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(Reaffirmed 2001)

Indian Standard

AUTOMOTIVE VEHICLES — MOTORCYCLES AND MOPEDS — LIGHT ALLOY WHEELS — METHODS OF TEST AND PERFORMANCE REQUIREMENTS

भारतीय मानक

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BUREAU OF INDIAN STANDARDS

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NEW DELHI 110002

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Price Group 3

Automotive Tyres, Tubes and Rims Sectional Committee, TED 007

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards on 19 July 1989, after the draft finalized by the Automotive Tyres, Tubes and Rims Sectional Committee had been approved by the Transport Engineering Division Council.

In order to reduce the overall weight of the vehicle in the interest of fuel economy, light alloy wheels are being increasingly used — particularly for motorcycles and mopeds. The ISO committee on 'Road vehicles' (ISO/TC 22), has been working on the preparation of International Standards for these types of wheels. The work at the national level has been closely aligned with that of ISO/TC 22. While ISO/TC 22 has brought out two International Standards for light alloy wheels, separately for motorcycles and mopeds, at the national level, the committee dealing with wheels has decided to bring out a single standard covering these types of wheels for both motorcycles and mopeds. In the preparation of this standard assistance has been derived from the following standards:

a) ISO 8644 : 1988 Motorcycles — Light alloy wheels — Test method, and

b) ISO 8645 : 1988 Mopeds — Light alloy wheels — Test method.

Indian Standard

AUTOMOTIVE VEHICLES — MOTORCYCLES AND MOPEDS — LIGHT ALLOY WHEELS — METHODS OF TEST AND PERFORMANCE REQUIREMENTS

1 SCOPE

1.1 This standard specifies the method of test for assessing the reliability of light alloy wheels for motorcycles and mopeds.

2 TERMINOLOGY

2.1 Unit Construction Light Alloy Wheels

Wheels of which the rim and spokes, or the disc, are manufactured as a single unit.

2.2 Composite Construction Light Alloy Wheels

Wheels of which the rim is made of light alloy, and the spokes or discs are made of light alloy or steel, which is then assembled.

3 TESTS

3.1 The tests to be carried out on the light alloy wheels are given below:

a) Rotation bending fatigue test (dynamic cornering fatigue test for three wheelers) (*see* **4**),
b) Radial load durability test (*see* **5**).
c) Radial impact resistance test (*see* **6**).
d) Torsion test (*see* **7**).
e) Air leak test (applicable only to wheels designed for use with tubeless tyres) (*see* **8**).

4 ROTATION BENDING FATIGUE TEST (DYNAMIC CORNERING FATIGUE TEST FOR THREE-WHEELERS)

4.1 Test Equipment

The test equipment shall be designed to produce a constant bending moment on the centre of the light-alloy wheel which rotates with a constant velocity. An example of such equipment is shown in Fig. 1.

4.2 Test Conditions

4.2.1 *Bending Moment*

The bending moment *M*, in Nm applied in accordance with **4.3** shall be determined by the following equation:

$$M = Sm./\mu . W . r$$

where

Sm is a coefficient equal to 0·7;

μ is the friction coefficient between tyre and road, equal to 0·7;

W is the maximum design load marked on the wheel, in decanewtons; and

r is maximum static loaded radius among those tyres that can be fitted to the wheel, in metres.

