WHEEL DEFECTS

WHEEL TREAD PROFILE DEFECTS

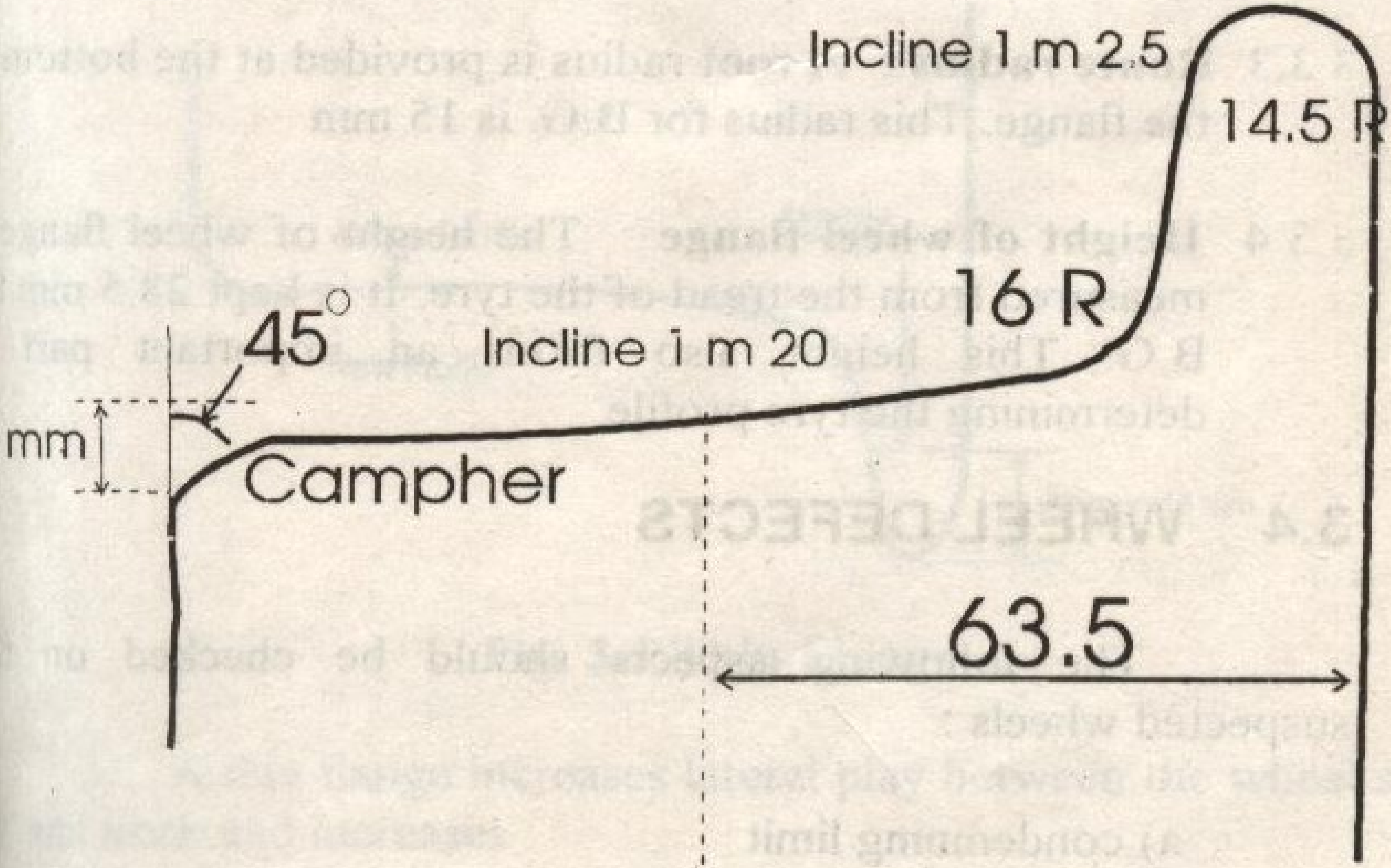


Fig. 3.2 Tyre Profile of a new Wheel

Dimensions of tyres when New

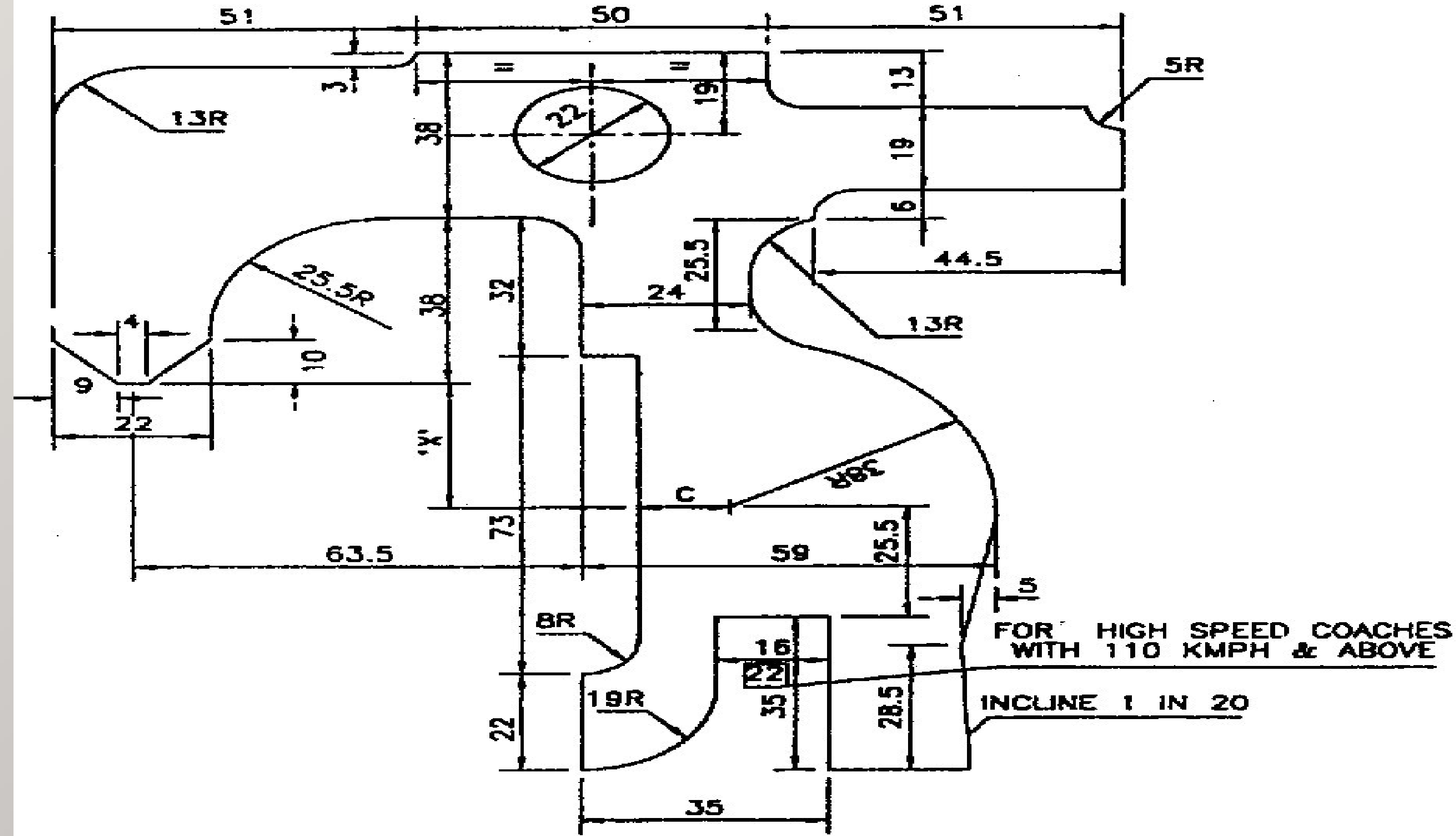
- Flange thickness – 28.5 mm
- Height at tread in center – 28.5 mm
- Top radius – 14.5 mm
- Radius at the root – 16 mm
- Flange Inclination / Taper – 1 in 2.5
- Tread inclination – 1 in 20

