इंटरनेट मानक

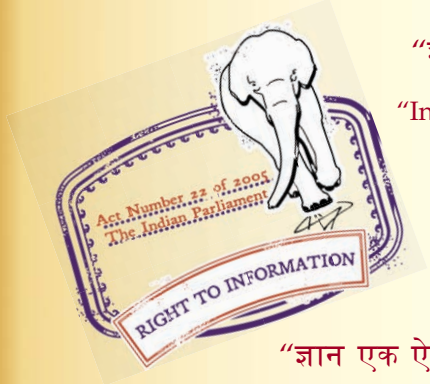
Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 11939 (1996): Automotive Vehicles - Steering Control Systems - Impact Protection Requirements and Methods of Measurement [TED 6: Automotive Body, Chassis, Accessories and Garage Equipments]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

भारतीय मानक

(Reaffirmed 2002)

स्वचल वाहन — स्टीयरिंग नियंत्रण प्रणाली — संघट्ट सुरक्षा अपेक्षाएं एवं मापन पद्धतियां

(पहला पुनरीक्षण)

Indian Standard

AUTOMOTIVE VEHICLES — STEERING CONTROL SYSTEMS — IMPACT PROTECTION REQUIREMENTS AND METHODS OF MEASUREMENT

(First Revision)

ICS 43.043.30

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

October 1996

Price Group 4

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Suspension and Steering Systems Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 1987. The present revision is necessary to incorporate the latest changes made in ECE and FMV standards. It is a known fact that in the case of accidents the eventualities are due to chest, neck and facial injuries as a result of the impact on collision.

This standard aims at the impact protection of the driver under the effect of the following three forces:

a) Those due to the driver's body inertia in the event of an impact against the steering control in a frontal collision.

b) Those resulting from a frontal collision which may produce rearward displacement of the steering column.

c) Those due to the drivers head inertia in the event of an impact against the steering control in a frontal collision.

While preparing the standard, considerable assistance has been derived from the following EEC directive and FMV standard:

EEC directive 91/662/EEC '*The behavior of the steering wheel and column in an impact*'

49 CFR-10-1-1988

While formulating the standard, assistance has also been obtained from the following Indian Standards:

IS 13389 : 1992/ ISO 3984 : 1982	Road vehicles — Passenger car — Moving barrier rear collision test method
IS 13390 : 1992/ ISO 3560 : 1975	Road vehicles — Frontal fixed barrier collision test method

The composition of the committee responsible for the preparation of this standard is given in Annex A.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance, with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

AUTOMOTIVE VEHICLES — STEERING CONTROL SYSTEMS — IMPACT PROTECTION REQUIREMENTS AND METHODS OF MEASUREMENT

(First Revision)

1 SCOPE

1.1 This standard specifies the requirements and methods of test for determination of impact of steering control system on the driver in the event of any frontal collision.

1.2 This standard is applicable to vehicles of category M_1 and N_1, with a maximum permissible mass up to 1 500 kg, fitted with steering control.

NOTE — Category M_1 Vehicles used for carrying passengers and comprising not more than eight seats in addition to the driver seat.

Category N_1 Vehicles used for carrying goods and having a maximum mass of not exceeding 3.5 tonnes.

1.3 This standard is not applicable for vehicles with forward control; for such vehicles an appropriate seat belt assembly preferably shoulder type shall be provided for the driver.

2 REFERENCE

The Indian Standard IS 13749 : 1993 'Automotive vehicles — Determination of H-point — Method of test' is an important adjunct to this standard.

3 TERMINOLOGY

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

3.1 Air Bag

Air bag means a flexible bag that is designed to be inflated with a gas under pressure, by a device actuated in case of vehicle's impact, in order to protect the driver against steering control.

3.2 Body Block

Means the torso shaped standardized body form used for carrying out the impact test.

3.3 Boss

The part of the steering control, usually at the centre, that joins the steering control to the steering shaft and transmits the torque from the steering control to the steering shaft.

3.4 Centre of the Boss

Centre of the boss means the point on the surface of the steering control boss which is in line with axis of the steering shaft.

3.5 Forward Control

Forward control means a configuration in which more than half of the engine length is rearward of the foremost point of the windshield base and the steering wheel hub is in the forward quarter of the vehicle length.

