

WOSS 612/10

British Railways Board

Director of Mechanical and Electrical Engineering

WHEELSET

OVERHAUL PROCEDURES

WORKSHOP OVERHAUL STANDARD SPECIFICATION

WOSS 612/10

REVISION RECORD

This Specification will be updated when necessary by the issue of amended pages accompanied by revision letters. The amended or additional part of re-issued pages will be marked with a vertical black line.

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WOSS 612/10

This Specification applies to equipment fitted to the vehicles indicated 'X' below, but it is only to be implemented when authorised by an appropriate maintenance/overhaul document.

LOCOMOTIVES

03	X	73	X
08	X	86	X
09	X	87	X
20	X	88	
25	X	89	X
26	X	90	X
27	X	91	X
31	X		
33	X		
37	X		
43	X		
45	X		
47	X		
50	X		
56	X		
58	X		

DMU's

101	X
104	X
107	X
108	X
110	X
111	X
114	X
115	X
116	X
117	X
118	X
119	X
120	X
121	X
122	X
127	X
128	X
140	X
141	X
142	X
143	X
144	X
150	X
151	X
154	X
155	X
156	X
157	X
158	X

EMU's

302	X	411	X
303	X	412	X
304	X	413	X
305	X	414	X
307	X	415	X
308	X	416	X
309	X	419	X
310	X	421	X
311	X	422	X
312	X	423	X
313	X	432	X
314	X	438	X
315	X	442	X
317	X	455	X
318	X	457	X
319	X	485	X
320	X	486	X
504	X	487	X
507	X	488	X
508	X	489	X

COACHING STOCK

Mk 1	X
Mk 1 Catering	X
Mk 2, 2a - c	X
Mk 2d - e	X
Mk 2f	X
Mk 2 DBSO	X
Mk 3a	X
Mk 3b	X
Mk 3 Catering	X
Mk 3 (HST)	X
Mk 3 (HST) Catering	X
Mk 3 SLE and SLEP	X
Mk 4 IC225	X
DVT IC225	X
DVT 125	X
Non Passenger	X

DEMU's

201	X
202	X
203	X
204	X
205	X
207	X
210	X

WAGONS

All BR Revenue Earning Vehicles	X

PRIVATE OWNER VEHICLES

All Private Owner and RIV Vehicles registered in this Country	X

DEPARTMENTAL VEHICLES

All Service and Departmental Vehicles	X

All Preservation Society Vehicles running on British Railways lines	X

WORKSHOP OVERHAUL STANDARD SPECIFICATION 612/10

WHEELSET OVERHAUL PROCEDURES

CONTENTS	PAGE
1 Introduction.	3
2 General.	3
3 Subsidiary and Superseded Documents.	4
4 Overhaul Work Content.	7
4-1 Overhaul Procedures.	7
4-2 Examination.	7
4-2.1 Initial Examination.	7
Table 4-2.1.1 - Initial Examination of Wheelsets before Cleaning.	9
Table 4-2.1.4 - Examination of Wheelset before Overhaul.	8
4-2.2 Examination Criteria.	9
4-2.3 Axle Examination.	11
Table 4-2.3.1 - Axle Examination Criteria.	11
4-2.4 Monobloc Wheel and Wheel Centre Examination.	15
Table 4-2.4.1 - Examination of Monobloc Wheels and Wheel Centres.	15
4-2.5 Examination of Bores of other Axle Mounted Components.	17
4-3 Dismantling.	17
4-4 Assembly.	18
Figure 1 - Illustrations of Terms - Monobloc Wheels.	19
Figure 2 - Illustrations of Terms - Tyred Wheels.	20
Figure 3 - Illustration of Terms - Axles.	21
Figure 4 - Monobloc Wheel Inner Rim Defects.	22
Figure 5 - Overheated Monobloc Wheel.	23
Figure 6 - Crack Depth Removable by Modifying Axle Profile.	24
Figure 7 - Crack Depth Removable by Adding Stress Relief Grooves.	25
Figure 8 - Permissible Witness Mark on Reprofiled Tread.	26
Figure 9 - Reclamation of Axles with Corrosion at the Journal to Journal Shoulder Transition Radius.	27
Figure 10 - Provision of Corner Radii for Axles.	28
Figure 11 - Wheel Centre Rim Vertical Face Corner Radii Requirements.	29
5 Test Specification (not applicable).	30

(Continued)

CONTENTS	PAGE
6 Technical Data.	
Table 6-1 - Wheel & Tyre Diameters, Profiles and Balancing Requirements.	31
Part 1 - Locomotives.	31
Part 2 - Multiple Units.	32
Part 3 - Locomotive Hauled Passenger/Non-Passenger Coaching Stock and Freight Vehicles with Carriage Bogies.	36
Part 4 - Freight Stock.	37
Part 5 - Tyre Profile Allocated against Suspension, Bogie Type and TOPS Carknd.	38
Part 6 - Permissible Wheelset Unbalance Limits.	43
Part 7 - Variation of Wheel Diameters.	44
Table 6-2 - Permissible Size Reductions for Axles.	45
Part 1 - Driving & Trailer Wheelsets Plain Bearing Journals (Imperial Sizes).	45
Part 2 - Trailer Wheelsets Plain Bearing Journals (Metric Sizes).	48
Part 3 - Driving & Trailer Wheelsets Roller Bearing Journals (Imperial Sizes).	49
Part 4 - Driving & Trailer Wheelsets Roller Bearing Journals (Metric Sizes).	54
Table 6-3 - Tread Profile Details	57
Table 6-4 - List of Wheel Balancing Drawings.	58
Table 6-5 - Supersession of BR Specification Materials by BS 5892 Materials.	59
7 Additional Procedures (not applicable).	

1. INTRODUCTION

- 1-1 This Specification defines the overhaul of Traction and Rolling Stock wheelsets.
- 1-2 Documents referred to in, or superseded by, this WOSS are listed on Pages 4 to 5.
- 1-3 Reference within this and all related documents to the Engineer shall refer to the authorised representative of the Director of Mechanical and Electrical Engineering, British Railways Board.
- 1-4 Reference within this and all related documents to the Contractor shall identify an organisation, including BR Depots, contracted to the British Railways Board for the purpose of undertaking specified Traction and Rolling Stock maintenance and/or overhaul, and shall include the successors and assigns of such an organisation.
- 1-5 Within this Specification:-
- i) The definitions used are those of BS 5892 Part 6, and as shown in Figures 1.2 & 3. In addition, the term "Approved Operator" is defined as a person holding a valid BRB Certificate of Competency for the Non-Destructive testing technique being referred to, see MT 280.
 - ii) Any of the terms used from the list on Page 6 shall be regarded as having the definition stated.
 - iii) All dimensions are in mm unless otherwise stated.

2. GENERAL

- 2-1 It is the responsibility of the Contractor to ensure that: -
- i) Wheelsets comply with the acceptance and repair standards detailed in this WOSS and in the related documents.
 - ii) The wheelset and its components is examined at the first stage of the overhaul to determine the total work content.
 - iii) During overhaul care is taken to avoid damage by impact to all items of the wheelset.
 - iv) Care is taken during storage to ensure the wheelsets and/or components are protected from mechanical and corrosion damage.
 - v) Whilst wheelsets are being overhauled, that axlebox bearings, transmission components, earth return systems, etc, shall be protected in a manner to prevent ingress of foreign matter. For example protection shall be provided when using cleaning fluids, paint, paint stripper, or drilling out bolts, cleaning the wheel web, or engaged in any activity generating swarf or dust.
- 2-2 The following is prohibited on wheelsets and components:
- i) Oxy-acetylene or electric arc cutting, burning, welding, or contact with cutting debris or welding spatter (with the specific exception of reclamation of wheel centres by welding).
 - ii) Application of electric current and any associated earth return or other electrical system, except as required for magnetic particle flaw detection.
 - iii) Use of chisels, or any device which may leave notches, pits or other markings which may give rise to stress concentrations.

3-1 SUBSIDIARY DOCUMENTS

3-1.1 British Standard Specifications

BS 1134	Method for the Measurement of Surface Texture.
BS 3643	Metric Screw Threads.
BS 5892 Part 1	Axles.
BS 5892 Part 2	Wheel Centres.
BS 5892 Part 3	Monobloc Wheels.
BS 5892 Part 4	Tyres.
BS 5892 Part 5	Tyre Retaining Rings.
BS 5892 Part 6	Wheelsets for Traction and Trailing Stock.

3-1.2 British Railways Specifications

BR Specification 2	- Painting Schedule : Passenger Rolling Stock.
BR Specification 3	- Painting Schedule : Freight Stock.
BR Specification 6	- Painting Schedule : Diesel and Electric Locomotives.

3-1.3 BRB DM & EE Publications

MT 240	Branding of Wheels, Tyres and Axles.
MT 280	Regulations for Non-Destructive Testing of Axles.
MT 288	Machining, Wear and Damage Standards for Wheel Tread Profiles.
CEPS 82	Copper Slip Rings on Axles.
WDSS 200/1	Inspection of Spur Gears for Mechanical Transmissions.
EI. HC/18	Vee Belt Pulleys Wear, Examination and Corrective Action
EI LG/11	Supply of Wheelsets, Traction Motors and Split Bush Suspension Bearings to meet Maintenance Requirements.

3-1.4 BRB DM & EE Drawings

B1-A4-9002208	BR Standard Axle Centre.
C1-A1-9003904	Oil Injection Port, Groove and Last Turning Groove.
B1-A0-9012713	Roller Bearing Cartridge Units for Traction and Rolling Stock.
B2-C1-9038255	Tyre/Wheel Centre Machining Details.

3-2 SUPERSEDED DOCUMENTS3-2.1 British Railways Specifications/Publications

BR 100	Steel Tyres for Locomotives, Carriages, Cars and Wagons.
BR 101	Rolled Steel Sections (for Gibson Rings).
BR 107	Rolled Steel Disc Wheel Centres.
BR 108	Solid Rolled Steel Wheels.
BR 109	Steel Straight Axles for Locomotives, Carriages, Cars and Wagons.
BR 164	Reconditioned Wheel and Axle Assemblies for Traction and Rolling Stock.
BR 167	Wheel and Axle Assemblies for High Speed Train Power Cars and Class 87 AC Electric Locomotives.
G 11	Wheelsets with Balance Plates to BR Drawing N° B-A0-986.
G 77	Axle End Drilling (Trebel Wheel Balancing Machine).
G 81	Tyre Tread Surface Texture.
G 88	Improvement of Axle Geometry and Reclamation of Cracked Motored Axles.
G 164	Provision of Oil Injection Grooves and Oil Holes in Gearwheel Boss.
G 169	Reclamation of Cracked Non-Motored Axles by Stress Relief Grooving.
G 269	Improvement of Axle Geometry and Reclamation of Cracked Trailing Axles.
G 299	Remedial Attention to Wheels with Inner Rim Defects.
G 354	Standardisation of Tyre Machining Details.
G 360	Reclamation of Scored Axles in Trailing Wheelsets.
G 467	Standardisation of Axle Centre Machining Details.
G 497	Standardisation of Wheel Back to Back Dimension.
G 498	Axle Attention Required to Eliminate Intrusive Signals Experienced During Ultrasonic Examination.
G 557	Axle Body Run-Out Tolerances.
G 627	Tyre Profiles and their Limits of Wear for Multiple Units and High Speed Trains.
G 706	Branding of Wheels, Tyres and Axles.
G 742	Railway Wheelsets : Introduction of BS 5892
HC 258	Axle Journal Corrosion, Treatment and Examination for Cracks. SKF Roller Bearing Axleboxes B4 and B5 Bogies.
HC 455	Attention Required to Wheel Centres.
HC 654	Tyre Profiles and their Limits of Wear for Loco-Hauled Passenger Rolling Stock.
HC 684	Reclamation of Carriage Axles with Surface Corrosion.
LG 52	Tyre Profiles and their Limits of Wear for Locomotives.
ME 54	Increased Interference of Tyres for Classes 302, 303, 305, 308 and 311 Stock EMUs.
ME 154	Loose Tyres on Electric Multiple Units.
ME 347	Rectification of Damaged Balance Weight Holes on Class 310 Motored Wheelsets.
ME 358	Axle Branding and Recording Procedures.
WF 38	Salt Wagon Axles.
WF 98	"Blue-Spotting" of Disc Brake Surfaces on Wagon Wheels.
WF 159	Wagon P6 Tyre Profiles Flange Wear Limits.
WF 311	Examination of Goods Brake Van Wheelsets.
WF 316	Wheel Profiles HAA Wagons.
WF 323	Tyre Profiles and their Limits of Wear for Freight Wagons and Loco-Hauled Non-Passenger Carrying Vehicles.

WOSS 612/10

<u>TERM</u>	<u>DEFINITION</u>
CHANGE	- Remove the original, and fit a new or overhauled part or assembly in its place.
CHECK	- Determine a particular nominated condition before, during or after repair, eg. completeness, security, position.
CLEAN	- Take off all dirt and deposits.
DEFECT/ DEFECTIVE	- Any fault or faults in a component or assembly, which may prevent the component or assembly from fulfilling its designed purpose.
DISMANTLE	- Take to pieces.
EXAMINE	- Determine general condition before repair, eg. wear, cracks, splits, leaks, scoring, corrosion, distortion, looseness.
GAUGE	- Determine a nominated dimension by using suitable measuring equipment, eg. ruler, micrometer, calipers, feeler gauge, or Go/No-Go gauge.
INSPECT	- Determine conformity to required standards during and after repair.
OVERHAUL	- Do what is necessary to make a component re-usable, ie. dismantle, strip, clean, examine, fit new parts, repair, re-assemble, test and inspect as required (does not include rewinding or renewal).
REASSEMBLE	- Put together.
RECORD	- Put down in writing the result of any specified examination, test, or inspection.
RECTIFY	- To set right (does not include rewinding or renewal).
REFIT	- Put back and reconnect.
REMOVE	- Disconnect and take off.
RENEW	- Remove and scrap the original part, and provide a new part in its place as defined in the BR catalogue.
REPAIR	- Restore an original part to the required condition, eg. by hand tooling, machining, building up, welding, patching, bending and setting, heat treating, re-securing etc. (does not include rewinding or renewal).
REPORT	- Convey to the Supervisor the condition of the item examined.
STRIP	- Take off covering, eg. paint, polish, fabric.
TEST	- Prove correct operation by specified trial.

WHEELSET OVERHAUL

4. OVERHAUL WORK CONTENT

4-1 OVERHAUL PROCEDURES

- 4-1.1 Wheelsets shall be examined and actions taken in accordance with paragraphs 4-2.1 to 4-2.5.
- 4-1.2 Unless otherwise specified by the Engineer, irrespective of condition all worn tread profiles shall be machined in accordance with paragraph 4-4.4 provided that the wheel diameter will be greater after machining than the minimum specified in Table 6-1. If required, dynamic balancing shall be carried out in accordance with paragraph 4-4.5, (see also Table 6-1).
- 4-1.3 It is not permissible to carry out a repair to a wheelset component in such a manner as to possibly adversely affect another component. For example it is not permissible to machine a wheelset to axle body double radius transition, of an axle, without removing or displacing the wheel on the affected wheelset, otherwise it would be impossible to avoid machining the wheel boss face at the same time.
- 4-1.4 New wheelsets and components shall conform to the requirements of BS 5892. Where existing drawings have not been amended to quote BS 5892, the requirements of Table 6-5 shall apply.

4-2 EXAMINATION

4-2.1 Initial Examination

- 4-2.1.1 Before cleaning, the wheelset shall be examined and action taken, in accordance with Table 4-2.1.1 below:-

TABLE 4-2.1.1

Initial Examination of Wheelset Before Cleaning

ITEM NUMBER	CHARACTERISTIC	EXAMINATION PROCEDURE	ACTION IF NOT COMPLYING	ACTION IF COMPLYING
1	Overheating of Monobloc Wheel	In accordance with paragraph 4-2.2.1	Mark wheel as scrap go to paragraph 4-3	Go to Item 3
2	Security of Tyre	In accordance with paragraph 4-2.2.2	Mark tyre as scrap go to paragraph 4-3	Go to Item 3
3	Visible Cracks in Wheel Centres or Monobloc Wheels	Visually	Mark cracked item as scrap go to para.4-3	Go to Item 4
4	Combined defects rendering a wheelset scrap, for example, cracked trailer axle having fully worn wheels	Visually	Renew wheelset	See para. 4-2.1.2

- 4-2.1.2 The wheelset shall be cleaned using a method approved by the Engineer, with effective protection provided for bearings and any other items requiring it.
- 4-2.1.3 All exposed areas of the axle shall be stripped of paint using Method 2a of the appropriate BR Maintenance Painting Schedule.
- 4-2.1.4 Wheelsets, except for items already marked for renewal in accordance with paragraph 4-2.1.1, shall be examined and actions taken in accordance with Table 4-2.1.4, items 1-20. Examination and action in accordance with items 21-24, shall be taken if, in accordance with items 1-19, removal of components renders these items accessible for examination.

WOSS 612/10

TABLE 4-2.1.4

Examination of Wheelset Before Overhaul.

REFERENCE NUMBER	CHARACTERISTIC	ACTION IN ACCORDANCE WITH
1	Tyre Security	See paragraph 4-2.2.2
2	Wheel Tread Diameter	See paragraph 4-2.2.3
3	Visible Cracks in Wheel Centres or Monobloc Wheels	See paragraph 4-2.2.4
4	Non-Destructive Testing of Axles	See paragraph 4-2.2.5
5	Plain Bearings	See paragraph 4-2.2.6
6	Roller/Ball Bearings	See paragraph 4-2.2.7
7	Monobloc Wheel Inner Rim Indentations	See paragraph 4-2.2.8
8	Security of Fit of Wheels, Brake Discs, etc. on Axle	See paragraph 4-2.2.9
9	Condition of Visible Parts of Axle	See paragraph 4-2.3
10	Traction Motor Axle Connection - i) Plain Bearings ii) Roller Bearings	CEPS 16 and CEPS 86 Appropriate Performance Specification or WOSS.
11	Brake Disc Condition	Appropriate WOSS.
12	Cracking of Integral Disc Braked Wheels	See paragraph 4-2.4.11
13	Gearbox Condition	Appropriate WOSS.
14	Traction Gear Condition	WOSS 200/1 : CEPS 16
15	Vee Belt Dynamo Pulley	EI HC 18
16	Flat Belt Dynamo Pulley	Appropriate Document.
17	Wheelset Back to Back Dimension	See paragraph 4-2.2.10
18	Security of Balance Weights	See paragraph 4-2.2.11
19	Number and Spacing of Balance Weight Holes	See paragraph 4-2.2.11
20	Spoked Wheels on Trailer Axles	See paragraph 4-2.2.12
21	Wheel/Wheel Centre Removed from Axle	See paragraph 4-2.4
22	Wheel Web Condition-Discs Removed	See paragraphs 4-2.4.3 and 4-2.4.4
23	Wheel Centre Boss Bearing Face	See paragraph 4-2.4.5
24	Wheel Centre Rim-Tyre Removed	See paragraph 4-2.4.8
25	Axle Straightness	See paragraph 4-2.4.13

4-2.1.5 Overhauled wheelsets shall comply with the requirements of Table 4-2.1.4.