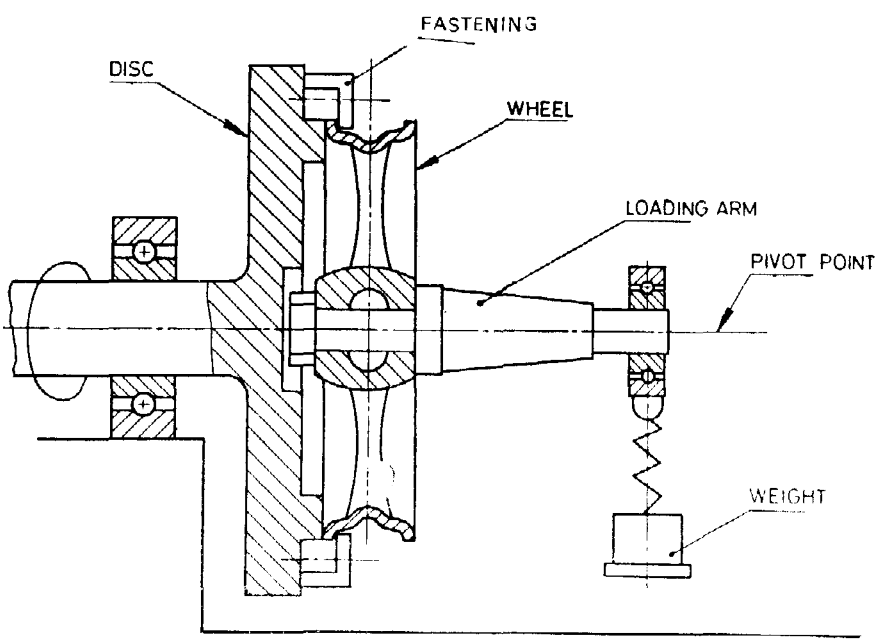

FIG. 1 MODEL EQUIPMENT FOR CORNERING FATIGUE TEST

4.2.2 *Loading Arm Length*

The length of the loading arm shall be such that the calculated moment M, is obtained by applying a mass equal to W (as defined in **4.2.1**).

4.3 Test Procedure

The wheel shall be rotated along with the test equipment by applying a bending movement M, determined in accordance with **4.2.1** applied, after the rim flange of the light alloy test wheel has been fixed to the driven rotating disc (*see* Fig. 1). A loading arm of the length specified in **4.2.2**, of sufficient rigidity shall be attached to the wheel by the same method as the wheel is normally attached to a vehicle.

5 RADIAL LOAD DURABILITY TEST

5.1 Test Equipment

The test equipment, of which Fig. 2 shows an example, shall meet the following requirements:

a) The test equipment shall have a drum with a smooth surface which is wider than the overall width of the tyre used in the test.

The diameter of the drum shall be greater than or equal to 400 mm.

b) The drum specified in (a) shall rotate at a constant velocity.

c) The test equipment shall permit a radial load to be applied to the wheel. The equipment shall be such that the wheel is maintained in contact with the drum under constant pressure.

5.2 Test Conditions

5.2.1 *Static Radial Load*

The radial load Q, in decanewtons to be applied in **5.3** shall be determined by the equation:

$$Q = Sr \cdot W$$

where

Sr is a coefficient equal to 2·25, and

W is as defined in **4.2.1**.

5.2.2 *Tyre Air Pressure*

The air pressure before the test, in kPa shall be at least that corresponding to the design maximum load of the tyre to be used in the test.

5.2.3 *Tolerance for Load Fluctuation*

The tolerance for load fluctuation during the test shall be ± 5 percent.

5.2.4 *Tyre Failure*

In case of tyre failure, the test shall be continued after replacing the tyre.

5.3 Test Procedure

The light alloy wheel, fitted with a tyre the rated load of which is at least equal to that marked on the wheel, shall be mounted on the test equipment (*see* Fig. 2) according to the method used for attaching the wheel to the vehicle. The drum shall then be rotated while the radial load Q, determined in accordance with **5.2.1** is applied.

6 RADIAL IMPACT RESISTANCE TEST

6.1 Test Equipment

The equipment shall have the following characteristics:

a) The light alloy wheel with a tyre attached shall be mounted on a bench;

b) The mount on which the wheel is anchored shall have sufficient stiffness and strength; and

c) A striker weight whose width is at least 1·5 times the width of the rim shall be dropped freely to strike the wheel/tyre assembly.

Figure 3A shows examples of such equipment.

In the case of equipment using a pendulum (*see* Fig. 3B), the minimum length of the pendulum arm shall not be less than 800 mm measured from the pivot point to the edge of the striker.