3.6 Impactor

Impactor means the rigid hemi-spherical head form 165 mm in diameter with a mass of 6.8 kg.

3.7 Passenger Compartment

Passenger compartment means the space for occupant accommodation bounded by the roof, floor, side walls, doors, outside glazing, front bulkhead and the plane of the rear seat back support.

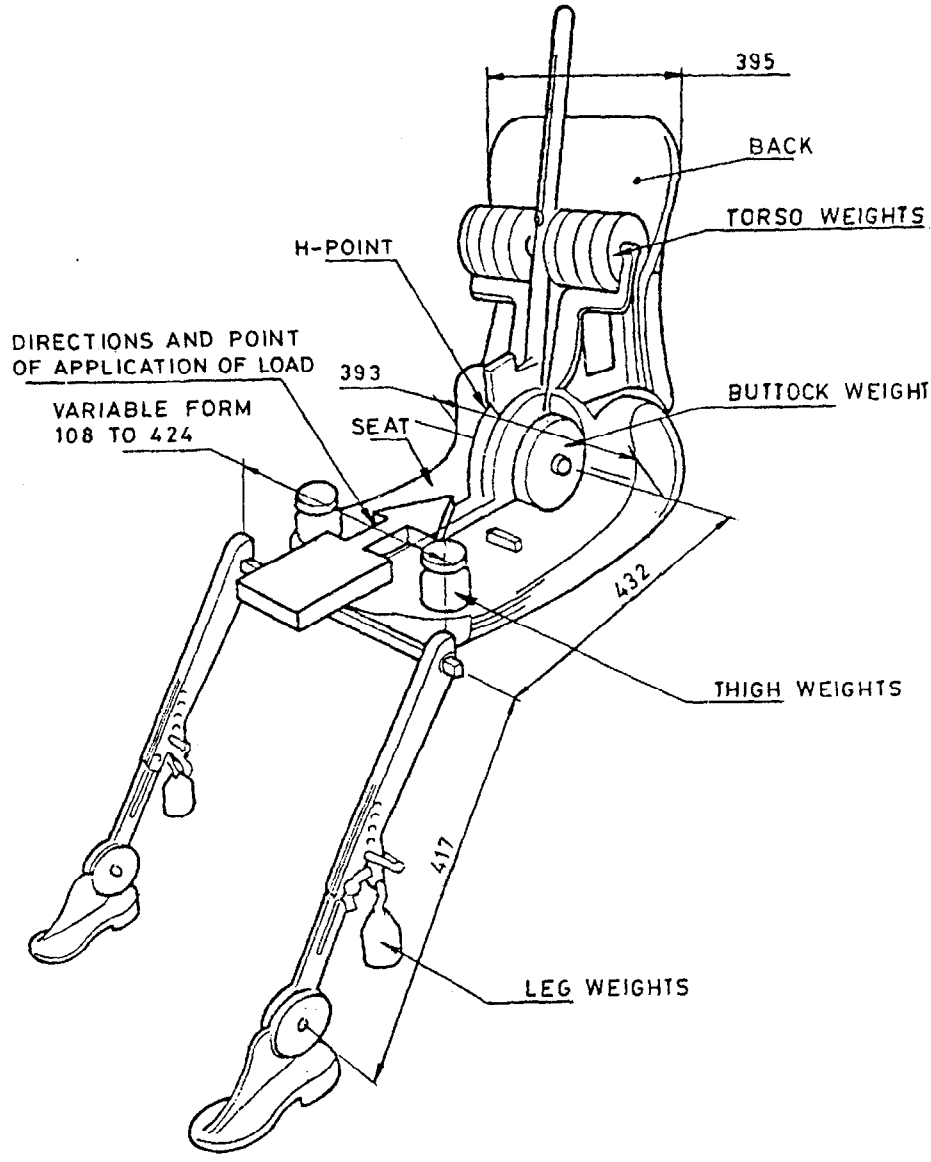
3.8 Plane of the Steering Control

Plane of the steering control means, in the case of the steering wheel, the flat surface that splits the steering wheel rim equally between the driver and front of the vehicle.

