measured as the difference between as-machined and fully worn Flange Height, eg. for the P8 profile with no restrictions, Wear Allowance is 6.5 mm (see Table 5). Tighter limits than the nominal profile limits may apply when a Restricted Flange Height is specified, and sometimes a tighter Wear Allowance applies between Last Turning Size and Scrap Size for economical reasons. (See Tables 1, 2 & 3).

6.14 Last Turning Size

Last Turning Sizes are specified for Wheel Diameter and either Tyre Thickness or Rim Thickness (monobloc wheels). These are the minimum finished machining limits for the reprofiled wheelset to be returned to service, and run for a planned economical service life before reaching scrapping size.

6.15 Toe Radius Build-up

Extruded material on the flange tip (see Figure 5a). Generally indicates excessive diameter difference across the wheelset, heavy flange wear, brake-block side wear or running on worn rails.

6.16 Sharp Flange

A sharp corner on the flange tip (see Figure 5b). Similar causes and effect as Toe-Radius Build-up.

6.17 Throat Thickness (Monobloc Wheels Only)

The dimension between the root of the radius of the tread profile (flange root), and the underside of the flange-side wheel rim, measured at the narrowest point (dimension 'G', see Figure 6). The minimum or Scrapping Throat Thicknesses are set by the design strength of the wheel, and cannot therefore be infringed. The general limits are traditionally specified according to the size of the wheel bearings, although in reality they relate to axle loads and wheel forces.

6.18 Tyre Thickness

The thickness of a tyre as measured between the tyre bore and the Tread Datum Position (dimension 'B', see Figure 7).

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6.19 Rim Thickness (Monobloc Wheels Only)

The thickness of the wheel rim as measured between the Tread Datum Position and rim inside diameter, on the outer (non flange) side of one wheel (dimension 'C', see Figure 8). Rim thickness is used as an indicator of throat thickness, because they are geometrically proportional, see 6.17, and as a means to estimate wheel diameter.

6.20 Last Turning Groove

A groove machined on the outside of a monobloc wheel rim to indicate the wear of the tread. When the wheel is reprofiled to its Last Turning Size, the run-out of the profile chamfer is coincident with the outer edge of the Last Turning Groove (see Figure 10). The Last Turning Groove is, however, only an approximate indicator of tread wear - Throat Thickness (normally assessed by measuring Rim Thickness or Wheel Diameter) being the limiting criteria for monobloc wheels. Not all wheels have a Last Turning Groove.

6.21 R.I.V. Vehicles

International R.I.V. registered vehicles can be recognised by a 12 digit vehicle identification number and an anchor symbol painted adjacent. British registered R.I.V. vehicles will have the numbers 70 as the 3rd and 4th digits of the 12 digit vehicle identification number.

6.22 Flange Angle (q_R Dimension) - Foreign Registered RIV Vehicles Only

The distance in mm measured parallel to the axis of the axle, between the points 10 mm above the Tread Datum position and 2 mm below the tip of the flange (see Figure 9 Distance q_R).

6.23 New/Rewheeled/Retyred/Wheelset

A new or overhauled wheelset, which has new wheels or tyres, finish-machined (profiled) to the specified dimensions and wheel profile.

6.24 Reprofiled Wheelset

A wheelset which has previously run in service and has just had its treads finish-machined (reprofiled) to the specified dimensions and wheel profile.

6.25 (Fully) Worn Profile

A profile which has reached one or more of the wear limits, thereby rendering it unfit for further service. Profiles which have not yet reached the limits and are still fit for service are usually referred to as Part-Worn Profiles.

6.26 Tyre Security

The integrity of the wheel-centre/tyre joint. If tyre security is lost, a Loose Tyre is the resulting condition.

6.27 For the definitions of other terms used, refer to those given in Railtrack Group Standards, in particular GM/TT 0089

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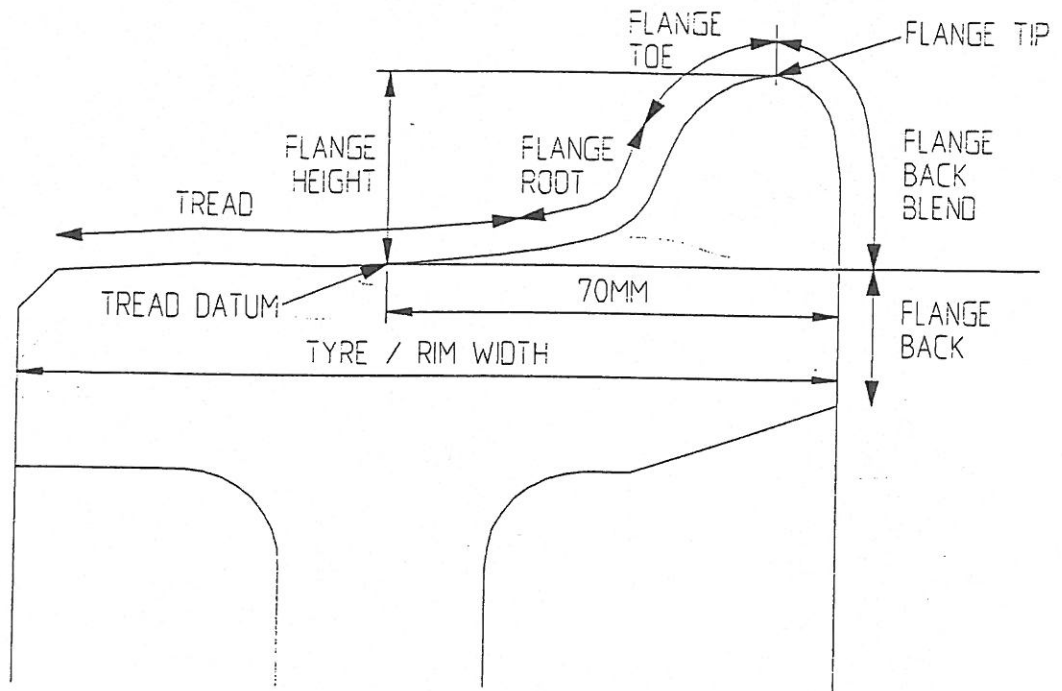


Figure 1 DEFINITION OF PROFILE

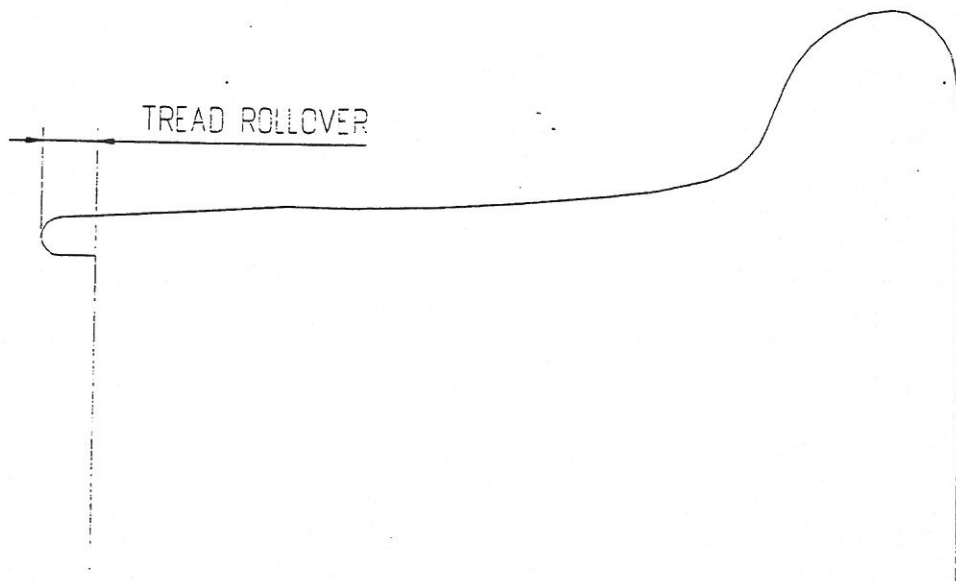


Figure 2 WHEEL TREAD ROLLOVER

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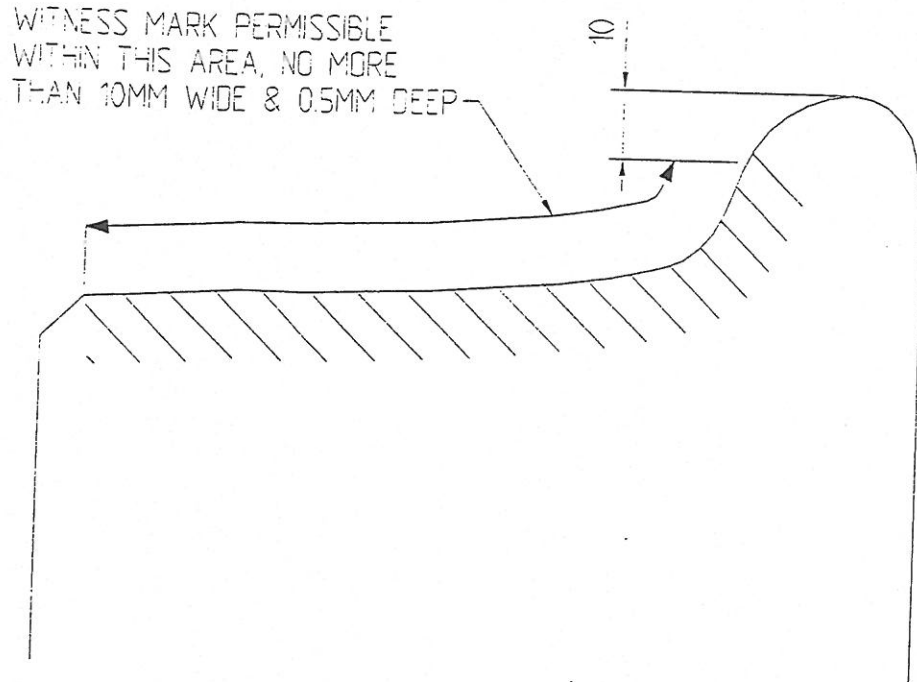


Figure 3 WITNESS MARK CRITERIA

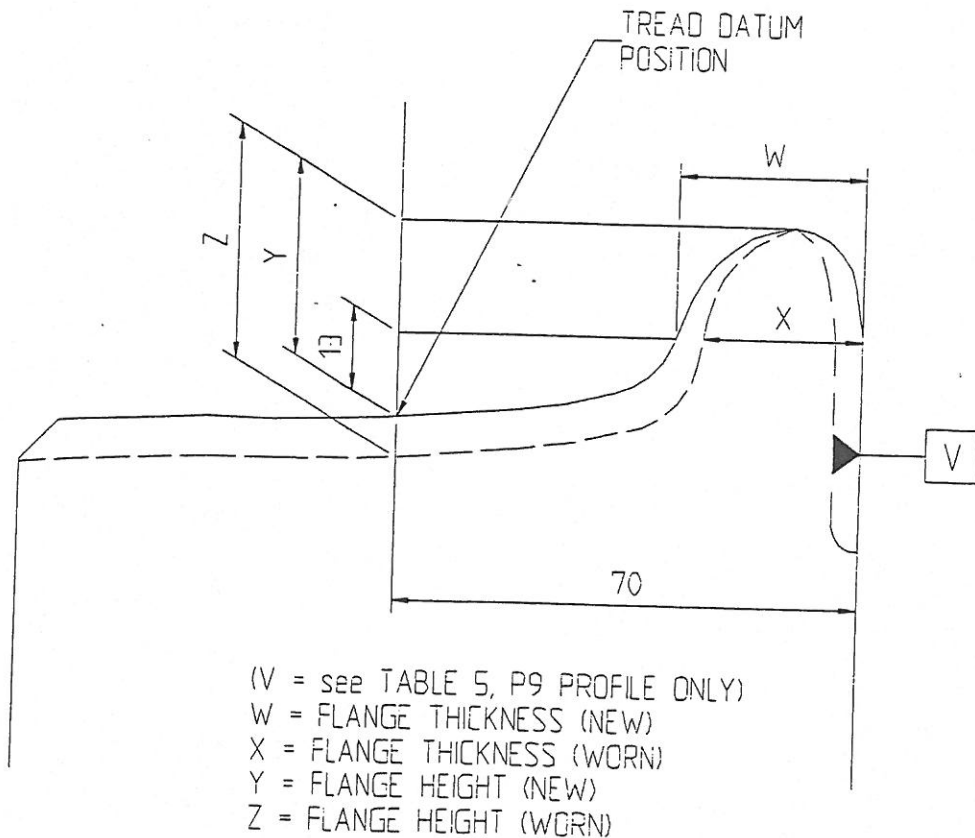


Figure 4 FLANGE HEIGHT & THICKNESS DATUMS

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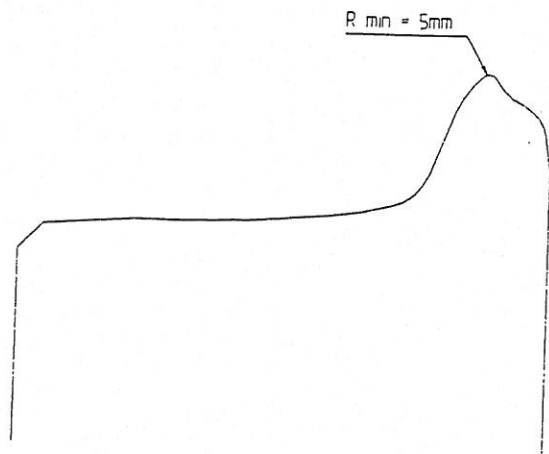


