भारतीय मानक **IS 16332 : 2024**

Indian Standard

स्वचल वाहन — बड़े यात्री वाहनों के सूपरस्ट्रक्चर की मज़बूती

(पहला पुनरीक्षण)

Automotive Vehicles — Strength of Superstructure of Large Passenger Vehicles

(First Revision)

ICS 43.060.40

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
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July 2024 **Price Group 7**

Automotive Body, Chassis and Accessories Sectional Committee, TED 06

FOREWORD

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

This standard was first published in 2017. This revision has been taken up with a view to incorporating the modifications found necessary as a result of experience gained on the use of this standard. Also, in this revision, the standard has been brought into the latest style and format of Indian Standard, and references to Indian Standards, wherever applicable have been updated. Amendments incorporated in this Standard.

The superstructure of the bus shall be so designed and constructed as to eliminate to the greatest possible extent the risk of injury to the passengers and operators in the event of an accident. This standard specifies the requirement of strength of the bus superstructure for the protection of passengers and operators of the bus.

In the preparation of this standard, considerable assistance has been derived from the following:

a) ECE regulation No. 66: Uniform provisions concerning the approval of large passenger vehicles with regard to the strength of their superstructure — (Revision 2, including the amendments entered into force on October 16, 1995) addendum 65: regulation No. 66, amendment 1, supplement 1 to the original version of the regulation — Date of entry into force: September 3, 1997 (issue: 1 Jul/1999); and

b) AIS 031 with amendment No. 1 — Automotive vehicles — The strength of superstructure of large passenger vehicles.

The composition of the Committee responsible for the formulation of this standard is given in Annex F.

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 test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE VEHICLES — STRENGTH OF SUPERSTRUCTURE OF LARGE PASSENGER VEHICLES

(First Revision)

1 SCOPE

1.1 This standard applies to single-deck rigid or articulated vehicles designed and constructed for the carriage of more than 22 passengers, whether seated or standing in addition to the driver and crew.

1.2 It does not apply to the vehicles of Type I category as defined in AIS-052: Code of practice for bus body design.

1.3 This standard may also be applicable to double-deck buses of categories Type II and Type III, as defined in AIS -139 : 2016 at the discretion of the manufacturer.

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards:

IS No./Other Standards	*Title*
IS 9211 : 2003	Terms and definitions of weights of road vehicles other than 2 and 3 wheelers (*second revision*)
IS 11849 : 1986	Method of determination of centre of gravity of automotive vehicles
AIS-052 (Rev.1) : 2017	Code of practice for bus body design and approval *first revision*)
AIS-139 : 2016	Specific requirements for double deck buses

3 DEFINITIONS

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

3.1 Approval of a Vehicle — The approval of a vehicle type with regard to the construction features specified in this standard.

3.2 Vehicle Type — A category of vehicles which do not differ essentially in respect of the constructional features specified in this standard.

3.3 Passenger Compartment — The space intended for passengers' use excluding any space occupied by fixed appliances such as bars, kitchenettes or toilets.

3.4 Driver's Compartment — The space intended for the driver's exclusive use and containing the driver's seat, the steering wheel, controls, instruments and other devices necessary for driving the vehicle.

3.5 Vehicle Kerb Weight (MK) (kg) — The complete vehicle kerb weight as defined in IS 9211 with an addition of 75 kg for mass of the driver.

3.6 Residual Space — The space to be preserved in the passenger compartment during and after the structure has been subjected to one of the tests prescribed in **6**.

3.7 Superstructure — The parts of a vehicle structure, which contribute to the strength of the vehicle in the event of a roll-over accident.

3.8 Body Section — A section containing at least two identical vertical pillars on each side representative of a part or parts of the structure of the vehicle.

3.9 Total Energy — The energy assumed to be absorbed by the complete structure of the vehicle. This may be determined as shown in **C-4**.

4 APPLICATION FOR APPROVAL

4.1 The application for approval of a vehicle type with regard to the strength of its superstructure shall be submitted by the vehicle/bus body manufacturer to the Test Agency.

4.2 It shall be accompanied the under mentioned documents giving the following particulars:

a) A detailed description of the superstructure of the vehicle type including its dimensions, configuration and constituent materials and its attachment to any chassis frame;
b) Drawings of the vehicle and those parts of its interior arrangement which have an influence on the strength of the superstructure or on the residual space;
c) The complete vehicle kerb weight (kg) as defined in IS 9211 (in the case of an articulated bus this information shall be given separately for the two rigid portions);
d) The vehicle kerb weight for each axle (kg) as defined in IS 9211;
e) The position of the centre of gravity of the unladen vehicle in the longitudinal, transverse and vertical directions as defined in IS 11849; and
f) The maximum distance between the centre lines of the outboard passenger seats.

