

GUIDANCE NOTE - GN 50

(July 1995)

TYRE TREAD WEAR

BRITISH INDUSTRIAL TRUCK ASSOCIATION



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GN 50

Tyre Tread Wear

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page 1 of 5

IMPORTANT NOTICE

PLEASE READ CAREFULLY

- (a) The recommendations and advice contained in this Guidance Note are based on specifications, procedures and other information which have been collected by the British Industrial Truck Association Limited ("BITA") from its members. They represent what is, so far as BITA is aware, the best available data at the time of publication on the construction and use of industrial trucks in the general conditions described, and are intended to provide guidance for such use.
- (b) However, there are a wide variety of situations in which industrial trucks may be used, consequently in all cases the suitability and safety of this Guidance Note must be determined by the person seeking to apply it on the basis of his own judgment, in the light of the conditions in which use is envisaged and subject to all relevant statutory requirements.
- (c) BITA accepts no responsibility for the recommendations, advice, statements, opinions and conclusions expressly or impliedly set out below and gives no warranty, representation of assurance in respect of the accuracy or validity of the same.

1. INTRODUCTION

The limits of tyre tread wear for industrial trucks are not defined in national or international standards. Some tyre manufacturers give guidance which is restricted to their own products.

The tyre manufacturers recommendations should always be followed where these are available, but if they are not available this guidance note may be used.

2. SCOPE

This guidance note recommends the limits of tyre tread wear for pneumatic and solid rubber tyres used on industrial trucks operating on premises not covered by the Road Traffic Regulations, and where no other recommendation is made by either the manufacturer of the truck or the tyres.

Note:- Industrial trucks operating on the public highway must comply with the relevant Road Traffic Regulations.

3. DEFINITIONS

3.1 Pneumatic Tyre

A tyre which is designed to be fitted to a wheel and inflated and deflated via a valve. The tyre will carry the design load when inflated to the pressure recommended by the tyre manufacturer. A typical construction is shown in figure 1.

Pneumatic tyres may be of either radial ply or diagonal ply (cross ply) construction, and are identified within the tyre size designation marked on the sidewall. Radial ply tyres are identified by a letter 'R' in the size marking, and diagonal ply tyres by a '-'. For example:-

8.25 R 15 is a radial ply tyre
8.25 - 15 is a diagonal ply tyre of the same size

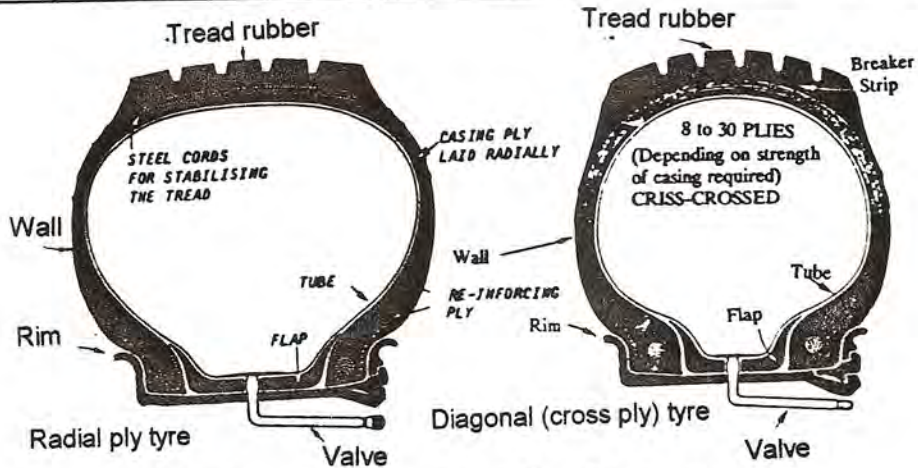


Figure 1. Typical Pneumatic Tyre Construction

3.2 Solid Rubber Tyre for Pneumatic Rim

A solid tyre having approximately the same overall dimensions as a pneumatic tyre and fitting on a pneumatic tyre rim. Also called a resilient tyre, which is the term used in this guidance note. A typical construction is shown in figure 2.

