

AUTOMOTIVE INDUSTRY STANDARD

Code of Practice for Construction and Approval of Truck Cabs, Truck Bodies and Trailers



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ON BEHALF OF
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER
CENTRAL MOTOR VEHICLE RULES – TECHNICAL STANDING COMMITTEE

SET-UP BY
MINISTRY OF SHIPPING, ROAD TRANSPORT & HIGHWAYS
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)
GOVERNMENT OF INDIA

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INTRODUCTION

The trucking industry is a significant lifeline of the country's economic activity. Over three million trucks traverse the length and breadth of our country, contributing immensely to movement of commodities, expansion of commerce and enhancement of the GDP. An important facet of this industry is its highly diversified character of ownership. About 90 per cent of vehicles are owned and operated by individual operators having 1 to 3 vehicles in their fleet. Also, over 70 per cent of them are owner-drivers directly depending on trucking for livelihood. There is a compelling and long-felt need to upgrade this segment in the country to enhance its efficiency as well as the safety standards.

Last two decades have witnessed phenomenal increase in economic activity in India and to keep pace with the development, there is a necessity to accommodate higher levels of transportation. Equally important is the safety of these transportation modes and means. A large majority of the truck cabs, truck bodies and trailers are constructed by units in semi-organised / unorganised sectors spread over the country. There is considerable scope to improve the design of their products and process controls. Ensuring conformity of production to type approved designs would be beneficial to the end-user and society at large.

The OE vehicle manufacturers have a large role to play to assist this segment by giving design recommendations on interface aspects, wherever necessary, in order to ensure the safety and performance levels of their vehicles after body building and when used on the road. Various aspects related with the design of the truck with respect to the cab, the load body, requirements for hazardous goods vehicles, containers and their requirements for mounting, handling and securing, requirements for trailers etc. need to be addressed in the right perspective.

A sub-committee of the CMVR - Technical Standing Committee looked into all the related aspects and formulated the "**Code of Practice for Construction & Approval of Truck Cabs, Truck Bodies and Trailers**". This sub-committee was chaired by Mr. B.Bhanot, the then Chairman of CMVR - Technical Standing Committee.

The work of the Sub-committee of the CMVR-Technical Standing Committee, was identified and respective areas were allotted to different co-ordinators from the Industry and ARAI. The subject co-ordinators had the privilege and freedom to involve as many experts in their group discussions so as to arrive at the final recommendations. The technical co-ordination work of all the groups and the secretarial work for the sub-committee was carried out by Mr. A. Akbar Badusha of ARAI.

The following was the scope of work handled by the individual subject co-ordinators.

Scope of Work	Subject Co-ordinators
Scope and Definitions	<ul style="list-style-type: none"> • A. Akbar Badusha, ARAI, • C.B.S.Menon, M/s. Ashok Leyland Ltd., • P. K. Kamat, M/s. Tata Motors Ltd.
Truck Cab requirements	<ul style="list-style-type: none"> • B. L.Thareja, M/s. Eicher Motors Ltd.,
Truck Load Body Requirements	<ul style="list-style-type: none"> • Rakesh Grover , M/s. Eicher Motors Ltd., • R. Devarajan, M/s. Ashok Leyland Ltd
Electrical - Lighting and Illumination Requirements	<ul style="list-style-type: none"> • S.V.Suderson , M/s. Volvo India Ltd.,
Requirements for Hazardous Goods Vehicles	<ul style="list-style-type: none"> • A. Akbar Badusha, ARAI
Requirements for Container Mounting, Handling & Securing	<ul style="list-style-type: none"> • C.B.S. Menon, M/s. Ashok Leyland Ltd., • P.K. Kamat, M/s. Tata Motors Ltd.
Requirements for Automotive Trailers	<ul style="list-style-type: none"> • A. Akbar Badusha, ARAI • B. Ramesh,M/s.PL Haulwel Trailers Ltd., • S.V. Suderson, M/s. Volvo India Ltd.
Working Stability of Vehicles	<ul style="list-style-type: none"> • A. Akbar Badusha , ARAI, • S.V.Suderson, M/s. Volvo India Ltd.
Type Approval & Conformity of Production	<ul style="list-style-type: none"> • A. Akbar Badusha, ARAI
Technical Specifications	<ul style="list-style-type: none"> • A. Akbar Badusha, ARAI

