FRONZ / ONTRACK

APPROVED CODE OF PRACTISE
FOR
HERITAGE NETWORK OPERATORS

Mechanical Supplementary Code B3.4.2.02

Wheels, Wheel Centres and Tyres

Issue	Prepared (P), Reviewed (R), Amended (A)	Approved by	Effective Date
1	P McCallum (P)	Heritage Technical Committee	27 June 2006

Reference Material

Source	Description	Date
NZ Railways	Mechanical Branch Code No 4, Issue 3	1/5/1947
NZ Railways	Mechanical Branch Code No 15, Issue 4	1/6/1972

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Amendment History

Version	Section	Amendment

Wheels, Wheel Centres and Tyres

1 Introduction

This Supplementary Code relates to:-
B3.1.1.01 - Mechanical Code Of Practice, Section 3.26 - Wheelsets

It contains:-

- NZ Railways Mechanical Branch Code No 4 - Wheel Centres; Issue 3 of 1/5/1947
- NZ Railways Mechanical Branch Code No 15 - Wheels, Wheel Centres and Tyres; Issue 4 of 1/6/1972

which contain information relevant to wheels, wheel centres and tyres. Operators are to use those sections that are relevant to their operation.

NEW ZEALAND GOVERNMENT RAILWAYS	**WHEEL-CENTRES**	**CODE No. 4**
		Issue No 3
MECHANICAL BRANCH	Cancelled by Issue 4, Code 15, 1/6/72	Date Issued 1/5/47

EXISTING LOCO. CODES TO BE CANCELLED: 247, 248

(1) WHEEL-CENTRES, Branding of

~~Every new wheel centre is to have the following particulars stamped on the top of the boss:-~~

~~N.Z.R. Manufacture~~ ~~Imported~~

~~Shop symbol, Serial No. Year fitted~~ ~~Shop symbol, Serial No. Year fitted, W.R. No.~~

[Every new wheel centre made in workshops is to be branded on the inside of the boss in accordance with the respective drawing. Where the drawing does not show the brands required drawing X27215 is to be worked to. Every new wheel centre made by outside firms will carry certain brands including the W.R. number or C.O.S. order number, as applicable. These brands must not be turned out. All centres are to be branded with the following additional particulars on the inside of the boss when the wheels are mounted on axles:-

Shop symbol
Serial number
Year fitted]

[C.M.E's 24/563 of 13.2.61]

(2) WHEEL-CENTRES, Examination of

Whenever convenient, and also when wheel-centres are removed from under rolling-stock, a thorough examination must be made to ensure that they are sound in every respect, and fit to run.

(3) WHEEL-CENTRES, Building up, by welding

The building-up of wheel-centres by electric or gas welding on wheel-centres is not permitted, unless approved or specified by the Chief Mechanical Engineer.

(4) WHEEL-CENTRES : Wheel Bosses strengthened by Shrinking on Steel Rings to Car and Wagon

Spoked wheel centres which have had the bosses strengthened by the shrinking on of rings are only to be fitted to 3 ¼ in. and 3 ¾ in. journals.

The practice of shrinking rings on wheel-bosses is not permitted in future.

Existing wheel-centres with ringed bosses must not be placed under car and van stock.

(5) WHEEL-CENTRES, Boring and Turning of

The bore of a wheel-boss must be machined smooth and parallel and left free from any defects.

(6) WHEEL-CENTRES: Pressure for forcing on Car and Wagon

The following table must be worked to:-

Journal Diameter	**Diameter of Wheel-seat.**	**Pressure in Tons.**		
		Minimum.	**Desired.**	**Maximum.**
Inches.	Inches.			
3¼	4	35	40	50
3¾	4½	40	45	50
4	$4^{7}/_{8}$	40	45	50
4	5¼	40	45	50
4½	$5^{5}/_{8}$	40	45	50

(7) WHEEL-CENTRES: Pressure for forcing on Engine, Bogie, ~~and~~ Tender [, Railcar and Multiple Unit]

Cast-steel and wrought-steel centres must be pressed on to the axles with a pressure corresponding to 10 tons per inch diameter of the wheel-seat. An allowance of 5 tons either way of the total desired pressure is permissible.