4-2.1.6 When the estimated cost of the wheelset overhaul exceeds 80% of the cost of a new wheelset, the matter shall be referred to the Engineer for a decision to overhaul or renew.

4-2.2 Examination Criteria.

4-2.2.1 Overheating of Monobloc Wheels.

Monobloc wheels shall be visually examined for signs of overheating, eg. dirt burnt off the wheel rim and web, see Figure 5. On any wheelset showing such signs the back to back dimension shall be checked, and actions taken in accordance with paragraph 4-2.2.10.

4-2.2.2 Tyre Security.

Tyred wheelsets shall be visually examined in accordance with MT288 for:-

- i) Displacement of any witness marks, on the tyre and wheel centre.
- ii) Clearance between inner vertical faces of wheel centre and the tyre and tyre retaining ring, or between the tyre retaining ring and the rolled down lip of the tyre. In addition, for Locomotive wheelsets, examine for clearance between outer vertical faces of wheel centre and the tyre
- iii) Cracking of the tyre (other than thermal cracking in the tread surface).
- iv) Damage to the tyre retaining ring (as applicable).

If any of the above are found both tyres of the wheelset shall be renewed. Where tyres are renewed the journal bearings shall be removed and overhauled in accordance with the appropriate bearing maintenance document. If a loose tyre is found, the interference between wheel centre and tyre shall be measured in accordance with EI G681.

4-2.2.3 Wheel Tread Diameter.

The diameter of the tread surface shall be gauged using the procedures specified in MT 288. If there is insufficient material to permit reprofiling in accordance with paragraph 4-4.4 to meet the requirements of Table 6-1, the tyres or monobloc wheels shall be renewed.

If, after allowing for reprofiling in accordance with paragraph 4-4.4 more than 50% of the available wear material (ie. the difference between new and scrapping diameters) is used up, and the other tyre or monobloc wheel on the axle is to be renewed due to reasons other than normal wear, then both tyres or monobloc wheels on that axle shall be renewed.

Where tyres or monobloc wheels are renewed the journal bearings shall be removed and overhauled in accordance with the appropriate bearing maintenance document.

4-2.2.4 Visible Cracks in Wheel Centres or Monobloc Wheels.

Wheel centres and monobloc wheels shall be visually examined for cracks, other than thermal cracking in the wheel tread surface. Wheels or wheel centres found to be cracked shall be renewed.

4-2.2.5 Non-Destructive Testing of Axles.

The axle shall be non-destructively tested, and actions taken, in accordance with the appropriate NDT Procedure Chart, and paragraph 4-2.3.16.

Note: In addition to the above requirements, the axles of Classes 101 to 128 DMU driving wheelsets shall be examined for torsional cracks by the use of a magnetic particle flaw detection technique, carried out by an Approved Operator, on the axle body surface between wheelseats, in accordance with procedures approved by the Engineer.

4-2.2.6 Plain Bearings.

Plain bearing journals reported as having run hot, or showing visual evidence of having run hot, shall, subject to the dimensional limits shown in Table 6-2, be machined removing the minimum amount of metal.

The machined journal shall be proved free of defects by the use of an approved magnetic particle flaw detection technique carried out by an Approved Operator.

4-2.2.7 Roller/Ball Bearings.

Roller or ball bearings reported as having run hot shall be removed for examination in accordance with the appropriate WOSS, CEPS, or other document, and the axle seat examined in accordance with Table 4-2.3.1 and paragraph 4-2.3.10. Both bearings of the wheelset shall be treated as having run hot.

4-2.2.8 Monobloc Wheel Inner Rim Indentations.

The inner rim of each monobloc wheel shall be examined for indentations, such as may be caused by lathe drive dogs during previous reprofiling of the treads. Any indentations with sharp internal angles, see Figure 4, shall be repaired by hand grinding in a circumferential direction, to a depth of 1mm beyond the indentation, subject to a maximum of 5mm depth of metal being removed. The profile of the ground portion of the wheel shall be blended in over a length of 5 times the depth of metal removed. Care shall be taken during grinding not to heat the metal sufficiently to cause it to blue.

Following grinding, the ground areas shall be proved free of defects by the use of an approved magnetic particle flaw detection technique, carried out by an Approved Operator.

4-2.2.9 Security of Fit of Wheels, Brake Discs, etc. on Axle.

The security of fit of wheels, wheel centres, traction gears, axle mounted brake discs and any other interference fitted component on the axle shall be visually checked. If there is any evidence of movement, or interface corrosion, the affected item shall be removed for examination of the axle seat and bore in accordance with Tables 4-2.3.1 and 4-2.4.1 and paragraphs 4-2.3 and 4-2.4.

4-2.2.10 Wheelset Back to Back Dimension.

The wheelset back to back dimension, as gauged in accordance with MT 288, at three equispaced locations around the wheels, shall :-

- i) Be not less than 1359mm or more than 1363.25mm.
- ii) Not have a variation between the minimum and maximum measurement greater than 3mm.

On wheelsets having suspected overheated monobloc wheels (see paragraph 4-2.1) and failing to meet i) above, the wheels shall be renewed. Other wheelsets failing to meet i) above shall be examined to determine whether wheel or wheel centre distortion, or movement on the axle is the cause. Where it is not possible to determine the cause of the deviation of the back to back dimensions from the limits above both wheels on the wheelset shall be treated as distorted. Distorted wheels or wheel centres shall be renewed. Treat moved wheels or wheel centres in accordance with paragraph 4-2.2.9.

The axle of any wheelset not meeting ii) above shall be gauged for axle body run-out in accordance with paragraph 4-2.2.13.

4-2.2.11 Number and Spacing of Balance Weight Holes.

Wheels with balance weights to BR Drawing N° B-A0-986 shall be visually examined for security of the balance weights. If there are more than 5 holes within a distance of less than 300mm, or there is less than 30mm of metal between any two holes, the balance weights shall be removed. The holes shall be proved free from defects by an approved Non Destructive Testing Procedure, carried out by an Approved Operator, and in conformity with the drawing requirements.

4-2.2.12 Spoked Wheels on Trailer Axles.

Any spoked wheel fitted to a trailer axle shall be renewed.

4-2.2.13 Axle Straightness.

The wheelset shall be spun between centres or on its bearings and gauged for axle run-out. If the requirements of BS 5892, Part 6, are not complied with the axle shall be dealt with in accordance with paragraph 4-2.3.10. It may be necessary to measure run out indirectly on portions of some axles e.g. by oscillation of a final drive gearbox.

4-2.3 Axle Examination.

4-2.3.1 The visible parts of the axle shall be examined, and actions taken, in accordance with the appropriate parts of Table 4-2.3.1, and paragraphs 4-2.3.11, and 4-2.3.13 to 15.

TABLE 4-2.3.1

Axle Examination Criteria

REF. N ^o .	AXLE DETAIL	MAXIMUM SURFACE TEXTURE	AXIAL SCORING, GROOVES, ETC	INDENTATIONS	CORROSION	FRETTING	HEATING, ARCING DAMAGE	DIMENSIONS	EXTERNAL RADII
1	Axle End, including m/c centre	N8	-	See para. 4-2.3.4	See para. 4-2.3.7	-	See para. 4-2.3.9	See para. 4-2.3.4	-
2	Thrust face, on Axle End	N6	-	Nil	Nil	-	"	See para. 4-2.3.4	See para. 4-2.3.4
3	Roller Bearing Journal	N6.5	See para. 4-2.3.3	See para. 4-2.3.5	See para. 4-2.3.5&6	See para. 4-2.3.8	"	See para. 4-2.3.10	-
4	Plain Bearing Journal	N5	Nil	Nil	Nil	-	"	"	See para. 4-2.3.12
5	Wheel Centre, Traction Gear, Dynamo Pulley, or Wheel Seat	N7	See para. 4-2.3.3	See para. 4-2.3.5	See para. 4-2.3.7	See para. 4-2.3.8	"	"	"
6	Traction Motor Suspension or Final Drive Roller Bearing Seat	N7	See para. 4-2.3.3	See para. 4-2.3.5	See para. 4-2.3.7	See para. 4-2.3.8	"	"	"
7	Traction Motor Suspension Plain Bearing Journal	N5	Nil	Nil	See para. 4-2.3.7	-	"	See para. 4-2.3.10	-
8	Oil Seal Seats	N5	Nil	Nil	Nil	-	"	"	See para. 4-2.3.12
9	Stress Relief Grooves	N6	Nil	Nil	See para. 4-2.3.7	-	"	-	"
10	Earth Brush ^{*2} Return Surface	N5	Nil	Nil	Nil	-	"	See para. 4-2.3.10	"
11	Journal Shoulder	N6	-	See para. 4-2.3.5	See para. 4-2.3.7	-	"	-	-
12	Transition Radii	N6	-	Nil	See para. 4-2.3.7	-	"	-	-
13	Parts of Axle Other Than Above	N8	-	See para. 4-2.3.5	See para. 4-2.3.7	-	"	-	-

Notes: 1. For axles reported or found with suspect defects during non-destructive testing, see paragraph 4-2.3.16.

*2. Coppered earth brush return surfaces shall be visually examined for damage to the coating, inadequate bonding, etc, and any necessary repairs carried out in accordance with CEPS 82.

3. Where Nil is shown above, the particular defect shall not be present.

4-2.3.2 Overhauled axles shall comply with the requirements of Table 4-2.3.1. Axle dimensions & tolerances shall comply with the design or as below. If applicable, reclamation by machining is permissible provided the cost is less than 20% of the cost of a new axle, and subject to the limits specified in Table 6-2.

4-2.3.3 Axle seats shall be visually examined for scoring resulting from the pressing on or off of wheelset components. Axial score marks shall not have any raised edges, burrs, sheared material or excessive depth, sufficient to cause suspect defects on ultrasonic examination or loss of oil injection pressure on subsequent wheelset overhaul/dismantling. Raised edges or burrs may be dressed out using an oilstone. Superficial scoring which can be repaired using fine emery paper shall be so treated. Rectification of seats shall be by machining to a clean surface, within the dimensional constraints of Table 6-2.

4-2.3.4 The axle end face and machining centre (excluding any axle end thrust faces) shall have no raised sharp edges/burrs. Removal of any sharp edges/burrs by use of an oil stone is permissible. There shall be no indentation or groove which hinders ultrasonic testing of the axle. Axle centres shall not be remachined except with the Engineer's approval. The diameter of the machining centre at the axle end shall not exceed the drawing dimension plus 3mm.

Axle end faces, used with axial thrust pads, shall have no evidence of scoring or metal pick-up. The surface texture shall not be coarser than N8 and the end face flatness and vertical run-out shall not exceed 0.08mm. Where machining is necessary the axle shall comply with the following :-

- i) A surface texture not coarser than N6 shall be obtained.
- ii) After machining the journal length shall not be less than nominal size minus 2.5mm.
- iii) The end face to journal/axle end spigot diameter radius shall be reinstated as specified on the relevant drawing.

4-2.3.5 Axlebox roller bearing journals, seats for wheels, wheel centres, traction gears, traction motor suspension or final drive roller bearings, journal shoulders, and the axle body shall have no visible circumferential scoring. Indentations up to 1mm deep are permissible, providing that the edges are blended in using fine emery and the surface texture requirements are not exceeded. There shall be no burrs or other raised material.

4-2.3.6 Corrosion which cannot be removed by hand using fine emery cloth is not permitted at the transition radius between journal and journal shoulder except on axles with geometry as illustrated in Figure 9, ie. a 45° abutment flank angle. On axles of the latter type corrosion shall be treated as follows:-

- i) Superficial corrosion shall be rubbed with a fine grade abrasive cloth wetted with light lubricating oil, and the treated areas subsequently polished to provide a surface texture not coarser than N6.5.
- ii) Corrosion containing surface pitting shall be machined out, subject to the limits specified in Figure 9. After machining the surface shall be polished to a surface texture not coarser than N6.5.
- iii) After the treatment in i) and ii) the axle shall be cleaned to remove all traces of abrasive or polish.

Note: If after the treatment specified in i) and ii) above, small corrosion pits are still present on the abutment flank, see Figure 9, the axle shall be reused providing the pitted area does not cover more than 20% of the total area of the flank.

4-2.3.7 There shall be no corrosion pitting or surface corrosion on the axle, except :-

- i) Journal shoulder with 45° flank angle, see 4-2.3.6.
- ii) On axle end faces (including machining centres) not used as thrust bearings, corrosion pitting up to 1mm diameter is permissible.
- iii) Roller bearing journal corrosion, see 4-2.3.5.

For rectification of corrosion of oil seal tracks on axles of DMU classes 100-127 see DMU gearbox & final drive WQSS.

For rectification of corrosion on earth brush return surfaces see 4-2.3.10.v.

Rectification of other surfaces shall be by:-

- a) Hand wire brushing.
- b) Fine grade emery cloth, used by hand.
- c) Machining to a clean surface, where permissible. Table 6-2 shows those axles which can be reduced in diameter and the minimum permissible diameters.

4-2.3.8 Seats for wheels, wheel centres, gears, bearings, or other interference fitted components shall have no fretting (indicated by brown staining of the surface), giving a surface texture coarser than N8, when compared with Roughness Comparison specimens to BS 1134, at the surface in question.

4-2.3.9 Axles shall be free of weld spatter, electric arc damage and signs of overheating (blueing).

4-2.3.10 Axles shall comply with the following :-

- i) Axlebox roller bearing journals, traction motor suspension tube/final drive gearbox roller/ball bearing seats, shall be parallel and cylindrical to within 0.05mm.
- ii) Wheel or wheel centre seats, seats for dynamo pulleys, traction gears and brake discs, shall be parallel within 0.05mm (any taper to be in a direction to increase interference in the direction of pressing on) and cylindrical to within 0.025mm.
- iii) Plain bearing axlebox and traction motor suspension journals shall be parallel and cylindrical to within 0.05mm. If there is visual evidence of copper penetration, it shall be removed by machining with minimum depth of cut, within the dimensional constraints of CEPS 86, and proved free of defects by the use of an approved magnetic particle flaw detection technique, carried out by an Approved Operator.

For plain bearing axlebox journals, unless otherwise specified in Table 6-2, the maximum journal length shall not exceed nominal plus 3mm. For the permissible reduction in journal diameter see Table 6-2.

- iv) Copper slip ring type earth return brush seats shall not be less than nominal size minus 4mm. Rectification shall be in accordance with CEPS 82.
- v) Slip ring type earth return brush seats other than iv) shall not be less than nominal size minus 3mm. Rectification shall be in accordance with CEPS 82.
- vi) The axle shall comply with the run-out tolerances as shown on the drawing and in BS 5892, Part 6. If not complying and the run-out increases towards the centre of the axle it is to be considered as bent and shall be scrapped. Other axles not complying shall be reconditioned by machining to a clean surface, with a minimum depth of cut, within the dimensional constraints of Table 6-2.

WOSS 612/10

4 2.3.11 When, for new or remachined axles, the drawing specifies cold rolling, the axle parts concerned shall be rolled using a force of between 8000N and 89000N.

Details of rollers: Diameter of rollers - 254mm
 Contour radii - Top roller - 35mm
 - Bottom roller - 140mm
 Speed - 24 RPM, Feed - 0.635mm/rev

The rollers shall be applied at the position of the stress relief groove, loaded with the axle rotating and traversed along the wheel seat towards the end of the axle. The rollers shall be unloaded over the last 25mm of seat length. The rollers shall then be re-applied at the initial starting point, loaded with the axle rotating and traversed in the opposite direction across the gear wheel and bearing seats at the appropriate diameter or at the opposite end of the axle the bearing seat only. The rollers shall be unloaded over the last 25mm of bearing seat length. The resultant tapers shall be removed when the seats are machined to finished sizes. The ripple left over the stress relief groove due to the displacement of material during the loading of the rollers, shall be removed by machining.

After machining, stress relief grooves to be rolled with a force of 5340N.

Details of rollers: Recommended contour radius = 5mm
 Speed - 24 RPM, Feed - 0.178mm/rev

4-2.3.12 All raised seats, journal ends, etc, shall have external corner radii to Figure 10 requirements.

4 2.3.13 Tapped holes in the axle end shall be examined for thread wear, using a thread gauge. Worn threads shall be repaired using Heli-Coil inserts, following the manufacturer's instructions and ensuring that the inserts are 1/4 to 1/2 thread pitch below the axle end surface.

Notes: 1. Suitable Heli-coil inserts are obtainable from Armstrong Patents, Beverley.
 2. Drilling of additional holes in the axle end is prohibited.

4-2.3.14 If the axle was manufactured 40 or more years previous to the date of examination, the axle record card (see MT 240) shall be endorsed with the date of manufacture. Where a record card is not available one shall be provided in accordance with MT 240 requirements.

4-2.3.15 Axles marked in Table 6-2 with 'G' or 'R', or as defined in the appropriate WOSS, shall be machined to the latest profile as specified on the relevant drawing, whenever any axle not so modified has the wheel/wheel centres and gears (if fitted) removed, or if specified in Table 6-2.

4-2.3.16 Axles confirmed as cracked (see paragraph 4-2.2.5) shall, if possible, be reclaimed by machining in accordance with Figure 6 or 7, or the modified axle profile (see Table 6-2) as applicable.

All external corners of wheel seats shall be radiused as shown in Figure 10, in order to avoid suspect defect signals occurring during non-destructive testing.

Notes: 1. The above may require displacement of components for access.
 2. After machining of the axle, inspection shall be carried out in accordance with Section 3, of NDT Procedure Chart REC 1, to confirm elimination of crack.
 3. Modified axles shall be identified by the stamping of the 'Reclaimed Axle Geometry Code' in accordance with MT 240.

4-2.3.17 New axles shall comply with the requirements of BS 5892, Part 6, and the relevant drawing. With the exception of axles with end thrust faces, wheelsets requiring dynamic balancing, see Table 6-1, and having no provision for tapped holes in the axle end, tapped holes may be provided in one axle end for dynamic balancing to be carried out. Where the journal diameter/axle end spigot diameter (whichever is the least) is equal to or greater than Ø 100mm the axle end face shall have 3 holes drilled and tapped M12 x 25mm deep, equidistant on a pitch circle diameter of 67mm. All threads shall be Class 6H, Coarse Pitch to BS 3643, Part 2.