4.3 The vehicle/bus body manufacturer may either offer a complete vehicle or one or more sections of the superstructure representative of the type to be approved shall be submitted to the Test Agency for conducting the approval tests unless the approval is to be conducted by means of calculation, in which case the calculation shall be submitted to the Test Agency.

5 APPROVAL

If the vehicle submitted for approval to this standard meets the requirements of **6**, approval of that vehicle type shall be granted.

6 GENERAL SPECIFICATIONS AND REQUIREMENTS

6.1 The superstructure of the vehicle shall be of sufficient strength to ensure that during and after it has been subjected to one of the methods of test or calculation prescribed in **7**.

6.1.1 No displaced part of the vehicle intrudes into the residual space, as specified in **7**.

6.1.2 No part of the residual space projects outside the deformed structure.

6.2 The requirements of **6.1** shall apply to the vehicle including all its structural parts, members and panels and all projecting rigid parts such as luggage racks, on-the roof ventilation equipment, etc. However, bulkheads, partitions, rings or other members reinforcing the superstructure of the vehicle and fixed appliances such as bars, kitchenettes or toilets shall be ignored for the purposes of **6.1**.

6.3 In the case of an articulated vehicle each part of the vehicle shall comply with the requirements specified in **6.1**.

7 TEST METHODS

7.1 Each type of vehicle shall be verified according to one of the following methods at the discretion of the manufacturer or according to an alternative method approved by the competent authority:

a) A roll-over test on a complete vehicle in accordance with the procedure set out in Annex A;
b) A roll-over test on a body section or sections representative of a complete vehicle in accordance with Annex B;
c) A pendulum test on a body section or sections in accordance with Annex C; and
d) A verification of strength of superstructure by calculation in accordance with Annex D.

7.2 If the methods prescribed in **7.1(b)** to **7.1(d)** cannot take account of a significant variation between one section of the vehicle and another, for example, an air conditioning installation on the roof, additional test methods or calculations shall be submitted to the test agency. In the absence of such additional information the vehicle may be required to undergo the method of test prescribed in **7.1(a)**.

7.3 In case of double-deck buses of categories Type II and Type III as defined in AIS-139 : 2016, only **7.1 (a)** or **7.1 (d)** will be applicable.

8 RESIDUAL SPACE

8.1 For the purpose of **6.1**, the residual space means the volume within the passenger compartment which is swept when the transverse vertical plane defined in Fig. 1 is moved in a straight line or lines so that the point '*R*' in Fig. 1 passes from the '*R*' point of the rearmost outer seat, through the '*R*' point of every intermediate outer seat to the '*R*' point of the foremost outer passenger seat.

8.2 The position of the "R" point shown in Fig. 2 shall be assumed to be 500 mm above the floor under the passengers' feet/seat (as applicable), 300 mm from the inside surface of the side of the vehicle and 100 mm in front of the seat back in the centre line of the outboard seats. No account shall be taken of wheel arches and other variations of the floor height

8.3 In case of double-deck buses of categories Type II and Type III as defined in AIS-139, the residual space defined in **8.1** above shall be applicable for both decks. Fig. 3 shows the complete residual space requirement for double deck buses.

9 INTERPRETATION OF TEST RESULTS

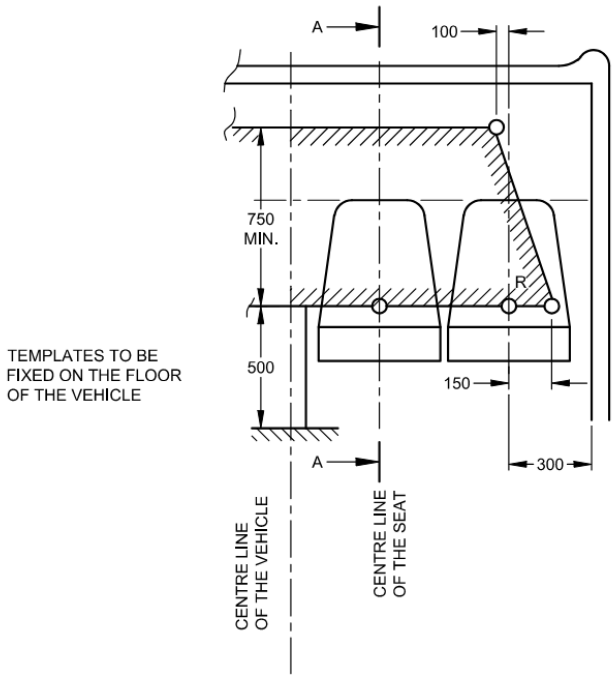
If body sections are tested, the test agency for conducting the test shall ensure that the vehicle complies with the conditions specified in **C-5**, which contains requirements for the distribution of the main energy absorbing parts of the superstructure of a vehicle.