Note 1 – Taper 1 in 2.5 reduce to frictional resistance of side thrusts with rails and thus helps in reducing the amount of wear on rail and flange to the minimum possible.

Note 2 – Inclination/Taper of 1 in 20 given on the tread profile of wheels help in turning in curve of any degree.

Tyre Defects

- Radius at the root of flange too small
- Deep flange
- False flange or Hollow tyre
- Thin flange
- Sharp flange
- Flat places on tread



All coaches (Including EMU & DMU) 50 mm

NOTE:-

1. CONDEMNING MARK 'C' TO BE STAMPED ON BOTH SIDE OF GAUGE.
2. CONDEMNING MARKS FOR TYPE OF STOCK ON LINE ONLY NEEDS TO BE STAMPED.
3. DISTANCE 'X' AT WHICH CONDEMNING MARK 'C' FOR VARIOUS TYPE OF WHEELS TO BE STAMPED ARE AS BELOW:-

i) SOLID WHEEL OF ICF & BEML MAIN LINE COACHES	6.5 mm.
ii) SOLID WHEEL OF IRS MAIN LINE COACHES	5 mm.
iii) TYRED WHEEL OF IRS, ICF & BEML MAIN LINE COACHES	26 mm.
iv) TYRED WHEEL OF ac & dc EMU MOTOR COACHES.	38.5 mm.
v) TYRED WHEEL OF ac & dc EMU TRAILER COACHES.	28.5 mm.

Radius at the root of flange too small

The radius at the root of flange is **16 mm** when new.

Cause – In service radius at the root of flange is subjected to maximum wear on curves and by snaking effect of the wheels in motion.

Root radius

How to check – It is checked by the tyre defect gauge. When it is reduced to **13 mm** the gauge will fit in properly. If it has reduced further we will see light in between the gauge and the root of the flange through gap.

This is called radius too small at the root of flange and such wheels should be rejected.