If this cannot be achieved, drill and tap in accordance with BR Drawing N^o 81-A0-9012713.

4-2.4 Monobloc Wheel and Wheel Centre Examination.

4-2.4.1 Monobloc wheels and wheel centres shall be examined, in accordance with Table 4-2.4.1.

TABLE 4-2.4.1

Examination of Monobloc Wheels and Wheel Centres

REFERENCE NUMBER	CHARACTERISTIC	ACTION IN ACCORDANCE WITH
1	Wheel Web Holes for Cheek Discs	See paragraph 4-2.4.3
2	Wheel Web Surface Condition (Cheek Discs Removed)	See paragraph 4-2.4.4
3	Bore	See paragraph 4-2.4.5
4	Wheel Centre Boss Bearing Face	See paragraph 4-2.4.6
5	Oil Injection Facility	See paragraph 4-2.4.7
6	Wheel Centre Rim	See paragraph 4-2.4.8
7	Cracks, Distortion, Overheating, etc	See paragraph 4-2.4.9
8	Corrosion	See paragraph 4-2.4.10
9	Integral Disc Braking System	See paragraph 4-2.4.11

4-2.4.2 Overhauled wheels and wheel centres shall comply with the applicable criteria of Table 4-2.4.1.

4-2.4.3 Wheel web holes for cheek mounted brake discs shall be examined whenever the discs are removed. There shall be a chamfer at each end of each hole, at least 1.5mm x 45°. The surface texture shall not be coarser than N7, and shall be free of burrs or sharp edges. The chamfer size may be increased to 3mm x 45° if necessary. Bolt holes shall be free of visible scoring, corrosion pitting and indentations. The surface texture shall not be coarser than N8.

The holes of wheels fitted with Lucas Girling brake discs shall be visually examined for cracks. There shall be no cracks initiating from any hole position. Corrosion pitting may be cleaned away from clearance bolt holes by opening out the holes, removing the minimum amount of metal, to a maximum of 14mm diameter and reinstating the chamfer at each end.

4-2.4.4 Both the web surfaces of the wheel from which cheek mounted discs have been removed shall :-

- i) Have a surface texture not coarser than N9
- ii) Have no corrosion which cannot be removed using coarse emery paper or wire brush or other means approved by the Engineer.
- iii) Have no indentations greater than 2.5mm deep.
- iv) Have no raised edges or burrs which cannot be removed by light grinding. Blending in to the adjacent surface/s without undercut and/or local overheating is permissible.

4-2.4.5 If removed from the axle the bore shall be visually examined for scoring resulting from pressing on, or off the axle. Axial score marks shall not have any raised edges, burrs, sheared material or excessive depth, sufficient to cause suspect defects on ultrasonic examination or loss of oil injection pressure on subsequent wheelset overhaul /dismantling. Raised edges or burrs may be dressed out using an oilstone. Superficial scoring which can be repaired using fine emery paper shall be so treated.

There shall be no visible fretting giving a surface texture coarser than N8, when compared with Roughness Comparison specimens to BS 1134. There shall be a corner radius of 3mm maximum at the entry end of the bore. The bore shall be parallel and cylindrical to within 0.05mm. The diameter shall be within the dimensional limits for the seat on which it is mounted.

For wheel centres only, it is permissible to build up the bore by welding, with preheat, using a technique approved by the Engineer. After machining the bore, the reclaimed surface to be inspected for freedom from defects, using a NDT technique approved by the Engineer.

4-2.4.6 Each wheel/wheel centre hub thrust bearing face and seal mating face shall be visually examined to establish :-

- i) Freedom from scoring or grooving
- ii) Freedom from corrosion
- iii) That the surface texture is not coarser than N7.

If necessary, the face shall be machined in accordance with the requirements of CEPS 16. If this results in the dimensional tolerances being exceeded it is permissible, for wheel centres only, to build up the surfaces using the same method as for hub bores, see paragraph 4-2.4.5.

4-2.4.7 The oil injection facility shall, if the wheel centre is removed from the axle, be visually examined and any deviation from the requirements of BR Drawing No C1-A1-9003904 corrected. If not provided this facility shall be added.

4-2.4.8 The rim of the wheel centre from which the tyre has been removed shall :-

- i) Have an outside diameter not less than nominal size minus 5mm.
- ii) Have ovality of not more than 0.6mm.
- iii) Have a surface texture on the outside diameter and inner and outer faces not coarser than N8.
- iv) Have a width not less than nominal size minus 2.5mm. The machined rim profile shall comply with the requirements of BR Drg N° B2-C1-9038255.
- v) Have no surface corrosion which cannot be cleaned away using emery paper or wire brush.
- vi) Have no indentations greater than 2.5mm across.
- vii) Have no raised edges or burrs which cannot be removed by filing. Filing below the surface of the rim is not permissible.

Machining, with minimum depth of cut, is permissible if necessary in order to achieve the above. With the exception of Locomotive wheelsets, the rim section adjacent to the 'Snip-End' recess for all other Traction and Rolling Stock wheel centres shall have radii provided in accordance with Figure 11.

Note: Irrespective of condition, and subject to i) and iv) being complied with, machining shall be carried out on the outside diameter of wheel centre rims of Classes 302, 303, 305, 308 and 311 Stock motored wheelsets.

Weld repair, by a technique approved by the Engineer, may be permitted.

4-2.4.9 The wheel or wheel centre shall be free of any visible cracks, distortion, overheating, weld spatter, electric arc damage, etc.

4-2.4.10 Surface corrosion is acceptable on the wheel tread. Other wheel surfaces shall be cleaned of all corrosion. There shall be no corrosion pitting or other indentations greater than 2.5mm in diameter.

4-2.4.11 Integral disc braked wheels shall have:

- i) A web thickness of not less than 28.0mm.
- ii) No visible cracks present within the braking surfaces.
- iii) A surface texture not coarser than N8.

To achieve the above, the wheel web may be machined, reducing its thickness, observing the parallelism and perpendicularity tolerances specified on the drawing. The braking surface shall be blended in at its inner and outer edges, with at least 19mm radius. If there is any undercut, the wheel web thickness at the undercut shall be greater than 28.0mm.

On wheelsets having two integral disc braked wheels, one having a web thickness between 28.0mm and 28.1mm, that wheel shall not be used for braking, but may be used as a non-braked wheel. Such wheels shall be painted in the normal manner, see paragraph 4-4.9. Otherwise, the braking surfaces shall be protected with two coats of Tectyl Valvoline 151A (BR Cat N° 28/76895) or Texaco Rustproof Compound (BR Cat N° 27/20310).

4-2.5 Examination of Bores of other Axle Mounted Components.

- 4-2.5.1 The bore of each axle mounted brake disc, traction gear and dynamo pulley shall comply with the requirements of paragraph 4-2.4.5 above.
- 4-2.5.2 The oil injection facility shall be visually examined and any deviation from the requirements of BR Drawing No C1-A1-9003904 corrected. If not provided this facility shall be added.

4-3 DISMANTLING

4-3.1 Dismantling of the wheelset shall be in accordance with paragraphs 4-3.2, 4-3.3 and 4-3.4. Removal of traction motor suspension tubes, bearings, gearboxes, etc, shall be in accordance with the appropriate WQSS or other documents.

4-3.2 When oil injection facilities are provided, the wheel, wheel centre, traction gear, dynamo pulley or axle mounted disc shall be removed from the axle using an approved oil injection procedure and:-

- i) A gravity drop method (ie. use of weights, with the axle held vertically) for shrink fitted components.
- ii) A hydraulic press (see BS 5892, Part 6) for press fitted components.

The method used shall not cause 'dishing' of wheels or other components, nor upsetting of axle ends. The pressing off load shall be applied equally around the component to be removed, so as to avoid metal pick-up of the seats, or bending of the axle.

4-3.3 When components are not provided with oil injection facilities, a hydraulic press shall be used, as in paragraph 4-3.2 above.

4-3.4 Tyres shall be removed by machining axially into the root of the retaining ring groove to release the ring, and heating the tyre by gas burners or other approved method to expand the tyre off the wheel centre.

Tyre or tyre retaining ring removal by oxy-acetylene cutting is not permitted unless the process is approved by the Engineer.

4-4 ASSEMBLY

- 4-4.1 The assembly of tyres on to wheel centres, and of monobloc wheels, wheel centres, traction gears, dynamo pulleys and axle mounted brake discs, shall be in accordance with paragraphs 4-4.2 to 4-4.11, and BS 5892 Part 6. Assembly of traction motor suspension tubes, bearings, gearboxes, etc, shall be in accordance with the appropriate WOSS or other document.
- 4-4.2 Shrink fitting of wheels, wheel centres, traction gears and axle mounted discs is preferred, using an interference of 0.0008mm to 0.001mm per 1mm of seat diameter. For press fitted items, an interference within the range of 0.001mm to 0.0013mm per 1mm of diameter is recommended. Provision of any lead in taper shall be on the axle seat, to comply with the requirements of BS 5892, Part 6.
- Note: Shrink fitted components shrink axially as well as radially. When required to abutt another component, the final movement shall be by oil injection. The proving thrust may then be applied in the same direction.
- 4-4.3 All new tyres shall be machined in accordance with BR Drg N^o. B2 C1-9038255, and fitted with new retaining rings, complying with the requirements of BS 5892, Part 5, Type A, with squared ends. Rolling down of the lip shall be with a roller angle of 23° to the back face of the tyre and a maximum force of 300 kN.
- On motored wheelsets for Class 302, 303, 304, 305, 308, 309 and 311 Stock the interference between tyre and wheel centre shall be increased from 1.320mm to 1.400mm.
- 4-4.4 If monobloc wheels or tyres are renewed, back to back dimension of the wheelset shall be within the range, 1360 - 1362mm.
- 4-4.5 The tread profile (unless new finish machined wheels have been fitted) shall be machined, see Tables 6-1 and 6-3, eliminating all visible cracks or cavities. The minimum amount of metal shall be removed, leaving witness mark as shown in Figure 8 if possible. The permissible variations in diameter across a wheelset shall comply with the requirements of Table 6-1.
- 4-4.6 If specified in Table 6-1, the completed wheelset shall be dynamically balanced. Where permissible values of unbalance are quoted in the Table, these override BS 5892 Part 6. Correction of unbalance shall be as shown on the appropriate wheelset assembly drawing (see also Table 6-4).
- 4-4.7 Electrical resistance testing of the wheelset is not required.
- 4-4.8 On completion of overhaul, if wheels/wheel centres have been renewed, or their fit to the axle disturbed in any way each axle shall be ultrasonically tested, and actions taken, in accordance with MT 280 and the appropriate NDT Procedure Chart.
- 4-4.9 The wheelset branding and recording procedures shall be in accordance with MT 240.
- 4-4.10 The wheelset (other than integral disc braking surfaces, see paragraph 4-2.4.11) shall be painted in accordance with the BR Painting Schedule N^o 2, 3 or 6, as appropriate, except for the areas required for ultrasonic testing. These areas shall be coated with Lithium based grease to N^o 3 consistency (BR Cat N^o 27/1350). In the case of tyred wheelsets, 3 equispaced radial white lines at least 20mm wide shall be painted on the outside of the wheel, extending 175mm inwards from the tread.
- 4-4.11 The overhang of wheel hubs, gear wheels, axle mounted brake discs, etc, and any other surfaces which cannot be painted, eg. stress relief grooves, etc, shall be treated with Shell Ensis CB.
- 4-4.12 If the wheelset is not for immediate fitting to a vehicle, disc brake surfaces, together with any traction gears, bearings and sliders, spring pins or other devices, shall be suitably protected against corrosion to give effective protection for up to 12 months of outdoor storage. Removal of the corrosion preventative shall be possible within the facilities normally available at BR depots, whilst complying with Health and Safety at Work legislation. A weatherproof label, giving clear instructions for stripping of the protective coating, shall be attached to the wheelset.
- 4-4.13 The wheelset shall be marked with a durable label clearly showing the Contractor's identity, the wheelset Catalogue Number, the wheelset serial No, the overhaul date and the Warranty expiry date. The label shall be securely attached to the wheelset in such a way as to avoid any mechanical or other damage to the wheelset and its protective coating, either at the time of fitting or during subsequent service.

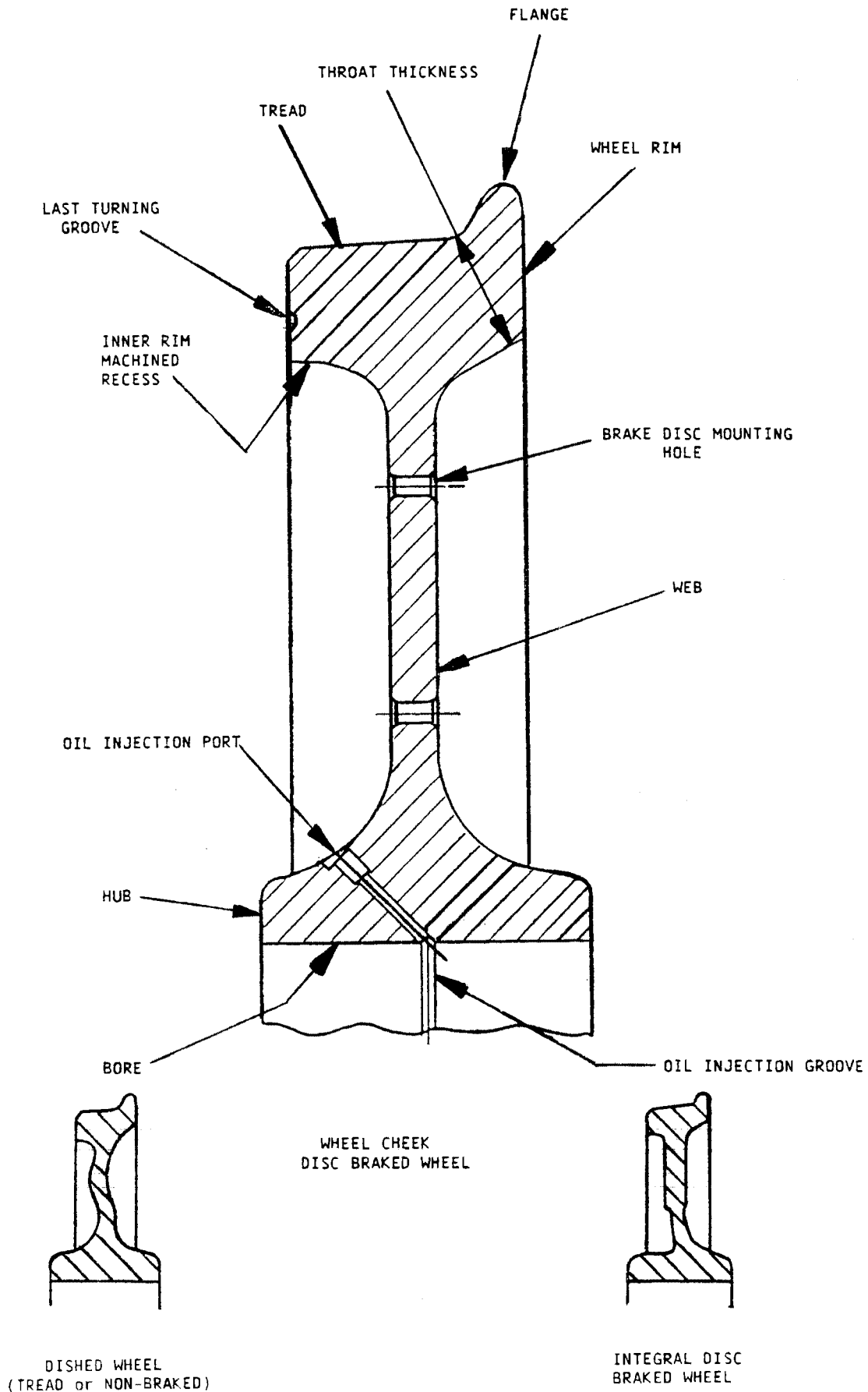


Figure 1 - Illustration of Terms - Monobloc Wheels.

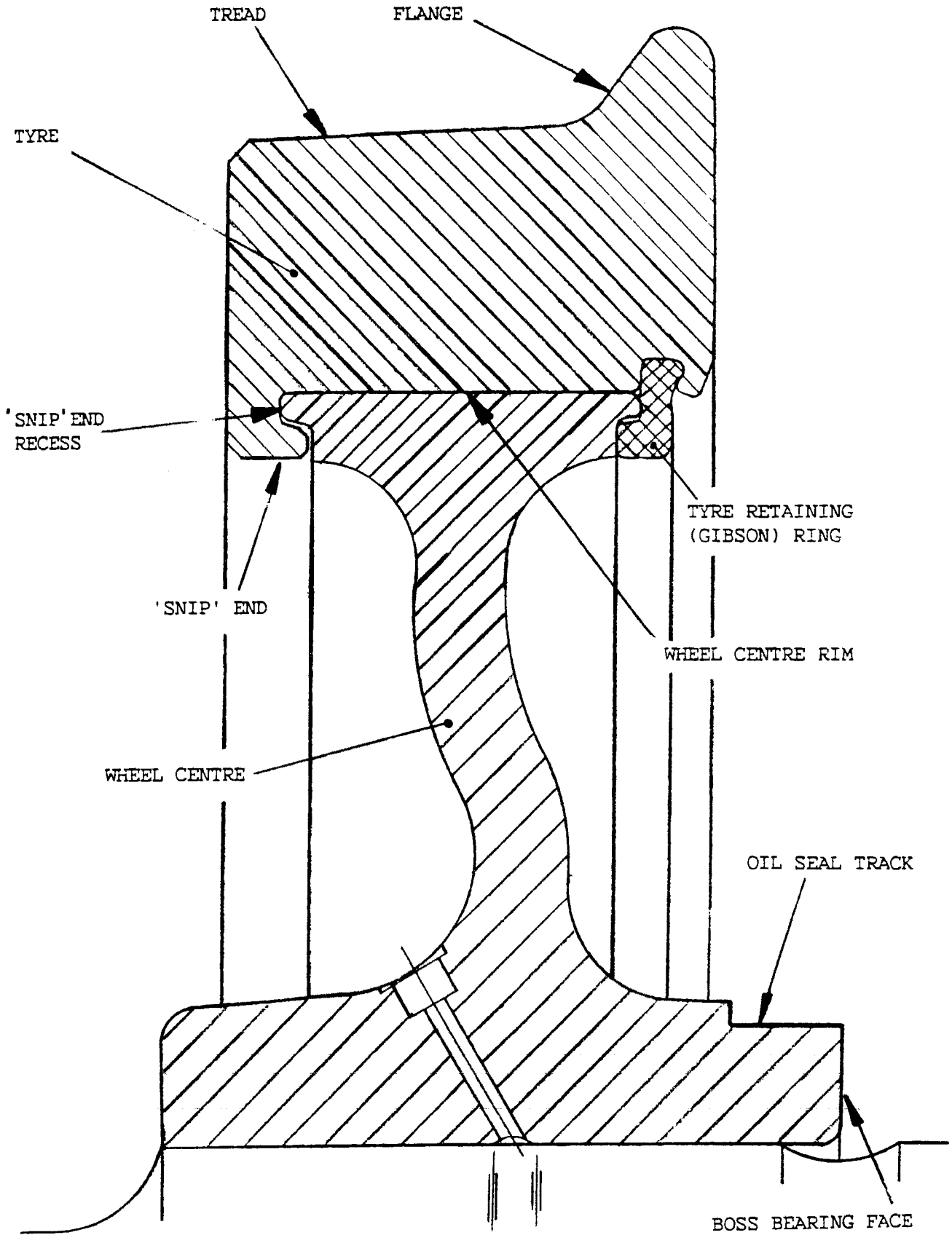
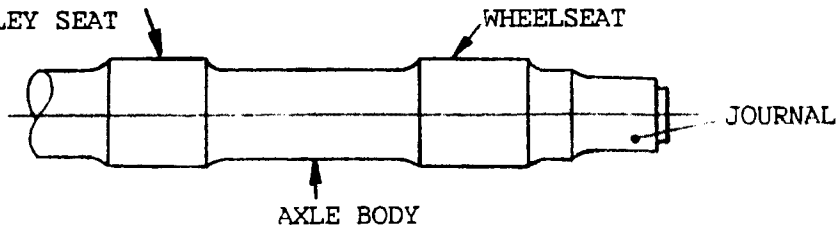


Figure 2 - Illustration of Terms - Tyred Wheels.