3.9 Seating Reference Point

Seating reference point is the point specified by the vehicle manufacturer which:

a) has coordinates determined in relation to the vehicle structure; and
b) Corresponds to the theoretical position of the points torso/thighs rotation (H-point) for the lowest and most rearward normal driving position or position of use given by the vehicle manufacturer(s) for each seating position specified by them (*see* Fig. 1).



MASS OF MANIKIN	kg
Components Simulating Back and Seat of Body	16
Mass of Torso Weights	31
Mass of Seat Weights	8
Mass of Thigh Weights	7
Mass of Leg Weights	13
Total	75

All dimensions in millimetres.

FIG. 1 DIMENSIONS AND MASS OF MANIKIN

3.10 Spoke

Spoke means a bar connecting the steering control rim to the boss.

3.11 Steering Column

It means a structural surrounding a steering shaft.

3.12 Steering Control

The steering device, usually the steering wheel, which is actuated by the driver

3.13 Steering Control Rim

The quasi-toroidal outer ring in the case of the steering wheel usually gripped by the driver's hand during driving

3.14 Steering Mechanism

The system comprising of steering control, shaft, steering gear housing and all other components such as those designed to contribute to the

absorption of energy in the event of impact against the steering control.

3.15 Steering Shaft

The component that transmits steering torque from steering control to the steering gear.

3.16 Maximum Permissible Mass

Maximum permissible mass means the maximum mass declared by the vehicle manufacturer to be technically permissible.

4 CONSTRUCTION REQUIREMENTS

4.1 The steering mechanism shall be so designed and constructed that no component or attachment, including horn actuating mechanisms and trim hardware can catch the driver's clothing or jewellery (namely, watch, ring and bracelets without loosely attached or dangling members) during normal driving.

5 TESTS

The following tests shall be carried out to determine the impact of steering control system on the driver in the event of any frontal collision:

a) Body block test (*see* **6**),
b) Frontal impact test (*see* **7**), and
c) Head form test (*see* **8**).

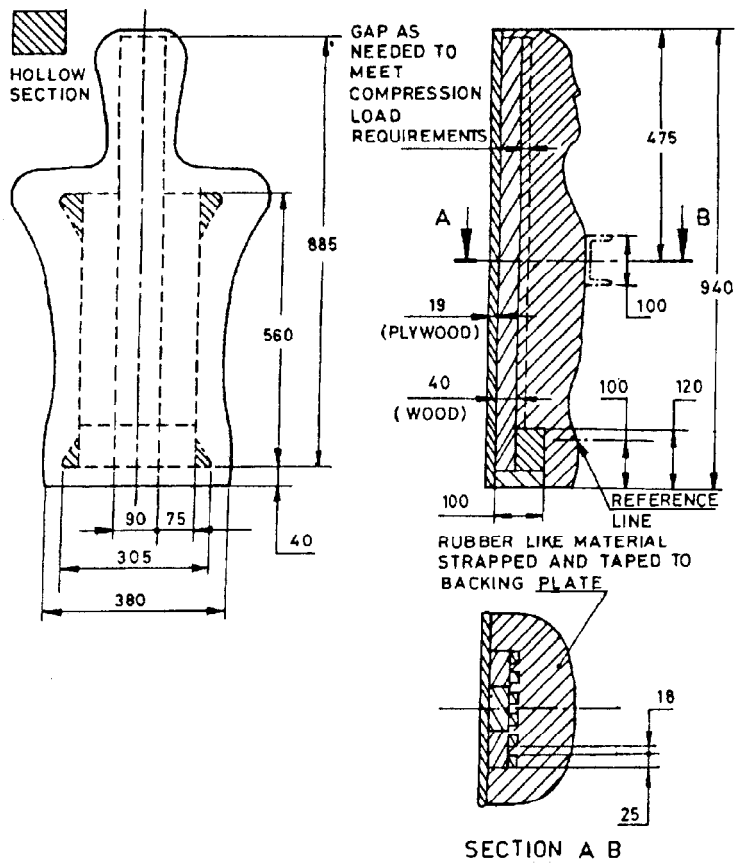
6 BODY BLOCK TEST

6.1 When the steering control is struck by a body block released against this control at a relative velocity of 24.1 km/h, in accordance with the following procedure and the force applied to the body by the steering control shall not exceed 11 150 N.

