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Indian Standard

COMMERCIAL ROAD VEHICLES — DRAWBAR COUPLINGS AND EYES FOR RIGID DRAWBARS — STRENGTH TESTS

ICS 43.040.70

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 2

Transport Tractors and Trailers Sectional Committee, TED 22

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Transport Tractors and Trailers Sectional Committee had been approved by the Transport Engineering Division Council.

In order to achieve harmony with the international practices this Indian Standard is based on ISO 12357 : 1999 'Commercial road vehicles — Drawbar couplings and eyes for rigid drawbars — Strength tests' published by International Organization for Standardization (ISO).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant placed retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

COMMERCIAL ROAD VEHICLES — DRAWBAR COUPLINGS AND EYES FOR RIGID DRAWBARS — STRENGTH TESTS

1 SCOPE

This standard specifies the test conditions and strength requirements to be met by drawbar couplings and the corresponding drawbar eyes for rigid drawbars, which are provided for use with centre-axle trailers with a maximum towing mass C exceeding 3.5 tonnes.

2 TERMS AND DEFINITIONS

For the purposes of this standard, the following definitions shall apply.

2.1 '*S*' Value — Mass imposed vertically on the coupling under static conditions by the centre-axle trailer loaded to its maximum design total mass.

2.2 Centre-Axle Trailer — Towed vehicle equipped with a towing device which cannot move vertically (in relation to the trailer), and in which the axle(s) is (are) positioned close to the centre of gravity of the vehicle (when uniformly loaded) such that only a small static vertical load, not exceeding 10 percent of the load corresponding to the maximum design total mass of the trailer or load of 10 kN (whichever is the smaller), is transmitted to the drawing vehicle.

3 GENERAL TEST REQUIREMENTS

3.1 The test shall be carried out with drawbar couplings and drawbar eyes having corresponding functional dimensions.

3.2 The strength tests described in this standard are static and dynamic tests to be performed on a test bed.

3.3 The fixing arrangements for the drawbar coupling and the drawbar eye on the test bed shall be the same as for its attachment to the vehicle, and shall be in accordance with the manufacturer's fitting instructions.

3.4 Drawbar couplings and drawbar eyes can be tested separately or together.

3.5 Preferably, couplings should be tested in the original condition as designed for road use. At the discretion of the manufacturer and in agreement with the test laboratory, flexible components may be neutralized if this is necessary for the test procedure and if there is no concern about unrealistic influence on the test result.

3.6 Flexible components which appear to be overstressed due to this accelerated test procedure may be replaced during the dynamic test.

3.7 The test loads may be applied by means of special slack-free devices.

4 DETERMINATION OF 'D_c' AND 'V' VALUES

4.1 The 'D_c' value is a comparative value determined by calculation of the longitudinal forces occurring between the towing vehicle and the trailer. It is expressed in kilonewtons, and calculated from the following equation:

$$D_c = g\frac{T.C}{T+C}$$

where

T is the maximum design total mass, in tonnes, of the towing vehicle, including '*S*' (*see* **2.1**), to which the drawbar coupling is to be attached;

C is the mass, in tonnes, transmitted to the ground by the axle or axles of the centre-axle trailer loaded to its maximum design total mass; and

g is the acceleration due to gravity:

$g = 9.81$ m/s²

4.2 The '*V*' value is a comparative value determined by calculation of the vertical forces occurring between the towing vehicle and the trailer. It is expressed in kilonewtons, and calculated from the following equation:

$$V = a \cdot \frac{x^2}{L^2} \cdot C$$

where

a is an equivalent vertical acceleration in the coupling point, depending on the type of suspension on the rear axle(s) of the towing vehicle, including a constant factor:

$a = 1.8$ m/s² of vehicles with air suspension (or systems with equivalent damping characteristics),

$a = 2.4$ m/s² for vehicles with other types of suspension systems;

C is the mass, in tonnes, transmitted to the ground by the axle or axles of the centre-axle

trailer loaded to its maximum design total mass;

x is the length, in metres, of the loading area of the trailer (*see* Fig. 1); and

L is the theoretical drawbar length, in metres, that is, the distance between the centre of the drawbar eye and the centre of the axle assembly, (*see* Fig. 1):

$$\frac{x^2}{L^2} \geq 1$$

if this is less than 1, the value 1 shall be used.