Worn Root

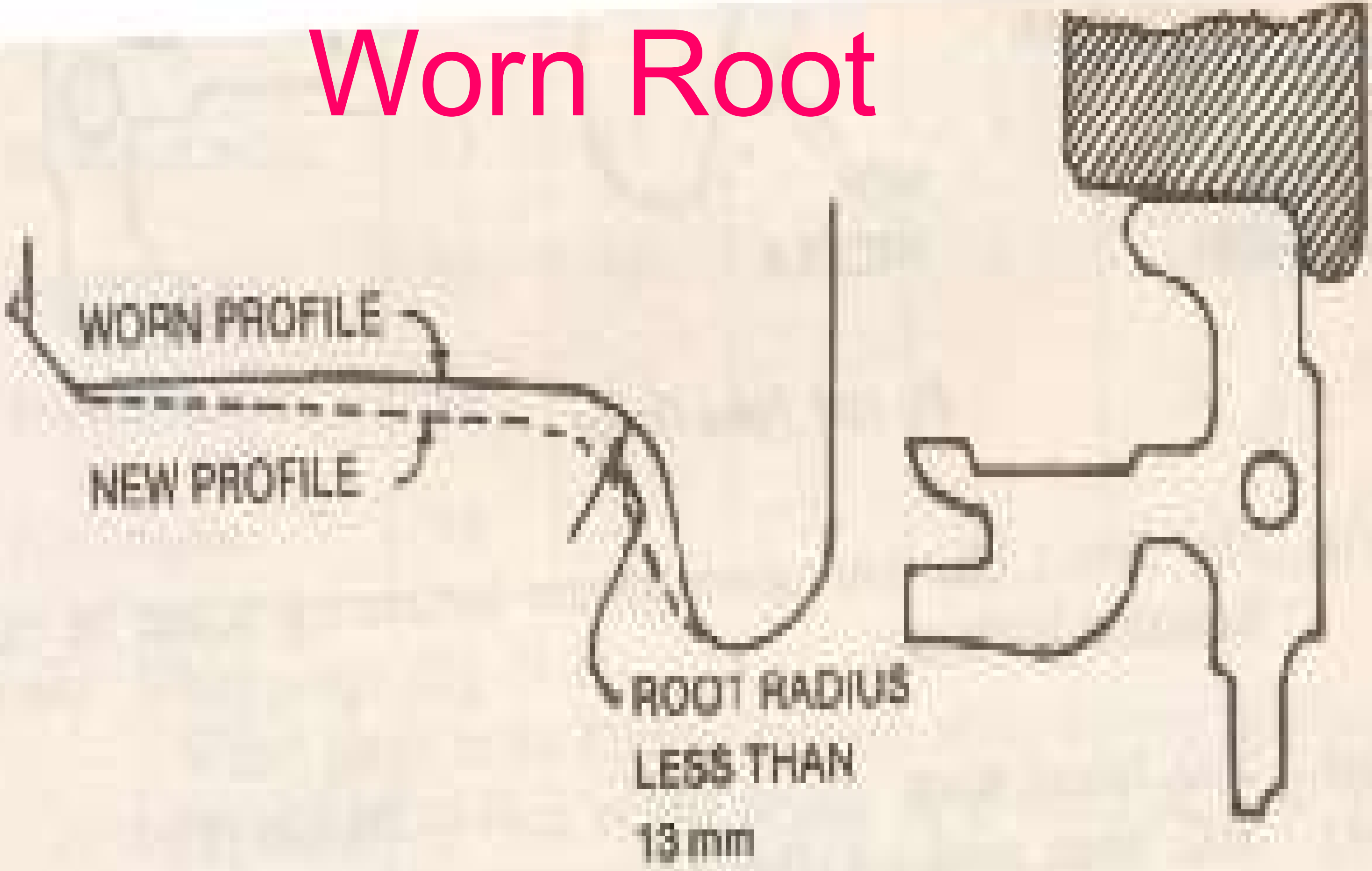


Fig 21./ Worn Root

Root radius

Effect – (1) This defect results into increased friction between the rails and the flange because of reduction in taper of 1 in 2.5 given on the wheel flange which affects hauling capacity of the locomotive besides wearing effects on the rails.

(2) If it is allowed to reduce further, the flange can get broken/sheared off and cause accident due to flange forces & side thrusts .

Deep flange

When new, The height of flange at tread in centre is 28.5 mm.

Cause – While the wheel moves there is constant wear on the tread of tyres and thus the diameter of wheels at tread starts reducing due to the wear on the tread. But the top of face of wheel flange is not subjected to any corresponding wear, the flange height at tread goes on increasing.

When this depth of tread or the height of flange fro tread increases from 28.5 to 35 mm. The tyre is called as **deep flange.**

How to Check – The deep flange tyre fits in as illustrated in the sketch.

Effect - (1) The deep flange becomes dangerous as it starts damaging fish plates, fish plate bolts, distance blocks, points and crossing etc.

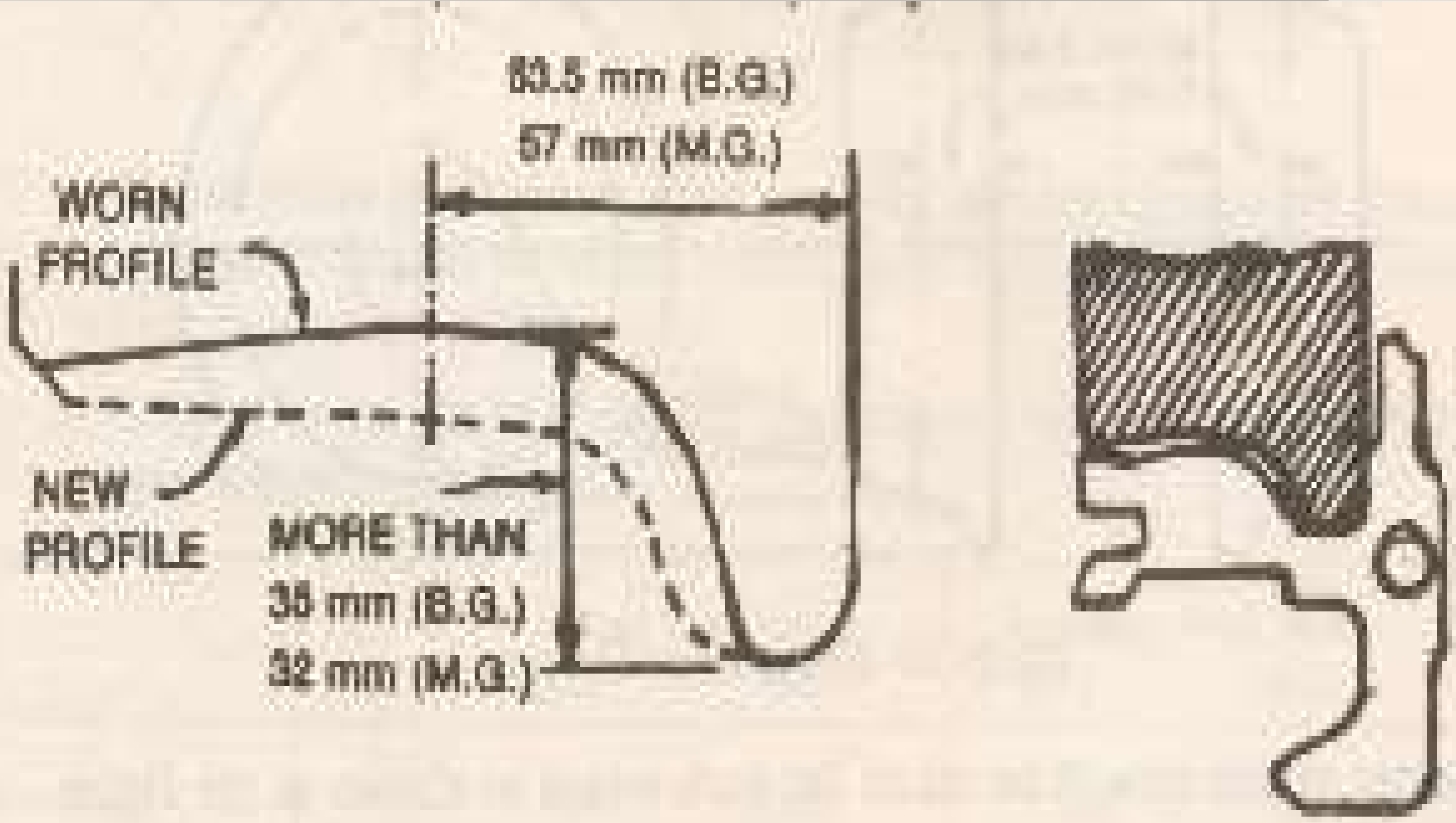


Fig 21.8 Deep Flange

Deep flange

Effect – (2) The inclination of 1 in 2.5 & 1 in 20 practically vanishes which results in higher friction and there is every possibility of wheels to derail on curves for the two wheels on same axle can not be suitably converted with different diameters to suit longer outer & shorter inner rails, automatically.

False flange or Hollow Tyre

Cause – False flange occurs when tread wears continuously when the wheels negotiate curves.