The sub-committee had about seven rounds of discussion on the subject to finalise the recommendations. Sufficient guidelines have been drawn from the European regulations on respective areas where ever they exist. The sincere efforts put in by the subject co-ordinators and all other experts in the making of this detailed document is greatly appreciated. This Code would give proper guidelines for the industry to follow and make necessary changes in design and construction of vehicles to improve safety on roads.

**Code of Practice for Construction and Approval of
Truck Cabs, Truck Bodies and Trailers**

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SECTION - 1.0
SCOPE AND DEFINITIONS
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1.1 SCOPE

- 1.1.1 The provision of the code shall be applicable to trucks of Gross Vehicle Weight (GVW) above 3.5 tonnes. The requirements shall not apply to the special purpose vehicles of the following categories as defined in CMVR, except in respect of those provisions, which are not compatible with the intended use and function of these vehicles.
- (i) Category N2
 - (ii) Category N3
 - (iii) Category T3
 - (iv) Category T4
- 1.1.2 The requirement of this code shall apply to the following types of truck bodies used in conjunction with the categories of trucks referred in Para 1.1.1.
- (i) Flat Bed or Full Open Body
 - (ii) Semi Open or Half Body
 - (iii) High Side Deck Body
 - (iv) Closed Body
 - (v) Bodies for Carrying ISO Tankers
 - (vi) Special Purpose Vehicles.
- 1.1.3 In respect of those provisions which are exclusively meant for the use and function of special purpose vehicles, the requirements shall be notified separately by the appropriate authorities.

1.2 DEFINITIONS

The definitions stated here shall apply only for this code. These are the definitions that may commonly apply to all the chapters of the code.

1.2.1 Vehicle and their Categories:

- 1.2.1.1 **“Articulated vehicle”** means a vehicle, which consists of two or more rigid sections, which articulate relative to each other, a coupling interconnects the super structures of truck and the trailer. The rigid sections are permanently connected and can only be separated by an operation involving facilities, which are normally found in a workshop.
- 1.2.1.2 **“Combination vehicle”** means motor truck or truck tractor coupled to one or more trailer including semi trailers.
- 1.2.1.3 **“Tractor”** means a motor vehicle designed primarily for drawing Truck trailers and constructed so as to carry part of the weight and load of a semi trailer.

1.2.2 **Chassis:**

- 1.2.2.1 **“Drive away chassis vehicle”** means the basic operating motor vehicle including engine, frame, and other essential structural and mechanical parts, but exclusive of cab and body or body and all appurtenances for the accommodation of driver, property or passengers, appliances, or equipment related to other than control.
- 1.2.2.2 **“Ladder type chassis”** means the chassis frame of the vehicle and is the main load-bearing element. The general construction of ladder frame consists of side long members and cross members. The side long members and cross members are connected with special gusset sections or pressed cross member sections. The junctions are riveted, bolted or welded.
- 1.2.2.3 **“Monocoque construction”** means a type of truck body structure where the cab, body and base frame are joined together either by welding or by other methods to form an integral structure. These structural elements may consist of pressed grid type of support elements and rectangular sections.
- 1.2.2.4 **“Cab & chassis”** means an incomplete vehicle, with a completed occupant compartment, that requires only the addition of cargo carrying and load bearing components to perform its intended functions.
- 1.2.2.5 **“Cowl & chassis”** means an incomplete vehicle, with the fitment of a front end structure with or without the windshield, that requires the building of the complete cab and the cargo carrying or load bearing components to perform its intended functions.
- 1.2.2.6 **“Truck body”** means the structure or fixture specially provided to contain, or support, the load to be transported on a motor truck or a trailer.