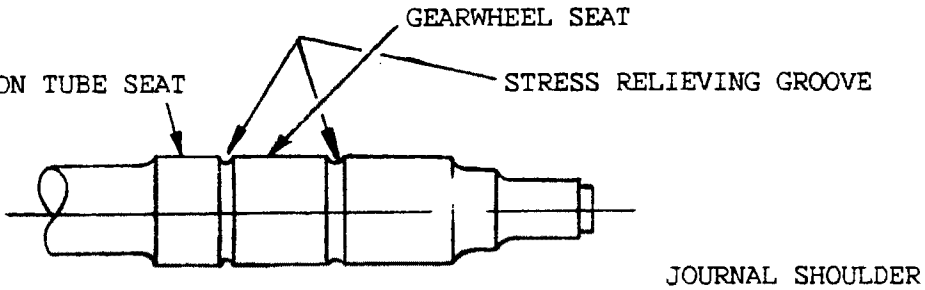
AXLE MOUNTED DISC/GEARWHEEL/
DYNAMO PULLEY SEAT



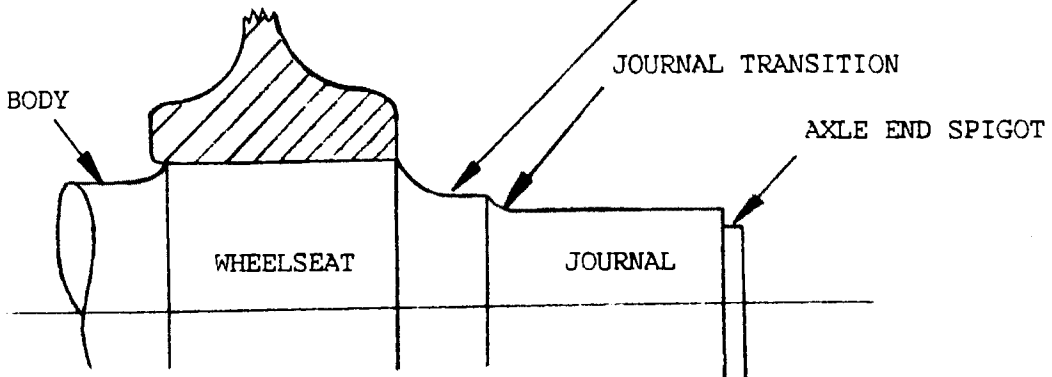
SUSPENSION TUBE SEAT

GEARWHEEL SEAT

STRESS RELIEVING GROOVE



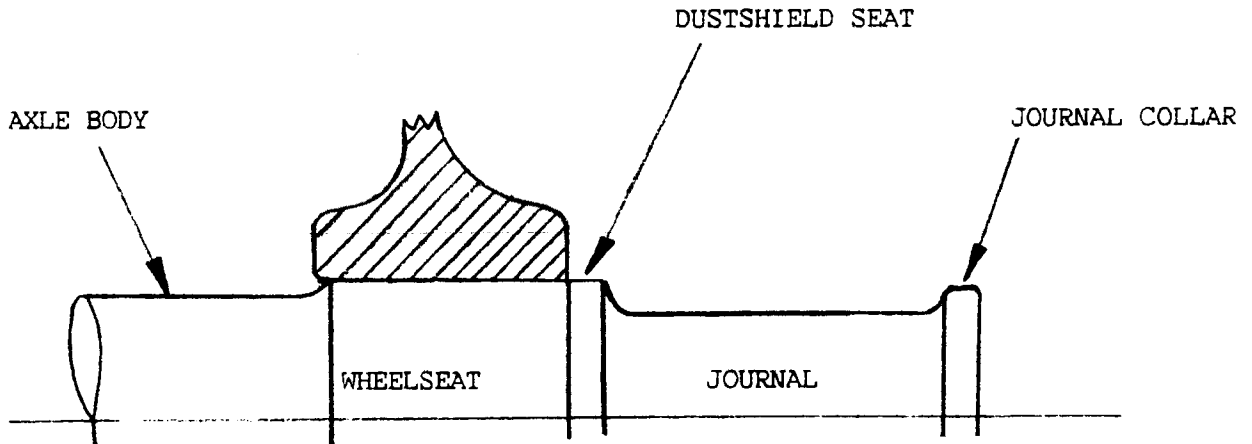
AXLE BODY



ROLLER BEARING AXLES.

DUSTSHIELD SEAT

AXLE BODY



PLAIN BEARING AXLE

Figure 3 - Illustration of Terms - Axles.

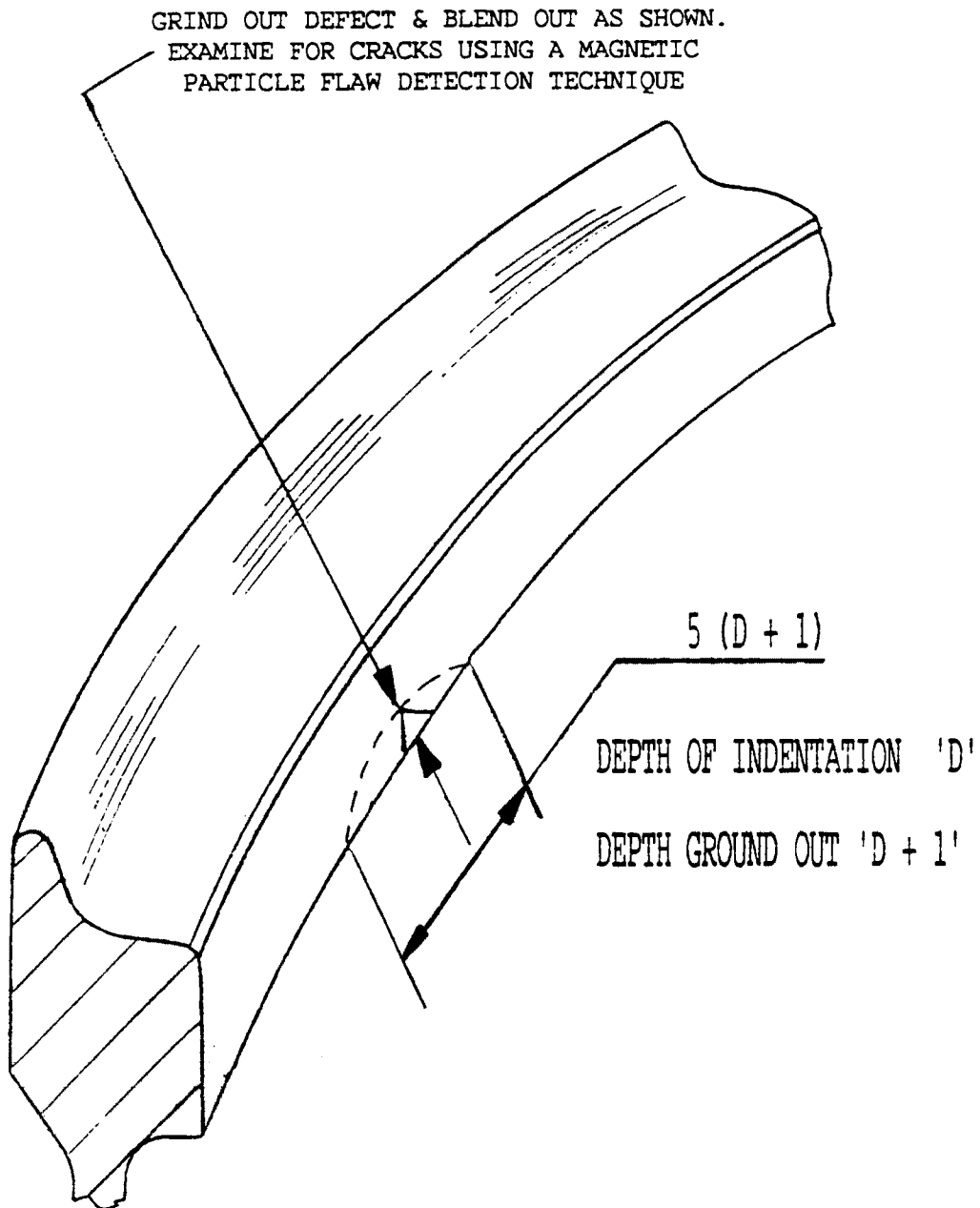
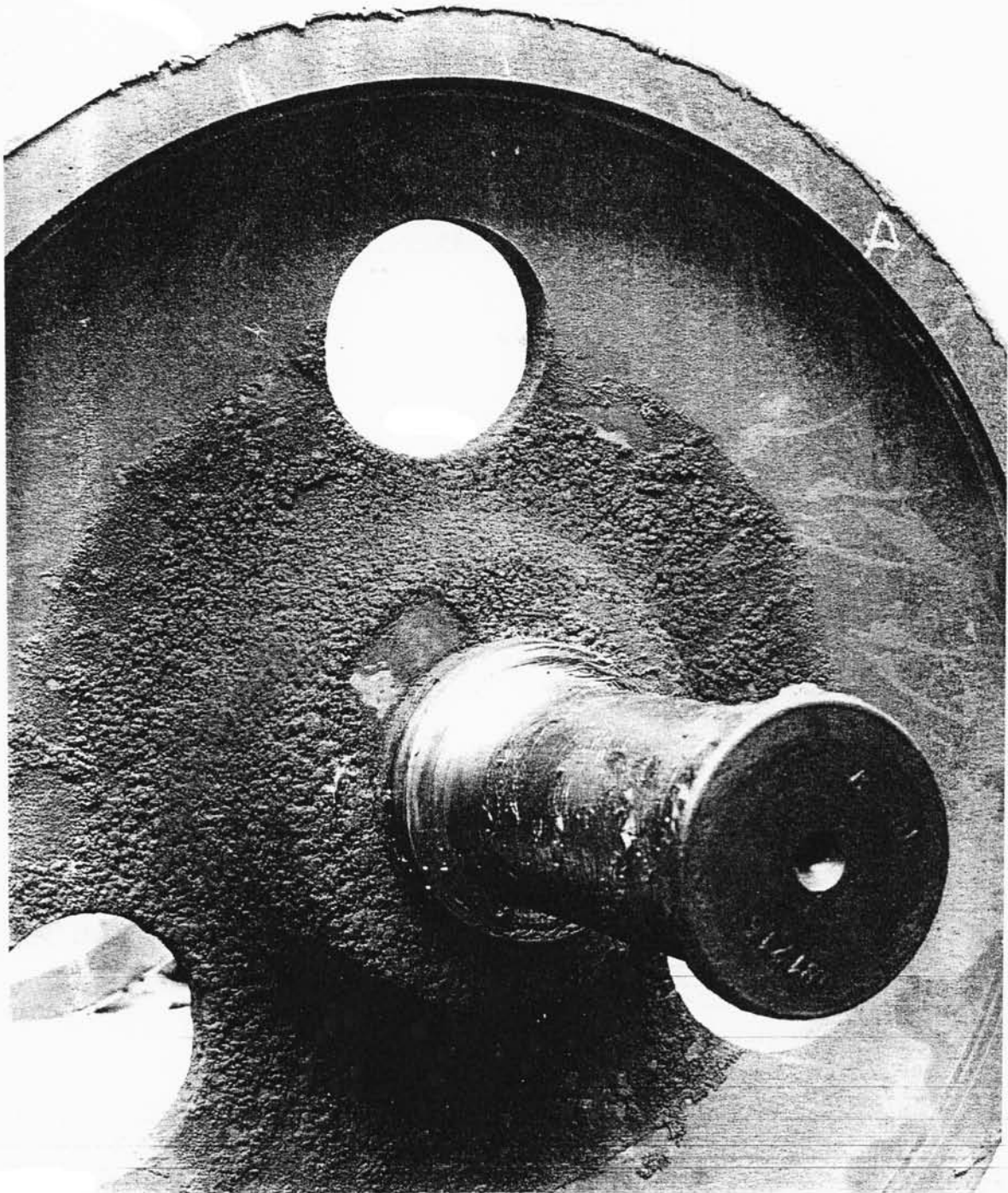


Figure 4 - Monobloc Wheel Inner Rim Defects.



NOTE THE LACK OF FOREIGN MATTER ON THE WHEEL WEB LOCAL TO THE WHEEL RIM INDICATING OVERHEATING OF WHEEL EXPERIENCED.

Figure 5 - Overheated Monobloc Wheel.

MAX CRACK DEPTH	Y	X CO-ORDINATE
0		0.8
5.2		3
6.3		6
7		9
7.8		12
8.4		15
9		18
9.2		21
9.4		24

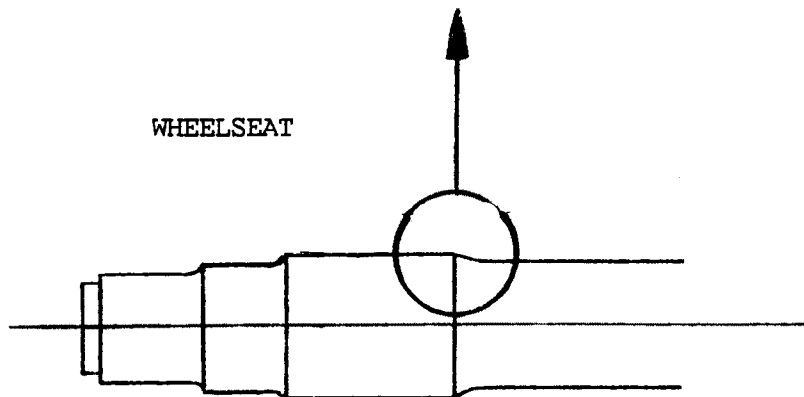
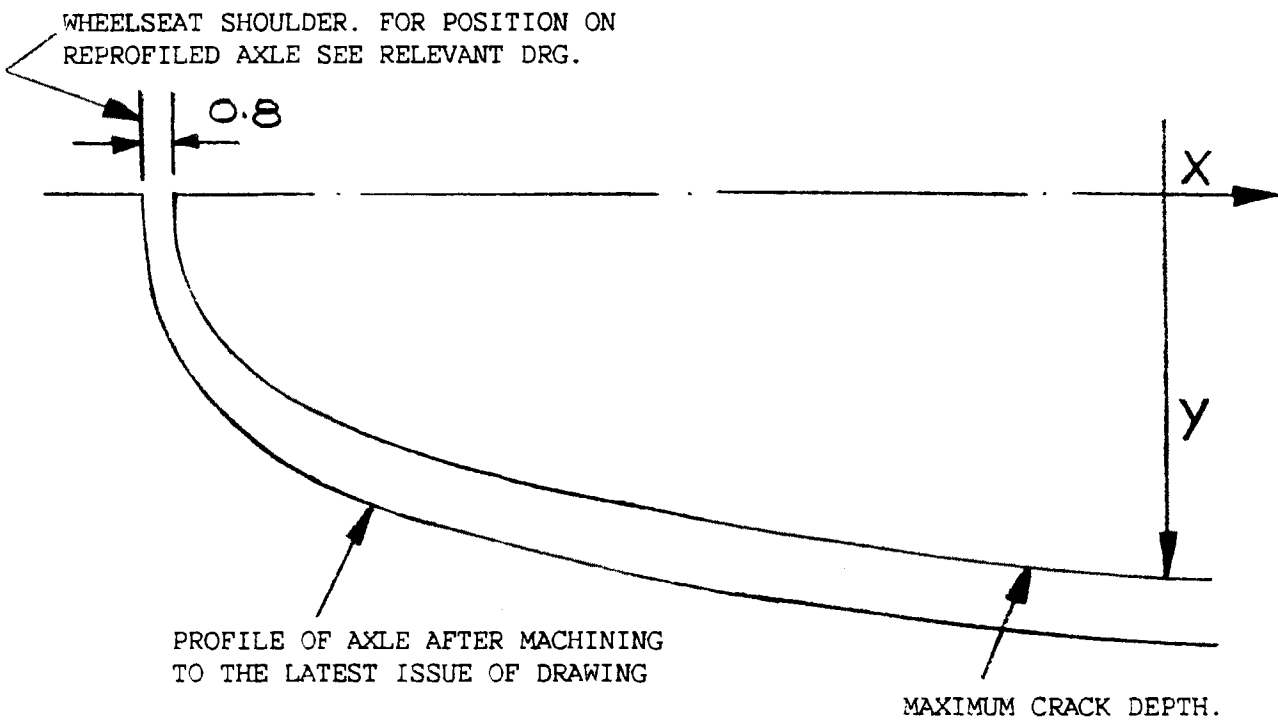


Figure 6 - Crack Depth Removable by Modifying Axle Profile.