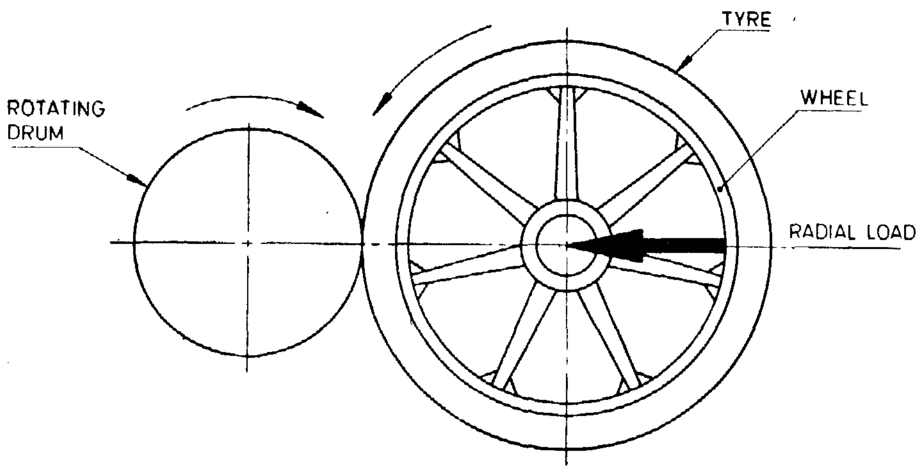

FIG. 2 MODEL EQUIPMENT FOR RADIAL LOAD DURABILITY TEST

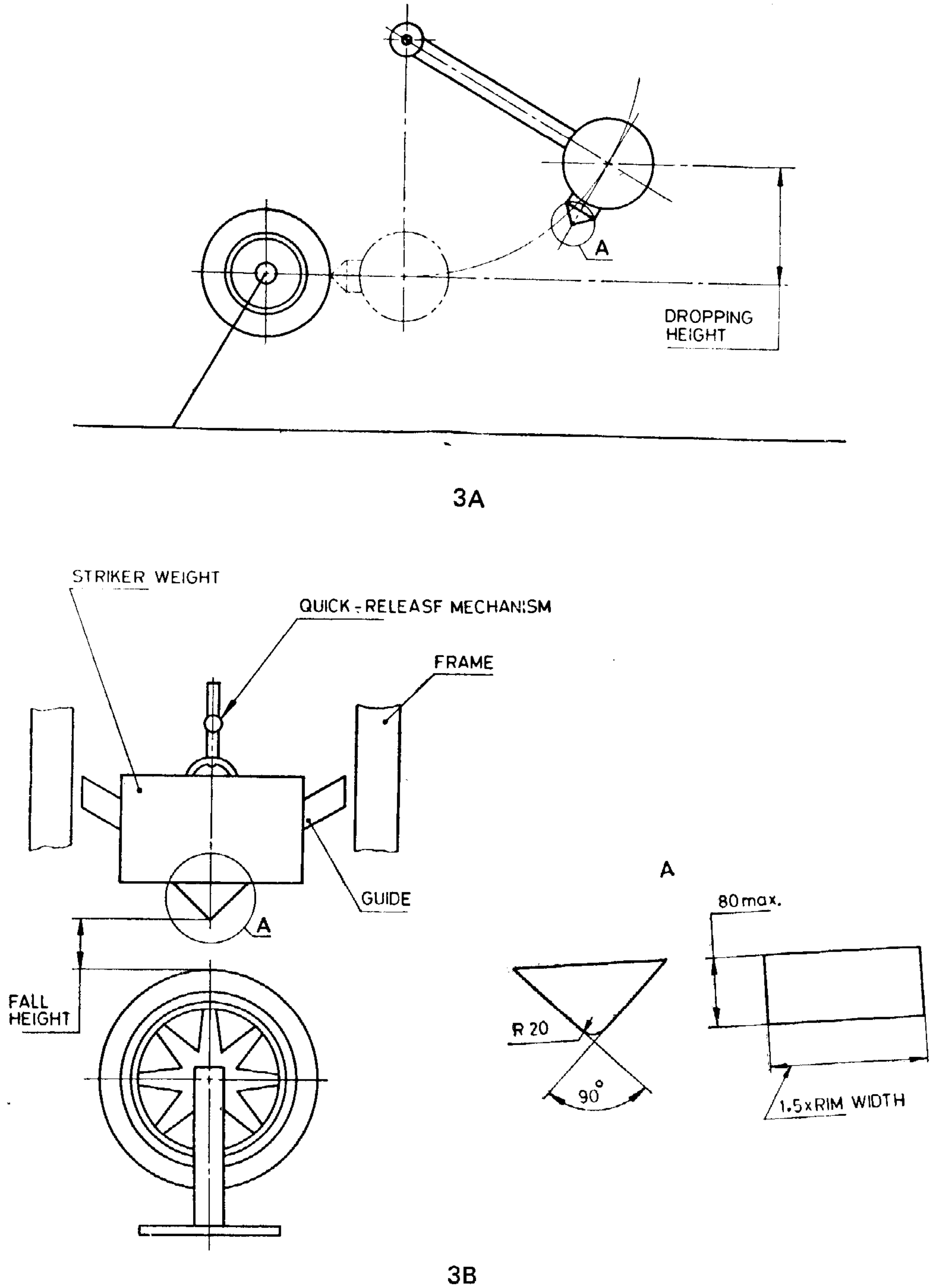

FIG. 3 MODEL EQUIPMENT FOR RADIAL IMPACT RESISTANCE TEST

6.2 Test Conditions

6.2.1 *Impact Energy*

By using the test equipment indicated in **6.1**, the striker shall be allowed to drop to apply the impact energy. The total energy, E, in deca-newton metres, of the striker at the moment of its striking the tyre shall be determined by the equation:

$$E = K \cdot W$$

where

K is 1·8 m for front wheels and 1·2 m for rear wheels; and

W is as defined in **4.2.1**.