1.2.3 **Weights :**

- 1.2.3.1 **“Unladen kerb mass”** means mass of vehicle with cab and body, fitted with all electrical equipment & auxiliary equipments necessary for normal operation of the vehicle plus mass of the elements which the vehicle manufacturer provides as a standard or option equipment which shall be specified in list plus mass of the following elements
- a) lubricants
 - b) coolant (if needed)
 - c) fuel (tank filled at least 90% of capacity specified by manufacturer)
 - d) standard tool kit
 - e) standard spare parts
 - f) spare wheel and
 - g) fire extinguisher.
 - h) warning triangles
 - j) wheel chocks

- 1.2.3.2 **“Gross vehicle weight”** means technically permissible maximum weight declared by the manufacturer of the vehicle.
- 1.2.3.3 **“Gross combined vehicle weight”** means total weight of the truck and trailer or tractor and trailer or semi trailer with payload.
- 1.2.3.4 **“Weight distribution on truck”** means the distribution of the body and payload and the relationship with respect to the permissible load on the axles.
- 1.2.3.5 **“Cubic capacity”** means the usable internal load carrying space as related to closed bodies, van trailers ,bulk trailers, tank trailers, containers etc.
- 1.2.4 **Driver’s Cab and related areas :**
- 1.2.4.1 Cab designs are generally classified into following two types:
- 1.2.4.1.1 **“Cab over engine (COE) or forward control (FC) cab”** : This means a vehicle in which all or substantial part of its engine is located under the cab i.e. below driver and co-driver. Also in case of cab over engine vehicles, the steering system is positioned right at the front of the vehicle.
- 1.2.4.1.2 **“Cab behind engine (CBE) or normal control (NC) cab or conventional cab”** : In cab-behind-engine vehicles, the engine transmission assembly is mounted ahead of the cab..
- 1.2.4.2 **“Cab or driver compartment”** : The space intended for the driver's exclusive use and contains driver seat, steering wheel, controls, instruments and other devices necessary for driving or operating the vehicle. Different types of cabs are,
- 1.2.4.2.1 **“Short conventional cab”** : When compared to the normal conventional cab, the short conventional cab has a shortened hood and front fenders and the engine extends into the cab area.
- 1.2.4.2.2 **“Sleeper cab”** : Truck with a sleeping compartment in the cab and the cab is incorporating with the sleeper berth for the driver/co-driver.
- 1.2.4.2.3 **“Tilt cab”**: Vehicle designed with the engine beneath the cab and having provision for tilting the cab forward to provide easy access to the engine.
- 1.2.4.2.4 **“Cab to axle of the frame (CA)”**: The dimension from the back of the cab to the centerline of the rear axle. For the tandem axle trucks, the distance from back of the cab to the centerline of the tandem cylinder.
- 1.2.4.2.5 **“Cab to end of the frame (CE)”**: The dimension from the back of the cab to the rear of the standard frame.
- 1.2.4.2.6 **“Door”** means a sub system of a Truck cab body that permits boarding and alighting for the driver and crew members.

- 1.2.4.2.7 **“Window”** means an aperture in the side or rear of the truck cab to let in light / air.
- 1.2.4.2.8 **“A pillar”** means a structural member integrating the floor, waist rail (bottom of windscreens panel) and roof.
- 1.2.5 **Axle and Types:**
- 1.2.5.1 **“Axle”** for the purpose of defining a vehicular wheel arrangement may be composed of either:
- (i) One beam extending across the vehicle and mounting at each end either a single wheel, a pair of dual disc wheels, or a demountable rim type wheel with dual rims; or
 - (ii) Two separate and independently suspended beams located transversely across the vehicle and each mounting one of the aforementioned wheel arrangements. In either case, two single wheels or two dual wheel arrangements are considered the complement of any axle depending on whether single or dual tires are used.
- 1.2.5.2 **“Non-powered axle”** means an axle designed to support of the portion of the vehicle but does not transmit a driving force to the wheels.
- 1.2.5.3 **“Powered axle”** means an axle designed to support a portion of the vehicle weight and to transmit a driving torque / force to wheels.
- 1.2.5.4 **“Steering axle”** means an axle through which directional control of the vehicle is applied. A steering axle may be powered or non-powered.
- 1.2.5.5 **“Tandem axle”** means any group of two or more axles, any of which may be powered and / or steering which are attached one behind the other to the same vehicle and associated through a mechanism designed to provide a specific relationship between their loading.
- 1.2.6 **Axle configuration :**
(Figures indicate the number of load-bearing wheels times the number of driving wheels)
- 1.2.6.1 4x2 Tandem-axle truck with drive on one rear axle.
- 1.2.6.2 4x4 Tandem-axle truck with drive on two axles.
- 1.2.6.3 6x2 Tri-axle truck with drive on one rear axle.
- 1.2.6.4 6x2/4 Tri-axle truck with drive on one rear axle and one tag axle, with steered wheels in front of the driving axle.
- 1.2.6.5 6x2/4 Tri-axle truck with drive on one rear axle and one tag axle, with steered wheels behind the driving axle.
- 1.2.6.6 6x4 Tri-axle truck with drive on two rear axles.
- 1.2.6.7 6x6 Tri-axle truck with drive on three axles.