How to check – It is shown in sketch. Rejection limit is that outer edge of the wheel tread below bottom line of the tread becomes **more than 5 mm.**

False flange

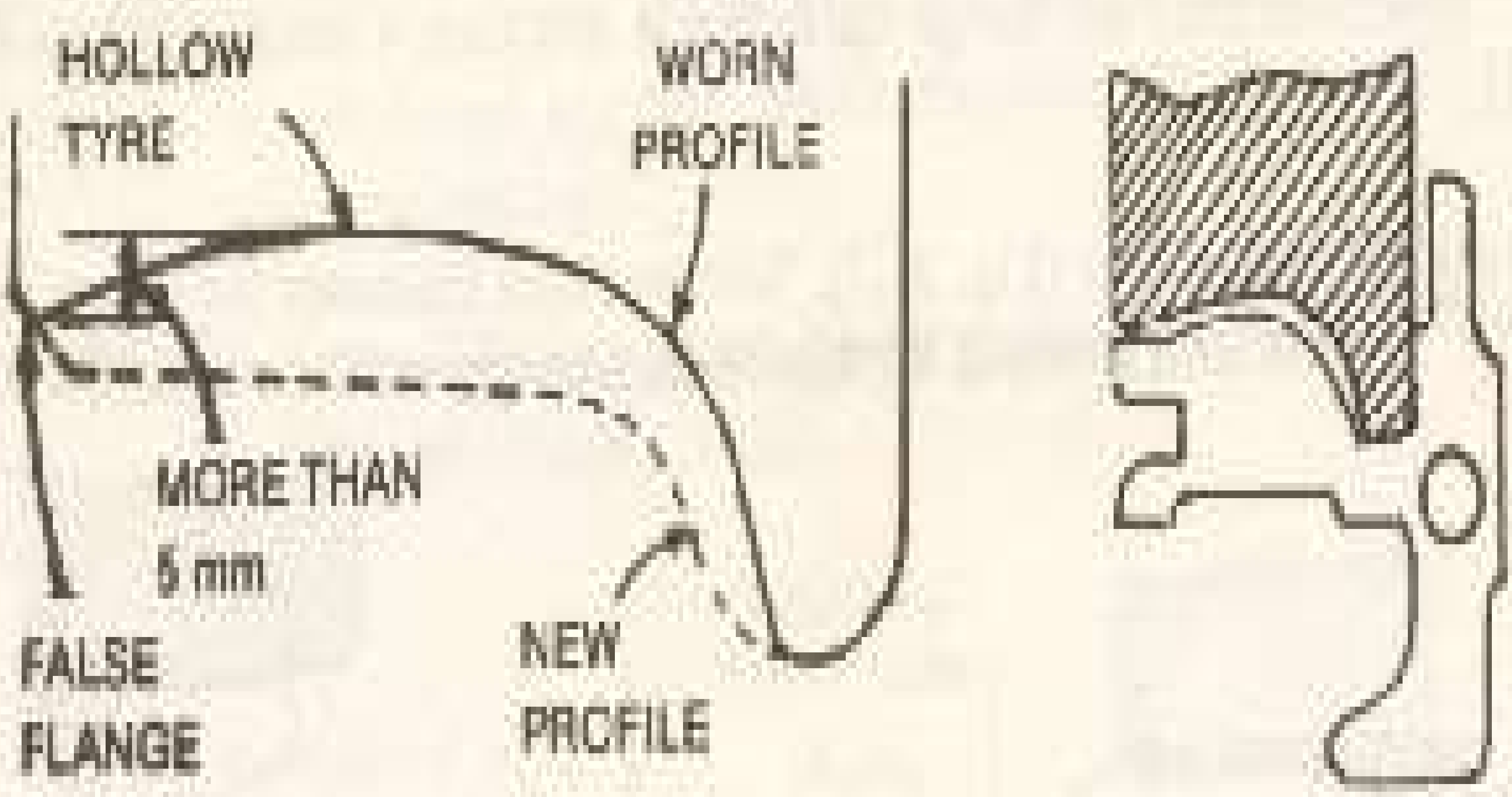


Fig 21.9 False Flange

Effect of False flange

(1) This causes excessive hunting and oscillation and increases the flange force.

(2) It may split open points while travelling in trailing direction.

Thin flange

The thickness of flange is **28.5 mm** (new).

Cause – (1) Flanges wear to the maximum due to the curves, side thrusts and snaking effect of the wheels.

(2) If one wheel diameter is lesser than that of other on the same axle, the flanges of shorter dia. Wheel will wear more because this wheel will travel nearer the flange touching rail head to compensate the difference in dia in order to remain in central position. The flanges wear thin.

How to check – When thickness of flange reduces from **28.5 to 16 mm (22 mm for high speed and Rajdhani)** the gauge fits in as shown in sketch and the flange is called as **thin flange.**

Effect –

(1) When they wear thin they become weaker and there are cases when thin flanges could not sustain the side thrusts and broke causing midsection accidents.

Effect of thin flange

(2) Thin flanges cut through the partly opened facing points due to any signal or permanent way or any other defect, causing two roads under the same vehicle or wagon and the serious accident follows there after.

(3) Oscillations increase due to greater play resulting in instability of the vehicle.