10 MODIFICATIONS OF THE VEHICLE TYPE AND EXTENSION OF APPROVAL

10.1 Every modification of the vehicle type shall be notified to the Test Agency which granted the type approval. The Test Agency may then either:

a) Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle still complies with the requirements; and
b) Require a further test report from the Test Agency.

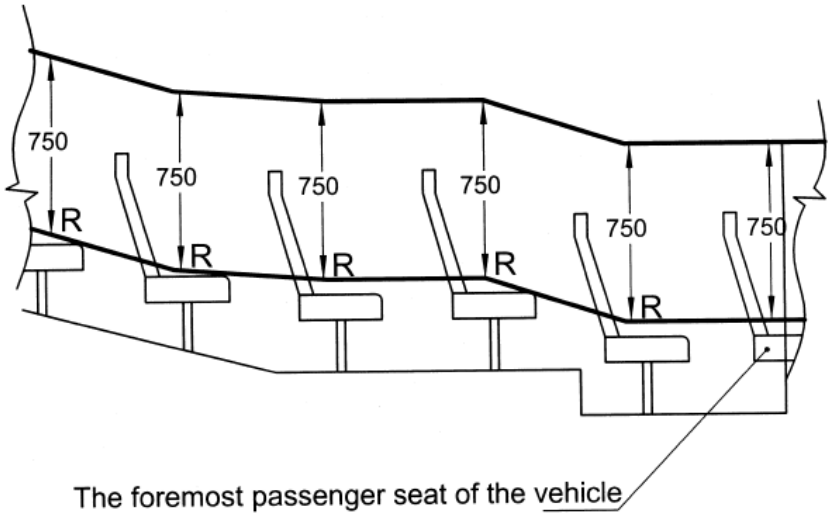
10.2 The criteria for extension of approval (CEA) are given in Annex E.



NOTE — Section A-A of the vehicle in the vertical plane of the centre-line of the inboard seats

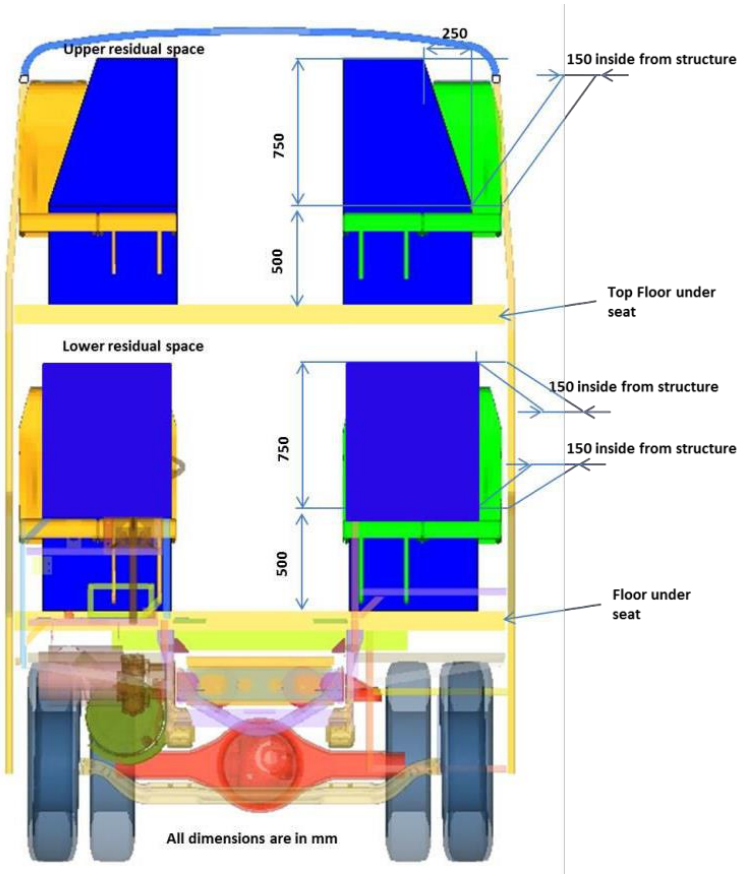
All dimensions in millimetres.