- 1.2.6.8 8x2 Four-axle truck with twin front axles and with drive on one rear axle.
- 1.2.6.9 8x2/4 Four-axle truck with drive on one rear axle and one tag axle, with steered wheels in front of the driving axle.
- 1.2.6.10 8x2/6 Four-axle truck with twin front axles and drive on one rear axle and one tag axle, with steered wheels behind the driving rear axle.
- 1.2.6.11 8x4 Four-axle truck with twin front axles and with drive on two rear axles.
- 1.2.6.12 8x8 Four-axle truck with drive on four axles.

1.2.7 Truck Trailer and Types :

- 1.2.7.1 **“Truck trailer”** means a vehicle with or without auxiliary motive power designed to be drawn by a motor truck or truck tractor.
- 1.2.7.2 **“Semi-trailer”** means a truck trailer equipped with one or more axles, and so constructed that the front end and a substantial part of its own weight and that of its load rest upon another vehicle.
- 1.2.7.3 **“Full trailer”** means a truck trailer constructed so that all its own weight and that of its load rest upon its own wheels.
- 1.2.7.4 **“Load dividing dolly”** is coupled between a Truck Tractor and semi-trailer to reduce the load imposed by the semi-trailer on the truck tractor. It is a truck trailer with one or more axles equipped with a fifth wheel, drawbar, and other parts necessary for its use.

- 1.2.7.5 **“Trailer converter dolly”** means a truck trailer with one or more axles equipped with a fifth wheel, a draw bar, and other parts necessary to convert a semi-trailer to a full trailer.

- 1.2.8 **Seats and their related areas :** All the related definitions for seats and their areas defined in AIS-023 shall be applicable.

1.2.9 Lighting and Illumination :

- 1.2.9.1 **“Cab lamp or courtesy lamp”** are lamps situated above the head of the driver lighting up the dash board area and inside of the cab. This is meant for operation while the vehicle is stationary. The cab lamp shall be capable of being operated only for a momentary duration while the vehicle is in motion.
- 1.2.9.2 **“Instrument lighting”** are lights that light up individual instruments. These can be connected to a single control through a rheostat or any other suitable means. By varying the control, the strength of the instrument lighting can be regulated by the driver while driving in the dark to avoid glare from instrument lighting.
- 1.2.9.3 **“Control unit lamps”** are similar to instrument lighting. However, these lamps illuminate individual controls discreetly to assist driver for identifying the controls.
- 1.2.9.3.1 **“Locker lamps”** are lamps to light up the inside of the locker when the door to the locker is opened, illuminating the interior of the locker.