Thin flange

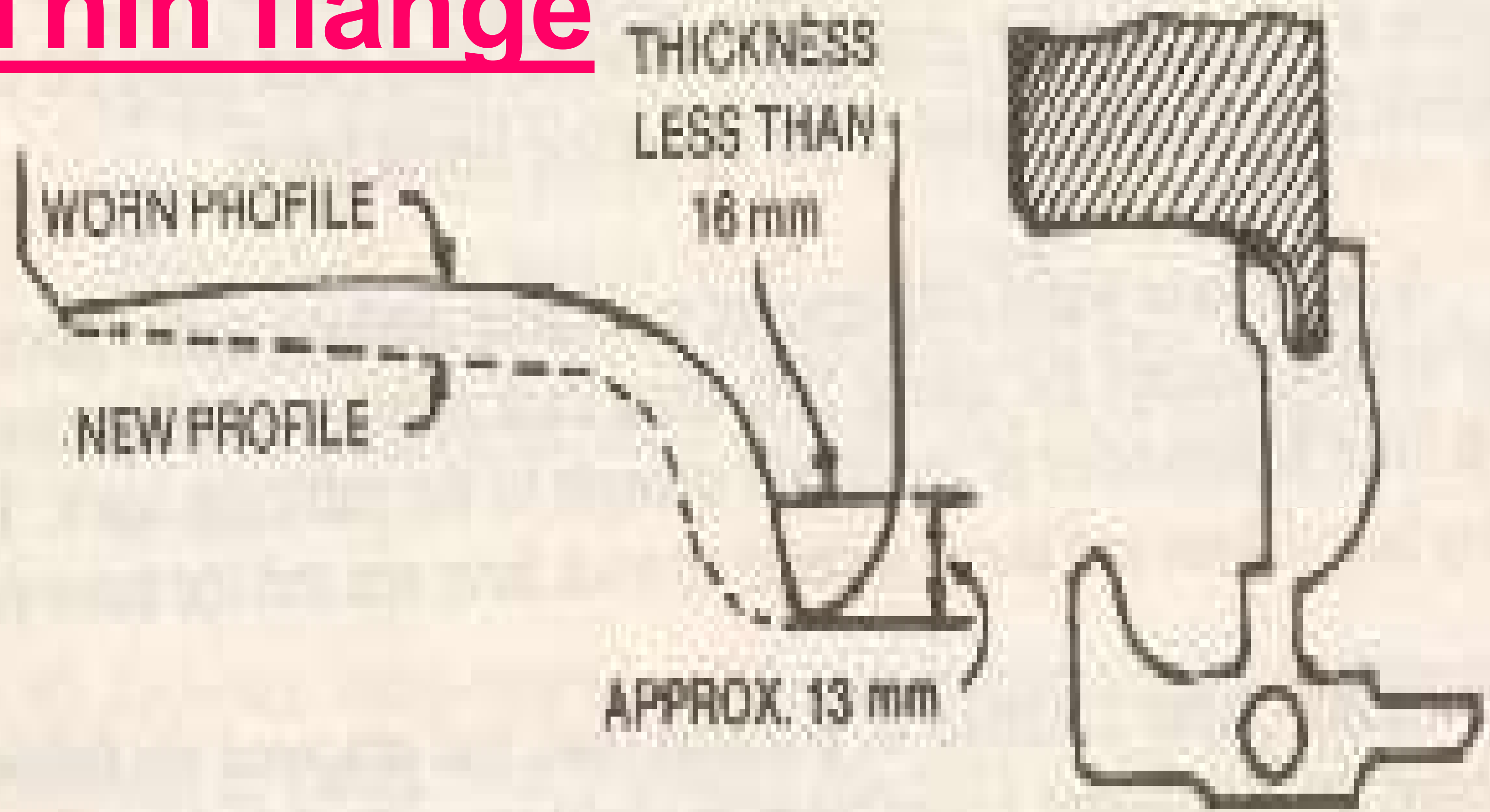


Fig 21.5 Thin Flange

Sharp flange

The top flange is not square but has been given a radius of **14.5 mm.**

Cause –

(1) Flanges wear sharp when continuously the wheels negotiate curves and during snaking affect of wheels.

(2) Also the biased wear on flanges causes sharp flanges, which can be attributed to difference in diameters of wheels on the same axle.

How to check – When the top radius at the corner towards tread reduces to **5 mm**, the flange is called to be sharp flange and can be detected by feeling of hand or application of gauge as shown in sketch.

Effect – (1) Sharp flange is highly dangerous as it mounts the rail at points and nose and heel of switch rails and crossings.

(2) It also mounts the rail on curves and causes accident if happens to negotiate outer rails.