FIG. 1 RESIDUAL SPACE LATERALLY



All dimensions in millimetres.

FIG. 2 RESIDUAL SPACE LONGITUDINALLY



All dimensions in millimetres.

FIG. 3 RESIDUAL SPACE FOR DOUBLE DECK BUSES.

ANNEX A

[*Clauses* 7.1(a) *and* B-2]

ROLL OVER TEST ON A COMPLETE VEHICLE

A-1 TEST CONDITION

A-1.1 While the vehicle need not be in a fully finished condition it shall be representative of production vehicles in respect of vehicle kerb weight, centre of gravity and distribution of mass as declared by the vehicle/bus body manufacturer.

A-1.2 Driver and passenger seats shall be placed with their backs, if adjustable, in their most upright position. The height of the seats, if adjustable, shall be the highest position.

A-1.3 Every door and opening window of the vehicle shall be closed and latched but not locked. Windows and glazed bulkheads or screens may be glazed or unglazed at the applicant's discretion. If they are unglazed an equivalent weight shall be imposed on the vehicle at the appropriate positions.

A-1.4 Tyres shall be inflated to the pressure prescribed by the vehicle manufacturer and, if the vehicle has an air-spring suspension system, the air supply to the air springs shall be ensured. Any automatic levelling system shall be adjusted with the vehicle on a flat, horizontal surface to the level specified by the manufacturer. Shock absorbers shall operate normally.

A-1.5 Fuel, battery acid and other combustible, explosive or corrosive materials may be substituted by other materials provided that the conditions prescribed in **A-1.1** are met.

A-1.6 The impact area shall consist of concrete or other rigid material.

A-2 TEST PROCEDURE (*see* Fig. 4)

A-2.1 The vehicle shall be placed on a platform in order to be rolled over on one side. This side shall be specified by the manufacturer.

A-2.2 The position of the vehicle on the platform shall be such that when the platform is horizontal.

A-2.2.1 The axis of rotation is parallel to the longitudinal axis of the vehicle.

A-2.2.2 The axis of rotation is 0 mm to 200 mm from the vertical step between the two levels.

A-2.2.3 The axis of rotation is 0 mm to 100 mm from the side of the tyre at the widest axle.

A-2.2.4 The axis of rotation is 0 mm to 100 mm below the horizontal starting plane on which the tyres stand.

A-2.2.5 The difference between the height of the horizontal starting plane and the horizontal lower plane on which impact takes place shall be not less than 800 mm.

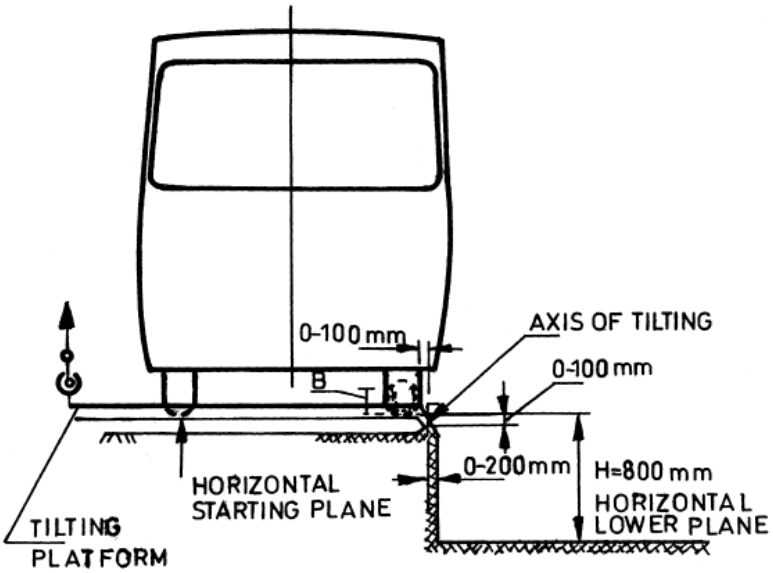
A-2.3 Means shall be provided to prevent the vehicle moving along its longitudinal axis.