MAX CRACK DEPTH ALLOWED AT DISTANCE X	MAX METAL DEPTH THAT CAN BE REMOVED BY REPROFILING	DISTANCE FROM GROOVE DATUM DIMENSION $\pm X$
3.3	4.8	0
3	4.6	3
2	3.7	6
0.9	2.7	9
0	0	12

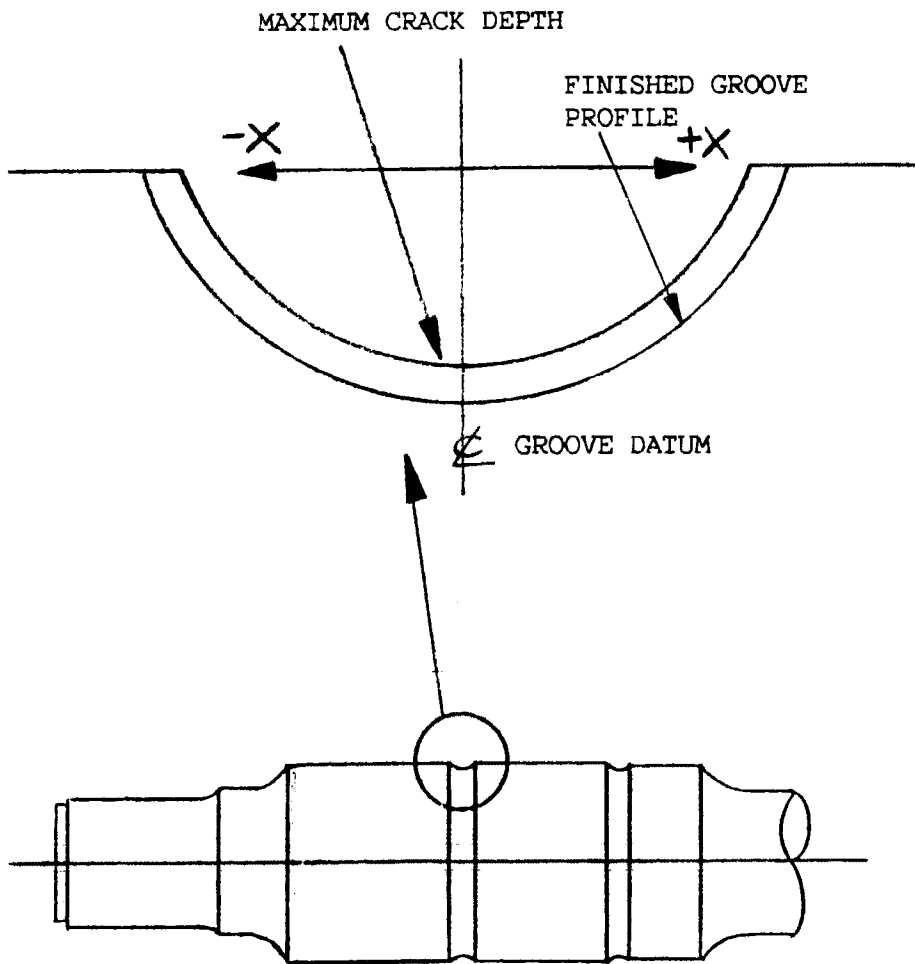


Figure 7 - Crack Depth Removable by Adding Stress Relief Grooves.

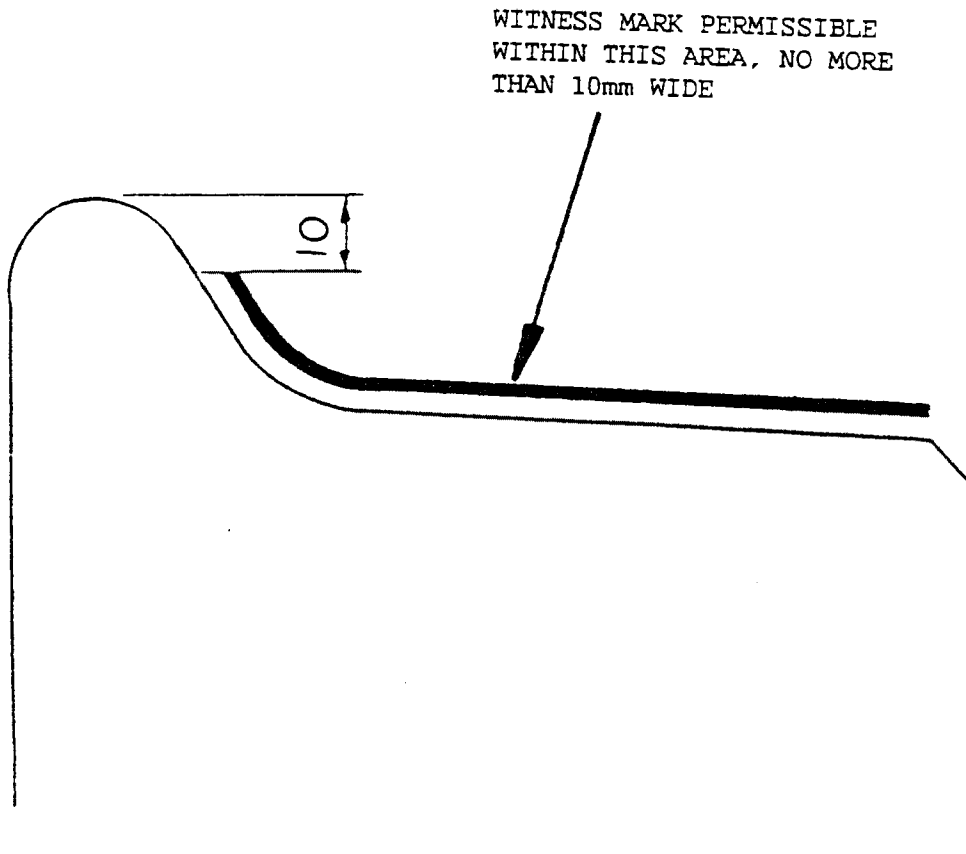
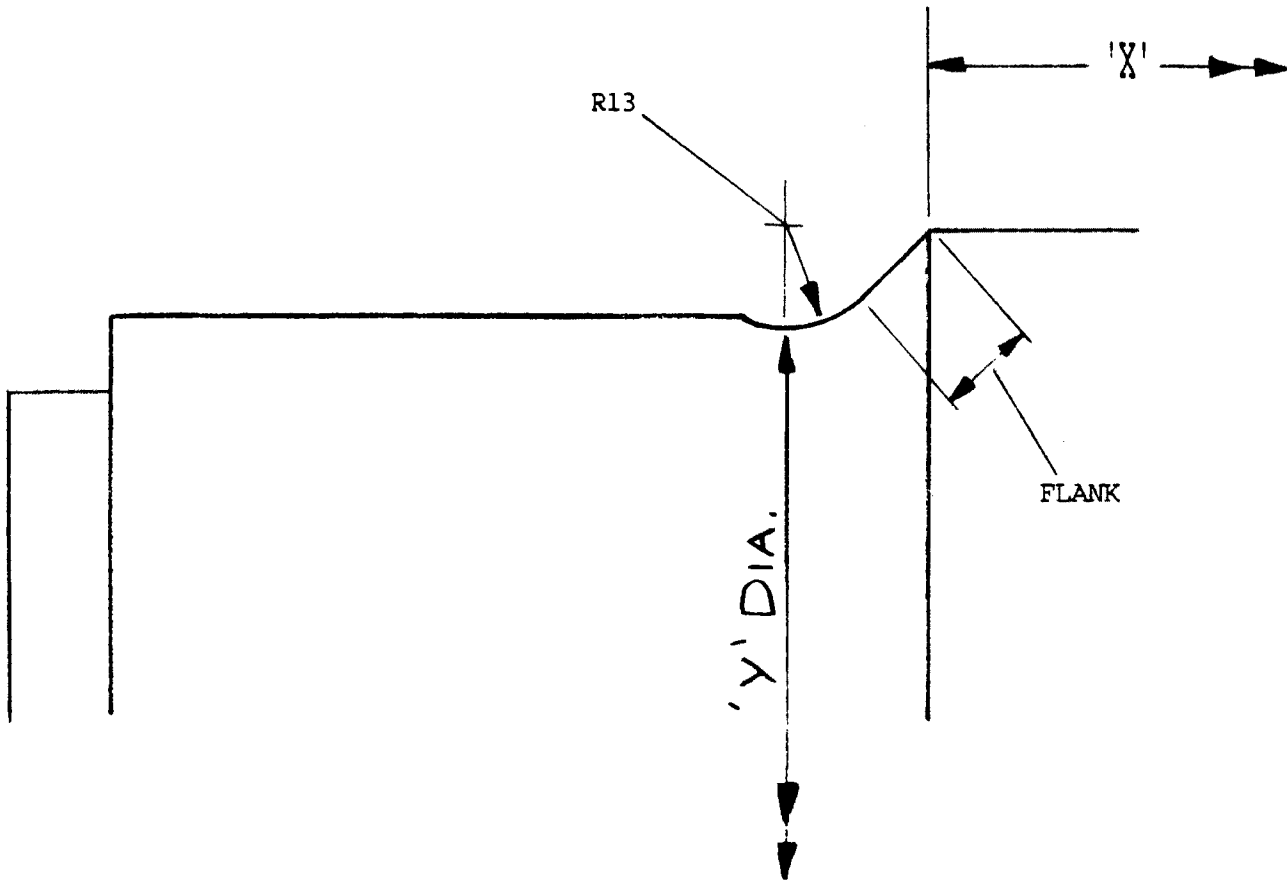


Figure 8 - Permissible Witness Mark on Reprofiled Treads.



1. REMACHINED RADIUS SHALL BLEND IN WITH EXISTING SHAPE WITH NO STEPS. RADIUS SHALL BE POSITIONED SO THAT THE INCREASE IN FLANK LENGTH IS A MINIMUM.
2. A REDUCTION OF JOURNAL DIAMETER 'Y' OF UP TO 3 mm BELOW NOMINAL SIZE IS PERMISSIBLE IN ORDER TO REMOVE CORROSION.
3. NO DEVIATION OF DIMENSION 'X' FROM NEW AXLE DRAWING TOLERANCES IS PERMITTED.
4. NO DEVIATION OF FLANK ANGLE FROM NEW DRAWING TOLERANCES IS PERMITTED

Figure 9 - Reclamation of Axles with Corrosion at the Journal to Journal Shoulder Transition Radius.

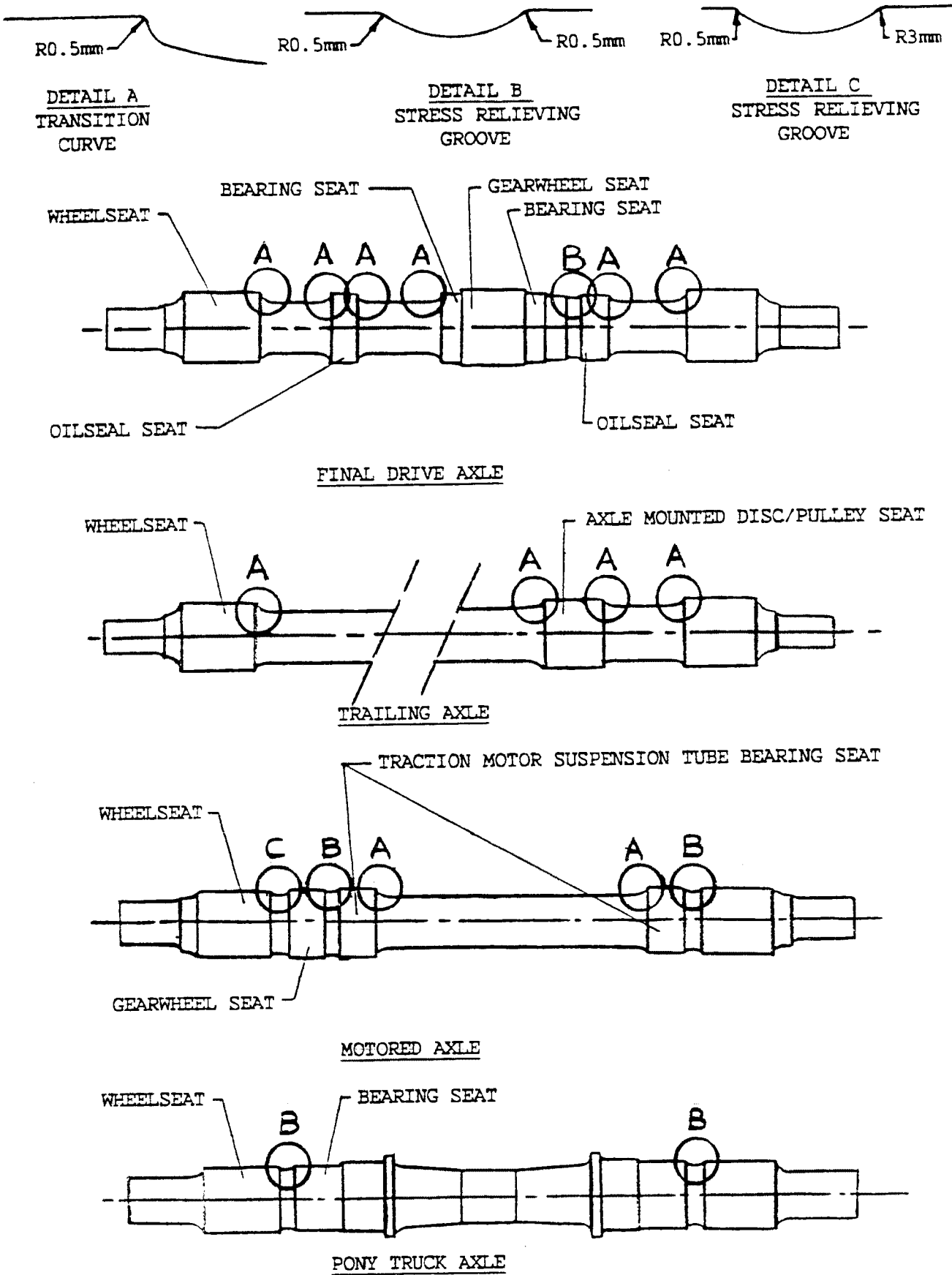


Figure 10 - Provision of Corner Radii for Axles.

ROLLING STOCK PRACTICE

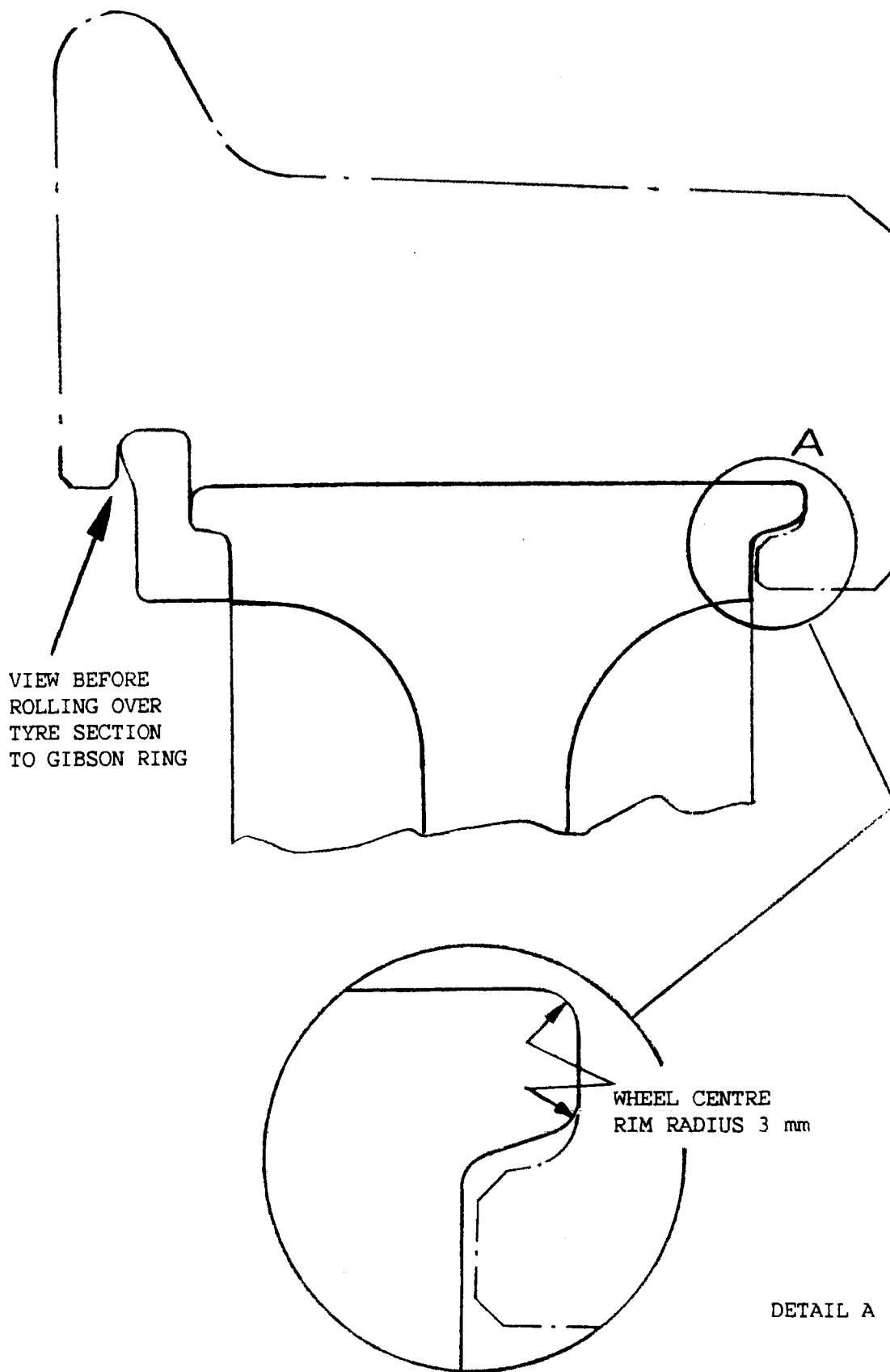


Figure 11 - Wheel Centre Rim Vertical Face Corner Radii.

5. TEST SPECIFICATION

Not Applicable.