6.1.1 After carrying out the impact test as specified in **6.1**, the part of the steering control surface directed towards the driver shall not present any sharp or rough edges likely to increase the danger or severity of injuries to the driver. Small surface cracks and fissures shall be disregarded.

6.2 Body Block

6.2.1 The body block shall have the shape, dimensions, mass and characteristics shown in Fig. 2.



Spring Rate : 107 kgf/cm — 143 kgf/cm

The chest is loaded with a 100 mm beam as shown, 90° to the longitudinal axis of the block and parallel to the backing plate. The load is measured when the beam has moved 12.7 mm in to the body block.

All dimensions in millimetres.

FIG. 2 MASS 34-36 KG, 50TH PERCENTILE TORSO-SHAPED BODY BLOCK

6.3 Positioning of Body Block

6.3.1 Using the layout drawing of the particular vehicle in which the steering system is to be used, the vertical dimension between the lower edge of the wheel rim and a point 19 mm vertically above the seating reference point of the driver shall be determined.

6.4 Conditioning of Body Block

6.4.1 All samples and the body block shall be stabilized at the ambient temperature for four hours before testing and this temperature shall be recorded in the test report.

6.5 Mounting of Steering Control

6.5.1 The control shall be mounted on the front section of the vehicle obtained by cutting the body transversely at the level of front seats and possibly eliminating the roof, windscreen and doors. This section shall be fixed rigidly to the test bench so that it does not move under the impact of the body block.

6.5.2 However, the steering control, alternatively, may be mounted on a framework simulating the mounting of steering mechanism provided that, as compared with the real front body section/steering mechanism, the framework/steering mechanism has the same geometrical layout and rigidity.

6.5.3 Adjustable steering controls shall be so adjusted that a tilting steering wheel hub is at the geometric centre of the locus it describes when it is moved through its full range of driving positions. A telescopic steering control is set at the adjustment position midway between the forward most and rearward most position.

6.5.4 The tolerance on the control mounting angle shall be $\pm 2°$ of the design value.

6.5.5 All parts under test shall be installed using the design attachment points and production parts or simulations thereof to the torque value recommended by the manufacturer.

6.6 Setting of Steering Mechanism

6.6.1 During the first test, the steering control shall be turned so that its most rigid spoke is perpendicular to the first point of contact with body block; if the steering control is a steering wheel, the test shall be repeated with the most flexible part of the steering wheel perpendicular to the point of contact. In the case of an adjustable steering control, both tests shall be carried out with the wheel adjusted to the middle position.

6.6.2 If the steering control is fitted with an air bag, the test shall be carried out with the air bag inflated. At the request of the manufacturer, and with the agreement of testing agency, the test may be carried out without the air bag inflated.

6.7 Propulsion of Body Block

6.7.1 Any method of propulsion may be used, provided that when the body block strikes the steering control, it shall be free from all connections with the propelling device, the body block shall strike the control after an approximately straight trajectory parallel to the longitudinal axis of this vehicle.

6.8 Speed of Body Block

6.8.1 The body block shall strike the steering control at a velocity of $24 \, {}^{+\,1.2}_{-\,0}$ km/h. This velocity shall be achieved either by the mere energy of propulsion or by using an additional propelling device. However, if the test has been carried out at a higher impact speed and the control has met the requirement laid down, the test shall be considered satisfactory. While carrying out the test care shall be taken that the body block collides against the steering mechanism at the specified speed without any rotation.

6.8.2 The body block at impact is positioned as shown in Fig. 3. The body block is centred laterally in relation to the plane of the steering wheel rim. The vertical dimension, as defined in **6.3.1**, is the relationship between the lower edge of the steering wheel and the reference line on the body block.

6.9 Test Measurements

6.9.1 *Force*

6.9.1.1 Measurements shall be made of the maximum force, acting horizontally and parallel to the longitudinal axis of the vehicle, applied to the body block as a result of impact against the steering control. This force may be measured directly or indirectly or may be calculated from values recorded during the test.

6.9.1.2 The measuring range of force shall be 19 600 N (2 000 kg) and it shall be recorded with channel frequency class of 600 Hz.

6.9.1.3 Load transducer for measuring the force may be inserted on the steering mechanism, between steering control and steering shaft.