Sharp flange

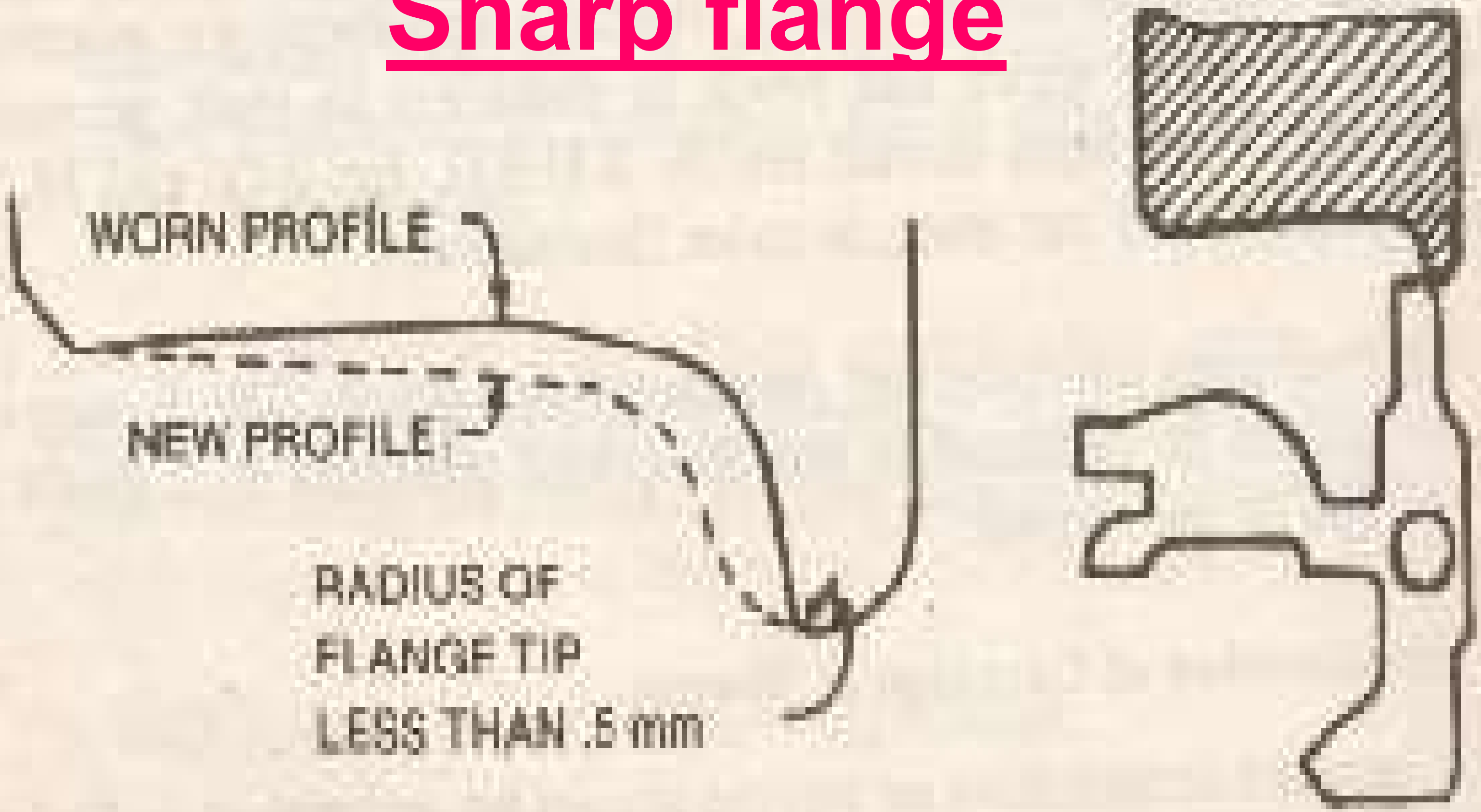


Fig 21.6 Sharp Flange

Flat places on tread

Cause – Jamming of brakes, caused by missing hanger pins or entanglement of brake block with trolley and the wheel or the piston getting jammed in its top position cause skidding of wheels. The seizure of roller bearing also results in wheel skidding. When skidding occurs at a particular point of tread and continuous for some distance, the tread wears excessively at that point of contact with the rail and becomes flat to a certain length and depth. This is flat tyre.

Effect -

(1) This defect irks the passengers and adds to their discomfort.

(2) This causes hot axles, journal breakage, derailments and skidding if allowed much, causes both sides false flanges on tread which is highly detrimental to safe running of trains.

How to check - This should be checked with the application of Tyre defect gauge as shown in sketch.