A-2.4 The test apparatus shall prevent the tyres from sliding sideways in the direction of roll-over by means of side walls.

A-2.5 The test apparatus shall ensure the simultaneous lifting of the axles of the vehicle.

A-2.6 The vehicle shall be tilted without rocking and without dynamic effects until it rolls over. The angular velocity shall not exceed 5° (0.087 rad/s).

A-2.7 High-speed photography, deformable templates or other suitable means shall be used to determine that the requirement of **6.1** has been met. This shall be verified at not less than two positions, nominally at the front and rear of the passenger compartment, the exact positions being at the discretion of the technical service. Templates shall be fixed to substantially non deformable parts of the structure.



All dimensions in millimetres.

FIG. 4 ROLL OVER PLATFORM

ANNEX B

[*Clause* 7.1 (b)]

ROLL-OVER TEST ON A BODY SECTION

B-1 TEST CONDITIONS

B-1.1 The body section shall represent a section of the unladen vehicle.

B-1.2 The geometry of the body section, the axis of rotation and the position of the centre of gravity in the vertical and lateral directions shall be representative of the complete vehicle.

B-1.3 The mass of the body section, expressed as a percentage of the vehicle kerb weight of the vehicle, shall be specified by the vehicle/bus body manufacturer.

B-1.4 The energy to be absorbed by the body section, expressed as a percentage of the total energy which would be absorbed by a complete vehicle, shall be specified by the vehicle/bus body manufacturer.

B-1.5 The percentage of total energy described in **B-1.4** shall not be less than the percentage of total kerb mass described in **B-1.3**.

B-1.6 The test conditions specified in **A-1.6** and **C-2.1** to **C-2.6** shall apply.

B-2 TEST PROCEDURE

The test procedure shall be the same as the procedure described in Annex A, except that the body section described above shall be used instead of a complete vehicle.

ANNEX C

[*Clauses* 7.1(c) *and* D-4.2]

PENDULUM TEST ON A BODY SECTION

C-1 ENERGY LEVEL AND DIRECTION OF IMPACT

C-1.1 The energy to be transmitted to a particular body section shall be the sum of the energies declared by the manufacturer to be allocated to each of the cross sectional rings included in that particular body section.

C-1.2 The appropriate proportion of the energy prescribed in **C-4** shall be applied to the body section by the pendulum such that at the moment of impact the direction of motion of the pendulum makes an angle of $25°^{0}_{-5}$ to the central longitudinal vertical plane of the body section. The precise angle within this range may be specified by the vehicle manufacturer.

C-2 TEST CONDITIONS

C-2.1 A sufficient number of tests shall be carried out for the test agency conducting the test to be satisfied that the requirement specified in **6.1** has been met.

C-2.2 For the purpose of the test body sections shall have sections of the normal structure fitted between the pillars in relation to the floor, under frame, sides and roof. Sections of such items as luggage racks, ventilation ducting, etc, where fitted, shall also be included.

C-2.3 Every door and opening window of the body section shall be closed and latched but not locked. Windows and glazed bulkheads or screens may be glazed or unglazed at the manufacturers discretion.

C-2.4 Where appropriate seats may also be included, at the option of the manufacturer, in their normal positions in relation to the structure of the body section. The normal fixings and joints between all members and attachments shall be incorporated. The backrests, if adjustable shall be in their most upright position and the height of the seats, if adjustable shall be the highest position.

C-2.5 The side of the body section to be impacted shall be at the discretion of the manufacturer. Where more than one body section is required to be tested both shall be impacted on the same side.

C-2.6 High speed photography, deformable templates or other suitable means shall be used to determine that the requirement specified in **6.1** has been met. Templates shall be fixed to a substantially non deformable part of the structure.

C-2.7 The body section to be tested shall be firmly and securely attached to the mounting frame through the cross-bearers or parts which replace these in such a way that no significant energy is absorbed in the support frame and its attachments during the impact.

C-2.8 The pendulum shall be released from such a height that it strikes the body section at a speed of between 3 m/s and 8 m/s.

C-3 DESCRIPTION OF THE PENDULUM

C-3.1 The striking face of the pendulum shall be made of steel, or plywood 20 mm ± 5 mm thick, and the mass of the pendulum shall be evenly distributed. Its striking face shall be rectangular and flat, having a width of not less than the width of the body section being tested and a height of not less than 800 mm. Its edges shall be rounded to a radius of curvature of not less than 15 mm.