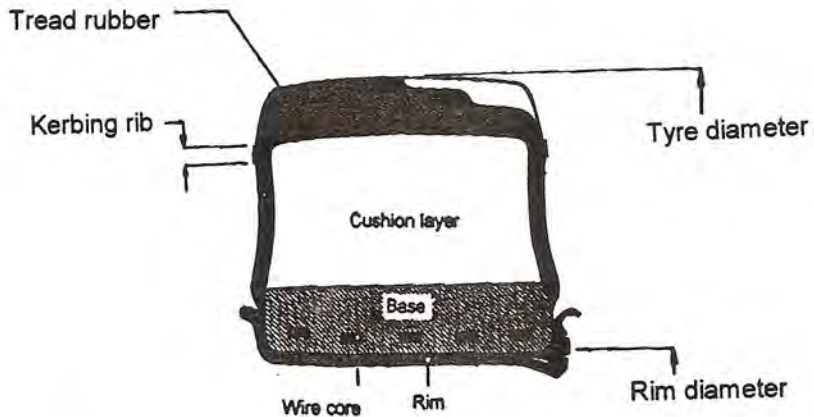


Figure 2. Typical Resilient Tyre Construction

3.3 Press-On Band Solid Rubber Tyre

A solid tyre with a cylindrical shaped base. It is retained on the rim by an interference fit. A typical construction is shown in figure 3.

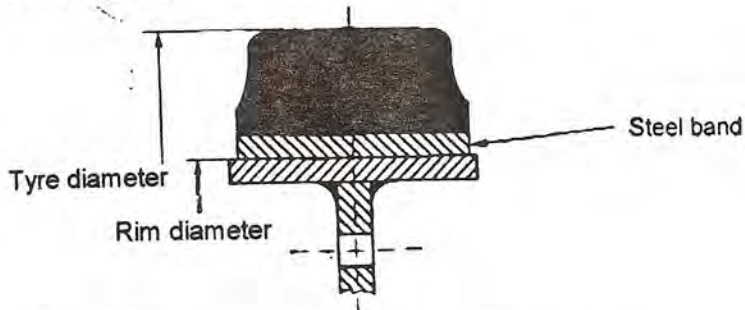


Figure 3. Typical Press-On Band Tyre Construction



3.4 Moulded Direct Solid Rubber Tyre

A tyre similar in construction to the press-on-type, but with the tyre moulded direct to the rim.

3.5 Conical Base Solid Rubber Tyre

A solid tyre with a conical shaped base, used on a divided conical rim which may be either centre parted or offset parted. This type of construction is shown in figure 4.

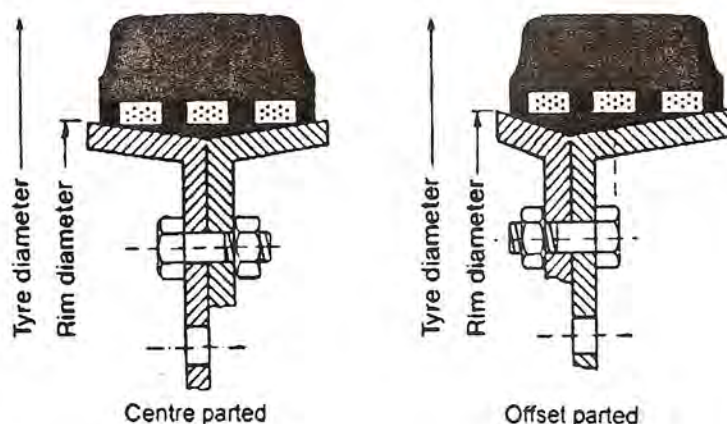


Figure 4. Typical Conical Base Tyre Construction

4. HAZARDS OF EXCESSIVE TYRE TREAD WEAR

Tyres must be fitted in accordance with the tyre manufacturers recommendations. The hazards that may be caused by excessive tyre tread wear are:-

- 4.1 The risk of rapid deflation of pneumatic tyres.
- 4.2 Loss of load capacity, causing accelerated wear and overheating.
- 4.3 The risk of wheel slip under acceleration or braking on low friction surfaces.