6.2.2 *Tyre Inflation Pressure*

The tyre inflation pressure, p, in kPa shall be determined by the following equation:

p = (the air pressure corresponding to the design maximum load of the tyre to be used in the test × 1·15) ± 10.

6.2.3 *Striker Mass and Dropping Height*

The striker mass and the dropping height shall be chosen to meet the equation:

$$m \, . \, h = \frac{1\,000}{g} \, . \, E$$

where

m = mass of the striker, in kg;
h = dropping height, in mm;
E = as defined in **6.2.1**; and
g = gravitational acceleration (9·8 m/s^2).

However the mass of the striker shall be equal to the force $W \pm 10$ daN.

6.3 Test Procedure

The smallest load rated tyre compatible with the design load of the wheel shall be fitted to the light alloy wheel and the combination shall be mounted on the support according to the attachment method to the vehicle. The relative position shall be so determined that at the moment of the impact the speed vector passes through the centre of the wheel (*see* Fig. 3).

The tyre inflation pressure, the striker mass and dropping height shall be determined in accordance with **6.2.**

7 TORSION TEST

7.1 Test Equipment

The test equipment shall permit a torsional moment to be applied between the hub and the rim. Figure 4 shows an example of such equipment.

7.2 Test Conditions

The torsional moment, T shall be applied as in **7.3** and shall be determined by the equation:

$$T = \pm W \, . \, r$$

where W and r are as defined in **4.2.1.**

7.3 Test Procedure

The flange of the wheel rim shall be fixed to the support (*see* Fig. 4A), and the torsional moment, determined according to **7.2**, shall be applied repeatedly through the contact face of the hub. The length of the loading arm shall be equal to the radius of the smallest tyre suitable for the wheel.

It is also permissible to fix the wheel to the support through the contact face of the hub and apply the torsional moment to the wheel rim by means of an annular ring rigidly attached to the rim (*see* Fig. 4B).