C-3.2 The body of the pendulum shall be rigidly attached to two rigid bars. The axis of the bars shall be not less than 3 500 mm from the geometric centre of the body of the pendulum.

C-4 CALCULATION OF TOTAL ENERGY (*E**) (*see* Fig. 5)

C-4.1 Assumptions

a) The shape of the cross-section of the body is assumed to be rectangular;
b) The suspension system is assumed to be rigidly fixed; and
c) The movement of the body section is assumed to be pure rotation about point ‘A’.

C-4.2 Calculation of Total Energy (*E**)

If the fall of the centre of gravity (h) is determined by graphical methods, E^* may be taken to be given by the formula:

$$E^* = 0.75\ M.g.h.\ \text{(Nm)}$$

Alternatively, E^* may be calculated by the formula:

$$E^* = 0.75\ M.g$$

$$\left\{\sqrt{\left(\frac{W}{2}\right)^2 + H_s^2} - \frac{w}{2H}\sqrt{H^2 - 0.8^2} + 0.8^2\frac{H_s}{H}\right\} \text{(Nm)}$$

where

M = vehicle kerb weight, in kg, of the vehicle;
g = 9.8 m/s^2;
W = overall width, in m, of the vehicle;
H_s = height, in m, of the centre of gravity of the unladen vehicle; and
H = height, in m, of the vehicle.

C-5 REQUIREMENTS FOR THE DISTRIBUTION OF THE MAIN ENERGY ABSORBING PARTS OF THE SUPERSTRUCTURE (*see* Fig. 6)

C-5.1 A sufficient number of tests shall be carried out for the Test Agency to be satisfied that the complete vehicle meets the requirements of **6.1**. This shall not necessarily require more than one test.

C-5.2 Calculations based on data obtained from a test on a body section may be used to demonstrate the acceptability of another body section which is not identical with the body section already tested, if it has many structural features in common with it.

C-5.3 The vehicle/bus body manufacturer shall declare which pillars of the superstructure are considered as contributing to its strength and shall also declare the amount of energy (Ei) that each pillar is intended to absorb. These declarations shall meet the following criteria:

a)
$$\sum_{i=1}^{i=m} E_i > E^*$$

where m is total number of declared pillars.

b)
$$\sum_{i=1}^{i=n} E_{iF} \geq 0.4E^*$$

where n is the number of declared pillars forward of the centre of gravity of the vehicle.

$$\sum_{i=1}^{i=p} E_{iR} \geq 0.4E^*$$

where p is the number of declared pillars to the rear of the centre of gravity of the vehicle

c) $L_F \geq 0.4\ l_f$

d) $L_R > 0.4\ l_f$

e) $\frac{d\ Max}{d\ Min} \leq 2.5$

This shall apply only where d_{Max} is greater than 0.8 × maximum deflection permitted without intrusion of the residual space.

where

E_i = declared amount of energy that can be absorbed by ith pillar of the superstructure.
E_{iF} = declared amount of energy that can be absorbed by the ith pillar forward of the centre of gravity of the vehicle.
E_{iR} = declared amount of energy that can be absorbed by the ith pillar to the rear of the centre of gravity of the vehicle.
E^* = total energy to be absorbed by the complete structure of the vehicle.
D_{Max} = greatest amount of deflection measured in the direction of impact of any section of the body structure after it has absorbed its own declared impact energy.
d_{Min} = least amount of deflection, measured in the direction of impact and at the same point on the bay as d_{max}, of any section of the body structure after it has absorbed its own declared impact energy.

$$L_F = \frac{\sum_{i=1}^{i=n}(E_{iF}l_{iF})}{\sum_{i=1}^{i=n}E_{iF}}$$

Weighted mean distance of the declared pillars in front of the centre of gravity of the vehicle:

$$L_R = \frac{\sum_{i=1}^{i=p}(E_{iR}l_{ir})}{\sum_{i=1}^{i=p}E_{iR}}$$

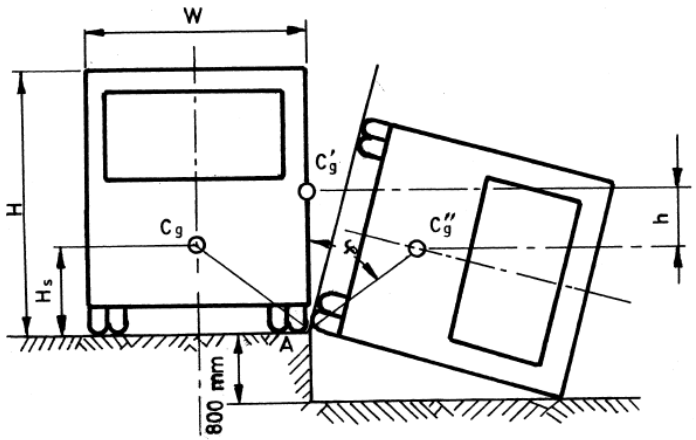
where

l_{if} = distance from the centre of gravity of the vehicle of the ith pillar forward of the centre of gravity;

l_{ir} = distance from the centre of gravity of the vehicle of the i^{th} pillar rearward of the centre of gravity;

l_f = distance of the front of the vehicle from the centre of gravity of the vehicle; and

l_r = distance of the rear of the vehicle from the centre of gravity of the vehicle.



All dimensions in millimetres.

FIG. 5 ROLL OVER POSITION

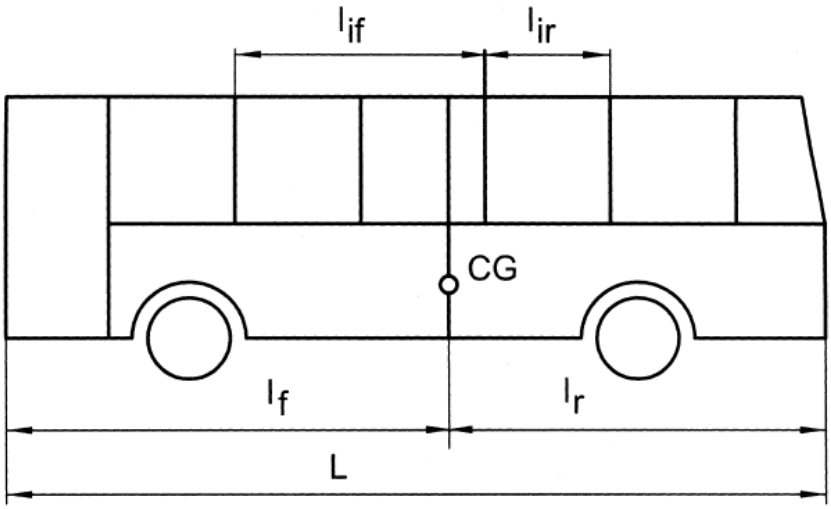


FIG. 6 POSITION OF CENTER OF GRAVITY OF VEHICLE

ANNEX D

[*Clause* 7.1(d)]

VERIFICATION OF STRENGTH OF SUPERSTRUCTURE BY CALCULATION

D-1 A superstructure or sections of a superstructure may be shown to meet the requirement specified in **6.1** by a calculation method approved by the test agency for conducting the tests.

D-2 If the structure is likely to be subject to deformations beyond the elastic limit of the materials used then the calculations shall simulate the behaviour of the structure when undergoing large plastic deformations.

D-3 The Test Agency for conducting the tests may require tests to be carried out on joints or parts of the structure to verify the assumptions made in the calculation.

D-4 PREPARATIONS FOR CALCULATION

D-4.1 Calculations cannot be started until the structure has been analyzed and a mathematical model of it produced. This will define the separate members to be considered and identify the points at which plastic hinges may develop. The dimensions of the members and the properties of material used must be stated. Physical tests must be made on the hinge points to determine the force (moment of rotation) — deformation characteristics in the plastic mode as this is essential data for the calculations. The strain rate and the dynamic yield stress appropriate for this strain rate must be determined. If the calculation method will not indicate when a significant fracture will occur it will be essential to determine, by experiment, separate analyses or appropriate dynamic tests that significant fractures will not occur. The assumed distribution of loading along the length of a vehicle shall be stated.

D-4.2 The calculation method shall include the deformations up to the elastic limits of the materials followed by the identification of where plastic hinges will form and the subsequent formation of other plastic hinges unless the position and sequence of formation of plastic hinges is known from previous experience. The method shall accommodate the changes of geometry of the structure that take place, at least up to the stage where the deformations have passed the acceptable limits. The calculations shall simulate the energy and the direction of impact which would occur, if that particular superstructure were to be submitted to the roll-over tests prescribed in Annex C. The validity of the calculation method shall have been established by comparison with the results of physical tests, which need not necessarily have been made in connection with the vehicle now being approved.