5 DYNAMIC TEST

5.1 The dynamic test loads given in Table 1, simulating practical loads under driving conditions, shall be applied to the coupling point.

5.2 The dynamic test force is the geometrical sum of the vertical and horizontal component as specified in Table 1. This can be achieved by the test bed configuration shown in Fig. 2. The vertical and the horizontal components shall have a sinusoidal shape (*see* Fig. 3) and shall be applied asynchronously, where the difference between their frequencies shall be

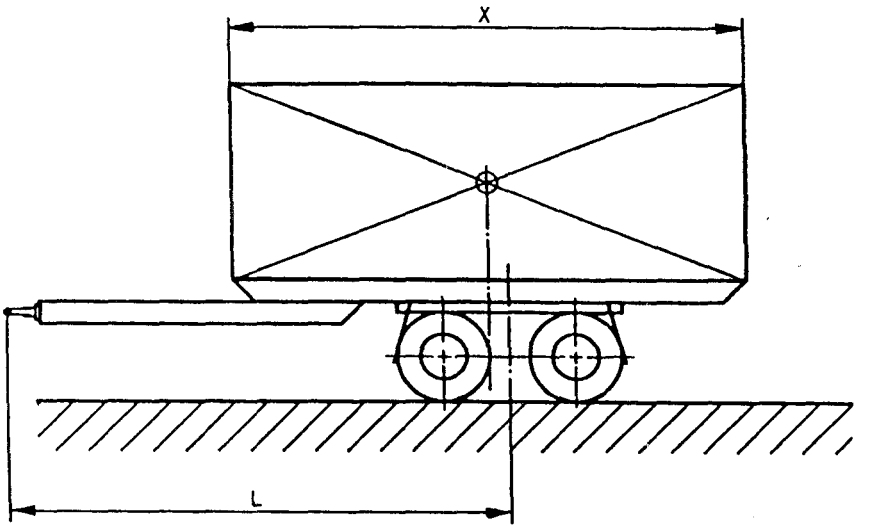


FIG. 1 DIMENSIONS OF CENTRE-AXLE TRAILER

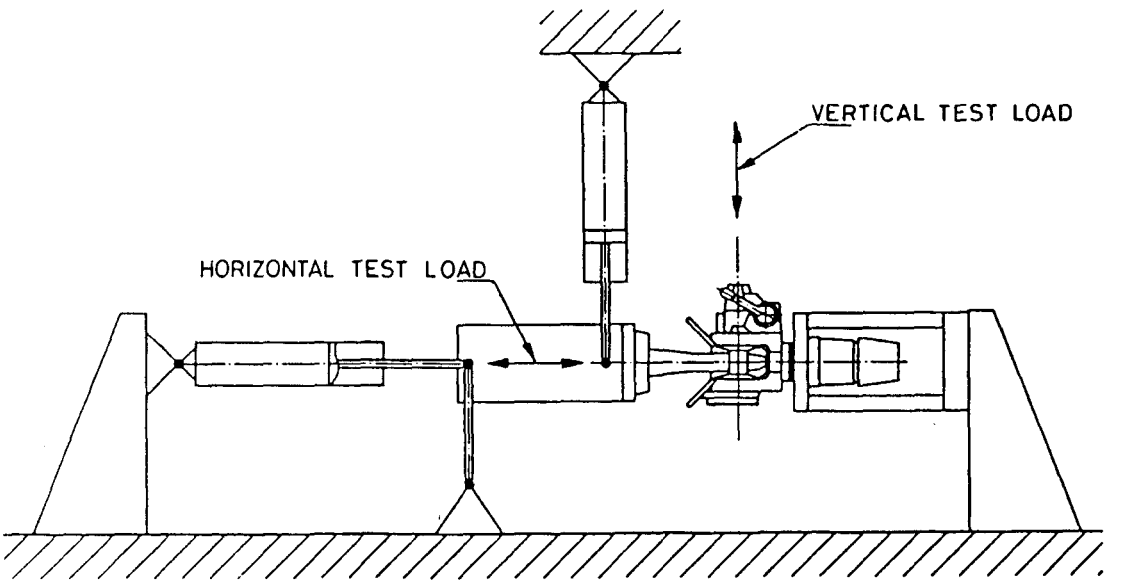


FIG. 2 EXAMPLE OF TEST BED CONFIGURATION

Table 1 Dynamic Test Loads

(*Clause* 5)