Figure 5a TOE RADIUS BUILD UP

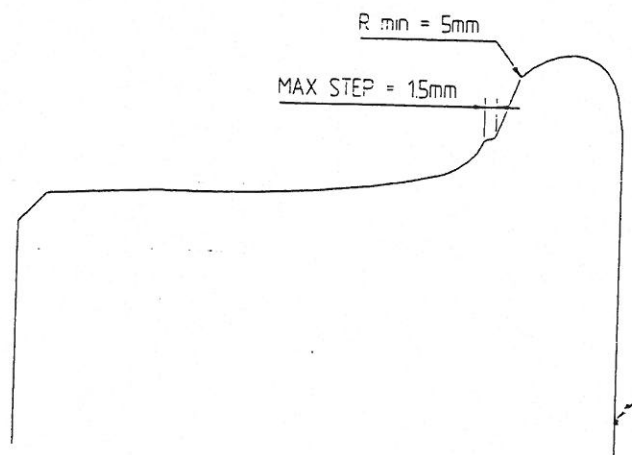
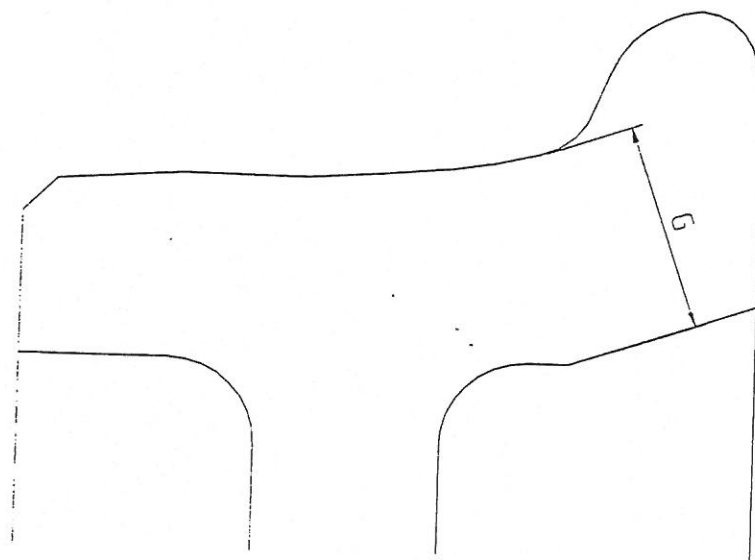


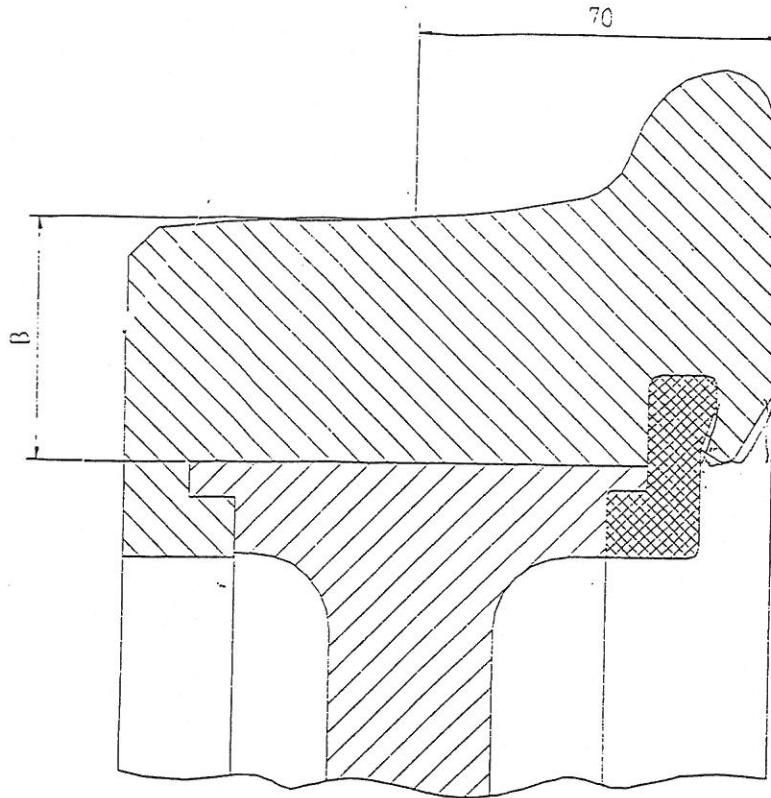
Figure 5b SHARP FLANGE



G = THROAT THICKNESS

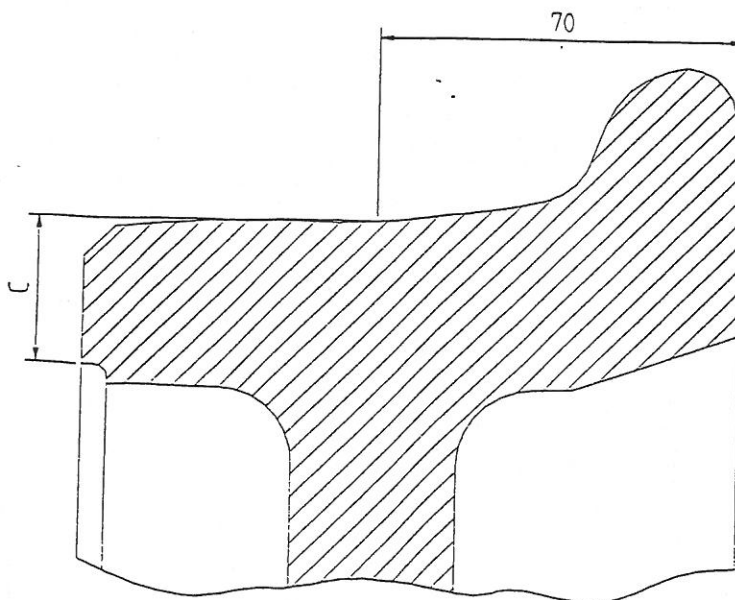
Figure 6 DEFINITION OF THROAT THICKNESS

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B = TYRE THICKNESS

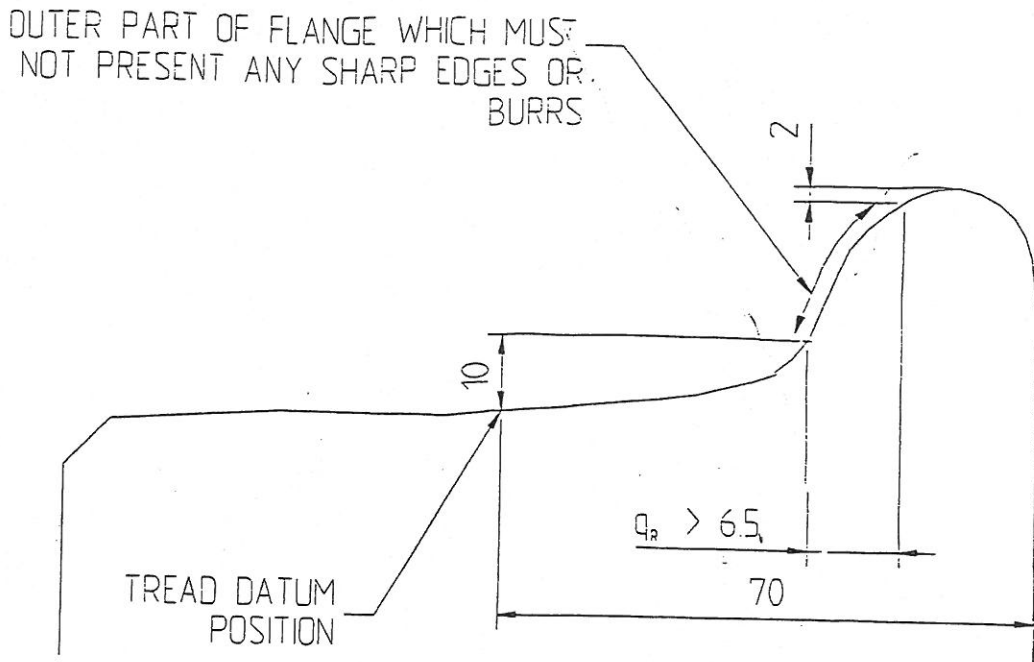
Figure 7 DEFINITION OF TYRE THICKNESS



C = RIM THICKNESS

Figure 8 DEFINITION OF RIM THICKNESS

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q_r = FLANGE ANGLE DIMENSION

Figure 9 FLANGE ANGLE REQUIREMENTS (RIV VEHICLES ONLY)

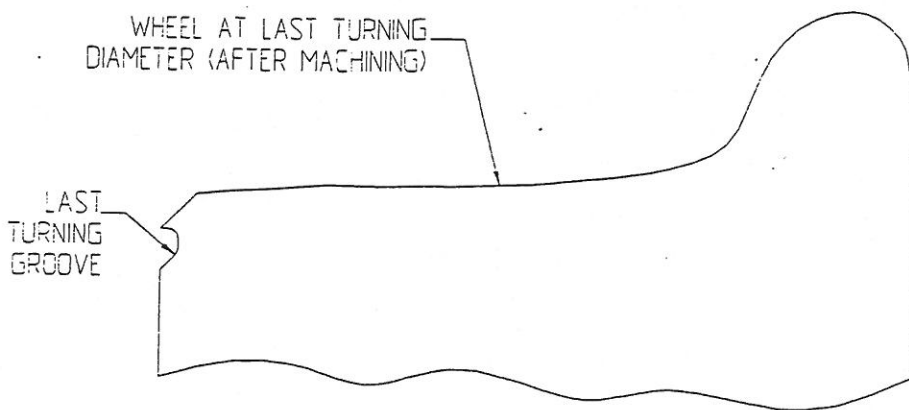
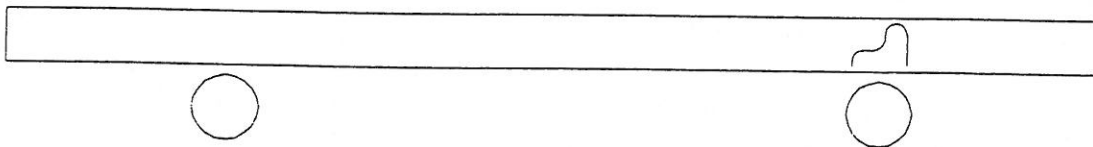


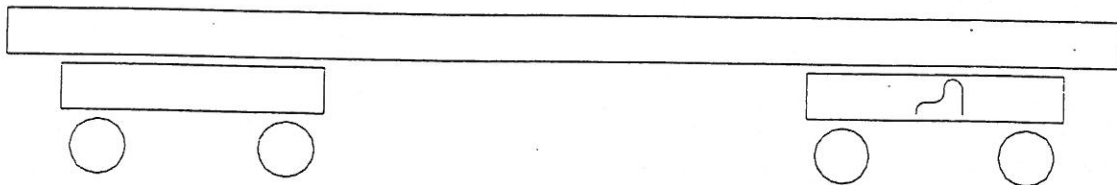
Figure 10 LAST TURNING GROOVE

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7. DESIGNATION OF WHEEL AND TYRE PROFILE TYPES
- 7.1 Wheel Profiles shall be as designated in Tables 1, 2, 3 and 4, with the relevant profile form to the drawings given in Table 5.
- 7.2 Wheelsets branded in accordance with GM/RT 2025 shall be stamped with the applicable wheel profile. Where the wheelset is interchangeable between classes of vehicle requiring different profiles, the Owner or Operator shall ensure the profile is applicable to the receiving class of vehicle, and that only the branding marks for this profile are stamped on the wheelset.
- 7.3 On 4 wheeled vehicles, the wheel profile applicable shall be painted on the solebar over the right hand wheel (see Figure 11), which is also designated Wheel Position No. 1.
- 7.4 On bogied vehicles, the wheel profile applicable shall be painted on the right hand bogie solebar (see Figure 12) between Wheel Positions No. 1 and 2. On Multiple Unit Vehicles, the absence of any profile indication on the bogie solebar shall indicate a P1 profile.
- 7.5 On vehicles with mixed wheel profiles (eg Class 08 locomotives), the relevant wheel profiles shall be painted adjacent to each wheel on the right-hand side.
- 7.6 Drawing C1-A4-9002407 specifies the wheel profile identification symbol for painting on rail vehicles.



Side Elevation
Figure 11 POSITION OF WHEEL PROFILE IDENTIFICATION
4-WHEEL VEHICLES



Side Elevation
FIGURE 12 POSITION OF WHEEL PROFILE IDENTIFICATION
BOGIE VEHICLES

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8. STANDARDS FOR WHEELSETS AFTER PROFILING

8.1 Application of Standards

Wheelset profiles which are placed in service, either as new or after reprofiling, shall meet the standards specified in this Section.

Procedures for inspection, measurement and gauging of wheelsets after profiling are specified in Section 11.

Additional limits or criteria to a higher standard may be imposed by the Owner or Operator for particular vehicles.

8.2 Profile Type, Tolerance and Condition

8.2.1 The wheel/tyre profile shall comply with the relevant profile drawing, shown in Table 5, with a geometric profile tolerance of $\pm 0.25\text{mm}$, unless tighter limits are specified. The profile tolerance requirements do not apply over the width of the Witness Mark if present (see Section 8.5).

8.2.2 The tread surface, including the flanges, shall be free of visible defects such as cracks, cavities, flats or spalling, and shall have a surface roughness of N10 or better. The Owner or Operator may specify partial exemption from this requirement in a separate procedure for "Economic Tyre Turning", although the limits specified in Railtrack Group Standard GM/TT0089 shall not be exceeded.

8.2.3 To avoid excessive removal of wheel material, back flange wear of up to 1mm is allowed to remain after reprofiling.

8.3 Profile Alignment

The profiles of wheels on the same axle shall be aligned relative to each other. There are presently no definitive limits for this, although operators should be aware that any misalignment of one profile relative to the other will affect wheelset conicity, and hence stability and curving performance; vehicle-specific tolerances may therefore be given on the wheelset assembly drawing or separate local procedure.