D-5 TESTS OF SECTIONS OF SUPERSTRUCTURE

When a calculation method is used for a section of the complete superstructure, the same conditions shall apply as stated above for the complete vehicle.

ANNEX E

(*Clause* 10.2)

CRITERIA FOR EXTENSION OF APPROVAL

E-1 The criteria for extension of approval (CEA) is as given below:

Sl No. (1)	**Parameter** (2)	**Change** (3)	**Test Required (Yes/No)** (4)
i)	Roll Over test		
ii)	Body mountings on chassis:		
	a) Number of mountings	a) Decreased	a) Yes
	b) Quality of fasteners	b) Superior quality or equivalent	b) No
	c) Position of mountings	c) Any change	c) Yes
iii)	Pillar pitch	a) Increase	a) Yes
		b) Decrease	b) No
iv)	Number of gussets at joints	Increase	No
v)	Number of reinforcements	Increase	No
vi)	Cross-sectional area of the body structure	Increase	No
vii)	Sheet metal thickness with same material	Increase	No
viii)	Sheet materials	Superior quality or equivalent	No
ix)	Centre of gravity	Increase more than 10 percent	Yes
x)	Total energy	Increase more than 10 percent	Yes

ANNEX F

(*Foreword*)

COMMITTEE COMPOSITION

Automotive Body, Chassis and Accessories Sectional Committee, TED 06

Organization	*Representative(s)*
Automotive Research Association of India, Pune	SHRI SREENIVASULU **(*Chairperson*)**
Asahi India Glass Limited, Rewari	SHRI DEVEN JALLY SHRI PANNEERSELVAM ARUMUGAM (*Alternate*)
Ashok Leyland Limited, Chennai	SHRI FAUSTINO V. SHRI PRASANNA VENKATESH (*Alternate*)
Automotive Component Manufactures Association of India, New Delhi	SHRI SANJAY TANK MS SEEMA BABAL (*Alternate*)
Automotive Research Association of India, Pune	SHRI GIRISH TANAWADE SHRI V. P. RAWAL (*Alternate*)
Bajaj Auto Limited, Pune	SHRI R. NARASIMHAN SHRI ARVIND V. KUMBHAR (*Alternate*)
BEML Limited, Bengaluru	SHRI H. D. SATYANARAYANA SHRI ASHWINI KUMAR M. (*Alternate*)
Central Farm Machinery Training and Testing Institute, Budni	SHRI P. K. PANDEY SHRI CHAKRADHAR V. CHIMOTE (*Alternate*)
Central Institute of Road Transport, Pune	SHRI S. N. DHOLE SHRI S. N. GUTTE (*Alternate*)
Daimler India Commercial Vehicles Private Limited, Chennai	SHRI P. DYANESWARAN SHRI RAMA MANIKANDAN (*Alternate*)
Directorate General of Quality Assurance, Ministry of Defence, New Delhi	COL P. K. SHRIVASTAV LT COL NIRANJAN OAK (*Alternate*)
Federation of Safety Glass, Faridabad	SHRI TARIQ KACHWALA SHRI ALI KAMIL (*Alternate*)
Force Motors Limited, Pune	SHRI P. R. SHIVARAMAN SHRI L. B. PATIL (*Alternate*)
Hero Motocorp Limited, New Delhi	SHRI FEROZ ALI KHAN SHRI PIYUSH CHOWDHRY (*Alternate*)
Honda Cars India Research and Development Limited, Noida	SHRI S. MUTHU KUMAR SHRI GAGAN MANRAL (*Alternate*)
Honda Motorcycle and Scooter India Private Limited, Gurugram	SHRI KARAN RAJPUT SHRI NAVNEET KAUSHIK (*Alternate*)
International Centre of Automotive Technology, Manesar	SHRI ASHISH KUMAR SHRIMATI VIJAYANTA AHUJA (*Alternate*)
Jamna Auto Industries Limited, New Delhi	SHRI SUNIL LAROIYA SHRI ANUJ SHARMA (*Alternate*)
Mahindra Trucks and Bus Division, Pune	SHRI NAGARAJU K. SHRI V. G. KULKARNI (*Alternate*)

Organization	*Representative(s)*
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Maruti Suzuki India Limited, Gurugram	SHRI GURURAJ RAVI SHRI ARUN KUMAR (*Alternate*)
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