Cast-iron centres for engine, bogie, and tender wheels must be pressed on to the axles with a pressure corresponding to 5 tons per inch diameter of the wheel-seat. An allowance of 3 tons either way of the total desired pressure is permissible.

(8) WHEEL-CENTRES, Lubrication for pressing on

No lubricant other than tallow may be used on wheel-seats when wheel-centres are being pressed on axles.

(9) WHEEL-CENTRES, Storing of

A protective coating of an approved rust preventative must be applied to all wheel-centres that require to be stored.

(10) WHEEL-CENTRES, Shrinking Tyres on New

Before new wheel-centres are pressed on to axles, the tyres must be shrunk on.

(11) WHEEL-CENTRES, Removing serviceable Tyres from Defective

When defective wheel-centres are removed from serviceable tyres the wheel-centre rim must not be cut through with an oxy-acetylene flame.

(12) WHEEL-CENTRES, Register of Axles pressed into

A Loco./76 register must be kept for recording all axles pressed into wheel-centres.

This register must also account for the pressing-in of crank-pins, also any other work worthy of special reference.

(13) PRESSURE-RECORDING APPARATUS: Wheel Press

The pressure-recording apparatus of a wheel-press must be maintained in good working-order.

When each completed pressure chart is taken out of the recording-apparatus, it must be checked with the Register of "Axles pressed into wheel-centres" by the Foreman in Charge. The wheel and axle numbers must be inserted against each respective pressure curve on the chart, and the pressures checked with those given in the register.

The register must be ruled off, indicating the completion of each chart, and both the chart and register must be signed by the Foreman in Charge.

All records must be carefully filed for future reference.

NEW ZEALAND GOVERNMENT RAILWAYS **MECHANICAL BRANCH**	**WHEELS, WHEEL CENTRES AND TYRES**	**CODE No. 15** Issue No 4 Date Issued 1/6/72

- This Code cancels Code No.4 issued 1 May, 1947, and Code No.15 issued 15 May, 1950.

1. PERMISSIBLE DIFFERENCE IN WHEEL TREAD DIAMETER IN A WHEELSET:

(a) When wheelsets are machined, the tread diameter of the wheels on the same axle must not differ by more than 0.5 mm (0.020 in.).

(b) Wheelsets which have not been re-machined must not be placed under rolling stock if the tread diameter of the wheels on the same axle differ by more than 1 mm (0.040 in.).

2. PERMISSIBLE DIFFERENCES IN WHEEL TREAD DIAMETERS BETWEEN DRIVING WHEELSETS:

(a) When driven by axle mounted electric motors:-
  (i) 13 mm (½ in.).

(b) When wheelsets coupled with side rods, chains, cardan shafts or gears:-
  (i) 0.5 mm (0.020 in.) within a bogie or rigid frame.
  (ii) 13 mm (1/2 in.) between bogies.

3. PERMISSIBLE DIFFERENCES IN WHEEL TREAD DIAMETERS BETWEEN NON-DRIVING WHEELSETS IN BOGIE VEHICLES:

(a) Wheelsets with a difference in tread diameter of up to ~~6 mm (¼ in.)~~ [12 mm ½ "] may be fitted in a bogie without axle box or spring packing to compensate for the difference.

(b) Wheelsets of any tread diameter may be fitted throughout a vehicle provided that the provisions of Clause 3 (a) above, and Clause 10 of Code 45 and Clause 5, Code 82 relating to drawbar heights and packing of bogie centres and float blocks are complied with.

4. PERMISSIBLE DIFFERENCE IN WHEEL TREAD DIAMETERS BETWEEN WHEELSETS IN FOUR WHEELED WAGONS:

Wheelsets of any tread diameter may be fitted provided that sufficient approved axlebox or spring packing is securely inserted to ensure that drawbar heights are within the limits of Clause 10 of Code 45.

5. TYRE SECTION DETAILS:

Drawing X7600 has a table of tyre applications and shows dimensions of tyre retaining rings and tyre blanks, as well as machining dimensions of finished tyre sections.