6. TECHNICAL DATA

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 1 - LOCOMOTIVES

CLASS	TREAD PROFILE	WHEEL DIAMETER / TYRE THICKNESS (mm)			MAXIMUM DYNAMIC UNBALANCE (kg m)	REMARKS
		NEW	MINIMUM FOLLOWING OVERHAUL	SCRAP		
03	P1	1092 / 76	1035 / 47.5	1007 / 33.5	Exempt	-
08 & 09		see WOSS 612/2				-
20		see WOSS 612/20				-
26	P1	1092 / 76	1068 / 64	1013 / 36.5	Exempt	-
31	P1	1092 / 76	1092 / 76	1013 / 36.5	0.25	Driving Wheelsets
	P9	1003 / 76	1003 / 76	924 / 36.5	0.25	Intermediate Wheelsets
33	P1	1092 / 76	1068 / 64	1010 / 35	0.25	-
37		see WOSS 612/23				-
43		see WOSS 612/1				-
45	P1	1143 / 76	1143 / 76	1077 / 43	0.25	Driving Wheelsets
	P1	914 / 76	890 / 64	829 / 33.5	0.25	Pony Truck Wheelsets
47		see WOSS 612/24				
50		see WOSS 612/23				-
56		see WOSS 612/11				-
58		see WOSS 612/25				-
73	P1	1016 / 63.5	1016 / 63.5	962 / 36.5	0.25	-
86/2, 86/4		see WOSS 612/15				-
86/1, 87/0, 87/1, 90/0		see WOSS 612/26				

NOTE: 1. Where specified refer to the WOSS quoted for details.
 2. For variation in wheel diameter across a wheelset, through a bogie and vehicle, refer to Table 6-1, Part 7.

WOSS 612/10

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 2 - MULTIPLE UNIT STOCK

CLASS	VEHICLE TYPE	TREAD PROFILE	WHEEL DIAMETER / TYRE THICKNESS (mm)			MAXIMUM DYNAMIC UNBALANCE (kg m)
			NEW	MINIMUM FOLLOWING OVERHAUL	SCRAP	
101, 107, 108, 116, 117, 118	A11	P1	914 / 63.5	875 / 44	851 / 32	0.075
114	DMBS DTC	P1 P1	914 / 63.5 914 / 63.5	881 / 47 875 / 44	857 / 35 851 / 32	0.075
127	DPU	P1	914 / 63.5	881 / 47	857 / 35	0.075
128	DMLV	P1	914 / 63.5	881 / 47	857 / 35	0.075
140	A11	P8	840 / -	840 / -	776 / -	0.125
141, 142, 143, 144	A11	see WOSS 612/18				
150, 150/1, 150/2	A11	see WOSS 612/17				
151	A11	P8	840 / -	794 / -	765 / -	0.125
154, 155, 156	A11	see WOSS 612/17				
A11 Other DMU Classes and Vehicle Types (Tyred Wheelsets)		P1	914 / 63.5	875 / 44	851 / 32	0.075
203, 204, 205, 207	DMBS Trailers	P1 P1	1016 / 63.5 1067 / 63.5	964 / 37.5 1008 / 34	956 / 33.5 1000 / 30	0.075
253, 254	Trailers	see WOSS 612/7				

NOTE: 1. For variation in wheel diameter across a wheelset, through a bogie and vehicle, refer to Table 6-1, Part 7.

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 2 - MULTIPLE UNIT STOCK

CLASS	VEHICLE TYPE	TREAD PROFILE	WHEEL DIAMETER / TYRE THICKNESS (mm)			MAXIMUM DYNAMIC UNBALANCE (kg m)
			NEW	MINIMUM FOLLOWING OVERHAUL	SCRAP	
302	MBS All Trailers *1 All Trailers *2	P1	1016 / 76 1067 / 63.5 914 / 63.5	958 / 47 1028 / 44 875 / 44	934 / 34 1004 / 32 851 / 32	0.075
303	MBS DTS BDTS	P1	1016 / 76 1067 / 63.5 1067 / 63.5	966 / 51 1034 / 47 1042 / 51	934 / 35 1004 / 32 1010 / 35	0.075
304	MBS All Trailers	P1 P1	1016 / 76 1063.5	966 / 51 1034 / 47	934 / 35 1004 / 32	0.075
305/1 305/2	MBSO All Trailers	P1 P1	1016 / 76 1067 / 63.5	958 / 47 1028 / 44	934 / 35 1004 / 32	0.075
307*1	BDTS & BDTS TC, TS, DTS & DTC MS	P1 P1 P1	1067 / 63.5 1067 / 63.5 1016 / 76	1034 / 47 1028 / 44 958 / 47	1010 / 35 1004 / 32 934 / 35	0.075
307*2	BDTS & BDTS TC, TS, DTS & DTC MS	P1 P1 P1	914 / 63.5 914 / 63.5 1016 / 76	881 / 47 875 / 44 958 / 47	857 / 35 851 / 32 934 / 35	
308/1, 308/2, 309/1, 309/2, 309/3, 309/4	MBS, MLV, DMBS BDTS, DTS, TC, TS, BDTC, TSK, TCK	P1 P1	1016 / 76 1067 / 63.5	958 / 47 1028 / 44	934 / 35 1004 / 32	0.075
310	MBSO - Tyres MBSO - Monobloc Wheels Trailers	P1 P1 P1	1016 / 76 1016 / - 914 / 63.5	958 / 47 984 / - 875 / 44	934 / 35 957 / - 851 / 32	0.075
311	BDTS DTS MBS	P1 P1 P1	1067 / 63.5 1067 / 63.5 1016 / 76	1042 / 51 1034 / 47 966 / 51	1010 / 35 1004 / 32 934 / 35	0.075
312/0, 312/1	MBS All Trailers	P1 P1	1016 / - 914 / -	984 / - 879 / -	957 / - 850 / -	0.075
312/2	MBSO All Trailers	P1 P1	1016 / - 914 / -	984 / - 867 / -	957 / - 850 / -	0.075

NOTES: *1. Original bogies fitted

*2. B4 or B5 Bogies fitted to all trailer vehicles

3. For variation in wheel diameter across a wheelset, through a bogie and vehicle, refer to Table 6-1, Part 7.

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 2 - MULTIPLE UNIT STOCK

CLASS	VEHICLE TYPE	TREAD PROFILE	WHEEL DIAMETER / TYRE THICKNESS (mm)			MAXIMUM DYNAMIC UNBALANCE (kg m)
			NEW	MINIMUM FOLLOWING OVERHAUL	SCRAP	
313, 314, 315	All		see WOSS 612/27			
317/1, 317/2, 318, 319	MSO All Trailers		see WOSS 612/28 see WOSS 612/27			
411/3 411/4 411/5 413 413/2 413/3 414/2 414/3 415/1 415/2 415/4 415/6 416/1 416/2 416/3 419	DMBS*1, MBS*1 MLS*1, DMLV*1 DMBS*2, MBS*2 MLS*2, DMLV*2 DTS, OTC TCB, TRB, TS	P1 P1	1016 / 63.5 1067 / 63.5	964 / 37.5 1008 / 34	956 / 33.5 1000 / 30	0.075 0.075
421/1, 421/2, 422/1, 423	MBS All Trailers	P1 P1	1016 / 63.5 914 / 63.5	964 / 37.5 855 / 34	956 / 33.5 847 / 30	0.075 0.035
432	DMBSO Trailers	P1 P1	1016 / 63.5 914 / 63.5	975 / 43 855 / 34	967 / 39 847 / 30	0.075 0.035
455 (Disc)	MSO Trailers		see WOSS 612/28 see WOSS 612/27			
455 (Tread)	MSO Trailers		see WOSS 612/28 see WOSS 612/27			
457	Motors and Trailers		see WOSS 612/28 see WOSS 612/27			

NOTES: *1. Motor Bogie

*2. Trailer Bogie

3. For variation in wheel diameter across a wheelset, through a bogie and vehicle refer to Table 6-1, Part 7.

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 2 - MULTIPLE UNIT STOCK

CLASS	VEHICLE TYPE	TREAD PROFILE	WHEEL DIAMETER / TYRE THICKNESS (mm)			MAXIMUM DYNAMIC UNBALANCE (kg m)
			NEW	MINIMUM FOLLOWING OVERHAUL	SCRAP	
482	DMS Trailers	P1 P1	1016 / 63.5 1067 / 63.5	964 / 37.5 1008 / 34	956 / 33.5 1000 / 30	0.075
485. 486	DMS*1 DMS*2 DTS & TS (Tyred Wheelsets)	P1 P1 P1	914 / 73 813 / 73 813 / 73	836 / 34 735 / 34 735 / 34	828 / 30 727 / 30 727 / 30	0.125
485. 486	All - Monobloc Wheels	P1	787 / -	706 / -	698 / -	0.125
487	DMS*1 DMS*2 TS	P1 P1 P1	914 / 57 787 / 57 787 / 57	880 / 40 746 / 36.5 746 / 36.5	867 / 33.5 733 / 30 733 / 30	0.125
488/2, *3 488/3	All Trailers	P1	914 / 63.5	855 / 34	847 / 30	0.035
489	DMLV*1 DMLV*2	P1 P1	1016 / 63.5 1067 / 63.5	964 / 37.5 1008 / 34	956 / 33.5 1000 / 30	0.075
491	All	P1	914 / 63.5	855 / 34	847 / 30	0.035
504	DMBS DTS	P1 P1	1016 / 76 1067 / 63.5	978 / 57 1041 / 51	934 / 35 1004 / 32	0.075
507, 508	All	see WOSS 612/27				

NOTES: *1. Motor Bogie

*2. Trailer Bogie

*3. For Class 73 Locomotive Tyre Criteria See Table 6-1, Part 1.

4. For variation in wheel diameter across a wheelset, through a bogie and vehicle, refer to Table 6-1, Part 7.

W0SS 612/10

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 3 - LOCOMOTIVE HAULED PASSENGER / NON-PASSENGER COACHING STOCK
AND FREIGHT VEHICLES WITH CARRIAGE BOGIES

BOGIE DETAILS		TREAD PROFILE	WHEEL DIAMETER/TYRE THICKNESS (mm)			MAXIMUM DYNAMIC UNBALANCE (kg m)
BOGIE TYPE	AXLE JOURNAL DETAILS		NEW	MINIMUM FOLLOWING OVERHAUL	SCRAP	
BR Mark 1 Non Compensated Brakework	9" x 4.5/8" & 10" x 5" Plain Bearing	P1	1067 / 63.5	1032 / 46	1024 / 42 *1	0.035
BR Mark 1 Compensated Brakework	9" x 4.5/8" Plain Bearing	P1	1067 / 63.5	1012 / 36	1004 / 32	0.035
	10" x 5" Plain Bearing	P1	1067 / 63.5	1018 / 39	1010 / 35	0.035
Commonwealth	4.5/8" Dia Roller Bearing	P1	1067 / 63.5	1016 / 38	1010 / 35	0.035
B4 Disc Braked	4.1/2" Dia Roller Bearing	P11	914 / -	865 / -	841 / -	0.035
B4 Tread Braked	4.1/2" Dia Roller Bearing	P11	914 / 63.5	875 / 44	851 / 32	0.035
B5	4.7/8" Dia Roller Bearing	P11	914 / 63.5	881 / 47	857 / 35	0.035
BT5	120 mm Dia Roller Bearing	P8	914 / -	866 / -	853 / -	0.050
BT10	120 mm Dia Roller Bearing	see W0SS 612/7				
Other Bogie Types Non- Compensated Brakework	All sizes of Plain and Roller Bearings	P1	-	- / 46	- / 42 *1	
Other Bogie Types Compensated Brakework	Maximum 9" x 4.5/8" Plain Bearing or 4.5/8" Dia Roller Bearing	P1	-	- / 36	- / 32	Refer to Table 6-1 Part 6.
	10" x 5" Plain Bearing	P1	-	- / 39	- / 35	

NOTES: *1. Wheelsets may be transferred to bogies with compensated brakework.

2. For variation in wheel diameter across a wheelset, through a bogie and vehicle, refer to Table 6-1, Part 7.

WOSS 612/10

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 4 - FREIGHT STOCK

(for Vehicles with Carriage Bogies see Table 6-1, Part 3)

CARKND	DETAIL	TREAD PROFILE	WHEEL DIAMETER / TYRE THICKNESS (mm)		
			NEW	MINIMUM FOLLOWING OVERHAUL	SCRAPPING
BAA BAB	-	P5	953 / -	883 / -	874 / -
BBA	-	P5	953 / -	883 / -	874 / -
BDA BPA BXA	-	P5	920 / -	870 / -	861 / -
BFA BMA	-				
CBA CDA	-		see WOSS 612/21		
CSA	-	P1	953 / -	881 / -	875 / -
FFA FGA FGB					
FJB FMA FUA	-		see WOSS 612/21		
FYA					
FNA FNB	3-Piece Cast Steel Bogie	P6	838 / -	772 / -	759 / -
	FBT-6 m Bogie	P5	953 / -	883 / -	874 / -
FPA	-	P5	953 / -	883 / -	874 / -
FQA	-	P6	813 / -	762 / -	749 / -
HAA HDA	-		see WOSS 612/19		
HEA HSA	Taperleaf	P5	953 / -	883 / -	874 / -
	Other Susp ⁿ s	P6	953 / -	892 / -	879 / -
MTV	-	P1	953 / -	888 / -	875 / -
OAA OBA OCA					
ODA OEA OTA					
PBA		P5	953 /	883 /	874 /
SDA SHA SKA					
SPA VAA					
VBA	Taperlite	P8	953 / -	892 / -	879 / -
	Long Link	P5	953 / -	883 / -	874 / -
	Other Susp ⁿ s	P6	953 / -	892 / -	879 / -
VCA	-	P5	953 / -	883 / -	874 / -
VDA ZRA	Taperlite	P8	813 / -	762 / -	749 / -
	Other Susp ⁿ s	P5	860 / -	800 / -	791 / -
VEA VGA	-	P5	953 / -	883 / -	874 / -
YAA	-	P5	920 / -	870 / -	861 / -
YCA YDA YEA	-	P5	920 / -	870 / -	861 / -
YCV	-	P1	914 / -	851 / -	838 / -
YGB	3-Piece Cast Steel Bogie	P6	953 / -	892 / -	879 / -
	Y27 Bogie	P5	920 / -	870 / -	861 / -
YGH	-	P6	953 / -	892 / -	879 / -
YGV	-	P1	953 / -	888 / -	875 / -
YLA YNA	-	P5	920 / -	870 / -	861 / -
YNB	-	P6	953 / -	892 / -	879 / -
	Up to and including 9" x 4.1/4" Plain Bearing Journal	-	-	-/*1	-/24
	Over 9" x 4.1/4" Plain Bearing Journal	-	-	-/*1	-/32
	Roller Bearing Wheelsets not Covered by Table 6-1, Part 3	-	-	-/*1	/32

- NOTES: *1. The last turning tyre thickness (after machining) shall be the scrapping thickness plus the allowable tread wear for the Tyre Profile applicable, see Table 6-3.
- In the case of monobloc wheels, not identified above, the throat thickness criterion specified in MT/288 determines the scrapping size. Size following overhaul, shall permit maximum tread wear (see Table 6-3) before scrapping size is reached.
 - For the profiles of vehicle Carkinds not covered in Table 6-1, Part 4 above refer to Table 6-1, Part 5.
 - For dynamic balancing requirements refer to Table 6-1, Part 6.
 - For variation in wheel diameter across a wheelset, through a bogie and vehicle, refer to Table 6-1, Part 7.

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 5 - TYRE PROFILES ALLOCATED AGAINST SUSPENSION/BOGIE TYPE
AND TOPS CARKND.

6-1.5.1 TWO AND THREE AXLE WAGONS/VEHICLES

6-1.5.1.1 Suspension Types: Eyebolt and Shoe. Tyre Profile P1

CARKND	CARKND	CARKND	CARKND	CARKND	CARKND	CARKND
CAP	SRV	ZFV	ZRP	ZYØ		
CAR	SPV	ZFW	ZRQ	ZYP		
CHP	STV	ZGA	ZRR	ZYR		
CHV	SUW	ZGV	ZRV	ZYV		
CSA	ZAØ	ZGW*1	ZRW	ZYW		
HJV	ZAV	ZHØ	ZSB	ZYX*1		
HKV	ZBØ	ZHV	ZSR			
HTV	ZBP	ZJV	ZVA			
HUØ	ZBQ	ZKV	ZVW			
MDV	ZBV	ZLV	ZVX			
MDW	ZCA	ZNV	ZXA			
MSV	ZCØ	ZPØ	ZXB			
MTV	ZCV	ZPP	ZXØ			
ØØV	ZDØ*1	ZPV	ZXP			
RDV	ZDP	ZPW	ZXQ			
RFQ	ZDV	ZQB	ZXR			
RGQ	ZDW	ZQØ	ZXV			
RHQ	ZDX*1	ZQP	ZXW			
SFW	ZEA	ZRF	ZXX			
SGW*1	ZEV	ZRG	ZYA			
SØV	ZEX	ZRØ	ZYB			

*1 Denotes the CarknDs concerned exist with other suspension types, refer to paragraph 6-1.5.1.2.

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 5 - TYRE PROFILES ALLOCATED AGAINST SUSPENSION/BOGIE TYPE AND TOPS CARKND.

6-1.5.1.2 Suspension Types: Single Link with Eyebolt Adjustment, BR Single Long Link, UIC Double Link, and Taperleaf Suspensions. Tyre Profile P5

CARKND	DESIGN CODE	CARKND	DESIGN CODE	CARKND	DESIGN CODE	CARKND	DESIGN CODE
CBA	-	ØJA	-	VDA	VDO01A	ZRA	ZR209A
CDA	-	ØTA	-		VDO01B		ZR212A
FBA	-	RBA	-		VDO01D		ZR212B
FBB	-	RBX	-		VDO01F		ZR212C
FPA	-	RRA	-		VDO03B		ZR212D
HAA	-	RRB	-		VDO08B		ZR216A
HDA	-	RRW	-	VEA	-		ZR217A
HEA	HEO01A	RRX	-	VGA	-		ZR219A
	HEO01B	SDA	-	VJX	-		ZR219B
	HEO01C	SHA	-	ZBA	-	ZRB	-
	HEO01D	SKA	-	ZDA	-	ZSX	-
HSA	-	SPA	-	ZDØ	ZD142A	ZYX	-
ØAA	-	VAA	-	ZDX	ZD144A		
ØBA	-	VBA	-	ZGB	-		
ØCA	-	VCA	-	ZGW	ZG084B		
ØDA	-			ZPX	-		
ØEA	-						

6-1.5.1.3 D.O.D, B.S.C. & Gloucester Pedestal Suspensions. Tyre Profile P6.

6-1.5.1.4 Taperlite Suspension Tyre Profile P8.

CARKND	DESIGN CODE
HEA	HE002A
	HE002B
VBA	VB003B
	VB003D
	VB003E

CARKND	DESIGN CODE
VBA	VB003A
VDA	VD001C
ZRA	ZR221A

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 5 - TYRE PROFILES ALLOCATED AGAINST SUSPENSION/BOGIE TYPE
AND TOPS CARKND.