8.4 Tread Run-Out and Wheel Wobble (Axial Run-Out)

8.4.1 The run-out tolerances for new, re-wheeled and re-tyred wheelsets shall comply with the following table:-

Vehicle Types	Tread Run-out H(mm)	Wheel Wobble G(mm)
Mainline locomotives and all passenger carrying stock including multiple units operating at maximum speeds up to and including 200km/h	0.25 max.	0.40 max.
Freight stock operating at maximum speeds over 120km/h and up to and including 160km/h	0.30 max.	0.40 max.
Freight stock operating at maximum speeds over 100km/h and up to and including 120km/h	0.40 max.	0.50 max.
Freight stock operating at maximum speeds of up to and including 100km/h	0.50 max.	0.50 max.
All other stock and maximum speeds	See note (1)	See note (1)

Notes: See Section 6 and Appendix 1 for definition of H & G.

(1). The tolerances specified in BS 5892 Part 6 shall be applied

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- 8.4.2 Reprofiled wheelsets shall comply with the Tread Run-out Tolerances of 8.4.1, and shall have a maximum Wheel Wobble Tolerance of 0.75 mm.
- 8.4.3 Resilient wheels with re-conditioned centres shall comply with the Tread Run-out Tolerances of 8.4.1 and 8.4.2, and shall have a maximum Wheel Wobble Tolerance of 0.75mm when re-wheeled or re-tyred, and 1.0mm when reprofiled.
- 8.4.4 Wheelsets for RIV vehicles shall comply with the Tread Run-out Tolerances of 8.4.1 and 8.4.2, and shall have a maximum Wheel Wobble Tolerance of 0.75 mm when new, re-wheeled, re-tyred and reprofiled.

8.5 Witness Mark

Subject to tread condition, at reprofiling a Witness Mark of unmachined material may be left on the profile as indicated in Figure 3. The Witness Mark shall be no more than 10mm wide and 0.5mm deep and shall blend in smoothly with the machined area of the tread. The Witness Mark demonstrates optimum use of the wear material.

8.6 Wheelset Back-To-Back Dimension

The Wheelset Back-to-Back Dimension shall comply with the following:-

Wheelset Type	New/Rewheeled/Retyred Wheelsets	Reprofiled Wheelsets
Outside Bearings	1360 - 1362 mm	1360 - 1363.3 mm
Inside Bearings	1358 - 1360 mm	1358 - 1360 mm
Low Track Force bogie Inside Bearing Wheelsets	1360 - 1362 mm	1360 - 1362 mm

Notes: British registered RIV vehicle wheelsets with a Wheelset Back-to-Back Dimension of less than 1360 mm, shall at reprofiling on a contractors works, have the flange back faces machined equally, removing the minimum of metal to comply.

Where the wheel is branded in accordance with GM/TT 2025 or MT 240, the details shall be recorded prior to machining and be reinstated after machining..

8.7 Wheel Diameter

8.7.1 Wheel Diameters shall be contained within the limits specified in Tables 1, 2 and 3. For all other vehicles the limits shall be specified by the Owner or Operator (see also Section 8.9). Note that the 'New' diameter shall not be exceeded for new wheels as this may affect suspension heights.

8.7.2 The Wheel Diameter Differential between wheels/ tyres on an axle shall comply with the following tolerances:-

Dimension	Differences
Difference between L and L ₁ for wheels on the same axle.	0.25 mm max. for locomotives and passenger carrying stock, and all vehicles operating at speeds over 120km/h. 0.50 mm max. for freight stock operating at maximum speeds up to and including 120km/h.

See Section 6 and Appendix 1, for definition of L and L₁.

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8.7.3 The Wheel Diameter Differential between wheelsets under the same bogie and same vehicles are specified in Table 6. For other vehicles the owner/operator shall specify any tolerances that may apply.

8.8 Wheel Rim/Tyre Thickness

Wheel Rim and Tyre Thickness shall be equal to or greater than the last turning dimensions specified in Tables 1, 2 and 3. For all other vehicles the thickness shall be specified by the Owner or Operator. The last turning sizes take into account the wear allowance and maximum flange height (which may be restricted).

8.9 Throat Thickness (Monobloc Wheels)

8.9.1 The following Scrapping Throat Thicknesses define the absolute minimum thicknesses which shall not be infringed:-

Type of Bearing	Journal Diameter	Scrapping Throat Thickness
Plain	Less than 125 mm (5in)	30mm
	125 mm (5in) and above	36.5 mm
Roller	Imperial Sizes less than 4-7/8in BT10 & BT15 Wheelsets Class 465/2 (MCL) Wheelsets Other Metric Sizes less than 120mm	30mm
	4-7/8in and above 120mm and above incl. Class 465/0 & 465/1 Wheelsets & UIC wheelsets	36.5 mm
	Class 466 Wheelsets	38.5
	Freightliner wheelsets Axle mounted brake discs	44 mm
	Freightliner wheelsets Wheel mounted brake discs	41 mm

For the vehicles listed in Tables 1, 2 and 3 there are presently no specified 'last turning' sizes for Throat Thickness. However, the specified 'last turning' sizes for Rim Thickness will ensure the above limits are not infringed before the wear allowance is taken up during service.

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8.9.2 For freight vehicles on Railtrack lines and British Registered RIV vehicles, Throat Thickness is used to assess the last turning size for monobloc wheels. The Last Turning Throat Thickness sizes are specified below:-

Type of Bearing	Journal Diameter	Profile	Last Turning Throat Thickness
Plain	Less than 125mm (5in)	-	37.5 mm
	125mm (5in) and above	-	44 mm
Roller	Imperial less than 4-7/8in & Metric less than 120mm	P1	36.5 mm
		P5	34.5 mm
		P6 & P8	36.5 mm
		P10	35.0 mm
Roller	4-7/8in and above & 120mm and above	P1	43 mm
		P5	41 mm
		P6 & P8	43 mm
		P10	41.5 mm
	Freightliner Wheelsets Axle mounted Brake Discs		50.5 mm
	Freightliner Wheelsets Wheel mounted Brake Discs		47.5 mm

The Last Turning Throat Thickness Sizes for Class 465-466 EMU's are also stated as follows:

Roller	Class 465/0 & 465/1 Wheelsets	P8	39.5mm
	Class 465/2 Wheelsets	P8	36.5mm
	Class 466 Wheelsets	P8	45mm

8.10 Wheel Tread Rollover

Reprofiled wheels shall exhibit no tread rollover.

8.11 Tyre Security

The tyre and its retaining ring shall be secure at all times. Any evidence of looseness or overheating shall be examined and actioned in accordance with procedures specified by the Owner or Operator.

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9. STANDARDS FOR WHEELSET PROFILES IN SERVICE

9.1 Application of Standards

Wheelset profiles, in service, shall not be permitted to exceed or infringe the standards specified in this Section.

Procedures for inspection, measurement and gauging of wheelset profiles in service are specified in Section 12.

Additional limits or criteria to a higher standard may be imposed by the Owner or Operator for particular vehicles.

9.2 Profile Condition and Tread Damage

Any wheel and tyre tread damage shall be within the limits defined by MT162, with the following exceptions:

- i) Privately-owned freight vehicles and RIV vehicles shall comply with PO/CL478.
- ii) Any alternative limits specified by the Owner or Operator shall comply with GM/TT 0089.

9.3 Flange Height and Thickness

9.3.1 Flange Thickness shall not be less than the limits shown in Table 5.

9.3.2 Flange Height shall not exceed the limits shown in Table 5.

The Owner or Operator may specify a Restricted Flange Height limit to optimise depth of cut during reprofiling, particularly when tread wear is dominant or if vehicle stability cannot be maintained throughout the full wear allowance. See Tables 2, 3 and 4 to determine whether a restricted flange height is applicable.

9.4 Toe Radius Build-up/ Sharp Flange

The Flange Toe and Flange Tip may be adversely affected by Toe Radius Build-up and Sharp Flange effects, such as shown in Figs 5a and 5b.

9.4.1 There shall be no radius on the Flange Toe or Flange Tip less than 5 mm (Rmin in Figs 5a & 5b). This is equivalent to 1.4mm of build-up over a 7mm circumferential band.

9.4.2 There shall be no circumferential step in the flange profile greater than 1.5 mm in depth.

9.4.3 No cracks of any kind in the flange or within any Toe-Radius Build-up shall be permitted (see MT162 and Group Standard GM/TT0089).

9.5 Wheelset Back-to-Back Dimension

The Wheelset Back-to-Back Dimension shall comply with the following:-

Wheelset Type	In Service Wheelsets Back-to-Back Dimension
Outside Bearings	1360 - 1363.3 mm
Inside Bearings	1358 - 1360 mm
Low Track Force Bogie Inside bearing wheelsets	1360 - 1362 mm

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9.6 Wheel Diameter

9.6.1 Wheel Diameters shall not be less than the scrapping sizes given in Tables 1, 2 and 3. For all other vehicles, the Owner or Operator shall specify the scrapping sizes, which are generally determined by gauge clearances and suspension arrangement.

9.6.2 Wheel Diameter Differential limits in-service are set for mechanically coupled wheelsets only (see Table 6). For other wheelsets, there are no specified in-service limits; however, excessive diameter differential is likely to result in Toe-Radius Build-up (See Section 9.4).

9.7 Wheel Rim/Tyre Thickness

9.7.1 Wheel rim/tyre thickness shall not be less than the scrapping sizes given in Tables 1, 2 and 3. For all other vehicles, the Owner or Operator shall specify the scrapping size.

9.8 Throat Thickness (Monobloc Wheels)

9.8.1 The following Scrapping Throat Thicknesses define the absolute minimum thicknesses which shall not be infringed:-

Type of Bearing	Journal Diameter	Scrapping Throat Thickness
Plain	Less than 125 mm (5in)	30mm
	125 mm (5in) and above	36.5 mm
Roller	Imperial Sizes less than 4-7/8in BT10 & BT15 Wheelsets Class 465/2 (MCL) Wheelsets Other Metric Sizes less than 120mm	30mm
	4-7/8in and above 120mm and above incl. Class 465/0 & 465/1 Wheelsets & UIC wheelsets	36.5 mm
	Class 466 Wheelsets	38.5
	Freightliner wheelsets Axle mounted brake discs	44 mm
	Freightliner wheelsets Wheel mounted brake discs	41 mm

9.9 Wheel Tread Rollover

9.9.1 Wheel Tread Rollover shall not exceed 5 mm in width, measured from the outer rim face of the wheel (see Fig 2).

9.9.2 Cracking of Wheel Tread Rollover shall not extend into the tread profile or rim face (see Fig 1 and MT162).

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9.10 Flange Angle (RIV Vehicles)

The flange angle of RIV vehicles shall conform to the limit specified in Fig 9, ie.. dimension q_R shall be greater than 6.5 mm.

9.11 Tyre Security

The tyre and its retaining ring shall be secure at all times. Any evidence of looseness or overheating shall be examined and actioned in accordance with procedures specified by the Owner or Operator.

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10. WHEELSET PROFILE GAUGING - PRINCIPLES FOR THE USER (AT MAINTENANCE DEPOTS, WHEELSET ASSEMBLERS & REPAIRERS)

- 10.1 In order to verify that wheelset profiles comply with the standards in Sections 8 and 9, a process of inspection and gauging shall be carried out in accordance with Sections 11 for profiling and 12 for in-service examinations.
- 10.2 Inspection and gauging of wheelset tread condition shall be carried out at profiling, and at in-service frequencies and other occasions specified by the vehicle Owner or Operator.
- 10.3 Approved gauges and their methods of use are given in Section 11 for profiling, and Section 12 for in-service examinations.
- 10.4 Approved gauges (refer to 10.3), shall be calibrated in accordance with Technical Standard TM/TT0017 - Wheel Tread Calibration Standard. It is the responsibility of the holder of each gauge to maintain its calibration, and set re-calibration periods based on the gauge wear rate to ensure tolerance limits are not infringed.
- 10.5 Alternative gauges or methods may be used provided they are approved by the vehicle Owner or Operator and that they do not permit profiles to exceed the specified standards. Such alternatives may include automated systems and wheel lathes equipped with Statistical Process Control.
- The gauges or other measuring systems shall be calibrated or tested to a procedure or drawing approved by the vehicle Owner or Operator.
- 10.6 The datum points for gauges are as defined in Fig 4.
- 10.7 The User shall have a quality management systems in place which follows the principles of BS 5750 or ISO 9000.
- 10.8 The User shall be qualified in accordance with Group Standard GM/RT2450 (formerly GM/TT0182).
- 10.9 The User may be subject to external audit by authorised agencies.
- 10.10 The quality management system shall encompass the control of gauges, their storage, upkeep and calibration.
- 10.11 Staff shall be satisfactorily trained and equipped to undertake the requirements of this Standard, and there shall be processes to ensure that the requirements are consistently being met in practice.
- 10.12 Only personnel with the necessary competencies shall be permitted to carry out gauging and inspection as part of a process which determines whether a wheelset may enter traffic on Railtrack lines. This may require personnel to be certified under the Railways (Safety Critical Work) Regulations.

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11. WHEELSET GAUGING AT PROFILING

11.1 This section defines the gauges and their methods of use for wheelsets during profiling on ground and free-standing lathes, which require manual gauging to verify profile standards. This will clearly not apply to lathes which incorporate automatic Statistical Process Control facilities for checking and recording the specified profile standards. Refer to Section 8 for the standards to be achieved. Note that additional examinations of the wheelset are likely to be required before they can be delivered fit for service. These will be specified in the appropriate vehicle maintenance and overhaul schedules, or wheelset assembly, repair and overhaul specifications, whichever is applicable. In many cases, an Ultrasonic Axle Test is required (ref. MT307).

11.2 Profile Alignment

11.2.1 The Profile Alignment shall be checked at the start of each shift and on the first wheelset off, after changing, or refitting the templates.