6. MACHINING OF WHEEL CENTRES, SOLID DISC WHEELS AND TYRES:

(a) **Wheel Centres**:

The bore must be machined cylindrical and with a surface finish not coarser than 3.2 micrometres CLA. The rim must be machined concentric and parallel with the bore, with a surface finish not coarser than 3.2 micrometres CLA.

(b) **Solid Disc Wheels:**

The bore must be machined cylindrical and with a surface finish not coarser than 3.2 micrometres CLA. The tread profile must be machined concentric with the axle centres.

(c) **Condemning of Solid Disc Wheels**:

When tread profiles will not finish within the last machining size, the wheel is to be condemned and replaced with a new solid disc wheel, except in those cases where provision is made on the appropriate wheel drawings for the wheel to be machined to a wheel centre.

(d) **Machining Bore of Tyres**:

When machining the bore of a new tyre it is to be set up to the outside circumference or tread with the inside face of the tyre parallel with the machine chuck. If this does not permit the bore to be

machined to the correct diameter, the minimum of re-positioning is to be carried out. The bore must be machined cylindrical and with a surface finish not coarser than 3.2 micrometres CLA and to give an interference fit as specified in Clause 10 of this Code.

An allowance for wheel centre rim wobble and deformation of the wheel centre diaphragm plate during tyre shrinkage' is to be made when machining the bore depth to ensure the tyre will set far enough on to the wheel centre to enable the inside face of mounted tyres to be machined to the correct distance between them, around the full circumference.

(e) **Machining Profile of Tyres and Solid Disc Wheels**:

The surface finish of tread profiles must not be coarser than 12.5 micrometres CLA and the surface finish of the tapered face of the flange and inside face of the tyre or wheel must not be coarser than 6.3 micrometres CLA. (see sketch).

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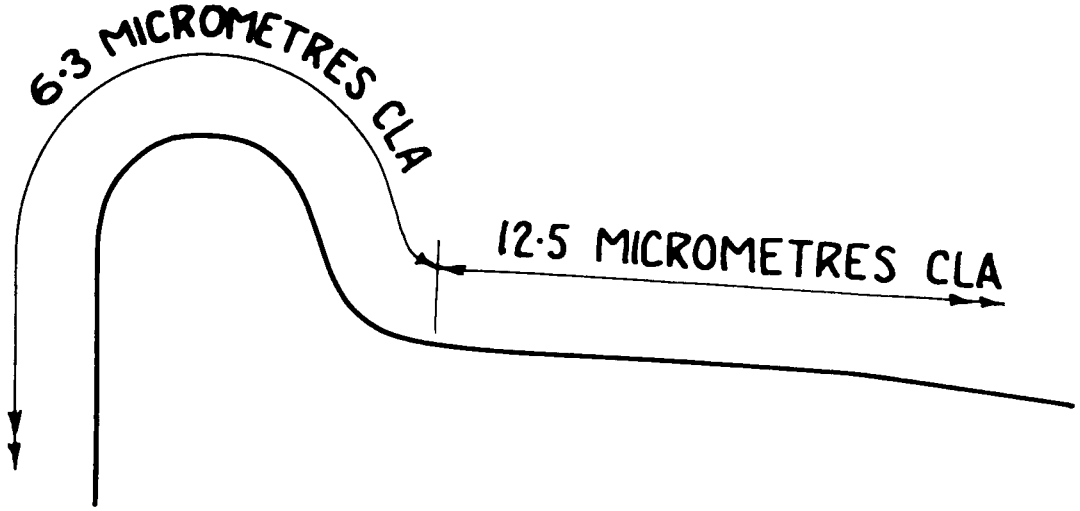


Tread profiles must be machined in accordance with the appropriate parts of Drawing X7601. When machining tyres which have just been mounted on wheel centres the tread diameters are to he left as large as possible to avoid wastage of metal. When re-machining worn profiles it is permissible to leave a witness groove on the flange up to 5 mm ($^{3}/_{16}$ in.) wide for the full circumference.

(f) **Condemning of Tyres:**

Tyres on which tread profiles will not finish within the last machining thickness must he condemned.]

7. LAST MACHINING AND CONDEMNING SIZES:

Details of last machining and condemning sizes for all wheels and tyres are shown on Drawing Y/X 7601/4.