6-1.5.2 BOGIE WAGONS/VEHICLES

6-1.5.2.1 Types of Bogies: Diamond Frame, Plate Frame and Three Piece Cast Steel with fixed Side Bearers, including Primary Laminated Spring Suspensions, Coach Bogies. Tyre Profile P1

CARKND	DESIGN CODE	CARKND	DESIGN CODE	CARKND	DESIGN CODE	CARKND	DESIGN CODE
BCV	-	YBP	-	YNV	-	YVQ	-
BCW	-	YCV	-	YNW	-	YVR	-
BDW	-	YCW	-	YPA	-	YVV	-
BNX	-	YEV	-	YRØ	YV047B	YVW	-
BQW	-	YFA	-	YRP	-	YXA	-
BSW	-	YFB	-	YRQ	-	YXB	-
BTW	-	YFØ	-	YRR	-	YXØ	-
BVW	-	YFP	-	YRV	-	YXP	-
BYV	-	YFW	-	YRW	-	YXQ	-
FEW	-	YGV	YG500C	YRX	-	YXR	-
FRØ	-		YG500F	YSB	-	YXV	-
FVV	-	YHA	-	YSØ	-	YXW	-
FVW	-	YKA	-	YSR	-	YYB	-
FVX	-	YLØ	-	YSV	-	YYØ	-
FWV	-	YMA	-	YSW	-	YYP	-
FWW	-	YMB	-	YTV	-	YYR	-
YAØ	-	YMP	-	YTX	-	YVV	-
YBA	-	YMØ	-	YVA	YV047B	YYW	-
YBB	-	YNP	-	YVØ	-	YYX	-
YBØ	-	YNR	-	YVP	-		

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 5 - TYRE PROFILES ALLOCATED AGAINST SUSPENSION/BOGIE TYPE AND TOPS CARKND.

6-1.5.2.2 Three Piece Cast Bogies with Resilient Side Bearers. Tyre Profile P6

CARKND	DESIGN CODE	CARKND	DESIGN CODE	CARKND	DESIGN CODE
FFA	-	FMA	-	FYA	-
FGA	-	FNA	FN002A	YGV	YG500A
FGB	-		FN002B		YG500B
FJA	-	FQA	-		YG500G
FJB	-	FUA	-		

6-1.5.2.3 Primary Suspension Bogies (FBT6, Y25, etc). Tyre Profile P5

CARKND	DESIGN CODE	CARKND	DESIGN CODE	CARKND	DESIGN CODE	CARKND	DESIGN CODE
BAA	-	BXA	-	FNA	FN004C	YGH	-
BAB	-	FHA	-	F0A	-	YGV	YG500H
BBA	-	FNA	-	YAA	-	YLA	-
BDA	-	FNB	FN003A	YCA	-	YNA	-
BFA	-		FN003B	YDA	-	YVA	YV060A
BMA	-		FN004A	YEA	-		
BPA	-		FN004B	YGB	-		

6-1.5.3 LOCO-HAULED NON-PASSENGER CARRYING VEHICLES : BOGIE VEHICLES

6-1.5.3.1 BT5 Bogies. Tyre Profile P8

CARKND	DESIGN CODE
QXA	QX136A
	QX138A

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 5 - TYRE PROFILES ALLOCATED AGAINST SUSPENSION/BOGIE TYPE AND TOPS CARKND.

6-1.5.3.2 Carriage Bogies, including B4, B5, Commonwealth, Mk 1 and other BR Bogies. Tyre Profile P1 for all bogie types other than B4 and B5 Bogie Wheelsets, where P11 will apply

CARKND	CARKND	CARKND	CARKND	CARKND	CARKND	CARKND
NAV	NJA	NUX	QPB	QRA	QTA	QXE
NBV	NJV	NVX	QPØ	QRW	QTV	QXØ
NCV	NJX	NWA	QPP	QRX	QTW	QXP
NDV	NKV	NWX	QPV	QRY	QVV	QXV
NDX	NLV	NXA	QPW	QSA	QVW	QXW
NEA	NLX	NXV	QPX	QSB	QVX	QXX
NEV	NSV	NXX	QQA	QSØ	QWA	QYA
NEX	NSX	NYV	QQB	QSP	QWQ	QYY
NFV	NTV	NYW	QQY	QSV	QWV	
NGV	NTX	NYX	QQW	QSW	QXA*1	
NHA	NUV	QPA	QQX	QSX	QXB	

*1 See paragraph 6-1.5.3.1, for vehicles with BT5 Bogies.

6-1.5.4 LOCO-HAULED NON-PASSENGER CARRYING VEHICLES: TWO AXLE VEHICLES

Eyebolt Primary Suspension Only. Tyre Profile P1

CARKND
NØV
NPV
NQV

NOTE: Where for a given Carkind different suspension types exist, e.g. VDA, the relevant design code is specified for reference.

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 6 - PERMISSIBLE WHEELSET UNBALANCE LIMITS

If the wheelset balancing requirements are not specified in Table 6-1, Parts 1 to 5, then the wheelset shall have a maximum unbalance as set out in the table below:-

VEHICLE	SPEED RANGE	MAXIMUM UNBALANCE
Locomotives.	120 km/h or less Over 120 km/h and up to and including 200 km/h Over 200 km/h	Exempt from balancing Not to exceed 0.25 kgm In accordance with BS 5892, Part 6, Section 12
Passenger & Non-Passenger Rolling Stock. Freight Stock with Carriage Bogies.	120 km/h or less Over 120 km/h and up to and including 200 km/h Over 200 km/h	Not to exceed 0.125 kgm Not to exceed 0.075 kgm In accordance with BS 5892, Part 6, Section 12
Freight Vehicles	120 km/h or less Over 120 km/h	Exempt from balancing Not to exceed 0.25 kgm

TABLE 6-1 : WHEEL & TYRE DIAMETERS, PROFILES & BALANCING REQUIREMENTS

PART 7 - VARIATION OF WHEEL DIAMETERS

VEHICLE CLASSIFICATION	DETAIL	VARIATION OF DIAMETER (mm)			
		BETWEEN WHEELSETS ON ONE BOGIE	BETWEEN WHEELSETS ON ONE VEHICLE	ACROSS A WHEEL SET	
LOCOMOTIVES	Class 03	-	0.25	0.25	
	Class 08 & 09	-	See WOSS 612/2	See WOSS 612/2	
	Class 43	20	20	In Accordance with BS 5892 Part 6	
	Others	6	6		
MULTIPLE UNITS	Class 140, 141, 142, 143, 144	see WOSS 612/18			In Accordance with BS 5892 Part 6 for Passenger Carrying Stock
	Class 150, 151, 154, 155, 156	Motor & Trailer	see WOSS 612/17		
	All Other D.M.M.U.s	Motor & Trailer	13	25	
	Class 203, 204, 205, 207	Motor & Trailer	13	25	
	Class 317, 318, 319, 455, 457	Motor	see WOSS 612/28		
		Trailer	see WOSS 612/27		
	Class 302, 305, 307, 308, 309	Motor	6	13	
		Trailer	6	25	
	Class 303, 304, 310, 311, 312, 501, 504	Motor & Trailer	6	13	
	Class 313, 314, 315, 507, 508	Motor & Trailer	see WOSS 612/27		
	Class 411, 412, 413, 414, 416, 419, 482, 485, 486, 487, 489	Motor & Trailer	13	25 *1	
Class 421, 422, 423, 432, 488, 491		Motor	13	13	
	Trailer	13	25		
PASSENGER AND NON-PASSENGER ROLLING STOCK, FREIGHT STOCK WITH CARRIAGE BOGIES.	Bogies with Non-Compensated Brakework	1.5	25	In Accordance with BS 5892 Part 6 for Passenger Carrying Stock	
	Bogies with Compensated Brakework	13	25		
	Mk II & III Coaches Fitted with Girling WSP Equipment	25	25		
	Mk III Coaches Fitted with BR WSP Equipment	see WOSS 612/7			
FREIGHT VEHICLES	2 Axles	-	25	In Accordance with BS 5892 Part 6	
	3 Axles	-	3 *2		
	Non-Carriage Type Bogies	13	25		

NOTES: *1 There is an intentional design difference in wheel diameter on the motored and trailing bogies fitted to these vehicles. The maximum permitted variation quoted applies after this difference has been taken into consideration.

*2 Where variation in diameter is present the wheelset with the smallest wheel diameter shall be located in the centre of the vehicle.

TABLE 6-2 : PERMISSIBLE SIZE REDUCTION FOR AXLES
PART 1: DRIVING & TRAILER WHEELSETS - PLAIN BEARING JOURNALS (IMPERIAL SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	JOURNAL SIZE		WHEELSET DIAMETER		AXLE BODY DIAMETER BETWEEN WHEELSEATS			PROFILE MODS #	REMARKS	
		NOMINAL LENGTH AND DIAMETER	MINIMUM DIAMETER	NOMINAL	MINIMUM	ADJACENT TO WHEELSEAT		AXLE MIDDLE			
						NOM.	MIN.				NOM.
WXA 01	SW-SW-26*	8" x 3.3/4"	86	133.35	127	133.35	127	114.3	107.95	-	
CQE 01	121515/	8" x 4"	92	149.22	142.87	149.22	142.87	127	120.65	-	
CXE 01	121428	8" x 4"	92	139.7	136.52	139.7	136.52	127	120.65	-	
CXE 02	54230*	8" x 4"	92	139.7	136.52	139.7	136.52	127	120.65	-	
WXC 01	12427N*	9" x 4.1/4"	98	139.7	136.52	139.7	136.52	123.82	117.47	-	
	12207N*	9" x 4.1/4"	98	139.7	136.52	139.7	136.52	123.82	117.47	-	
COH 10	E14142*	9" x 4.1/2"	105	158.75	-	158.75	-	139.7	-	-	
CXH 10	12297D*	9" x 4.1/2"	105	158.75	-	158.75	-	139.7	-	-	
WXH 01	DN-20118*	9" x 4.1/2"	105	146.05	142.87	146.05	142.87	127	120.65	-	
	13312N*	9" x 4.1/2"	105	146.05	142.87	146.05	142.87	127	120.65	-	
	14224N*	9" x 4.1/2"	105	146.05	142.87	146.05	142.87	127	120.65	-	
COJ 10	SC-ES-4293/	9" x 4.5/8"	108	168.27	-	146.05	-	133.35	-	-	
CXJ 10	SC-SW-2	9" x 4.5/8"	108	168.27	-	146.05	140	133.35	128	R	The maximum journal length and minimum journal diameter for Loco-Hauled Passenger/ Non-Passenger Rolling Stock axles is 230.1 and 114.3 respectively. For all other vehicles the minimum journal diameter is 108.
	SC-SW-1/	9" x 4.5/8"	See Remarks Column	168.27	-	146.05	140	133.35	128	R	
	SC-SW-2	9" x 4.5/8"	See Remarks Column	168.27	-	146.05	140	133.35	128	R	
WXK 01	SW-DN-21636*	9" x 5"	114	171.45	168.27	171.45	168.27	152.4	146.05	-	

NOTES * Denotes the drawing concerned gives both wheelset assembly and axle details.
For geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-2 : PERMISSIBLE SIZE REDUCTION FOR AXLES (CONTINUED)

PART 1: DRIVING & TRAILER WHEELSEIS -- PLAIN BEARING JOURNALS (IMPERIAL SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	JOURNAL SIZE		WHEELSEAT DIAMETER		AXLE BODY DIAMETER BETWEEN WHEELSEATS			PROFILE MODS #	REMARKS
		NOMINAL LENGTH AND DIAMETER	MINIMUM DIAMETER	NOMINAL	MINIMUM	ADJACENT TO WHEELSEAT		AXLE MIDDLE		
						NOM.	MIN.			
CQL 01 CXL 01	SC-SW-23/ SC-SW-22	10" x 5"	See Remarks Column	174.62	-	152.4	146	139.7	134	R The maximum journal length and minimum journal diameter for Loco-Hauled Passenger/ Non-Passenger Rolling Stock axles is 255.5 and 123.8 respectively. For all other vehicles the minimum journal diameter is 114
CQL 02 CXL 02	7879N*	10" x 5"	114	168.27	-	168.27	-	146.05	-	-
WXL 01	13319N* SW-DE-45647* RCH 2878*	10" x 5"	114	171.45	168.27	171.45	168.27	152.4	146.05	-
WXL 05	19021N*	10" x 5"	114	171.45	168.27	171.45	168.27	152.4	146.05	-
WXT 01	18901N* DN-20348*	11" x 5"	114	171.45	168.27	171.45	168.27	152.4	146.05	-
WXM 01	11641N* 13600N* DN-20599*	10" x 5.1/2"	127	171.45	168.27	171.45	168.27	152.4	146.05	-
WXM 02	15677N* DN-20177*	10" x 5.1/2"	127	184.15	-	184.15	-	165.1	-	-
WXN 01	SW-ES-26*	11" x 5.1/2"	127	180.18	-	174.62	-	165.1	-	-
WXN 02	013-1229*	11" x 5.1/2"	127	174.62	168.27	174.62	168.27	152.4	146.05	-

NOTES : * Denotes the drawing concerned gives both wheelset assembly and axle details.
for geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-2 : PERMISSIBLE SIZE REDUCTION FOR AXLES (CONTINUED)

PART 1: DRIVING & TRAILER WHEELSETS - PLAIN BEARING JOURNALS (IMPERIAL SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	JOURNAL SIZE		WHEELSEAT DIAMETER		AXLE BODY DIAMETER BETWEEN WHEELSEATS			PROFILE MODS #	REMARKS
		NOMINAL LENGTH AND DIAMETER	MINIMUM DIAMETER	NOMINAL	MINIMUM	ADJACENT TO WHEELSEAT	NOM.	MIN.		
WXP 01	SW-SW-114/ SW-SW-112	10" x 6"	140	203.2	-	203.2	-	177.8	-	When reaching the maximum journal length for further machining of journals, re-oversize bearings, see BR Drg. No B1-A1-8600696
	SW-DN-22*	10" x 6"	140	203.2	-	203.6	-	177.8	-	
WXQ 01	18766N* DN-20835*	12" x 6"	140	203.2	-	203.2	-	177.8	-	
WXR 01	DN-20287*	13" x 7"	165	203.2	-	203.2	-	165.1	-	
WXS 01	DE-34441*	12" x 7.1/4"	171	222.25	-	190.5	-	177.8	-	
SF0 01	L-A0-7697/ L-S-7672-01	8.5/8" x 7.1/2"								
SF0 02	L-A0-7697/ L-S-7672-02	8.5/8" x 7.1/2"								
SX0 01	L-A0-7698/ L-S-7671-01	8.5/8" x 7.1/2"								
SX0 02	L-A0-7698/ L-S-7671-02	8.5/8" x 7.1/2"								
SF0 01	S--DE-20672/ S--DE-20665	9" x 7.1/2"								
SF0 02	SL--DN-T-726/ SL--DN-T-727	9" x 7.1/2"								
SX0 01	SL--DE-20673/ S--DE-20667	9" x 7.1/2"								
SX0 02	S--DN-T-729/ S--DN-T-728	9" x 7.1/2"								

see WOSS 612/2

see WOSS 612/2

NOTES * Denotes the drawing concerned gives both wheelset assembly and axle details.
For geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-2: PERMISSIBLE SIZE REDUCTION FOR AXLES (CONTINUED)

PART 3: DRIVING AND TRAILER WHEELSETS - ROLLER BEARING JOURNALS (IMPERIAL SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	NOMINAL JOURNAL DIAMETER	WHEELSEAT DIAMETER		AXLE BODY DIAMETER BETWEEN WHEELSEATS				PROFILE MODS #	REMARKS
			NOMINAL	MINIMUM	ADJACENT TO WHEELSEAT		AXLE MIDDLE			
					NOM.	MIN.	NOM.	MIN.		
CSA 01	SC-SW-406/ DE-57777									
CSA 02	SC-SW-406/ DE-57989	4"	157.16	-	131.76	-	120.65	-	-	-
CPA 01	SC-SW-406/ DE-57778									
CPA 02	SC-SW-406/ DE-57990									
MDA 04	SC-SW-406/ DE-57988	4"	163.51	-	141.28	-	142.88	-	-	For final drive axle bearing and oil seat diameter reductions refer to Table 6-2, Pt 5
WSB 01	DN-21851* SW-DN-21552*	4.3/8"	146.05	142.9	146.05	142.9	127	120.65	G	-
WSB 02	SW-SW-230*	4.3/8"	146.05	142.9	146.05	142.9	127	120.65	-	-
CPC 02	SC-SW-406/ SC-SW-397	4.1/2"	157.16	-	152.4	-	130.17	-	-	-
CSC 01	SC-SW-406/ DE-36886(B)	4.1/2"	157.16	-	153.99	-	133.35	-	-	-
CSC 02	SC-SW-406/ DE-46660	4.1/2"	157.16	-	152.4	-	130.17	-	-	-
CSC 10	SC-SW-147* SC-SW-193*	4.1/2"	168.27	-	146.05	140	133.35	128	R	-
MDC 02	SC-SW-406/ DE-46078	4.1/2"	157.16	-	152.4	-	165.1	-	-	-
MDC 03	SC-SW-406/ DE-36886(A)									
MDC 04	SC-SW-406/ SC-SW-4113 SC-SW-406/ SC-SW-4114 SC-SW-406/ SC-SW-395	4.1/2"	163.51	-	142.88	-	142.88	-	-	For final drive axle bearing and oil seat diameter reductions refer to Table 6-2, Pt 5
		4.1/2"	157.16	-	152.4	-	152.4	-	-	For final drive axle bearing and oil seat diameter reductions refer to Table 6-2, Pt 5

NOTES * Denotes the drawing concerned gives both wheelset assembly and axle details.
For geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-2 : PERMISSIBLE SIZE REDUCTION FOR AXLES (CONTINUED)