11.2.2 Profile Alignment shall be checked using the Sliding Gauge BR Cat No. 39/28048 (Table 7 and Figure 13). The profile templates for the appropriate profile shall be attached to either end of the sliding bar, using the location dowels and knurled nuts provided.

11.2.3 Compress the sliding bar and fit the gauge to the wheel profiles, parallel with the axle, releasing the compression so that the gauging points are in contact with the treads and the flange backs.

11.2.4 Check the profiles, using the Go/No-Go Plug Gauge BR Cat No. 39/29763 (Table 7 & Figure 13). The Go Gauge shall enter, and the No Go Gauge shall not enter between points K - L & M - N on each profile template. If a Witness Mark has been left, the No Go Gauge may enter over the width of the mark. Back flange wear may allow the No Go end of the Plug Gauge to pass in the back flange area. This is only acceptable if the Witness Mark and back flange wear requirements for the individual profiles are met (see 11.3.4).

Note 1 When the Sliding Gauge is used on a wheelset carrying the weight of a vehicle, it may be necessary to fit the gauge to the profiles at the same height above rail as the axle (i.e. 3 o'clock or 9 o'clock positions on the wheel) and to release the brakes. This is to avoid errors due to axle deflection under load. (Additional safety precautions may be necessary to prevent the vehicle moving.)

Note 2 When the Profile Alignment has been checked and found correct, it is not necessary to carry out a separate check on the Profile Tolerance (see 11.3.2) except for back flange wear and witness mark limits.

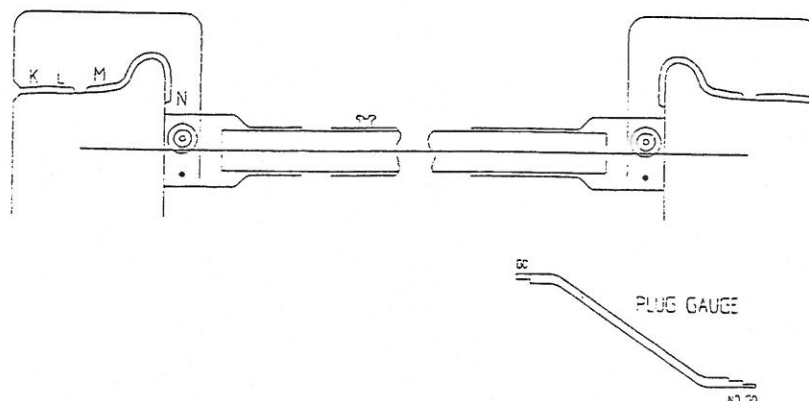


Figure 13 PROFILE SLIDING GAUGE

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11.3 Profile Tolerance and Condition

11.3.1 The Profile Tolerance and surface finish shall be checked at the start of each shift and on the first wheelset off after changing or refitting the templates. If Profile Alignment has been confirmed, Profile Tolerance does not require assessment unless Back Flange Wear and/or a Witness Mark have been allowed.

11.3.2 To confirm that the Profile Tolerance is correct, the appropriate Profile Limit Machining Gauge together with the Go/No-Go Plug Gauge, BR Cat No. 39/29763 (Table 7 and Figure 14) shall be used. Hold the Profile Limit Machining Gauge on the profile, perpendicular to the flange back and the tread surface, and in contact with these surfaces. Check the profiles using the Go/No-Go Plug Gauge. The Go end shall enter, and the No Go end shall not enter, between points K - L & M - N on the Profile Limit Machining Gauge. If a Witness Mark has been left, the No Go end may enter over the width of the mark. The No Go end may enter in the area of the flange back, if Back Flange Wear has been left.

Note:- Profile Identification Gauges do not verify the profile accuracy, and must not be used for this purpose.

11.3.3 The surface finish specified on the relevant profile drawing (Table 5) may be checked using the Surface Finish Sample Profile BR Cat No. 39/29006, or standard comparator block, or a hand-held measuring instrument (which must have a valid test certificate).

11.3.4 Back Flange Wear

To avoid excessive removal of wheel material, Back Flange Wear of up to 1mm is allowed to remain after reprofiling. To gauge Back Flange Wear, the alternative Plug Gauge, BR Cat No. 39/29826 must be used, in conjunction with the Profile Limit Machining Gauge.

- If the Plug Gauge does not enter, then the Back Flange Wear is acceptable.
- If the Plug Gauge enters the slot, it should be lowered from the flange toe towards N. If the gauge becomes trapped at or above the zero datum of the calibrated section, then the Back Flange Wear is acceptable.
- If the centre of the Plug Gauge aligns with a number on the graduated scale, this indicates the radial depth of cut in mm required to make the profile acceptable (see Fig 14.)

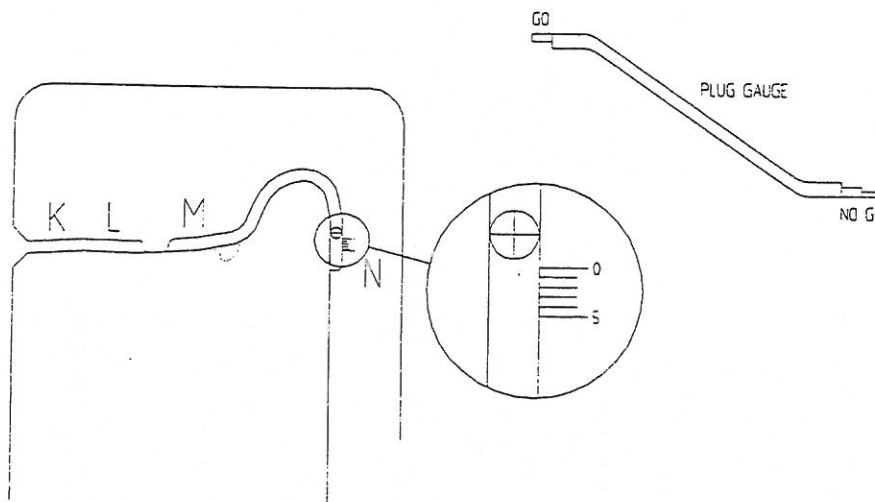


Figure 14 PROFILE LIMIT MACHINING GAUGE & PLUG GAUGE

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11.4 Tread Run-out and Wheel Wobble

A check for Tread Run-out and Wheel Wobble is only required for new, rewheelled or re-tired wheelsets using a dial indicator or inbuilt measuring facility. For wheelsets being reprofiled in service, 100% checking is not required. However, checks at locally determined intervals shall be carried out as part of the wheel lathe maintenance programme, (unless there is an automatic self-check).

11.5 Wheelset Back-to-Back Dimension

11.5.1 The Wheelset Back-to-Back Dimension for all outside bearing wheelsets shall be checked using the appropriate Go/No-Go Gauge for Distance Between Wheels (Table 7 and Fig 15.) For inside bearing wheelsets, use a 1358-1360mm Go/No-Go Gauge approved by the Owner or Operator, or follow the method given in 11.5.4.

11.5.2 Where the wheelset concerned is being gauged following derailment, the Wheelset Back-to-Back Dimension shall be gauged at four equi-spaced points about the wheelset to check for a bent axle.

11.5.3 The Gauge shall be used on wheelsets under vehicles with the brakes released, and wherever possible relieved of vehicle weight. Failing this, it shall be applied at the same height above rail as the axle (i.e. 3 o'clock or 9 o'clock positions on the wheel). This is to avoid errors due to normal axle-deflection from the vehicle weight. This can usually be accomplished by jacking up the axleboxes and rotating the wheelsets, or by moving the vehicle. (Additional safety precautions may be necessary to prevent the vehicle moving accidentally.)

11.5.4 If it is required to measure precise Wheelset Back-to-Back Dimensions, this shall be done using a calibrated internal micrometer, or the Go/No-Go Distance Gauge in conjunction with feeler gauges.

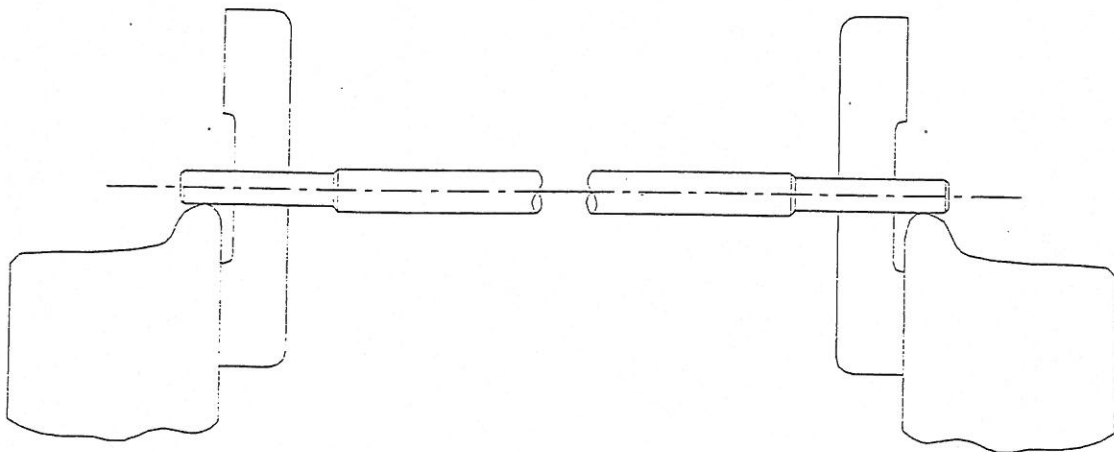


Figure 15 GO/ NO-GO GAUGE FOR DISTANCE BETWEEN WHEELS

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11.6 Wheel Diameter

11.6.1 Wheel Diameters shall be determined by use of calibrated equipment built into wheel lathes, or by an External Tread Diameter Comparison Gauge BR Cat No. 39/29975 (Table 7 and Figure 16) used in conjunction with a calibrated internal micrometer. Use the Comparison Gauge as follows:-

- a) Adjust the gauge to the correct range using the knurled nuts and the sliders for the dial gauges and the anvil.
- b) Locate the gauge over the wheel with ball locations against the flange back, and the anvil contacting the tread.
- c) Slide the dial gauge end circumferentially along the tread, and note the highest reading.
- d) Remove from the wheel, insert the internal micrometer, adjust the micrometer until the same dial gauge reading is obtained and read off the wheel diameter.

Alternative "Versine" type diameter measuring devices are listed in Table 7.

11.6.2 For diameter differential across a wheelset, the External Tread Diameter Comparison Gauge shall be used as in a) to c) above, note the dial gauge reading and without readjusting the gauge, repeat b) and c) for the other wheel. The difference in dial gauge reading gives the difference in diameter.

11.6.3 As a rough guide the Wheel Rim Thickness, measured with the Wheel Rim Thickness Gauges may be used to estimate diameter difference through a vehicle with monobloc wheels (see Section 11.8). Twice the difference in gauge reading being the difference in diameter. For example:

Max. and Min gauge readings: 38 and 32mm
diameter difference: $2 \times (38 - 32) = 12\text{mm}.$

This method may only be considered to give the diameter difference to +/- 2mm, and should not be used where greater accuracy is required (eg mechanically-coupled wheelsets and certain creep-controlled wheelsets.)

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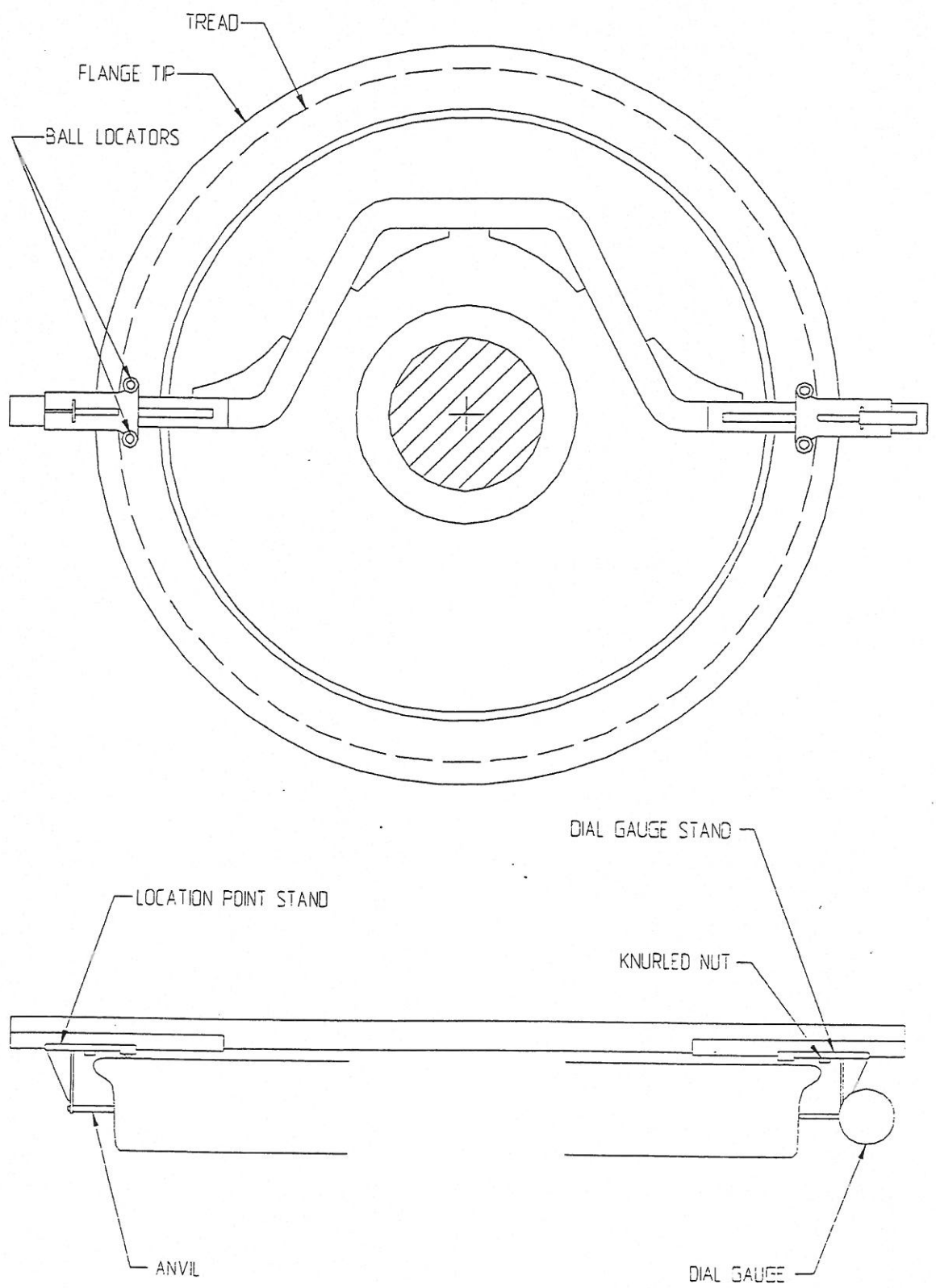