Further hazards are created if tyres with substantially different amounts of tread wear are used on the same axle. This risk is greater with solid tyres, even if they are within the wear limits.

- 4.4 Reduction of sideways stability of the truck.
- 4.5 Risk of one wheel slipping under acceleration or braking, causing loss of directional control.
- 4.6 Uneven tyre loading on twin tyre arrangements.



5. REDUCTION OF HAZARDS

To reduce the hazards of clause 4:-

- 5.1 Tyres on any one axle should be made by the same manufacturer, be of the same type and size, and be matched for wear.
- 5.2 When replacing tyres, all tyres on any one axle should be replaced.
- 5.3 Do not mix radial ply pneumatic, diagonal ply pneumatic and resilient tyres on the same truck.

6. TYRE TREAD WEAR LIMITS

6.1 Pneumatic Tyres

Pneumatic tyres should have a minimum of 1mm of the original or regrooved tread pattern over the centre 75% of the tread around the entire circumference.

Note that tyres designed for high traction in off road conditions such as construction sites will lose their tractive performance before the 1mm wear limit is reached.

Tyres must be replaced if any part of the carcass of the tyre is exposed.

6.2 Resilient Tyres

Resilient tyres may be used until the tread is worn to the wear indicator, if the tyre has such a marking, or to the top of the kerbing rib, see figure 2. Where there is no indicator or kerbing rib, use the tyre until 3/4 of the original total thickness of the tyre remains. To calculate the minimum diameter corresponding to this wear limit, measure the outside diameter of the worn tyre, the outside diameter of an unworn tyre of the same type, make and size, and the diameter of the wheel rim. The minimum permitted diameter of the worn tyre is given by the formula:-

$$D_{\text{worn}} = 3/4 (D_{\text{new}} - d_{\text{rim}}) + d_{\text{rim}}$$

where D_{worn} = the outside diameter of the worn tyre
 D_{new} = the outside diameter of an unworn tyre
 d_{rim} = the diameter of the wheel rim

6.3 Press-On Band, Moulded Direct and Conical Base Tyres.

Press-on band, moulded direct and conical base tyres may be used until 2/3rds of the original total radial thickness of the tyre remains, as given by the formula:-

6.3.1 Moulded Direct Tyres

$$D_{\text{worn}} = 2/3 (D_{\text{new}} - d_{\text{rim}}) + d_{\text{rim}}$$

6.3.2 Press-on Band and Conical Base Tyres

$$D_{\text{worn}} = 2/3 (D_{\text{new}} - d_{\text{rim}} - 20) + (d_{\text{rim}} + 20)$$

BRITISH INDUSTRIAL TRUCK ASSOCIATION



GUIDANCE NOTE

GN 50

Tyre Tread Wear

page 5 of 5

Notes:-

- a) All dimensions are measured in millimetres
- b) The outside diameter of the tyre D_{worn} and D_{new} may be calculated by measuring the circumference of the tyre with a flexible tape, and calculating the diameter from the formula:-

$$\text{Diameter} = \frac{\text{Circumference}}{3.14}$$

7. REGROOVING

Some tyres may be regrooved, alternatively called recut.

7.1 Pneumatic Tyres

Pneumatic tyres may be regrooved if the tyre is marked 'regroovable' on the sidewall and the work is carried out in accordance with the manufacturers recommendations.

7.2 Solid Rubber Tyres.

Tyres that originally had a tread pattern may be regrooved in accordance with the manufacturers recommendations.

It is the responsibility of the user to decide if tyres may be used after the tread pattern has worn away, taking into account local operating conditions and the wear limits recommended in clauses 6.2 and 6.3.