8. PRESSING OF WHEELS ON TO AXLES:

All steel wheels must be pressed on to the axles with a force of ~~4KN~~ [400 kg] per mm (10 tons per inch) of diameter of the wheel seat.

A tolerance of ± 50 KN (5 tons) of the total pressure is permissible.

Tallow must be used to lubricate wheelseats when pressing wheels on to axles. No other lubricant is permitted.

Tyres must be shrunk on to new wheel centres before centres are pressed on to axles.

[Any machined surface still visible following pressing of wheels onto axles must be coated with suitable paint or preservative.]

9. DISTANCE BETWEEN WHEELS:

The inside faces of mounted wheels and tyres must be parallel and the distance between the faces

must be within the limits 997 $^{+1}_{-0}$ mm (3'-3¼" $^{+1/32}_{-0}$) for all wheelsets.

An out-of-gauge wheelset, or a wheelset with a bent axle, is permitted to run to the nearest wheel change depot for replacement, provided the distance between the inside faces of the wheels is not, at any point, greater than 999 mm (3'-3 $^{11}/_{32}$") or less than 995 mm (3'-3$^{3}/_{16}$".). Outside these limits the wheelset must be replaced, or the vehicle in which the out-of-gauge wheelset is fitted, must be loaded on to a wagon.

10. SHRINKAGE ALLOWANCE FOR TYRES:

The shrinkage allowance for tyres is 0.001 mm per mm (1/1000 in. per inch) of diameter of the wheel centre.

The machining tolerance for the bore of tyres is:

Bore in Millimetres	Tolerance in Millimetres
457 - 864 (18" - 34")	+ 0.000, - 0.127 (0.005 in.)
864 - 1168 (34" - 46")	+ 0.000, - 0.152 (0.006 in.)

11. SHRINKING TYRES ON TO WHEEL CENTRES:

Tyres must be heated uniformly to a temperature not exceeding 288^{O}C (550^{O}F). Temperature indicating salts ("Tempilstiks" or equivalent) must be used to determine the temperature of the tyres.

When fitted, each tyre must be allowed time to contract, before being moved. Tyres must be allowed to cool in still air and under no circumstances may forced cooling be adopted.]]

[The above section is Pages 3 & 4 of Issue 5; Dated 19/7/78]

12. FLATS ON TYRES AND WHEEL TREADS:

When flats on treads exceed 38 mm (1½ in.) in length, the tread profiles must be re-machined. Flats which do not exceed 38 mm (1½ in.) in length may remain in service providing any burned metal at the end of the flat is dressed off.

13. REMOVING TYRES FROM WHEEL CENTRES:

Condemned tyres may be removed from wheel centres by cutting through the tyres with oxy-acetylene, care being taken not to damage the wheel centre. When tyres are fitted with a "Gibson" retaining ring, the rolled-over lip of the tyre is to be machined off in order to release the ring undamaged for further use before the tyre section is cut through with oxy-acetylene.

14. WELDING OF WHEEL CENTRES, SOLID DISC WHEELS AND TYRES:

Building up solid disc wheels and tyres by any welding process is not permitted, unless approved by the Chief Mechanical Engineer.

Electric welding is permitted on wheel centres only to repair any damage to the rim, caused by gas cutting, while removing condemned tyres. No other welding is permitted on wheel centres unless approved by the Chief Mechanical Engineer.

15. EXAMINATION OF WHEELS AND TYRES:

All wheels removed from locomotives and vehicles must be thoroughly examined to ensure that they are sound in every respect. Loose or otherwise defective wheels, wheel centres or tyres must not be returned to service.

16. CHAMFER ON EDGE OF WHEEL TREAD:

The size of the chamfer on the edge of wheel treads must be as shown on the respective drawings for the class of vehicle, the machining tolerance is 2 mm ($^{+1/16}_{-0}$ in.) on either dimensions. Wheels must not be fitted to vehicles during lift or overhaul, unless they have the correct chamfer.

17. REPORTING FRACTURED TYRES:

Works Foremen and Inspectors, Car and Wagon Inspectors and Locomotive Supervisors must

report partly and fully fractured tyres, on Loco. 90 forms in duplicate, to the District Mechanical Engineer concerned who will countersign and forward the original to the Chief Mechanical Engineer. Works Managers must report partly and fully fractured tyres found in a Workshop on Loco. 90 forms to the Chief Mechanical Engineer.