Figure 16 EXTERNAL TREAD DIAMETER COMPARISON GAUGE

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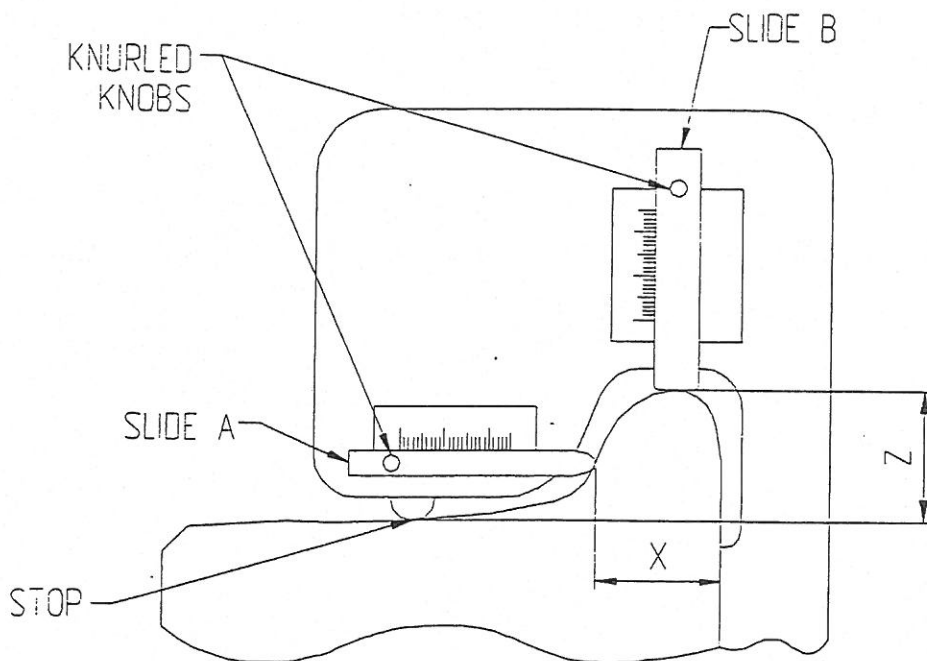
11.7 Flange Thickness and Height

11.7.1 Measurements of Flange Thickness and Height are useful in assessing the level of wear of the existing tread prior to machining. This information assists in the selection of a suitable depth of cut on the lathe.

11.7.2 For the measurement of actual Flange Thickness and Height, the Adjustable Flange Thickness and Height Gauge BR Cat No. 39/29967 shall be used (Table 7 and Figure 17). Open out both slides, hold the gauge squarely on the flange back, and draw down on to the profile at right-angles to the tread surface. Check that the gauge remains correctly located, in contact with both the flange back and tread datum position. Move the sliders into position, against the tread and flange. Read off the measurements.

11.7.3 Alternatively, calibrated gauges to Drawing Number SL-SW-3412 may be used in conjunction with the following procedure:

Open out the slides, hold the gauge squarely on the flange back, and draw down onto the profile at right-angles to the tread surface. Clamp the gauge to the tread ensuring that the flange tip is in contact with the gauge. Move the flange height slider into contact with the tread and then the flange thickness slider. Read off the measurements.



X = FLANGE THICKNESS
Y = FLANGE HEIGHT

Figure 17 ADJUSTABLE FLANGE THICKNESS & HEIGHT GAUGE

11.8 Wheel Rim/Tyre Thickness

11.8.1 Some monobloc wheels have a Last Turning Groove, which may be used as a guide when the wheel rim is getting close (see Definition 6.18), and should be followed up with gauging as below.

11.8.2 To determine the thickness of a monobloc wheel rim, use the Rim Thickness Gauge BR Cat No. 39/28032 or 39/28033 (Table 7 and Figure 18). Hold the gauge square and radially on the outer face of the wheel rim

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with the anvil in contact with the inner rim diameter. Depress the trigger, and slide the cursor tip down on to the tread, release the trigger, remove the gauge from the wheel and read off the dimension. The alternative gauge has a push button in place of a trigger and varies slightly in appearance; the method of use is the same.

- 11.8.3 To determine the thickness of a tyre, use the Rolling Stock Tyre Thickness Gauge BR Cat No. 39/29799 (Table 7 and Figure 19). Hold the gauge square and radially on the outer face of the tyre, with the slide set to clear the inner diameter of the tyre. Draw the slide into contact with the inner diameter of the tyre, and lock in position. Remove from the tyre, and read off the dimension at the applicable datum line - "LOCO" or "C&W".

Due to changes in tyre assembly techniques, the former Locomotive Tyre Thickness Gauge must no longer be used. Measurements for all types of tyre shall be made with the Rolling Stock Tyre Thickness Gauge.

- 11.8.4 Should there be any doubt as to the acceptable diameter/rim thickness of a monobloc wheel, the Throat Thickness shall be measured (see Section 11.9).

Notes for tyred wheels.

- a) Calibrated gauges to BR Cat No. 39/29778 may also be used on rolling stock.
- b) New Tyre Thickness maybe up to 5mm greater than that specified in Tables 1, 2 and 3. This occurs if the wheel centre diameter is reduced to the minimum permissible after successive overhauls (see WOSS 612/10).
- c) Tyre Thickness cannot be used to give an accurate indication of Wheel Diameter, as the wheel centre diameters may vary through a vehicle and across a wheelset.
- d) Where wheel centre diameters vary across a wheelset, the minimum Tyre Thickness (associated with the largest wheel centre), shall be assessed against scrapping criterion.

11.9 Throat Thickness

- 11.9.1 It is not necessary to check for minimum Throat Thickness where a corresponding Rim Thickness or Wheel Diameter has been defined (see Tables 1, 2 & 3).
- 11.9.2 In all other cases, the appropriate Throat Thickness Gauge BR Cat No. 39/29968 or 39/29969 (Table 7 and Figure 21) shall be used over an area free from balance correction, (ie. avoid balance weights or areas where metal has been locally ground away). Close the gauge over the flange throat. If the stop of the gauge is contacted, the wheel is either at or below the scrapping thickness 'G', and shall not be allowed to run.
- 11.9.3 For Freight vehicles only, Throat Thickness shall also be used to assess the last turning diameter (see Table in Section 8.9.2). For this purpose, the Adjustable Throat Thickness Gauge BR Cat No. 39/28038 (Table 7 and Figure 22) shall be used over an area free from balance correction, (ie. avoid balance weights or areas where metal has been locally ground away). Close the gauge over the flange throat, and read the Throat Thickness off the scale.

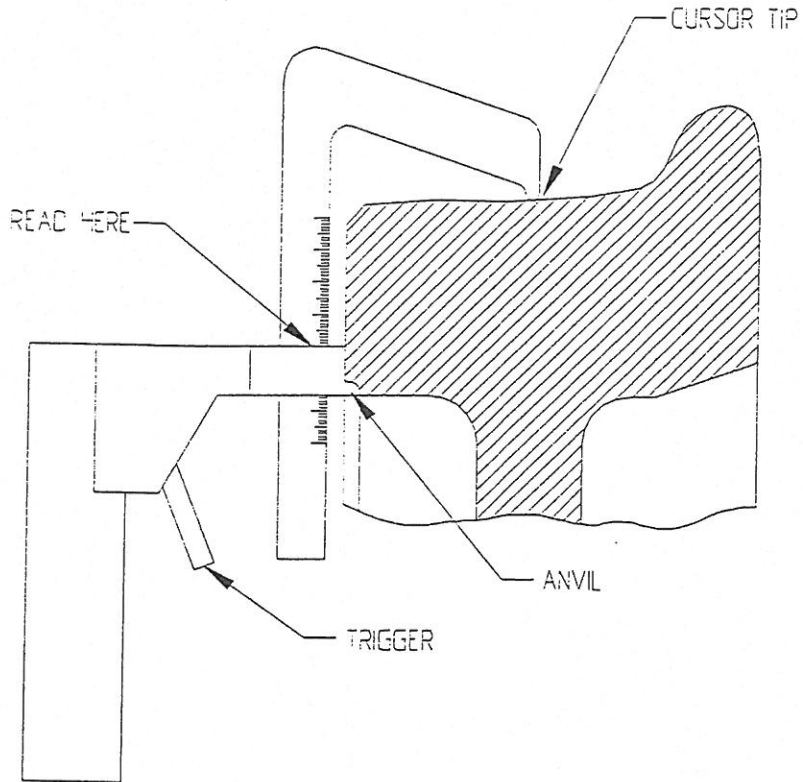


Figure 18 RIM THICKNESS GAUGE

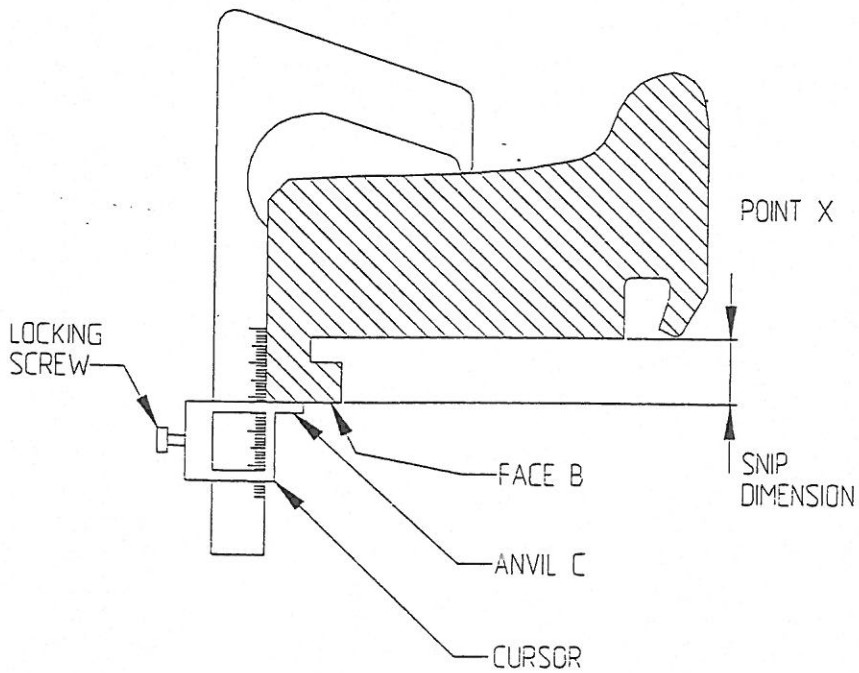


Figure 19 TYRE THICKNESS GAUGE

Figure 20 Not Used

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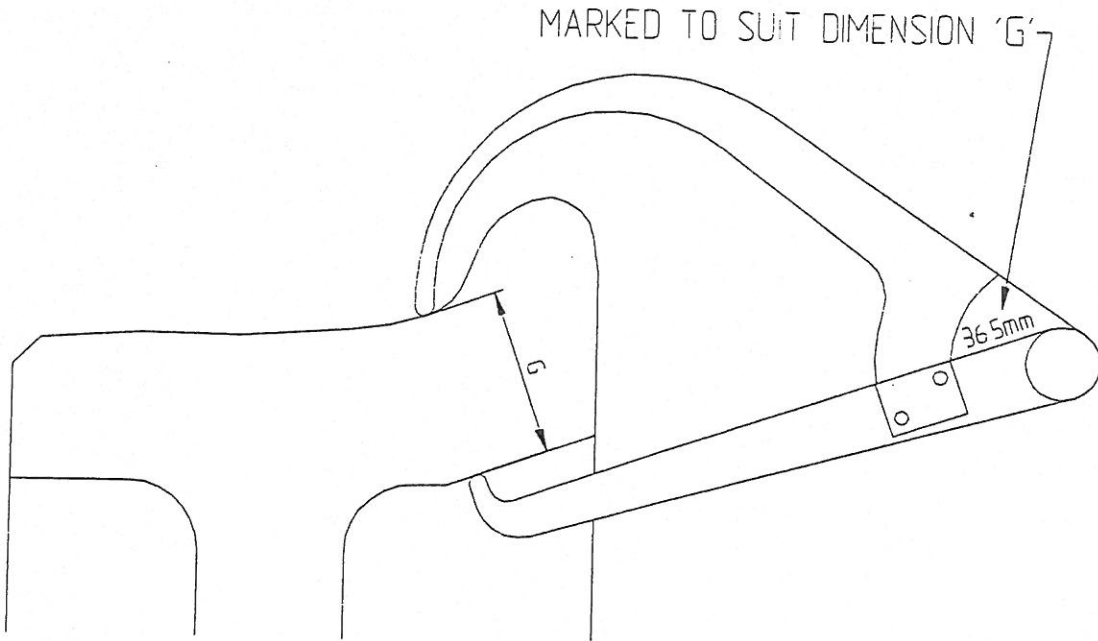


Figure 21 GO/NO-GO THROAT THICKNESS GAUGE

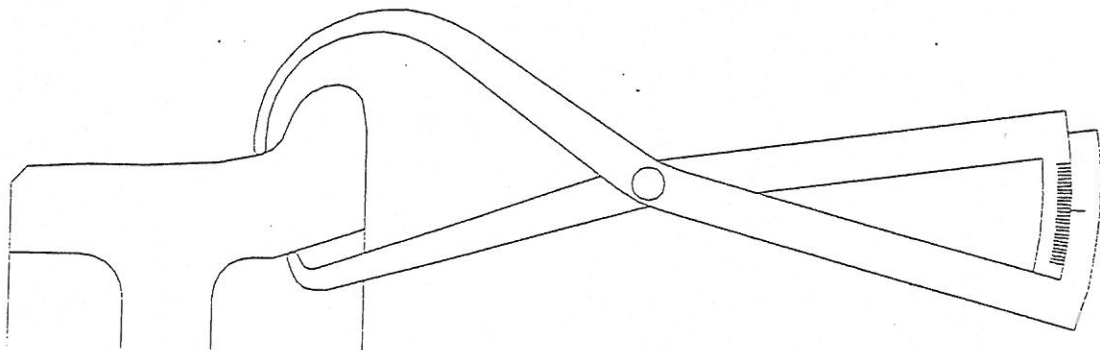


Figure 22 ADJUSTABLE THROAT THICKNESS GAUGE

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12. WHEELSET GAUGING & INSPECTION OF TREAD CONDITION - IN SERVICE EXAMINATION

12.1 This section defines the gauges and methods of use for checking wheelset profiles at maintenance depots, as part of the routine maintenance plan and for checking the tread condition of wheelsets reported for damage, rough riding, derailment or other abnormality. Refer to Section 9 for the standards to be achieved. Note that additional examinations of the wheelset are likely to be required before they can be declared fit for further service. These will be specified in the appropriate maintenance schedule or instruction, including the frequency and other occasions of examination.