6.9.1.4 Measurements shall also be made of the impact velocity of the body block. This velocity is the velocity recorded immediately before the body block collides against the steering mechanism.

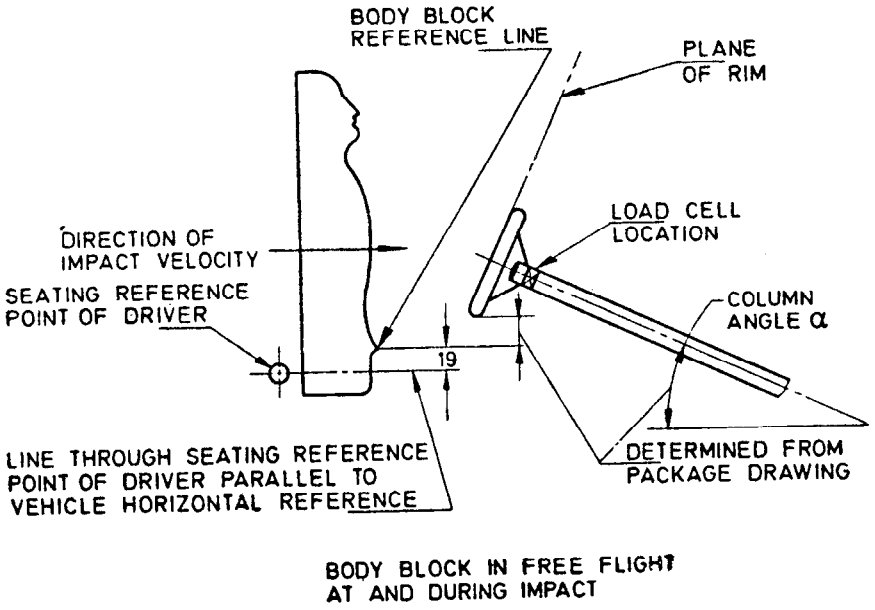


FIG. 3 STEERING WHEEL-BODY BLOCK RELATIONSHIP

6.10 Instrumentation

6.10.1 The accuracy of instruments used to record parameters specified in **6.1** shall be such that the measurements made shall have the accuracies indicated below:

a) Speed of body block : within 2 percent
b) Recording time : within 1/1 000 s

6.10.2 The beginning of the impact (zero point) at the moment of first contact of the body block with the steering control shall be identified on the recordings.

6.11 Results of Test

6.11.1 After the test, the damage sustained by the steering mechanism shall be ascertained and recorded in a test report, at least one side-view and one front-view photograph of the steering control/steering column/instrument panel area shall be taken.

6.11.2 The maximum value of force shall be measured or calculated as indicated in **6.9.1**, and it shall be reported.

7 FRONTAL IMPACT TEST (AGAINST A BARRIER)

7.1 When the vehicle, in running order, without a manikin, is collision-tested against a barrier at a speed of 48.3 km/h, in accordance with the following procedure, the top of the steering column and its shaft shall not move backwards, horizontally or vertically by not more than 12.7 cm in the plane parallel to the longitudinal axis of the vehicle in relation to a point of the vehicle not affected by the impact.

7.2 Installation Procedure and Instrumentation

7.2.1 *Test Area*

7.2.1.1 The test area shall be large enough to accommdate the run-up track, barrier and teachical installations necessary for the test. The last part of the track, for at least 5 m before the barrier, shall be horizontal (slope less than 3 percent measured over a length of one metre), flat and smooth.

7.2.2 *Barrier*

7.2.2.1 The barrier shall consist of a black of reinforced concrete not less than 3 m wide in front and not less than 1.5 m high. The barrier shall be of such thickness that it's mass is at least 70 tons. The front face shall be flat, vertical and perpendicular to the axis of the run-up track. It shall be covered with plywood boards 19 ±1 mm thick, in good condition. A structure on a steel plate atleast 25 mm thick may be placed between the plywood board and the barrier. A barrier with different characteristics may like wise be used, provided that the area of the impact surface is greater than the frontal crash area of the vehicle being tested and also would give equivalent results.