Flat Tyre

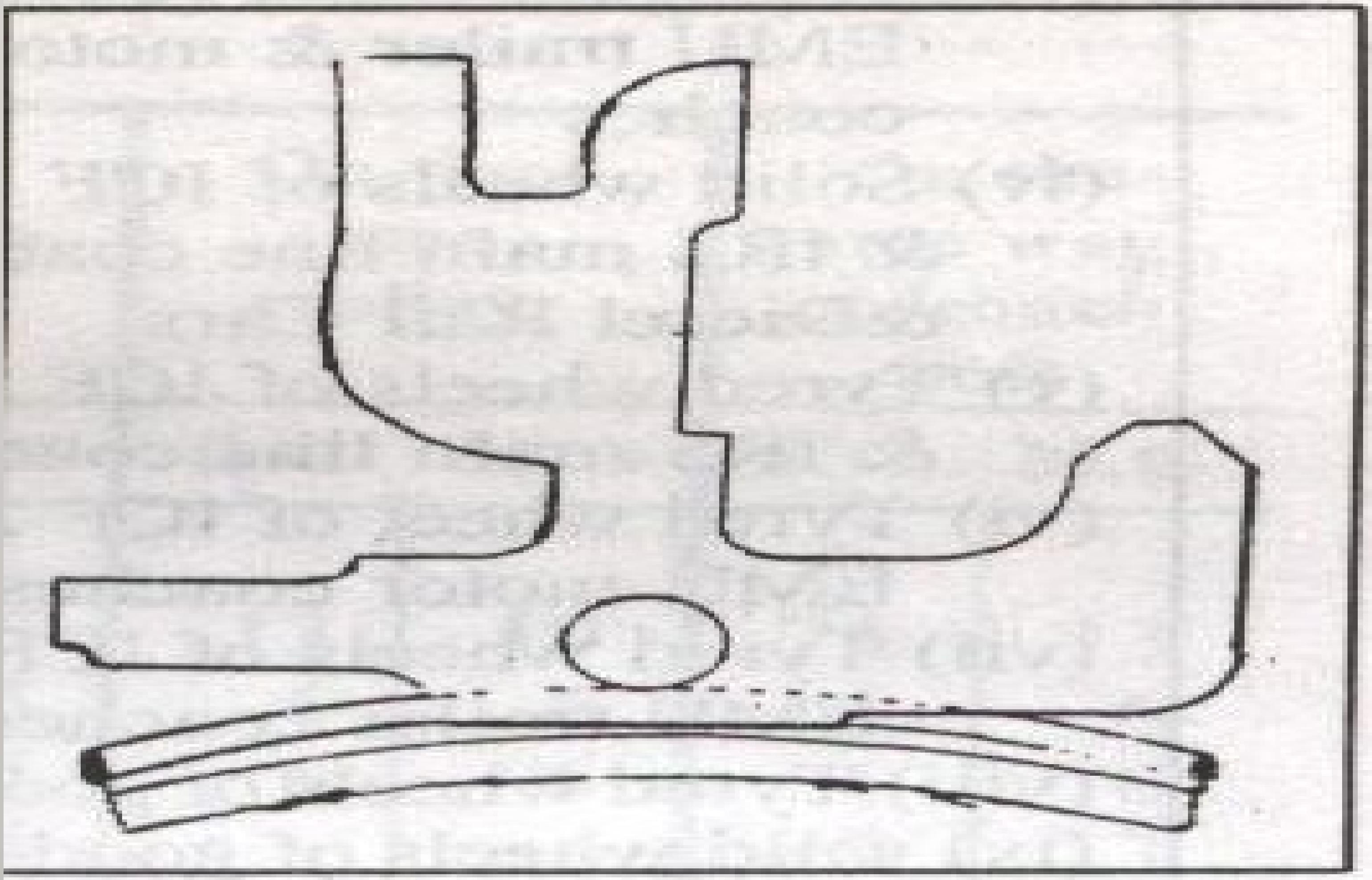


Fig. 23 : Flat places on tyre tread

75 mm

Flat Tyre

ECH/M/3

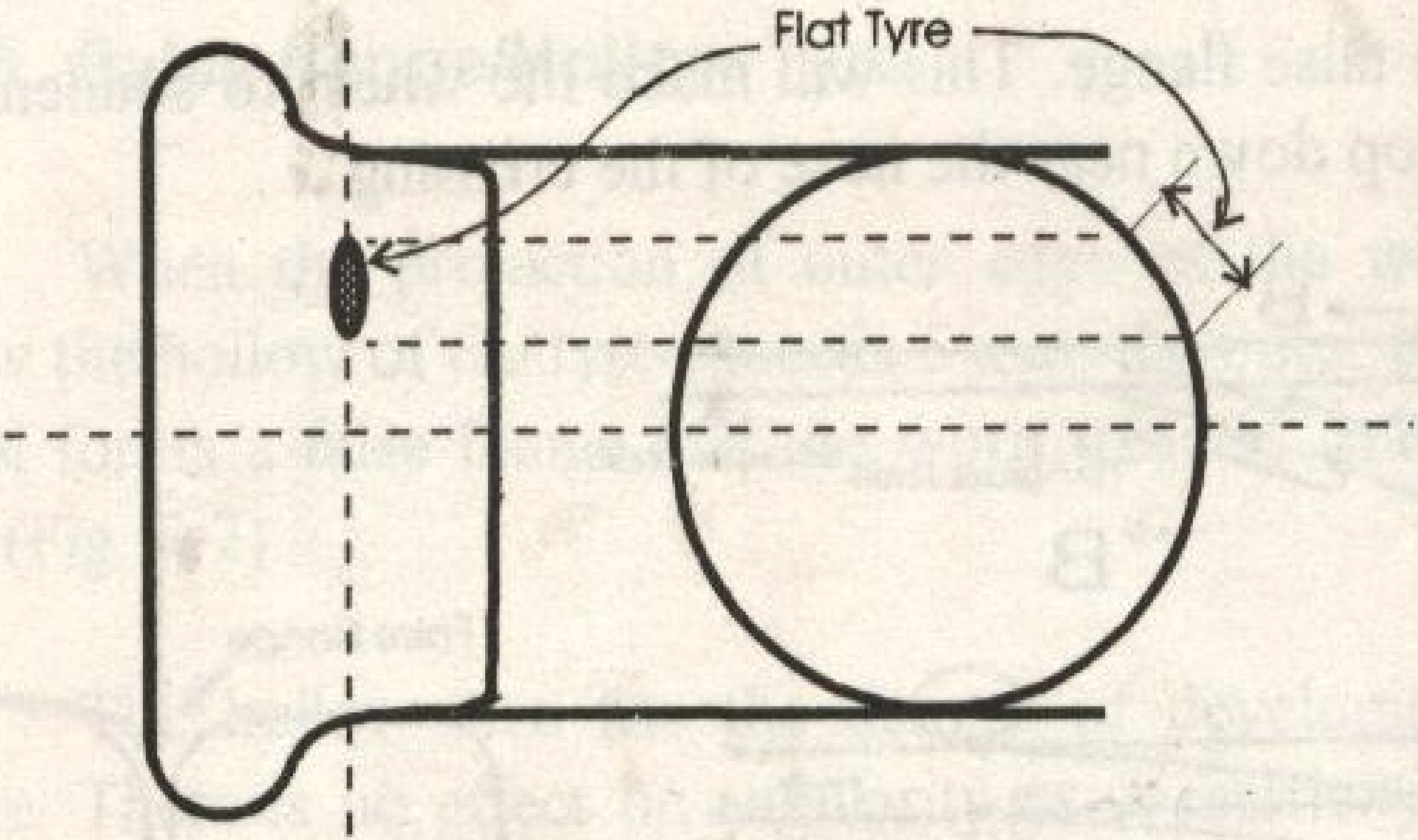


Fig. 3.9 Flat Tyre

Flat places on tread

Max. permissible limits -

ICF coaches - 50 mm

Wagon - 60 mm

No depth has been prescribed for flat places and can also not be checked easily.

Difference in wheel diameter On same axle

Measurement of dia. – The wheel diameter is measured on the tread at a distance of 63.5 mm from the back of wheel.

How to check – Two measurements across the quarters points should be taken for each wheel as shown in sketch.