12.2 Flange Thickness and Height

12.2.1 Flange and tread wear in service shall be assessed using appropriate Go/No-Go Gauges or the Adjustable Flange Thickness and Height Gauge BR Cat No. 39/29967 (Table 8).

12.2.2 Flange Thickness acceptability is determined by holding the appropriate Flange Thickness and Height Go/No-Go Gauge (Table 8 and Figure 23), with face 'A' squarely on the flange back, and draw down on to the profile at right-angles to the tread surface. Acceptable profiles are indicated by the gauge contacting the profile only at the flange. If the gauge contacts the tread, then the profile is not acceptable. A graduated scale is provided on the gauge for the measurement of wheel flats, cavities etc.

12.2.3 Flange Height acceptability is determined by using the appropriate Flange Thickness and Height Go/No-Go Gauge, with Face 'B' squarely on the flange back, and draw down on to the profile at right-angles to the tread. If the gauge contacts the flange tip, then the profile is not acceptable. Acceptable profiles have the gauge contacting the profile only on the tread, with a clearance at the flange tip.

Where a Restricted Flange Height limit of 33mm or 34mm is indicated in Tables 2, 3 or 5, use the Restricted Flange Height Gauge BR Cat No. 39/29830 (Table 8 and Figure 24). Place the vertical face squarely on the flange back, and draw down on to the profile at right-angles to the tread. If the gauge contacts the flange tip, then the profile is not acceptable. Acceptable profiles have the gauge contacting the profile only on the tread, with a clearance at the flange tip.

12.2.4 Where actual Flange Thickness and Height are required, measure using the Adjustable Flange Thickness and Height Gauge BR Cat No. 39/29967 in accordance with 11.7.2.

12.3 Flange Angle (RIV Vehicles Only)

Flange Angle acceptability is determined by use of the RIV Flange Angle Gauge BR Cat No. 39/29231 (Table 8 and Figure 25). Place the gauge squarely in position on the profile, at right-angles to the tread surface, and draw the gauge into contact with the flange. If the gauge contacts near to the flange tip, i.e. point C, the profile is not acceptable. If only the corner of the gauge close to the flange root contacts the flange face, i.e. point B, then the profile is acceptable.

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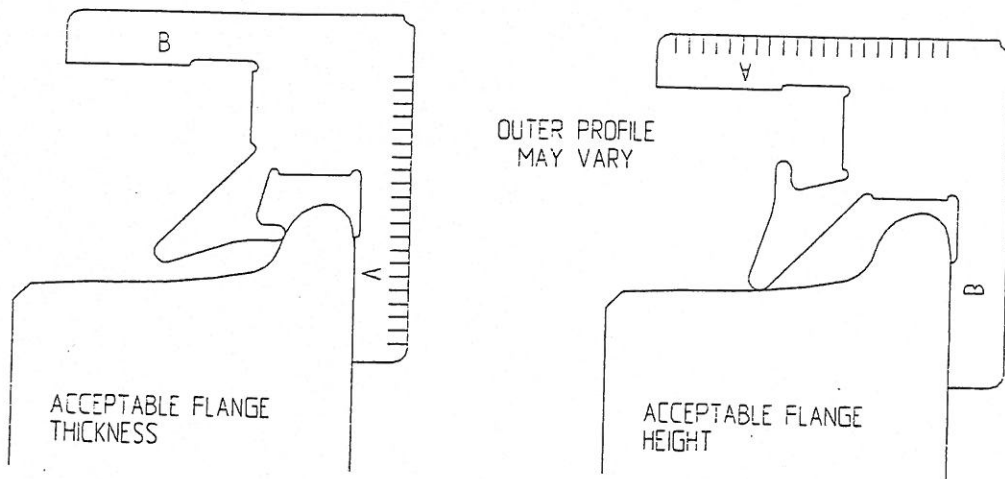


Figure 23 GO/NO-GO FLANGE THICKNESS & HEIGHT GAUGE

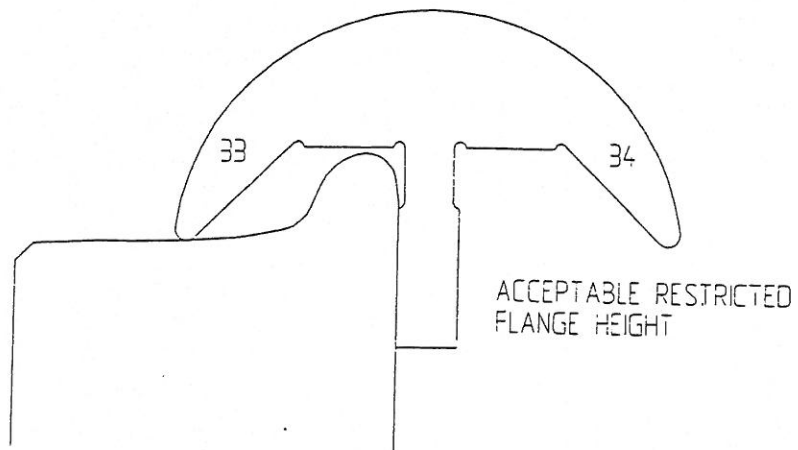


Figure 24 GO/NO-GO RESTRICTED FLANGE HEIGHT GAUGE

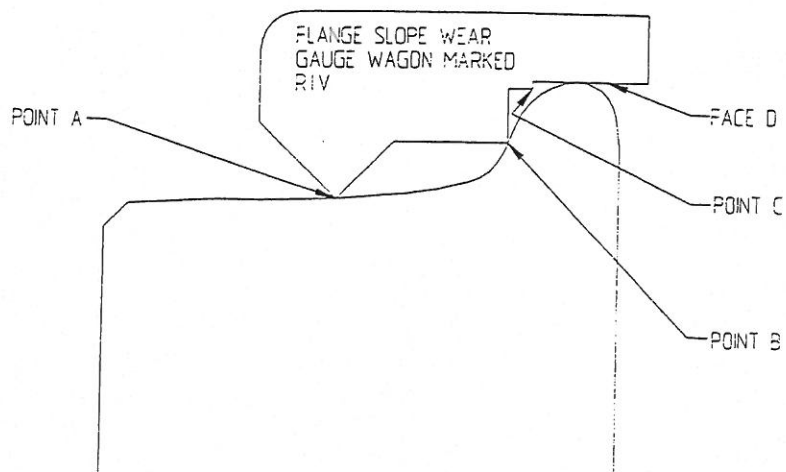


Figure 25 RIV FLANGE ANGLE GAUGE

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12.4 Toe Radius Build-up or Sharp Flange Gauging

The corners of the Go/No-Go Flange Thickness and Height Gauges (Table 8 & Figure 26) have a 5mm radius cut-out. Apply this radius to the flange toe section, where build-up or a Sharp Flange tip is evident. If any part of the flange toe makes contact with the concave portion of the Gauge, then the profile is not acceptable. The presence of Toe Radius Build-up or a Sharp Flange is likely to be due to excessive Wheel Diameter Difference across an axle.

Measure the depth of any circumferential step in the flange using a steel rule. Any step greater than 1.5mm is not acceptable.

If there are any cracks in the flange or within any Toe Radius Build-up, the wheelset must be withdrawn from service immediately and sent for reprofiling or overhaul.

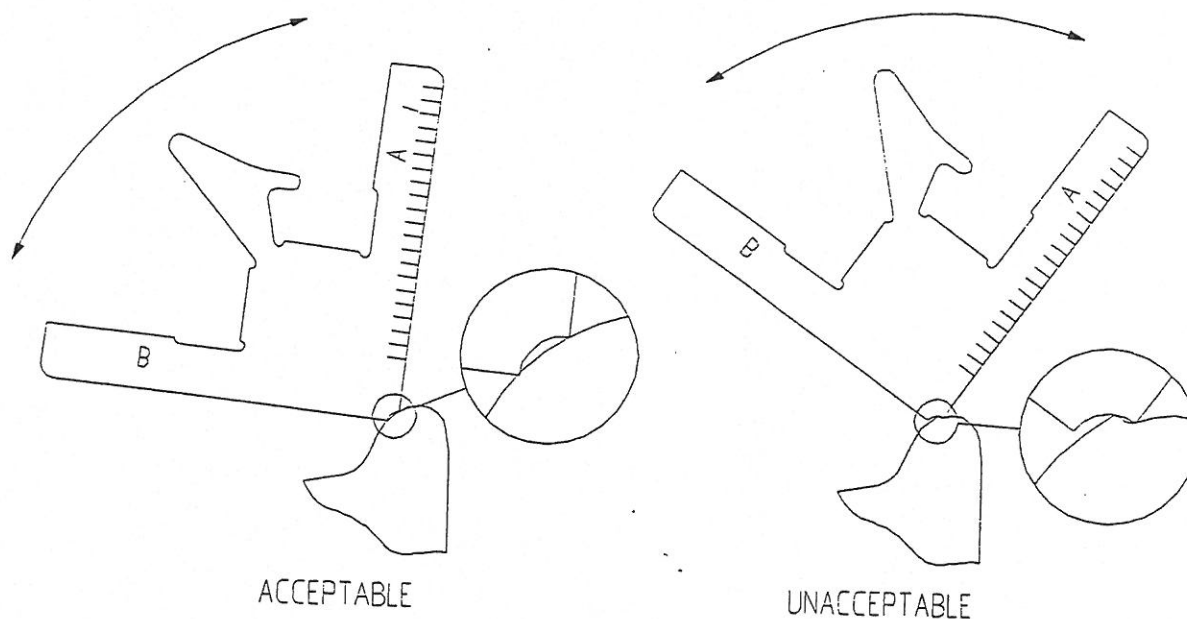


Figure 26 GAUGING FLANGE TOE RADIUS

12.5 Wheel Rim/ Tyre Thickness

When wheels are approaching scrapping size, measure Rim/Tyre Thickness in accordance with 11.8.2 and 11.8.3. If the limit is reached, the wheelset shall be taken out of service and sent for overhaul.

12.6 Wheel Diameter

Wheel Diameters need to be measured directly only when wheel rim/ tyre scrapping thicknesses are not quoted, or when accurate diameter difference must be determined see Section 9.6, or when abnormal tread wear is observed. An External Tread Diameter Comparison Gauge BR Cat No. 39/29975 (Table 8 and Figure 16) is used in accordance with 11.6.1 & 11.6.2. The cause of abnormal diameter difference should be investigated and rectified.

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12.7 Throat Thickness

For wheelsets where neither scrapping Rim/ Tyre Thickness nor scrapping Wheel Diameter are defined, the Throat Thickness shall be checked in accordance with 11.9.2.

12.8 Profile Condition, Tread Damage, Tread Rollover and other Abnormal Types of Damage

These are assessed against the standards specified in Section 9.2 & 9.9, without any need for routine gauging.

Any abnormal types of damage, defects or wear shall be examined and accurately measured as far as practicable. The wheelset shall be taken out of service or quarantined, if it cannot be adequately assessed against the standards defined in this document or by a separate instruction issued by the Owner or Operator. A written report of the examination shall be forwarded to the Owner or Operator, who shall determine a course of action for the wheelset.

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13. OVERHEATED WHEELS

13.1 When wheels or tyres are found to have overheated, or suspected of having overheated, an examination shall be carried out in accordance with procedures specified by the vehicle Owner or Operator. This shall always include a check of Wheelset Back-to-Back dimension in accordance with Sections 9.5 and 11.5, and any relevant checks in Section 12.

The results of this check shall be recorded as part of the incident report.

13.2 Note the requirements of Section 3.4 for the movement of vehicles with non-conforming wheelsets.

14. WHEELSETS INVOLVED IN DERAILMENT

14.1 For Freight, Private Owner and Departmental vehicles, derailed wheelsets shall be examined in accordance with TF/TI0007 - Regulations Governing the Examination and Lubrication of BR and PO Freight Revenue and Departmental Rolling Stock.