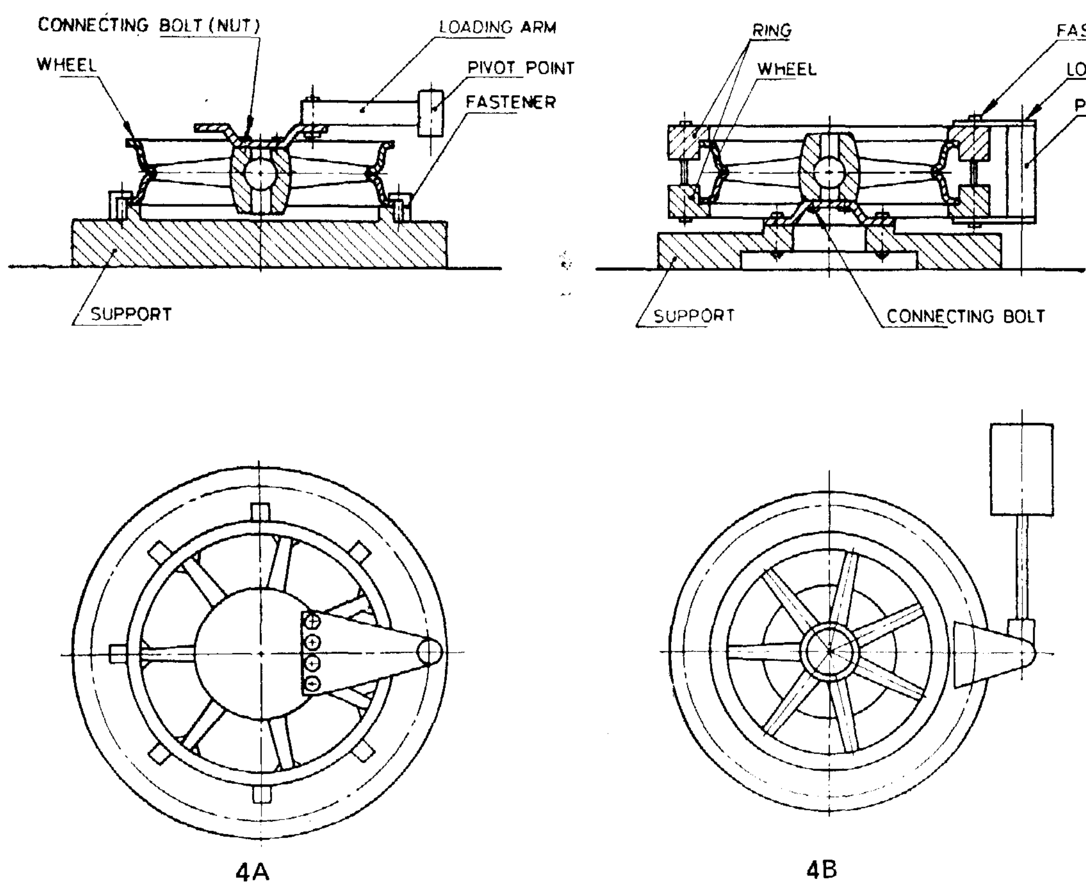

FIG. 4 MODEL EQUIPMENT FOR TORSION TEST

8 AIR LEAK TEST

8.1 This is applicable only to wheels designed and marked for use with tubeless tyres.

8.2 Test Equipment

Figure 5 shows an example of test equipment suitable for the air leak test.

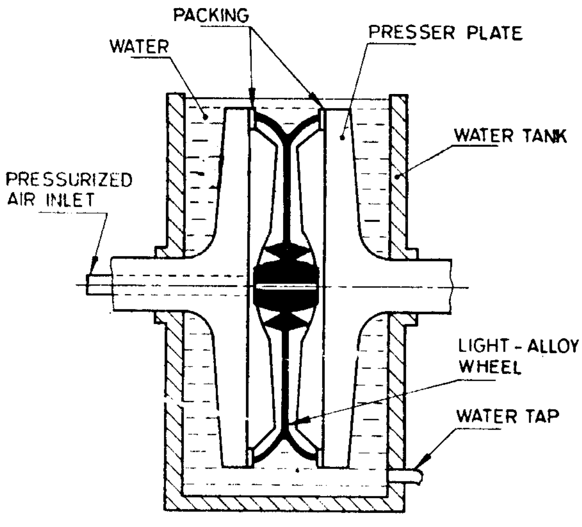

FIG. 5 MODEL EQUIPMENT FOR AIR LEAK TEST

8.3 Test Conditions

The air pressure to be applied according to **8.4.1** shall be greater than 300 kPa.

8.4 Test Procedure

8.4.1 Both sides of the flange shall be tightly closed by the presser plates (*see* Fig. 5) and the pressurized air as indicated in **8.3** shall be supplied to the inside of the wheel in order to confirm the airtightness of the rim.

8.4.2 Alternatively, for rims of divided construction where sealing rings are used, the rim may be fitted with a tyre, the tyre inflated and the whole assembly immersed in water.

9 PERFORMANCE REQUIREMENTS

9.1 Durability Against Bending Moment

After being subjected to 10^5 cycles, or 10^6 cycles in the case of reinforced wheels, according to the rotation bending fatigue test specified in **4**, there shall be no evidence of harmful cracks, significant deformation or any abnormal looseness at points.

Reinforced wheels shall be used for three-wheeled vehicles specifically designed to carry goods and such wheels shall be marked with the letters 'HD' after the marking for dimension and maximum design load.

9.2 Durability Against Radial Load

After being subjected to 5×10^5 cycles of the radial load durability test specified in **5**, there shall be no evidence of harmful cracks, significant deformation, or any abnormal looseness at joints.

9.3 Radial Impact Resistance

After being subjected to the radial impact resistance test specified in **6**, there shall be no evidence of harmful cracks, significant deformation, abnormal looseness at joints, or any sudden air leakage due to failure of the rim.

NOTE — Sudden air leakage shall be a case where the test pressure drops by more than 50 percent in less than 30 seconds.

9.4 Durability Against Torsional Moment

After being subjected to 10^5 cycles of the torsion test in **7**, there shall be no evidence of harmful cracks, significant deformation or any abnormal looseness at joints.

9.5 Airtightness of Rims

There shall be no leakage of air as indicated tby bubbles through the rim of the wheel afer application of the test pressure in accordance with **8** for a minimum period of 2 minutes.

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