18. FORWARDING PIECES OF FRACTURED TYRES FOR EXAMINATION:

All wheelsets on which tyres have partly or fully fractured in service must be sent to the nearest workshop, where a portion on each side of the fracture is to be cut off and sent, together with details of all brands relative to the tyre from which the portions were cut, directly to the Chief Mechanical Engineer.

Each portion shall be about 50 mm long and may be cut off with a cold saw or oxy-acetylene and the details of tyre brands may be written on a label which must be securely attached to the portions of the tyre.

19. BRANDING OF WHEEL CENTRES AND SOLID DISC WHEELS:

Every new wheel centre made in the workshops must be lightly branded on the inside of the boss, in accordance with the respective drawing. Where the drawing does not show the brands required, drawing X27215 must be followed.

Every wheel centre and solid disc wheel made by outside firms carries certain brands including the W.R. number or C.O.S. number; these brands must not be removed.

20. TYRE BRANDS:

All tyres carry certain manufacturers' brands including W.R. numbers or C.O.S. numbers; these brands must not be removed.

[All tyres are to be hot branded in accordance with drawing W16572 to a depth not exceeding 4 mm.]

[C.M.E.'s 24/563 of 23/9/81]

21. GAUGES:

The following gauges are to be used for checking wheelsets:

		Drawing No.
(a)	Wheel Gauge (tread profiles)	Y/X7601/ 5
(b)	Distance Gauge (between tyres)	Y/X7601/ 6
(c)	Gauge for Tyre Contour : .....Flange Y/X7601/3-A	Y/X7601/ 7
	Flange Y/X7601/3-B	Y/X7601/ 8
	Flange Y/X7601/3-E	Y/X7601/16
	Flange Y/X7601/3-D	Y/X7601/17
	Min. flange Gauge for groups 1 to 7 on drg. Y/X7601/4-Z	Y/X7601/10
	Min. flange Gauge for groups 8 to 10 on drg. Y/X7601/4-Z	Y/X7601/11
(d)	Tyre thickness at tread for condemning:	
	Tread Gauge (Tyred Wheels)	Y/X7601/12
	Tread Gauge (Solid Disc Wheels)	Y/X7601/13
(e)	Maximum Depth of flange and maximum guttering: Gauge	Y/X7601/14
(f)	Condemned flange gauge	Y/X7601/15
(g)	Sharp flange gauge	Y/X7601/ 9
(h)	Measurement of wear on flange and tread	PD100766 types 1 and 2
(j)	Measurement of tyre tread thickness	PD 100766 Type 1
(j)	Measurement of guttering wear	PD100766/4

22. TESTING OF GAUGES:

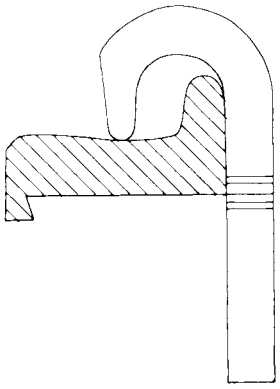
All working gauges listed in Clause 21 of this code, except gauges PD100766 type 2, and PD100766/4 are to be sent to the nearest main workshops (Otahuhu, Hutt, East Town, Addington or Hillside) annually for checking and standardising.

Gauges PD100766 type 2 and PD100766/4 are to be tested monthly, or at any time after the gauge has been dropped, with test plate PD100766 Part A supplied with the gauges. Scales X, Y and V on these gauges should register zero on the test plate. These two gauges need only be sent to Workshops, for standardizing, when the scale readings are inaccurate by more than 0.5 mm (0.020 in.).

Works Managers in the above-named Workshops are to maintain master gauges for checking the working gauges.

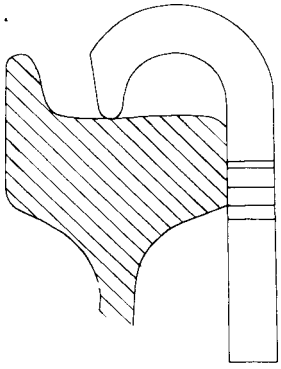
Working gauges are to have the date of the check stamped on with 3 mm (1/8") type and are to be returned promptly to the point of origin.