14.2 For all other rail vehicles, irrespective of location, the wheelsets shall be examined in accordance with procedures specified by the vehicle Owner or Operator. This shall include the following checks:-

14.2.1 Ultrasonically test the axle in accordance with the relevant NDT procedure chart.

14.2.2 Check the Wheelset Back-to-Back Dimension in accordance with Sections 9.5 and 11.5.

14.2.3 Check Flange Thickness and Height in accordance with Sections 9.3 and 12.2.

14.2.4 Check flange toe radius and sharp flange features in accordance with Sections 9.4 and 12.4.

14.2.5 Check for tread flats and damage in accordance with MT 162.

14.2.6 Check the diameter differential across the wheelset in accordance with Sections 9.6 and 11.6.2.

14.2.7 Check Flange Angle for RIV vehicles only, in accordance with Sections 9.10 and 12.3.

The above list is by no means exhaustive for a full post-derailment examination.

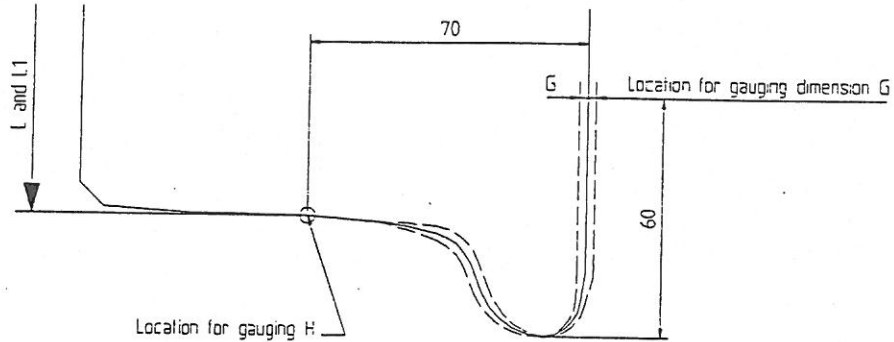
14.3 The results of the checks specified in 14.1 or 14.2 shall be recorded as part of the incident report.

14.4 Note the requirements of Section 3.4 for the movement of vehicles with non-conforming wheelsets.

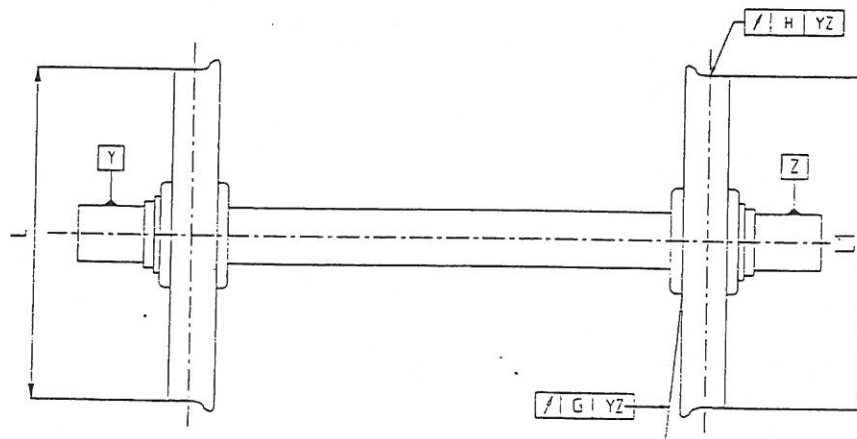
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Appendix 1

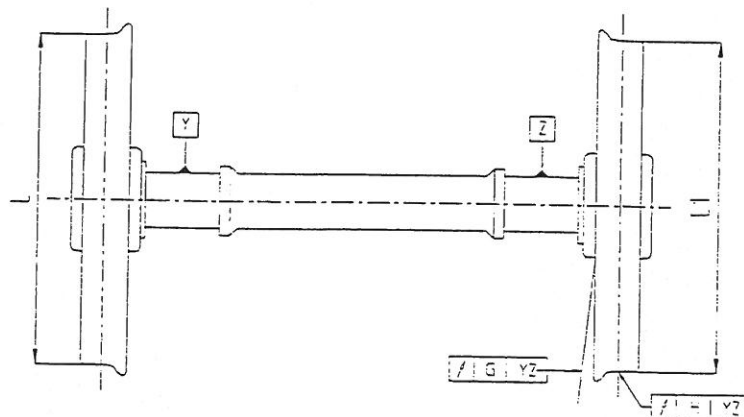
Dimensional Tolerances for Wheelsets Based on BS 5892



H = Tread Run-out
G = Wheel wobble (Axial Run-out)
L-L1 = Wheel Diameter Difference



WHEELSETS WITH OUTSIDE JOURNALS



WHEELSETS WITH INSIDE JOURNALS

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TABLE 1 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE - LOCOMOTIVES

CLASS	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			REMARKS
		NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
03	P1	1092	1020	1007	76	40	33.5				
08 & 09	P1 P9 P1	1372	1300	1287	76	40	33.5				P9 IS CENTRE WHEELSET
20 & 26	P1	1092	1026	1013	76	43	36.5				
31	P1	1092	1026	1013	76	43	36.5				DRIVING WHEELSETS
	P9	1003	937	924	76	43	36.5				INTERMEDIATE WHEELSETS
33	P1	1092	1023	1010	76	41.5	35				
37	P1	1092	1039	1026	76	49.5	43				
43	P8	1020	972	966				52	28	25	
45	P1	914	842	829	76	40	33.5				PONY TRUCK WHEELSETS
	P1	1143	1090	1077	76	49.5	43				DRIVING WHEELSETS
47	P1	1143	1106	1093	76	57.5	51				

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

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TABLE 1 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE -- LOCOMOTIVES

CLASS	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			REMARKS	
		NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP		
56	P1	1143	1090	1077	76	49.5	43				TYRED WHEELSETS	
		1150	1096	1088				75	48 (NOTE 4)	44		ORIGINAL MONOBLOC WHL
		1150	1082	1069				75	41	34.5		
58 & 60	P8	1120	1053	1040				73.5	40	33.5	MODIFIED MONOBLOC WHL	
59	P8	1067	1004	991				63.5	31	25		
73	P1	1016	975	962	63.5	43	36.5					

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated
- (4) Position of last turning groove to be ignored.

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TABLE 1 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE -- LOCOMOTIVES

CLASS	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			REMARKS
		NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
81 & 85	P6	1219	1166	1153	76	49.5	43				
86/2/4	P6	1155	1099	1086				71	43	36.5	
86/6	P6	1155	1099	1086				71	43	36.5	RESILIENT WHLS
86/1	P6	1155	1080	1067				74	36	30	MONOBLOC WHEELS
87/0		1150	1080	1067				75	40	33.5	
87/1											
90/0											
90/1											
91	P8	1000	950	937				70.5	45.5	39	
92	P8	1072	1003	990				74.5	40	33.5	

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

WHEELSET TREAD AND GAUGING STANDARDS

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TABLE 2 - LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE - MULTIPLE UNITS

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
101	ALL	P1	914	859	851	63.5	36	32				34mm
104												
107												
108												
117												
114	DMBS	P1	914	865	857	63.5	39	35				34mm
115												
116												
118	DTC	P1	914	859	851	63.5	36	32				34mm
119												
121	DTS	P1	914	859	851	63.5	36	32				34mm
122												

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

WHEELSET TREAD AND GAUGING STANDARDS

TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS , MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE --- MULTIPLE UNITS

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
127	ALL	P1	914	859	851	63.5	36	32				34mm
141	ALL	P8	800	747	734				54	27.5	21	
142												
143												
144												
150/0	ALL	P8	840	789	776				60	34.5	28	
150/1												
150/2												
151	ALL	P8	840	778	765							

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

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TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE --- MULTIPLE UNITS
Date: September 1996

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
153	ALL	P8	840	789	776				60	34.5	28	
154												
155/1												
156												
158	ALL	P8	840	786	780				50	23	20	
159												
165	ALL	P8	840	783	777							
166												
205	DMBS	P1	1016	964	956	63.5	37.5	33.5				34mm
207	TSO, DTC DTS, TCL	P1	1067	1008	1000	63.5	34	30				34mm

*

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

WHEELSET TREAD AND GAUGING STANDARDS

TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE --- MULTIPLE UNITS
Date: September 1996

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS(mm)			ACTUAL RIM THICKNESS (mm)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
302	MBS	P1	1016	942	934	76	39	35				34mm
	BDTC, DTS, TS (NOTE 4)	P1	1067	1012	1004	63.5	36	32				34mm
	BDTC, DTS, TS (NOTE 5)	P1	914	859	851	63.5	36	32				34mm
303	MBS	P1	1016	942	934	76	39	35				34mm
	DTS	P1	1067	1012	1004	63.5	36	32				34mm
	BDTS	P1	1067	1018	1010	63.5	39	35				34mm
304	MBS	P1	1016	942	934	76	39	35				34mm
	BDTS	P1	1067	1012	1004	63.5	36	32				34mm
	DTBS TC											

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated
- (4) Fitted with original Gresley Trailer Bogies
- (5) Fitted with B4 and B5 Trailer Bogies ex Mkl coaches

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TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE -- MULTIPLE UNITS

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS(mm)			ACTUAL RIM THICKNESS (mm)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
305/1	MBS	P1	1016	942	934	76	39	35				34mm
305/2	BDTS	P1	1067	1012	1004	63.5	36	32				34mm
305/3	DTS, TC											
307	MS	P1	1016	942	934	76	39	35				34mm
	BDTBS & BDTS (NOTE 4)	P1	914	865	857	63.5	39	35				34mm
	TC, TS	P1	914	859	851	63.5	36	32				34mm
	DTS,DTC (NOTE 4)											
	BDTBS & BDTS (NOTE 5)	P1	914	865	857	63.5	39	35				34mm
	TC,TS	P1	914	859	851	63.5	36	32				34mm
	DTS,DTC (NOTE 5)											

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated
- (4) Fitted with original Eastleigh plateframe bogies
- (5) Fitted with B4 or B5 bogies ex M&I coaches - limits apply to vehicle types, not bogies

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TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE --- MULTIPLE UNITS

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
308	MBS	P1	1016	942	934	76	39	35				34mm
	BDTC, DTS	P1	1067	1012	1004	63.5	36	32				34mm
	MBS, DMBS	P1	1016	942	934	76	39	35				34mm
310/0 310/1	MBS	P1	1016(4)	942	934	76	39	35				34mm
	BDTS, TS, BDTC, TC DTS	P1	1067	1012	1004	63.5	36	32				34mm
	BDTS, DTS, TS	P1	914	859	851	63.5	36	32	60.5	34	31	34mm

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated
- (4) Tyred wheelsets
- (5) Monobloc wheelsets

WHEELSET TREAD AND GAUGING STANDARDS

TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE --- MULTIPLE UNITS

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm)			ACTUAL RIM THICKNESS (mm)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	(TO GAUGE SEE FIG 18)			
									NEW	LAST TURNING	SCRAP	
312	MBS	P1	1016	963	957				60.5	34	31	34mm
	BDTS,DTS & TS	P1	914	856	850				60	31	28	34mm
313, 314 & 315	ALL	P8	840	782	776				59	30	27	
317/1/2	MS	P8	925	867	861				65.5	36.5	33.5	
318, 319	DTS, TC,	P8	840	782	776				59	30	27	
320, 321 & 322	TS & DTC											
323	DMS,TS	P8	840	793	780							

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

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TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE -- MULTIPLE UNITS

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)		ACTUAL TYRE THICKNESS (mm)		ACTUAL RIM THICKNESS (mm)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)		
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW		LAST TURNING	SCRAP
411/4	DMS	P1	1016	964	956	63.5	37.5	33.5				
411/5	(NOTE 4)											
412(6)	TBC, TSO DMS (NOTE 5)	P1	1067	1008	1000	63.5	34	30				34mm NOTE 7

NOTE

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated
- (4) Motor Bogie
- (5) Trailer Bogie
- (6) Class 412 fitted with original Mk3/4 motor bogies and Commonwealth trailer bogies
- (7) Restricted Flange Height does not apply to the Class 411 trailer bogies operated by South East Trains Co Ltd. However, motor bogies are restricted to 34mm.