Test Load	Mean Value kN	Amplitude kN
Horizontal load, $F_{h,t}$	0	$\pm 0.6D_c$
Vertical load, $F_{v,t}$	$g \cdot S/1\,000$	$\pm 0.6V$

where

D_c is determined according to **5.1**;

V is determined according to **5.2**; and

S is defined in **3.1**.

between 1 percent and 3 percent, so that resulting test forces in all directions are created.

5.3 For steel materials, the dynamic test shall be carried out for 2×10^6 cycles. For other materials, the number of cycles should be agreed between the manufacturer and the test laboratory.

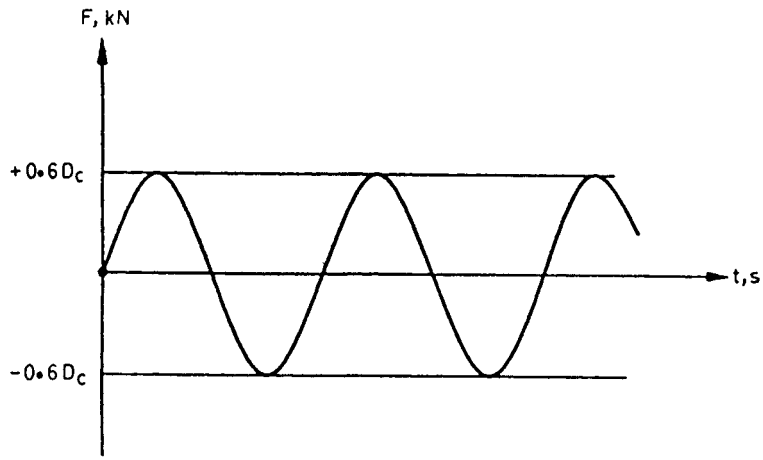
5.4 The selected frequency shall not exceed 25 Hz, and shall not coincide with the natural frequency of the system.

6 STATIC TEST

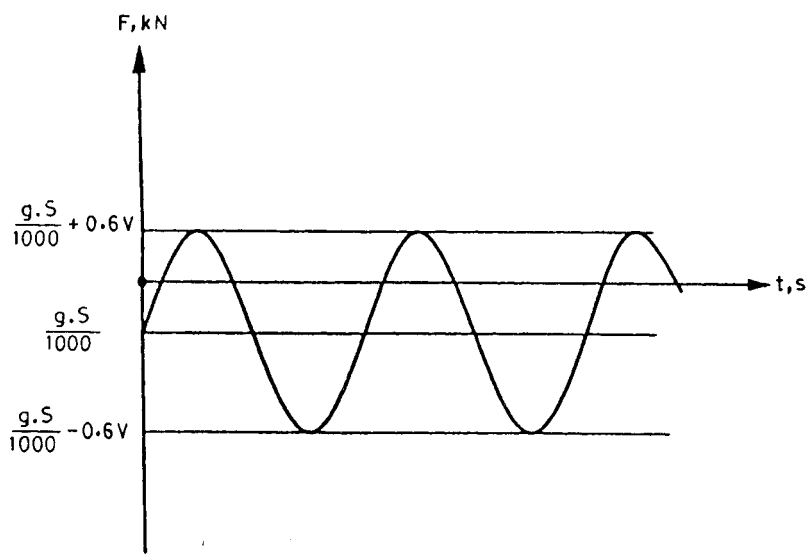
With drawbar couplings it is also necessary to test the closure and any locking devices by means of a static force $0.25D_c$ acting in the direction of opening.

7 STRENGTH CRITERIA

The dynamic tests shall not cause permanent deformation fractures or cracks. The static test shall not cause the closure to open and it shall not cause any damage.



a) HORIZONTAL LOAD



b) VERTICAL LOAD

FIG. 3 DYNAMIC TEST LOAD

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