23. Illustrations showing use of gauges Y/X7601/12, Y/X7601/13, Y/X7601/14, Y/X7601/15, Y/X7601/9, PD100766, type 2, PD100766/4.



Gauge Y/X7601/12

When engraved line on gauge corresponds with tyre seat diameter, the wheelset must be taken out of service.



Gauge Y/X7601/13

Solid disc wheels. When engraved line on gauge corresponds with wheel rim edge, wheelset must be taken out of service.

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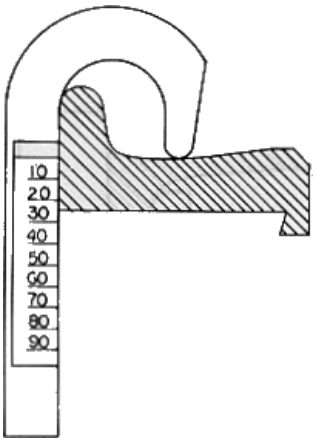
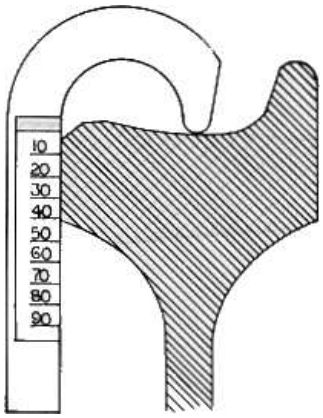


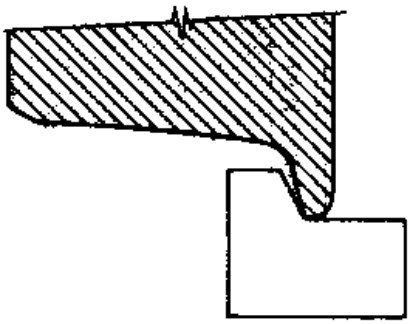
Gauge Y/X 7601/12 (Reverse side)
Tyred wheels

Drawing References:
13090011 – scale application
S3861 – "Z" condemning sizes

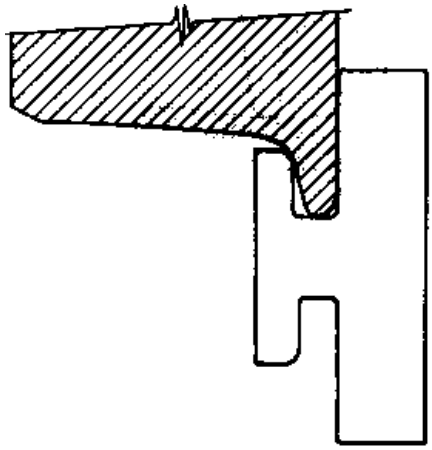


Gauge Y/X 7601/13 (Reverse side)
Solid disc wheels

Use graduated scale to measure tyre thickness "Z" in mm.