7.2.3 *Propulsion of Vehicle*

7.2.3.1 At moment of impact, the vehicle shall no longer be subject to the action of any additional steering or propelling device. It shall reach the obstacle on a course perpendicular to the barrier; the maximum lateral misalignment permissible between the vertical median line of the front of the vehicle and the vertical median line of the barrier is ±30 cm.

7.2.4 *State of Vehicle*

7.2.4.1 For the test the vehicle shall either be fitted with all the normal components and equipment included in its unladen (kerb) mass or be in such a condition as to satisfy this requirement so far as the components and equipment of concern to the passenger compartment and the distribution of the mass of the vehicle as a whole, in running order, are concerned.

7.2.4.2 If the vehicle is driven by an external means, the fuel feed systems shall be filled to at least 90 percent of its capacity with a non-flammable liquid having a specific gravity ranging between 0.7 and 1 and all the other systems (brake-fluid reservoir, etc) may be left empty.

7.2.4.3 If the vehicle is driven by its own engine, the fuel tank shall be filled to at least 90 percent of it's capacity. All other reservoirs shall be filled to their capacity. If the manufacturer so desires and the testing agency agrees, the fuel feed to the engine may be provided from an auxiliary tank of small capacity. In such case, the fuel tank shall be filled to not less than 90 percent of its capacity with a non-flammable liquid having a specific gravity ranging between 0.7 and 1.

7.2.4.4 If the manufacturer so requests, the testing agency responsible for conducting the tests may allow the same vehicle as is used for tests specified by other Indian Standards (including tests capable of affecting its structure) to be used also for the tests specified in this standard.

7.2.5 *Speed on Impact*

7.2.5.1 The speed on impact shall be between 48.3 km/h and 53.1 km/h. However, if the test has been carried out at a higher impact speed and the vehicle has met the requirements laid down, the test shall be considered satisfactory.

7.2.6 *Instrumentation*

7.2.6.1 The instruments used for recording the speed specified in 7.2.5.1 above shall be accurate to within 1 percent.

7.3 Results of Test

7.3.1 To determine the rearward and upward movement of the steering control during the collision, a recording shall be made, of the horizontal variation in distance measured horizontally and parallel to the longitudinal axis of the vehicle and vertical variation in distance, in the direction perpendicular to that axis and upwards between the top of the steering column (and shaft) and a point on the vehicle which is not affected by the impact. The largest value of this variation, obtained from the recording shall be taken as the rearward and upward movement.

7.3.2 Measurements of distances as mentioned in 7.3.1 shall be made with reference to the passenger compartment when the vehicle is stationary before the test, not in space during movement of the vehicle in relation to the ground.

7.3.3 Recording of the variations in distance may be replaced by the maximum measurement.

7.3.4 After the test the damage sustained by the vehicle shall be recorded in a test report; one photograph at least shall be taken of each of the following views of the vehicle:

- side (right and left),
- front,
- bottom,
- affected area inside the passenger compartment.

7.4 Correction Factors

7.4.1 The corrected variation D_1 used to check the conformity of the prototype with the requirements of this standard shall be calculated by the following formula:

$$D_1 = D_0 \times K_1 \times K_2$$

where

D_0 = variation in the distance measured during the impact, as defined in 7.3.1.
D_1 = variation in the distance used to determine the results of the test.
K_1 = the greater of $(48.3/v)^2$ and 0.83.
V = recorded speed in km/h.
K_2 = the greater of m_0/m_i and 0.8.
m_0 = mass of prototype in the state defined in 7.2.4.1.
m_i = mass of prototype with testing apparatus.

8 HEAD FORM TEST

8.1 When the steering control is struck by an impactor released against this control at a relative speed of 24.1 km/h, in accordance with the following procedure, the deceleration of the impactor shall not exceed 80 g cumulative for more than 3 milliseconds. The deceleration shall always be lower than 120 g with channel frequency class 600 Hz

8.2 After carrying out the impact test as specified in 8.1, the part of the steering control surface directed towards the driver shall not present any sharp or rough edges likely to increase the danger or severity of injuries to the driver. Small surface cracks and fissures shall be disregarded.

8.3 Installation Procedure and Instrumentation

8.3.1 *Mounting of Steering Control*

8.3.1.1 The control shall be mounted on the front section of the vehicle obtained by cutting the body transversely at the level of the front seats and possibly eliminating the roof, windscreen and doors. This section shall be fixed rigidly to the test bench, so that it does not move under the impact of the head form .