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TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE -- MULTIPLE UNITS
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CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
421/1/3	MBS	P1	1016	964	956	63.5	37.5	33.5				
	DTC,TS	P1	914	855	847	63.5	34	30				34mm
412 (4)	MBS,DMS	P1	1016	970	962	63.5	41	37				34mm
421/2/4												(NOTE 5)
421/5	DTC, TS	P1	914	855	847	63.5	34	30				34mm
422	DTS,TBS											(NOTE 5)
423	TBC,TRBS											(NOTE 5)
442	MBRSM	P8	1016	963	957				60.5	34	31	
	DTF,DTS &TS	P8	840	782	776				59	30	27	

NOTE

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated
- (4) Class 412 rebogied with Mk VI motor & B5(SR) Trailer bogies
- (5) Restricted Flange Height does not apply to Class 421 & 423 units operated by The South East Trains Co Ltd

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TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE -- MULTIPLE UNITS

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
455,456	MSO	P8	925	867	861				65	36	33	
	DTS,TS	P8	840	782	776				59	30	27	
465/0	ALL ABB	P8	840	782	776				59	30	27	
465/1	VEHICLES											
465/2	ALL MCL	P8	840	793	780				53	29.5	23	
466	ALL	P8	840	793	780				59	35.5	29	
466	VEHICLES											
483	DMS	P1	787	732	724	63.5	36	32				
483	(TYRED)											
483	WHEELS)											
483	DMS	P1	787	726	718				76	45	41	
483	(MONO-											
483	BLOC											
483	WHEELS)											
488/2/3	TFH,TSOH	P1	914	855	847	63.5	34	30				34mm
488/2/3	&TSO											34mm

NOTE

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

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TABLE 2 -- LIMITING WHEEL DIAMETERS / TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE --- MULTIPLE UNITS

CLASS	VEHICLE TYPE	TYRE PROFILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
			489	DMLV (4)	P1	1016	964	956	63.5	37.5	33.5	
	DMLV (5)	P1	1067	1008	1000	63.5	34	30				34mm
507, 508	ALL	P8	840	782	776				59	30	27	

NOTE

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated
- (4) Motor Bogie
- (5) Trailer Bogie

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TABLE 3 - LIMITING WHEEL DIAMETERS/TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE - LOCOMOTIVE HAULED PASSENGER/ NON-PASSENGER COACHING STOCK AND FREIGHT VEHICLES WITH CARRIAGE TYPE BOGIES

BOGIE TYPE	BOGIE DETAILS		PRO-FILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm)			ACTUAL RIM THICKNESS (mm)		MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
	AXLE JOURNAL DETAILS			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	
BR1 & BR2 NON COMPENSATED BRAKEWORK	9" x 4.5/8" & 10" x 5"		P1	1067	1032	1024	63.5	46	42			34mm
	PLAIN BRG											
	4.1/2" & 4.5/8" ROLLER BRG											
BR1 & BR2 COMPENSATED BRAKEWORK	9" x 4.5/8"		P1	1067	1012	1004	63.5	36	32			34mm
	PLAIN BRG											
	4.1/2" & 4.5/8" ROLLER BRG											
	10" x 5"		P1	1067	1018	1010	63.5	39	35			34mm
	PLAIN BRG											

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining.
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

WHEELSET TREAD AND GAUGING STANDARDS

TABLE 3 - LIMITING WHEEL DIAMETERS/TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE - LOCOMOTIVE HAULED PASSENGER/ NON-PASSENGER COACHING STOCK AND FREIGHT VEHICLES WITH CARRIAGE TYPE BOGIES

BOGIE TYPE	AXLE JOURNAL DETAILS	PRO-FILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
BT5, BT10	120 mm DIA	P8	914	842	836				60	24	21	
BT15 & BT17	CARTRIDGE			859(Note 4)	853(Note 4)					32(Note 4)	29(Note 4)	
BT10	120 mm DIA	RD9	914	842	836				60	24	21	
Note (5)	CARTRIDGE			859(Note 4)	853(Note 4)					32(Note 4)	29(Note 4)	
BT21 (B4 DISC BRAKED)	4.1/2IN DIA ROLLER BRG	P11	914	849	841				60	27	23	34mm
BT35 & BT36	120 mm DIA CARTRIDGE	P8	840	766	760				59	22	19	
BT41	130 mm DIA CARTRIDGE	P8	920	866	860				50	23	20	
ABB T4-5	-	P8	920	866	860				50	23	20	

NOTES

- 1 For new and worn limits of flange thickness and height for all profiles see Table 5
- 2 Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining.
- 3 General tolerance on all dimensions ± 0.25 mm unless otherwise stated
- 4 Limits of wheel wear to be used only where the vehicle shell and bogies have not been modified in accordance with Mod Nos. IM0105/043, IM0105/044, IM2701/109 & 8018/071
- 5 HST MkIII Trailer Vehicles running on East Coast Mainline are specified with RD9 profiles.

WHEELSET TREAD AND GAUGING STANDARDS

TABLE 3 - LIMITING WHEEL DIAMETERS/TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE - LOCOMOTIVE HAULED PASSENGER/
NON-PASSENGER COACHING STOCK AND FREIGHT VEHICLES WITH CARRIAGE TYPE BOGIES

BOGIE TYPE	BOGIE DETAILS		PRO-FILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm)			ACTUAL RIM THICKNESS (mm)			MAXIMUM FLANGE HEIGHT (IF RESTRICTED)
	AXLE JOURNAL DETAILS			NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
BT42 (B4 TREAD BKD)	4.1/2" DIA ROLLER BRG		P11	914	859	851	63.5	36	32				34mm
BT43 (COMMONWTH)	4.5/8" DIA ROLLER BRG		P1	1067	1016	1010	63.5	38	35				33mm
BT45 (B5)	4.7/8" DIA ROLLER BRG		P11	914	865	857	63.5	39	35				34mm
BT46 (WCML DVT)	130 MM DIA CARTRIDGE		P8	920	866	860				50	23	20	

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining.
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

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TABLE 3 - LIMITING WHEEL DIAMETERS/TREAD THICKNESS, MAXIMUM FLANGE HEIGHT AND PROFILES APPLICABLE - LOCOMOTIVE HAULED PASSENGER/
NON-PASSENGER COACHING STOCK AND FREIGHT VEHICLES WITH CARRIAGE TYPE BOGIES

VEHICLE TYPE	PRO-FILE	WHEEL DIAMETER (mm)			ACTUAL TYRE THICKNESS (mm) (TO GAUGE SEE FIG 19)			ACTUAL RIM THICKNESS (mm) (TO GAUGE SEE FIG 18)			REMARKS
		NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	NEW	LAST TURNING	SCRAP	
SANDITE DRIVING TRAILERS	P6	1016	947	934	76	41.5	35				VEHICLE NOS 6910-6915 (EX-CLASS 501)

NOTES

- (1) For new and worn limits of flange thickness and height for all profiles see Table 5.
- (2) Last turning dimensions apply to Depot ground and freestanding wheel lathes after machining
- (3) General tolerance on all dimensions ± 0.25 mm unless otherwise stated

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**TABLE 4 - TREAD PROFILE BY SUSPENSION/BOGIE TYPE
FOR
FREIGHT VEHICLES**

VEHICLE SUSPENSION / BOGIE TYPE	PROFILE
Eyebolt or shoe suspension. Plate frame, diamond frame or 3-piece cast steel bogie having fixed sidebearers. Carriage bogies.	P1
BR long or short link, taperleaf and UIC double link suspensions. Y25C bogie and derivatives eg FBT6. Gloucester GPS and BSC axle bogies.	P5
BSC, Gloucester or Schlieren coil spring suspensions. 3-piece cast steel bogies having resilient sidebearers. BSC, Gloucester or Schlieren coil spring primary suspension bogies (1).	P6
BR "Taperlite" suspensions.	P8
Irrespective of suspension bogie/type, all RIV registered wagons having wheel diameters of 760 - 1000mm.	P10

Note (1) P5 profile may be specified in certain cases by vehicle owner/operator.

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**TABLE 5 - WHEEL PROFILE DRAWINGS,
FLANGE HEIGHT & THICKNESS DIMENSIONS**

TREAD PROFILE	DRAWING NUMBER	FLANGE THICKNESS (mm)		FLANGE HEIGHT (mm)		FLANGE HT. EXCEPTIONS
		NEW PROFILE (W)	MINIMUM WORN (X)	NEW PROFILE (Y)	MAXIMUM WORN (Z)	
P1	S8-C2-8006234	28	24	30	36.5	See Note (1)
P5	S8-C2-8003908	31.5	27	28.5	33	
P6	S8-C2-8006238	29	24	30	36.5	
P8	S8-C2-8006239	29	24	30	36.5	
P9	S8-C2-8006240 See Note (2)	25.5 (22.5)	21 (18)	30	36.5	
P10	F-C-00234	31	27	28	33	
P11	C1-C1-9016365	28	24	30	34	
RD9	A1-C1-8700150	26	24	30	36.5	

Notes

- (1) Max worn flange height (Z) is 33mm for 'Flyash' wagons CARKND CSA.
- (2) The dimensions in brackets will apply if the Datum Face V of the tread profile is used for measurement (Fig 4).

General Notes

- (3) For datum points at which Flange Thickness and Height are measured, see Fig 4.
- (4) The former P3 tread profile has now been superseded by P10.
- (5) For steam locomotive tread profile requirements see MT 276.
- (6) Restricted flange heights apply to certain vehicles - see Tables 1,2 &3.

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TABLE 6 - DIAMETER DIFFERENTIAL BETWEEN WHEELSETS

VEHICLE CLASSIFICATION	DETAIL		VARIATION OF DIAMETER (mm)	
			BETWEEN WHEELSETS ON ONE BOGIE	BETWEEN WHEELSETS ON ONE VEHICLE
LOCOMOTIVE	Class 03, 08 & 09		-	0.25
	Class 43		20	20
	Class 60		6	13(4)
	Class 90/0		13	13
	Class 90/1		13	NO LIMIT(5)
	Class 92		2	6
	Others (incl 97/7)		13	13
MULTIPLE UNITS	Class 101 - 127 First Gen DMU's		13	25
	Class 141 - 144 Railbuses		-	25
	Class 150 - 156 75mph Sprinters	Motor	0.25 (1) 2.0 (2)	25
		Trailer	25	25
	Class 158-159 90mph Express	Motor	0.25 (1) 1.5 (2)	25
		Trailer	13	25
	Class 165 & 166	Motor	0.25(1) 1.5(2)	13
		Trailer	13	13
	Class 205 & 207 DEMU		13	25
	Class 302 - 312 AC EMU's Class 421, 422, 423 DC EMU's Class 488 Gatwick Trailer Sets	Motor	13	13
		Trailer		25
	Class 313, 314, 315, 317, 318, 319, 321, 322, 455, 456, 507, 508 EMU's		13	20
	Class 320 AC EMU's		6	13
Class 323 AC EMU's	Motor	3	3	
	Trailer	6	13	

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TABLE 7 - LIST OF GAUGES FOR USE AT DEPOT GROUND / FREESTANDING WHEEL LATHES

GAUGE TYPE	TREAD PROFILES	DRAWING NO.	BR CAT NO
Profile Sliding Gauge Assembly	All	9039352/01	39/28048
Profile Machining Limit Gauges	P1 P5 P6 P8 P9 P10 P11 RD9	B-A1-1324/01 F-A2-4201 F-A2-4203 L-A1-10593 L-A2-10592 C1-A1-9007981 C1-C1-9016367 B2-C1-9035015	39/29823 39/29792 39/29786 39/29827 39/29825 39/27968 39/27972 39/29846
Plug Gauge	All	F-A3-4909/01	39/29763
Plug Gauge (Back Flange Wear)	All	B-A1-1324/02	39/29826
Flange Thickness & Height Gauge	All	F-A2-41	39/29967 (1)
Go/No Go Gauge Distance Between Wheels (1360-1362mm: New & Overhauled) (1360-1363.3mm: Reprofiled)	All	B-A1-1286/01 B-A1-1286/02	39/29832 39/28114
Tread Diameter Comparison	All	F-S-4545	39/29975(4)
Tyre Thickness Gauge	All	F-A2-5748	39/29799 (2)
Rim Thickness Gauge (without magnet)	All	B2-C1-9038482/02	39/28032
Rim Thickness Gauge (with magnet)	All	B2-C1-9038482/03	39/28033
Throat Thickness Gauge 30mm	All	F-A2-47/01	39/29968
Throat Thickness Gauge 36.5mm	All	F-A2-47/02	39/29969
Adjustable Throat Thickness Gauge	(3)	B2-C2-9038488/02	39/28038
Surface Finish Sample Profile	All	RUBERT & Co No 120	39/29006

Notes

- (1) Calibrated Gauges to Drawing No. SL-SW-3412 may also be used.
- (2) Calibrated Gauges to BR Cat No 39/29778 Drawing No. F-A3-42 may also be used.
- (3) This gauge is used for Freight Wagons only, with P1, P5, P6, P8 & P10 profiles.
- (4) Alternative Gauges (not available BR Cat No):
 - i) Digital Wheel Diameter Measuring Device
Type 1 M-315 (590-1030mm) &
Type 1 M-350 (760-1255mm)
Supplied by Gomek Oy, PO Box 10, 02211 Espoo, Finland
 - ii) Wheel Diameter Versine Gauge 776-850mm
Manufactured by Bedestone Ltd, Boulton House, 41 Icknield Street, Hockley, Birmingham, B18 5AY.

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TABLE 8 - LIST OF GAUGES FOR WHEELSETS IN SERVICE

GAUGE TYPE	TREAD PROFILES	BR DRG NO.	BR CAT NO.
Adjustable Flange Thickness & Height Gauge	All	F-A2-41	39/29967 (1)
Go/No Go Flange Height & Thickness Gauge (incorporates Toe Radius Gauge)	P1, P6, P8, P11 & RD9	B-A2-1710/01	39/29839
	P5 & P10 (33mm flange ht)	F-A3-458	39/29781
	P9	L-A3-3375	39/29794
Go/No Go Gauge for Flange Height (Restrictive Limits)	All	B-A2-1711/01	39/29830
RIV Flange Angle Gauge	P10	F-A3-6991	39/29231
Tread Diameter Comparison	All	F-S-4545	39/29975 (3)
Tyre Thickness Gauge	All	F-A2-5748	39/29799 (2)
Rim Thickness Gauge without Magnet	All	B2-C1-9038482/02	39/28032
Rim Thickness Gauge with Magnet	All	B2-C1-9038482/03	39/28033
Throat Thickness Gauge 30mm	All	F-A2-47/01	39/29968
Throat Thickness Gauge 36.5mm	All	F-A2-47/02	39/29969

Notes

- (1) Calibrated Gauges to Drawing No. SL-SW-3412 may be used.
- (2) Calibrated Gauges to BR Cat No 39/29778 Drawing No. F-A3-42 may also be used.
- (3) Alternative Gauges (not available BR Cat No):

Digital Wheel Diameter Measuring Device
Type 1 M-315 (590-1030mm) &
Type 1 M-350 (760-1255mm)
Supplied by Gomek Oy, PO Box 10, 02211 Espoo, Finland

Wheel Diameter Versine Gauge 776-850mm
Manufactured by Bedestone Ltd, Boulton House, 41 Icknield Street, Hockley, Birmingham,
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