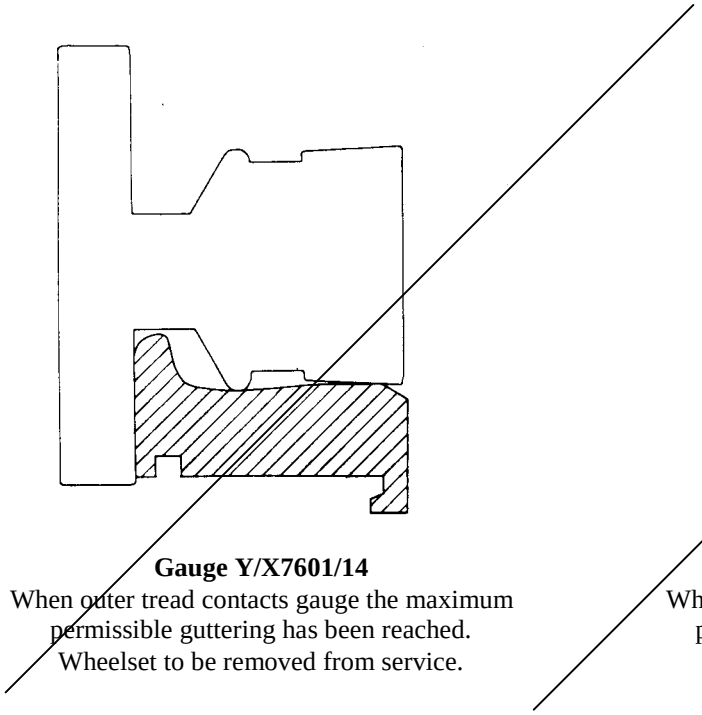


Gauge Y/X7601/9
When the gauge rocks about its corner radius the tyre is considered to have an excessively sharp flange and action is to be taken to rectify the position.

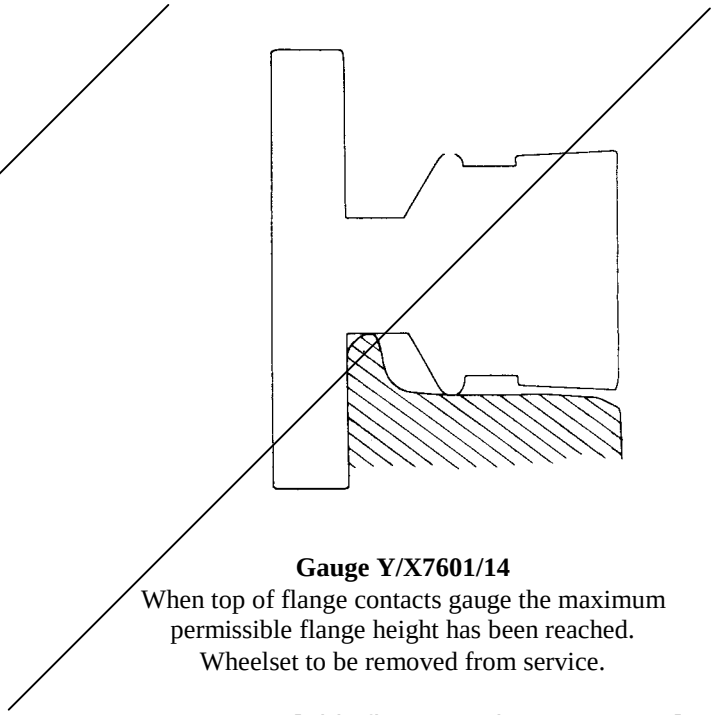


Gauge Y/X7601/15
For showing when flanges have reached minimum allowable thickness. When gauge bottoms on flange the wheelset is to be removed from service

The above section is pages 9 & 10 of Issue No. 5; 1/4/85]

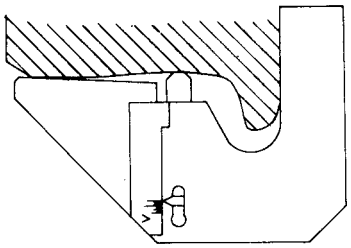


Gauge Y/X7601/14
When outer tread contacts gauge the maximum permissible guttering has been reached.
Wheelset to be removed from service.

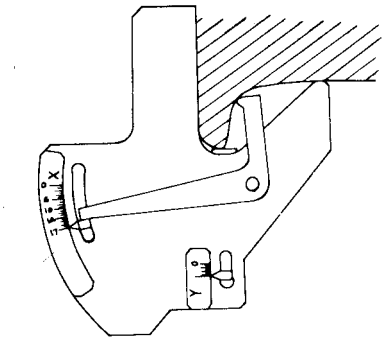


Gauge Y/X7601/14
When top of flange contacts gauge the maximum permissible flange height has been reached.
Wheelset to be removed from service.

[This figure not in Issue No. 5]



Gauge PD100766/4
Scale marked to show maximum gutterings of 3¼ mm (1/8") and 6½ mm (¼").
Wheelsets to be removed from service when guttering is at the maximum for the group concerned.



Gauge PD100766 Type 1
When "X" reading exceeds 17 mm use gauge Y/X7601/15 to determine when flange is condemned.
Wheelset to be removed from service when "Y" reading exceeds 6¼ mm (high flange).

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