- 1.2.9.4 **“Electrical distribution panel lamps”** are lamps meant to light up electrical distribution panel when the cover to the distribution center is opened for checking and maintenance purposes.
- 1.2.10 **Components of Body Structure :**
- 1.2.10.1 **“Cross bearers”** are structural members mounted on the chassis frame or to the long member through ‘U’ Bolts, gussets or out rigger brackets. The cross bearers transmit the body load to the chassis or to through the long member and also withstand the forces induced during the normal operation of the vehicle.
- 1.2.10.2 **“Vertical pillars”** (body pillar) are structural members that support the side structure are connected to the cross bearers through gussets. The side pillars transmit load to the cross bearers and also withstand the forces induced during the normal operation of the vehicle.
- 1.2.10.3 **“Long member”** are structural members that support the cross bearers and helps to transmit the load from cross bearers to the chassis.
- 1.2.10.4 **“U bolts”** are fasteners used for fastening the cross bearers to the chassis frame.
- 1.2.10.5 **“Outrigger”** Members are provided to transfer load of Body structure members. These are fixed to the chassis side members.
- 1.2.10.6 **“Rear gate(s) (Rear doors/tail gate)”** are structural members that are provided for protecting the load and also act as load bearing members to support the load. The rear doors also transmit load to the load and also withstand the forces induced during the normal operation
- 1.2.10.7 **“Head board (also called crash guard or front wall)”** are structural members that are provided for supporting the load and act as load bearing members. (Headboard, can be treated as part of the load restraint system)
- 1.2.10.8 **“Floor board”** (Platform) are structural members that are provided for supporting the load and act as load bearing members and are capable of withstanding a vertical forces acting on it during normal operation.
- 1.2.10.9 **“Side board”** (Side gates) are structural members that are provided for supporting the load and act as load bearing members and are capable of withstanding a horizontal forces(Side thrust) induced on it during normal operation. Side boards also transmit roof load in case of closed body or containers.
- 1.2.10.10 **“Bolster”** Rigid support base commonly used to support logs.
- 1.2.10.11 **“Blocking”** Material, usually timber, placed between the load and the vehicle structure, used to prevent movement of the load. (Also Baulking - “blocking”)
- 1.2.10.12 **“Chocks”** Blocks, normally wedge shaped, used to prevent movement of the truck wheels.
- 1.2.10.13 **“Dunnage”** Packing placed between the base of the load and the surface of the vehicle’s load platform. See also “**blocking**”.
- 1.2.10.14 **“Frail”** A frame for holding sheets of glass during transport.

- 1.2.10.15 **“Lashings”** Fastening devices, chains, cables, ropes or webbing used to restrain loads.
- 1.2.10.16 **“Load binder”** A device fitted to a chain or lashing used to tighten (tension) the restraint. An over-centre locking action is incorporated.
- 1.2.10.18 **“Shackle”** A metal coupling link closed by a bolt, which can be used for connecting chains to anchor points. The two principal shapes are “D” and “bow”.
- 1.2.10.19 **“Shoring bar”** Metal or wooden load-carrying beam or fabricated truss section used to restrain or transmit a load from one frame, column, post, wall or bearing point to another. It may be adjustable and also can be known as a shoring pole.
- 1.2.10.20 **“Thimble”** A metal liner, usually pear-shaped and concave on the outside which is fitted into the eye of a rope to prevent chafing and to distribute the load.
- 1.2.10.21 **“Turnbuckle”** A type of coupling fitted between the ends of a lashing or between two lashings used primarily for adjusting or regulating the tension in lashings. It consists of a loop or sleeve with a screw thread on one end and a swivel at the other. Alternatively, it has an internal screw thread at each end.
- 1.2.10.22 **“Twist lock”** A locking device designed to fasten containers to the vehicle on which they are being transported.
- 1.2.10.23 **“Crew members”** means any person(s) assigned to support the operation of the vehicle.

Note : In case if any of the above mentioned definitions are at variance with the notified definitions under Central Motor Vehicle Rules, 1989, the later shall be considered to have the final standing for all technical and administrative purposes.