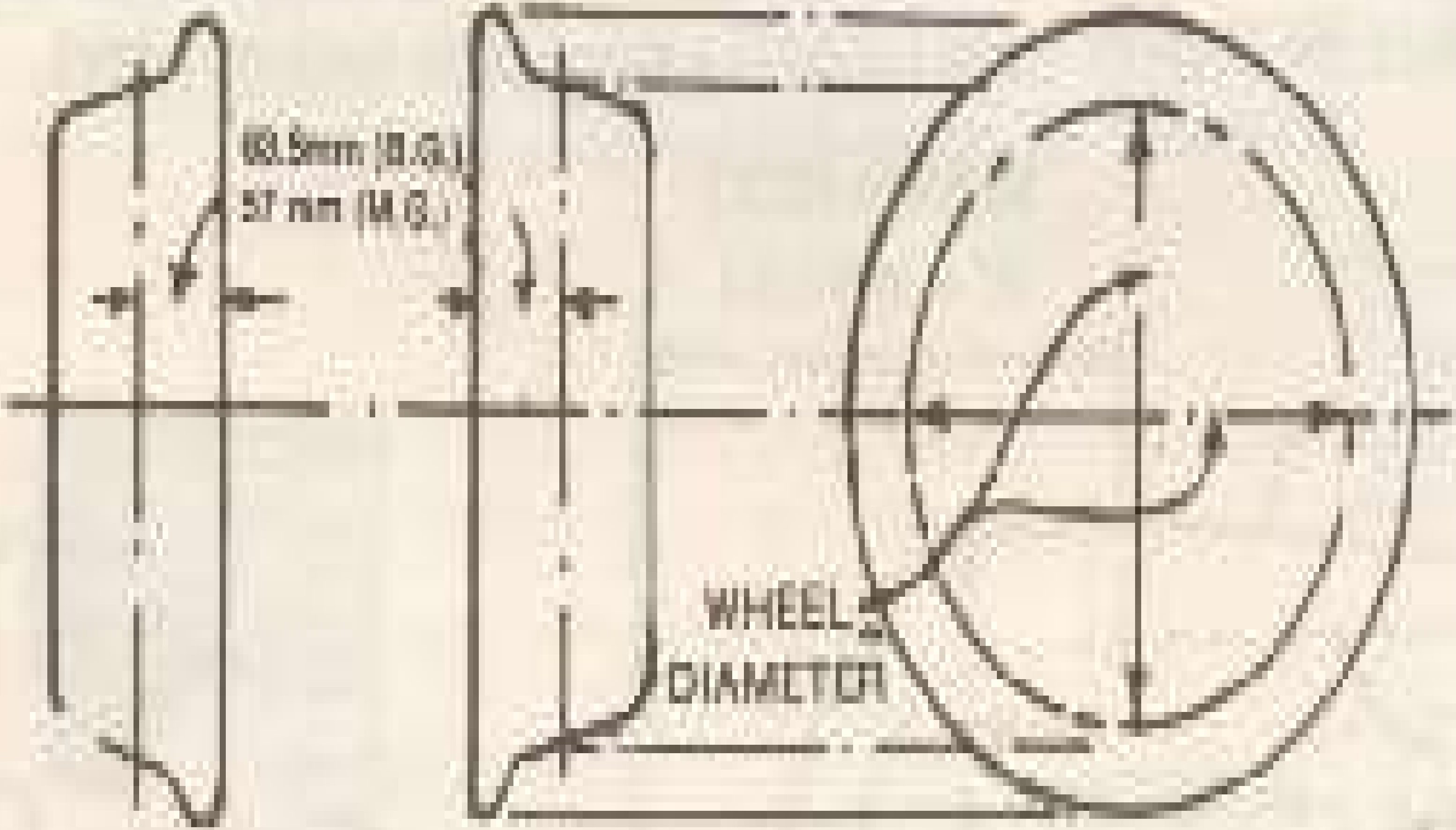


Fig 21.10 Wheel Tread Diameter

Wheel tread Diameter

Limitation – The wheel diameter shall not differ in the same axle. A variation in tread diameter of more than 0.5 mm is not permissible at tyre turning.

Effect – The variation of the wheel diameter on the same axle causes differential distance of travel by each wheel thus causing axle to take an angular position thereby increasing the potential hazard to derailment.

Irregular wheel gauge

Wheel gauge is the distance between wheel flanges i.e. distance between back to back of the wheels on a wheel set.

How to check – The wheel gauge should be checked at quarter points as shown in sketch.

Limitation – No variation is permitted among values of wheel gauge measured at quarter points.

Wheel Gauge

... in quarter points.

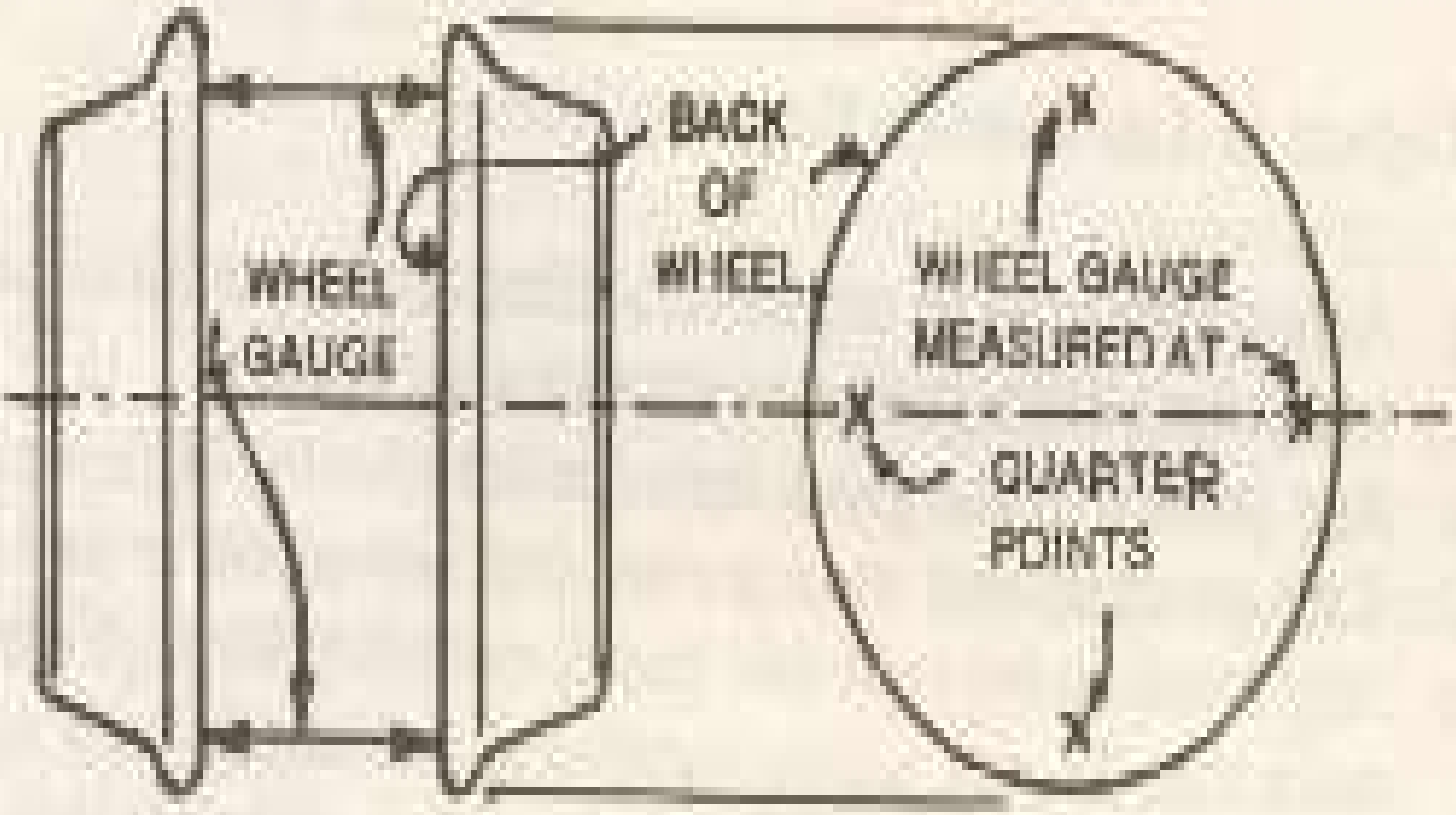


Fig 21.11 Wheel Gauge

Effect of irregular gauge –

A variation in the values will indicate a bent axle, which may result in instability. The excessive bend may cause fracture of the axle or may result in hot axle due to wobbling and may cause derailment.

	B.G.	**M.G.**
Standard	1600 mm	930mm
Maximum	1602mm	932mm
Minimum	1599mm	929mm

BUFFING GEAR

Buffer projection limits from head stock

	For long case buffers	For short case buffers
Max.	635 mm	456 mm
Min.	584 mm	406 mm

A. Buffer projection for POH stock should not be less then 625 mm for long case and 445 mm for short case buffers.

B. No dead buffers shall be permitted from the sick line. The buffers shall be considered dead when the projection is below the prescribed minimum Limits.

C. Buffer heights in BG Stock shall be within the -limits shown above and it should be measured on level track.

Displaced Buffer

Buffer displaced 35 mm in any direction from its normal position in case of goods stock and 38 mm for coaching stock are called displaced buffers.

THANKS