8.3.1.2 However, the steering control, alternatively may be mounted on a framework simulating the mounting of the steering mechanism provided that, as compared with the real front body section /steering mechanism, the framework/steering mechanism has the same geometric layout and greater rigidity.

8.3.1.3 The tolerance on the control mounting angle shall be ±2° of the design angle.

8.3.2 *Setting of Steering Mechanism*

8.3.2.1 The plane of the steering control shall be set up perpendicular to the direction of impact. A typical head form setup is shown in Fig. 4.

8.3.2.2 Testing shall be carried out by setting the steering control so that the axis of impactor is in line with following points during each impact:

a) The centre of the steering control boss;
b) The joint of stiffest or most supported spoke to the inner edge of the steering control rim;
c) The mid-point of the shortest unsupported are of the steering control rim that does not include a spoke; and
d) Any other 'worst case' position on the steering control, in the event that such a case exists, as determined by the testing agency.

8.3.2.3 A new steering control shall be used for each impact.

8.3.2.4 If the steering control is fitted with an air bag the test shall be carried out with the air bag inflated. At the request of the manufacturer, and with the agreement of the testing agency, the test may be carried out without the air bag inflated.

8.3.3 *Test Apparatus*

8.3.3.1 This apparatus consists of a fully-guided linear impactor as specified in **3.6.**

8.3.3.2 The head-form shall be fitted with two accelerometers and a speed measuring device, all capable of measuring values in the impact direction.

8.3.4 *Speed of Impactor*

8.3.4.1 The impactor shall strike the steering control at a velocity of 24.1 km/h; this velocity shall be achieved either by mere energy of propulsion or by using an additionl propelling device.

8.3.5 *Instrumentation*

8.3.5.1 The instrumentation used to record the parameters specified in **8.1** shall enable the measurements to be made with the following accuracy characteristics:

a) Acceleration
   Channel amplitude class: 150 g
   Channel frequency class: 600 Hz
b) Speed: within 1 percent
c) Time recording: 1/1 000 s

8.4 Results of Test

8.4.1 In the tests carried out according to the above procedure, the deceleration rate of the impactor shall be taken as the average of the simultaneous readings of the two decelerometers.

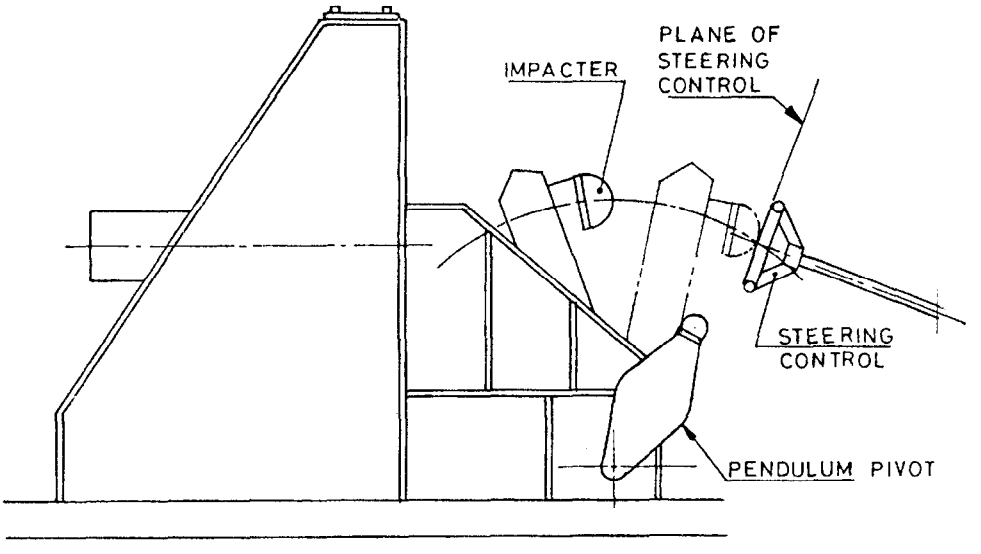


FIG. 4 TYPICAL HEAD FORM IMPACT SET-UP

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Automotive Suspension and Steering Systems Sectional Committee, TED 5