PART 3: DRIVING AND TRAILER WHEELSETS - ROLLER BEARING JOURNALS (IMPERIAL SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	NOMINAL JOURNAL DIAMETER	WHEELSEAT DIAMETER		AXLE BODY DIAMETER BETWEEN WHEELSEATS			PROFILE MODS #	REMARKS		
			NOMINAL	MINIMUM	ADJACENT TO WHEELSEAT		AXLE MIDDLE				
					NOM.	MIN.				NOM.	MIN.
CPD 01	SC-DN-21037*	4.5/8"	168.27	-	146.05	-	133.35	-	-		
CPD 02								R			
CPD 07	SC-SW-23/	4.5/8"	174.62	-	152.4	146	139.7	134	-		
CSD 07	SC-DE-57284							R			
CSD 01	WN-9-33*	4.5/8"	168.27	-	161.92	-	139.7	-	-		
	SC-ES-1774*										
	SC-DN-21323										
CSD 02	SC-ES-1774/										
	SC-DN-28095										
CSD 03	SC-ES-1774/	4.5/8"	168.27	-	146.05	-	139.7	-	-		
	SC-DN-21321										
	ES-9090/										
	SC-DN-21321										
CSD 04	SC-ES-2405*	4.5/8"	188.91	-	171.45	-	146.05	-	-		
CSD 05								R			
CSD 08	SC-SW-406/	4.5/8"	168.28	-	158.75	-	139.7	-	-		
	DE-56973										
MDD 02	SC-SW-406/	4.5/8"	168.28	-	152.4	-	165.1	-	-		
	DE-46434										
MDD 04	SC-SW-406/	4.5/8"	163.51	-	142.88	-	142.88	-	-		
	DE-56825										
MED 04	SC-ES-9088/	4.5/8"	188.91	-	188.91	-	177.8	-	-		
	SC-ES-3968							G			
	SC-ES-3931										
	SC-ES-3968										
MED 08	SC-DN-20827*	4.5/8"	188.91	-	-	-	177.8	-	-		
MED 14	SC-ES-2404*							G			
MED 15											
MED 22	WN-9-17*	4.5/8"	188.91	-	-	-	180.97	-	-		
MED 24	SC-DN-22104*	4.5/8"	188.91	-	-	-	180.97	-	-		
MED 25								G			

NOTES * Denotes the drawing concerned gives both wheelset assembly and axle details.
For geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-2 : PERMISSIBLE SIZE REDUCTION FOR AXLES (CONTINUED)

PART 3: DRIVING AND TRAILER WHEELSETS - ROLLER BEARING JOURNALS (IMPERIAL SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	NOMINAL JOURNAL DIAMETER	WHEELSEAT DIAMETER		AXLE BODY DIAMETER BETWEEN WHEELSEATS				PROFILE MODS #	REMARKS	
			NOMINAL	MINIMUM	ADJACENT TO WHEELSEAT		AXLE MIDDLE				
					NOM.	MIN.	NOM.	MIN.			
WSF 08	F-A1-3990/ F-A0-3963	4.7/8"	190.5	-	165.1	-	139.7	-	-	-	
CAF 01	ES-13064/	4.7/8"	168.28	-	152.4	-	139.7	-	R	To enable reclamation axles to BR Drawing N° ES-13055-01 shall be machined to BR Drawing N° ES-13055-02 requirements.	
CSF 01	ES-13055										
CPF 01	SC-SW-406/ SC-SW-3234	4.7/8"	176.21	-	152.4	146	139.7	134	R	-	
CPF 02	SC-SW-406/ SC-SW-3334										
CPF 03	SC-SW-406/ C-A1-18										
CSF 01	SC-SW-406/ SC-SW-2112	4.7/8"	168.27	-	146.05	-	139.75	-	R	-	
CSF 10	SC-SW-406/ SC-SW-3236	4.7/8"	176.21	-	152.4	146	139.7	134	R	-	
WAF 01	DE-59056*	4.7/8"	see MOSS 612/21								-
WSF 01	SW-DN-21730/ SW-DN-21834 DN-32375*	4.7/8"	171.45	168.27	171.45	168.27	152.4	146.05	G	-	
WSF 02	DN-22457*	4.7/8"	171.45	168.27	171.45	168.27	152.4	146.05	-	-	
	SW-SW-351*										
	SW-DE-35370*										
WSF 04	SW-DN-31419* DN-733066*	4.7/8"	196.85	-	177.8	-	155.57	-	-	-	
WSF 07	C1-S-9000977/ DE-58669 SW-SW-208*	4.7/8"	171.45	168.27	171.45	168.27	152.4	146.05	G	-	

NOTES * Denotes the drawing concerned gives both wheelset assembly and axle details.
 # For geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-2 : PERMISSIBLE SIZE REDUCTION FOR AXLES (CONTINUED)

PART 3: DRIVING AND TRAILER WHEELSETS - ROLLER BEARING JOURNALS (IMPERIAL SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	NOMINAL JOURNAL DIAMETER	WHEELSEAT DIAMETER		AXLE BODY DIAMETER BETWEEN WHEELSEATS				PROFILE MODS #	REMARKS	
			NOMINAL	MINIMUM	ADJACENT TO WHEELSEAT		AXLE MIDDLE				
					NOM.	MIN.	NOM.	MIN.			
LEN 01	SL-DN-T-776*	5"	186.33	-	-	-	177.8	-	G	-	
	A-4001813*	5"	187.33	-	184.15	-	171.45	-	-	-	
WSG 01	C-S-9000977/ F-A1-985	5.3/16"	see WOSS 612/21								-
MET 01	ES-14993*	5.1/2"	188.91	-	188.91	-	177.8	-	G	-	
MET 04	B2-C0-8301111/ B-S-1272	5.1/2"	215.9	-	196.85	-	184.15	-	G	-	
WSH 01	DN-21999*	5.1/2"	184.15	-	184.15	-	165.1	-	-	-	
WSH 02	SW-DE-37689*										
WSH 04	SW-SW-281*	5.1/2"	203.2	-	203.2	-	177.8	-	-	-	
WSH 05	F-S-324*	5.1/2"	see WOSS 612/19								-
	DN-32066*										
WSH 06	DE-38389/ 17-3952	5.1/2"	203.2	-	203.2	-	177.8	-	-	-	
WSH 10	F-S-195*	5.1/2"	215.9	-	187.33	-	171.45	-	-	-	
	SW-DE-38211*										
	SW-DE-37726*	5.1/2"	215.9	-	215.9	-	196.85	-	-	-	
WSH 11	F-S-1589*	5.1/2"	203.2	-	177.8	-	152.4	-	-	-	

NOTES * Denotes the drawing concerned gives both wheelset assembly and axle details.
For geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-2: PERMISSIBLE SIZE REDUCTION FOR AXLES (CONTINUED)

PART 3: DRIVING AND TRAILER WHEELSEATS - ROLLER BEARING JOURNALS (IMPERIAL SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	NOMINAL JOURNAL DIAMETER	WHEELSEAT DIAMETER		WHEELSEAT DIAMETER ADJACENT TO WHEELSEAT	AXLE BODY DIAMETER BETWEEN WHEELSEATS			PROFILE MODS #	REMARKS
			NOMINAL	MINIMUM		NOM.	MIN.	MIDDLE		
MET 01	W-12792/ W-14072	5.5135"	189.91	-	188.91	-	177.8	-	G	-
MET 02	W-13748/ W-13628	5.5135"	198.44	-	190.5	-	184.15	-	G	If stress relieving grooves are not provided then during overhaul the wheelsets concerned shall be dismantled & the axle geometry modified to the latest drawing requirements.
LEK 01	SL-DE-35813*									
LEK 02	SL-DE-35814* SL-DE-35815* SL-DE-35816*	6"	187.33	-	-	-	184.15	-	G	-
LEK 10	B2-A0-9038253/ B2-A0-9038252	6"			see MOSS 612/20					-
LEL 01	B2-A0-9038247/ SL-DN-T-777	6.1/2"			see MOSS 612/23					-
LEL 03	B2-A0-9038254/ SL-DN-T-762	6.1/2"			see MOSS 612/15					-
LEL 10	C3-A0-8000945/ C3-A0-8000901	6.1/2"			see MOSS 612/23					-
LEL 16	SL-DE-32513*	6.1/2"			see MOSS 612/24					-
LSL 01	SL-DN-T-721*	6.1/2"	228.6	-	-	-	196.85	-	-	-

NOTES * Denotes the drawing concerned gives both wheelset assembly and axle details.
For geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-2 : PERMISSIBLE SIZE REDUCTION FOR AXLES (CONTINUED)

PART 4: DRIVING AND TRAILER WHEELSETS - ROLLER BEARING JOURNALS (METRIC SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	NOMINAL JOURNAL DIAMETER	WHEELSEAT DIAMETER		AXLE BODY DIAMETER BETWEEN WHEELSEATS			PROFILE MODS #	REMARKS
			NOMINAL	MINIMUM	ADJACENT TO WHEELSEAT		AXLE MIDDLE		
					NOM.	MIN.			
CPR 01	SC-SW-406/ C-A1-6455	120	176.21	-	152.4	146	139.7	134	-
CPR 02	SC-SW-406/ C-A1-6457								
CSR 01	SC-SW-406/ C-A1-6454								
CSR 10	B-A0-985-01/ C-A1-2857	120			see WOSS 612/7				-
CSR 11	B1-A0-9000352/ B1-A0-9018672	120			see WOSS 612/27				-
	A1-A0-9021521/ B1-A0-9018672	120			see WOSS 612/17				-
CSR 12	C1-A1-9012978/ C1-A0-9012980 E-A1-8201292/ E-C0-8201286	120	188	-	162	-	162	-	-
CSR 13	E-A1-8201292/ 8291956	120	196	-	160	-	160	-	-
MDR 02	8290641/ 8292036	120			see WOSS 612/17				-
MDR 04	E-A1-8201291/ E-C0-8201287	120			see WOSS 612/18				-
MDR 12	C1-A1-9012977/ C1-A0-9012979 E-A1-8201291/ 8291955								
MER 01	B1-A0-831781/ B1-A0-179								
MET 10	C3-A0-8300578/ B1-A0-1698								
WSR 01	C1-S-9019995/ F-A0-4424	120	193	-	168	-	145	-	-
WSR 02	F-S-3539*	120	184	-	160	-	140	-	-
WSR 03	F-A0-4845/ F-A0-4816	120	193	-	168	-	145	-	-

NOTES * Denotes the drawing concerned gives both wheelset assembly and axle details.
For geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-2 : PERMISSIBLE SIZE REDUCTION FOR AXLES (CONTINUED)

PART 4: DRIVING AND TRAILER WHEELSE'S - ROLLER BEARING JOURNALS (METRIC SIZES)

RAVERS NUMBER	WHEELSET ASSEMBLY/ AXLE DRAWING	NOMINAL JOURNAL DIAMETER	WHEELSEAT DIAMETER		AXLE BODY DIAMETER BETWEEN WHEELSEATS			PROFILE MODS #	REMARKS	
			NOMINAL	MINIMUM	ADJACENT TO WHEELSEAT	AXLE MIDDLE	MIN.			MIN.
LEU 01	A-15191*	150	228.6	-	-	-	184.15	-	For traction motor connection plain journal axle diameter reductions refer to Table 6-2, Part 6.	
LEU 05	B-A1-1195/ B-A0-1192	150	see WOSS 612/11						-	
LEU 06	C1-A0-9000508-01/	150	see WOSS 612/25						-	
LEU 07	C1-A0-9000509	150	see WOSS 612/25						-	
LEU 11	B2-A0-9011321-01/ B2-A1-9011315-01	150	230	-	-	-	185.88	-		
LEV 11	B2-A0-9011321/ B2-A0-9011315	150	see WOSS 612/26						-	
LEV 15	L-A0-7016/ L-A0-6747	150	see WOSS 612/1						-	
LEV 16	L-A0-11650/ L-A0-11594	150	see WOSS 612/1						-	
WSU 11	F-S-2738/ SM-SW-6177	150	222.25	-	193.67	-	174.63	-		
WSU 20	F-S-2774/ F-S-2775 F-A1-2965/ F-S-2942 F-A1-7683/ F-A0-7702	150	222.25	-	194	-	175	-		
WSU 21	F-A1-3640/ F-A0-3639 C1-A0-9004416/ F-A0-7703	150	222.25	-	194	-	175	-		
LEW 01	B-A1-1196/ B-A0-1193	170	see WOSS 612/11						-	

NOTES * denotes the drawing concerned gives both wheelset assembly and axle details.
for geometry modifications refer to paragraphs 4-2.3.15 and 4-2.3.16.

TABLE 6-3 : TREAD PROFILE DETAILS

TREAD PROFILE	DRAWING NUMBER	FLANGE THICKNESS DETAILS (mm)		FLANGE HEIGHT DETAILS (mm)		FREIGHT VEHICLE APPLICATIONS. VEHICLE SUSPENSION / BOGIE TYPE
		AFTER OVERHAUL (W)	MINIMUM (WORN) (X)	AFTER OVERHAUL (Y)	MAXIMUM (WORN) (Z)	
P1	F-C-00172	28	24	30	36.5	All 2-axle wagons with eyebolt or shoe suspensions. All bogie wagons with plate frame, diamond frame of 3 piece cast steel bogies having fixed sidebearers. All FVX Car and vehicles irrespective of bogie types. All other vehicles with carriage bogies, Commonwealth, Mk 1 and other BR bogies (excluding B4 & B5).
P3	F-C-00174	31.5	27	28.5	33	Original profile for all 2-axle or bogie wagons. Registered for R.I.V. Services in Europe, having wheel diameters greater than ϕ 840. Overhauled wheelsets to be reprofiled with P10 Profile.
P5	F-C-00176	31.5	27	28.5	33	All 2-axle wagons having U.I.C. Double link, BR single (short and long) link, taperleaf suspensions. All wagons with Y25C type bogie and derivatives of this bogie, e.g. FBT6.
P6	F-C-00177	29	24	30	36.5	All 2-axle wagons having BSC or Gloucester pedestal coil spring suspensions. All wagons with 3-piece cast steel bogies having resilient sidebearers.
P8	F-C-00178	29	24	30	36.5	All 2-axle wagons with BR 'Taperlite' suspension.
P9	F-C-00179	29 (22.6)	24 (17.9)	30	36.5	-
P10	F-C-00234	31	27	28	33	All 2-axle or bogie wagons, Registered for R.I.V. Services in Europe, having wheel diameters within the range of ϕ 760-1000.
P11	C1-C1-9016365	28	24	30	36.5	Tyre Profile requirements for vehicles with B4 and B5 bogies.
RD9	A1-C1-8700150	26	24	30	36.5	-

NOTES: 1. For datum points at which flange thickness and height are measured, see 6-3, Figure A.

2. The dimensions in brackets will apply if the Datum Face V of the tread profile is used for measurement, see 6-3, Figure A.

3. Where a last turning groove is provided, when the chamfer of the tread profile intersects the last turning groove, the wheel last turning diameter has been reached. There is still one service life remaining in the wheel. However some freight wheels have the groove incorrectly placed. After machining the wheel diameter shall be measured and compared with the minimum specified following overhaul.

4. Wheelset back-to-back dimension is 1360mm to 1362mm.

TABLE 6-3 : TREAD PROFILE DETAILS (Continued)

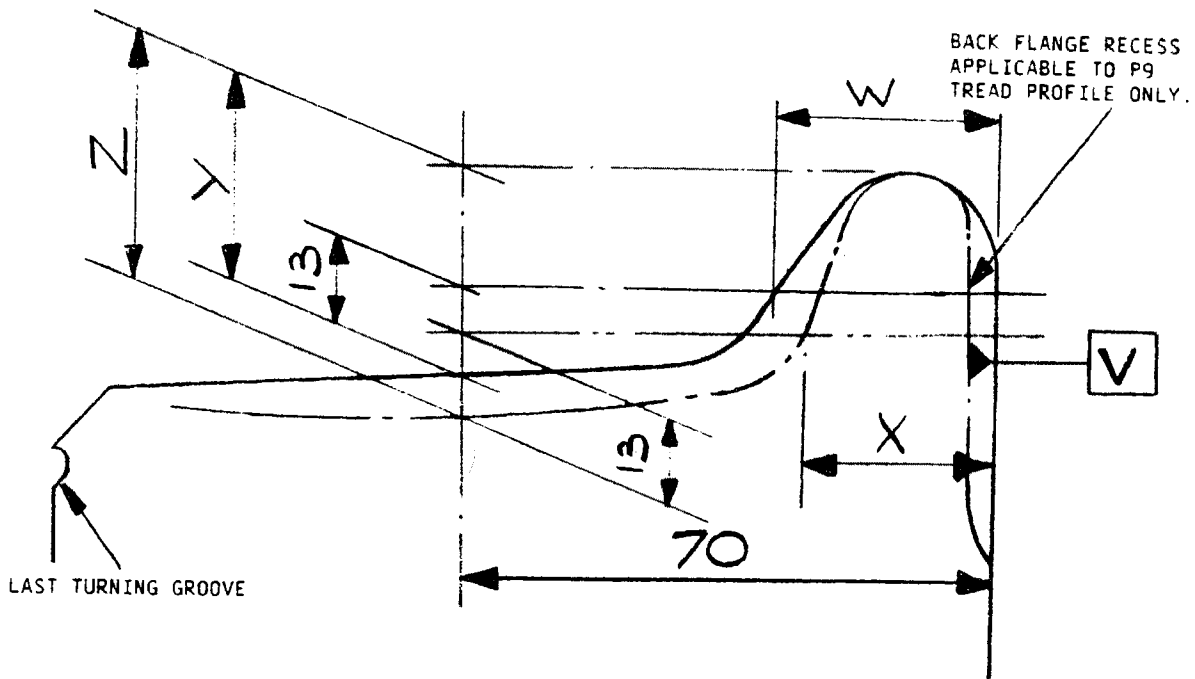


Figure A - Tyre Profile Dimensions

TABLE 6-4 : LIST OF WHEEL BALANCING DRAWINGS

DRAWING N°.	WHEEL TYPE	BRAKE TYPE
C1-A0-9001278	Monobloc Wheels	Disc
B-A1-1448	Monobloc Wheels	Disc
B-A0-986	Carriage and Freight Stock Tyred Wheels	Tread
B2-A1-9011371	Locomotive Tyred Wheels	Tread
B2-A2-9011319	Locomotive Monobloc Wheels	Tread

TABLE 6-5

SUPERSESION OF BR SPECIFICATION MATERIALS BY BS 5892 MATERIALS

The BR Specifications relating to wheelsets are superseded by BS 5892. Where drawings have not yet been amended to show the new requirements, the following shall apply:-

BS 5892 MATERIAL SPECIFICATION TO BE USED	COMPONENT	SUPERSEDED BR SPECIFICATION
BS 5892, Part 1, Grade A1T	Axles	BR 109
BS 5892, Part 2, Grade U	Wheel Centres	BR 107
BS 5892, Part 3, Grade R7E	Monobloc Wheels	BR 108, Grade B
BS 5892, Part 3, Grade R8T	Monobloc Wheels	BR 108, Grades C (Normalised) and D (Rim Sprayed) and BR 167, Section 4
BS 5892, Part 3, Grade R8E	Monobloc Wheels	BR 108, Grade D (Oil Quenched & Tempered)
BS 5892, Part 4, Grade B6E	Tyres	BR 100, Grade E
BS 5892, Part 4, Grade B5E	Tyres	BR 100, all Grades except E
BS 5892, Part 5	Tyre Retaining Rings	-
BS 5892, Part 6	Wheelset Assembly	BR 163 & 167