Chairman	*Representing*
DR S. SATYA MURTY	Eicher Goodearth Limited, Ballabhgarh
Members	
SHRI M. BALAKUMAR	Ashok Leyland Limited, Madras
SHRI S. SUNDARARAJ (*Alternate*)	
DR P. R. SAJANPAWAR	Automotive Research Association of India, Pune
SHRI S. RAJU (*Alternate*)	
SHRI B. BHAUMIK	Bajaj Auto Limited, Pune
SHRI C. Y. DESHPANDE (*Alternate*)	
SHRI C. S. MAIKHURI	Bajaj Tempo Limited, Pune
SHRI A. A. KHINVASARA (*Alternate*)	
SHRI S. R. TAPADE	Central Institute of Road Transport, Pune
SHRI S. KUMAR (*Alternate*)	
SHRI S. S. KHOSLA	Department of Technical Development, Ministry of Industry, New Delhi
SHRI A. P. SINGH (*Alternate*)	
SHRI K. C. JAIN	Escorts Ltd, Faridabad
SHRI RAJU AGARWAL (*Alternate*)	
SHRI K. SUNDRARAMAN	Gabriel India Limited, Mumbai
SHRI S. K. BHAUMICK (*Alternate*)	
SHRI V. N. SAHARSA BUDHE	Kinetic Engg Limited, Pune
SHRI G. B. LAL	HMT Limited (Tractor Division), Pinjore
SHRI G. S. KHUNNU (*Alternate*)	
SHRI N. N. NEELAKANTAN	Hydraulics Limited, Madras
SHRI I. V. RAO	Maruti Udyog Limited, Gurgaon
SHRI DEEPAK SAWKAR (*Alternate*)	
SHRI B. L. PATHARIYA	Ministry of Defence (DGOF), Jabalpur
SHRI M. K. MISHRA (*Alternate*)	
SHRI O. P. NARULA	Ministry of Defence, DGQA(V)
SHRI K. C. GUPTA (*Alternate*)	
SHRI A. K. MALIK	Ministry of Surface Transport, New Delhi
SHRI S. N. SRINIVASAN	Premier Automobiles Limited, Mumbai
SHRI V. MURUGAN (*Alternate*)	
SHRI J. K. SUBRAMANIAN	Rane (Madras) Ltd, Madras
SHRI S. RADHAKRISHNAN	Rane power Steering Ltd, Pudukkottai
DIRECTOR MOTIVE POWER	Research Design and Standards Organization, Lucknow
SHRI T. K. PAL	Sona Steering Systems Ltd, New Delhi
SHRI K. DESHMUKH (*Alternate*)	
DR P. D. SINGHAL	Tata Engineering and Locomotive Co Ltd, Pune
SHRI V. VISHWANATHAN (*Alternate* I)	
SHRI B. K. DE (*Alternate* II)	
SHRI B. S. MOHAN	Vehicle Research and Development Establishment, Ahmednagar
SHRI P. K. CHATTOPADHYAYA (*Alternate*)	
SHRI G. M. KISHINCHANDANI	XLO India Limited, Mumbai
SHRI V. V. ATHAVALE (*Alternate*)	
SHRI J. H. MUNOT	Z. F. Steering Gear (I) Ltd, Pune
SHRI C. K. DANGE (*Alternate*)	
SHRI A. R. GULATI, Director (Transport Engg)	Director General, BIS (*Ex-officio Member*)

Member Secretary

SHRI M. V. S. D. PRASADA RAO
Joint Director (Transport Engg), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'.

This Indian Standard has been developed from Doc : No. TED 5 (206).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 323 01 31, 323 83 75, 323 94 02

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :		Telephone
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	323 76 17 323 38 41
Eastern	: 1/14 C. I.T. Scheme VII M, V. I. P. Road, Maniktola CALCUTTA 700054	337 84 99, 337 85 61 337 86 26, 337 91 20
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43 60 20 25
Southern	: C. I. T. Campus, IV Cross Road, MADRAS 600113	235 02 16, 235 04 42 235 15 19, 235 23 15
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	832 92 95, 832 78 58 832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. PATNA. THIRUVANANTHAPURAM.

Printed at Dee Kay Printers, New Delhi-110015, India.