SECTION - 2.0

TRUCK CAB REQUIREMENTS

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2.1 General requirements of truck cab design :

- 2.1.1 **Overall dimensions :** The overall dimensions of the truck cab shall comply with the provisions laid down in Rule 93 of the Central Motor Vehicle Rules, 1989 as amended from time to time.
- 2.1.2 **External projections :** The cab shall comply with the external projection requirements as per IS 13942:1994, as laid down in Rule 124 of the Central Motor Vehicles Rules, 1989, as amended from time to time.
- 2.1.3 **Driver door :**
- 2.1.3.1 All truck cabs shall be provided with minimum two entries one for the driver and one for the co-passenger, on either sides of vehicle.
- 2.1.3.2 The driver and co-passenger doors shall be hinged from A-Pillar.
- 2.1.3.3 All doors shall be hinged at the front and shall open minimum by 65° . An opening of 800mm minimum must be available from 'B'-Pillar, in the fully open condition.
- 2.1.3.4 The minimum height of the door aperture (clear opening) measured from floor to the top shall not be less than 1050 mm. In case of floor with hump, the minimum height shall be measured as clear max opening. (Refer Q in Figure - 2).
- 2.1.3.5 The minimum width of the door aperture measured from A Pillar to B Pillar shall be 800 mm. (Refer P in Figure - 2)
- 2.1.4 **Climb facility :** The requirements of Climb facility are as given in the table under Figure-3.
- 2.1.4.1 The maximum height (a) from ground to top surface of first step shall be 550 mm measured on vehicle in unladen condition. However, in case of off- road vehicles this dimension shall not be more than 700mm.
- 2.1.4.2 The vertical distance (b) between top surface of subsequent steps shall not be more than 400mm. The vertical distance between two subsequent steps shall not vary by more than 50 mm. The last requirement shall not apply to the distance between the uppermost step and the cab floor. For off-road vehicles, this latter value may be increased up to 100 mm and the dimension (b) shall not be more than 500 mm.
- 2.1.4.3 The lowest step may be designed as a rung, if this is necessary for reasons relating to construction or use, and in the case of off road vehicles. The rung, thickness (t) shall be at least 20 mm. Rungs of round cross section are not permitted.
- 2.1.4.4 In addition, the following geometrical specifications shall be fulfilled:
 - Minimum step width (f) shall be 200 mm.
 - Minimum step width (g) for lower step shall be 100mm
 - Minimum step depth (d) shall be 80 mm.
 - Minimum step clearance including step depth (e) shall be 150 mm
 - Minimum height of uppermost step to floor (s) shall be 120 mm

- 2.1.4.5 Other requirements shall be as per the table under Figure - 3.
- 2.1.4.6 Steps need be provided with anti-slip surface, as per the relevant AIS as and when notified. In addition, steps exposed to weather and dirt during driving shall have adequate run off (draining surface).
- 2.1.5 **Hand holds :**
- 2.1.5.1 The handhold requirements shall comply with AIS-046 as amended from time to time.
- 2.1.5.2 Figure - 3 may be referred for guidelines.
- 2.1.6 **Window on cab door :**
- 2.1.6.1 The window panes shall be winding type for all trucks.
- 2.1.6.2 The minimum width of the window aperture (clear vision zone) shall be 450 mm. (Refer R in Figure - 2).
- 2.1.6.3 The minimum height of the window aperture (clear vision zone) shall be 400 mm. (Refer S in Figure - 2)
- 2.1.7 **Driver seat / Co-occupant Seat :** Driver / Co-driver seat shall comply with the requirements specified in AIS-023-“Automotive Vehicles – Seats, their Anchorages and Head Restraints”.
- 2.1.8 **Safety belt assemblies and anchorages :** Safety belt assemblies and anchorages shall comply with the requirements laid in AIS-005 and AIS-015 respectively.
- 2.1.9 **Sleeper berth :**
- 2.1.9.1 The sleeper berth (wherever provided) shall be located within the cab. No sleeper berth shall be permitted in the cargo area.
- 2.1.9.2 The sleeper berth shall be so constructed as to provide minimum length of 1750 mm measured along the center line of the longitudinal axis of the berth. Figure - 2 of the section may be referred.
- 2.1.9.3 The sleeper berth shall have minimum width of 500 mm at least over the length of 1200 mm and 400 mm for the remainder. (Refer K in Figure -2).
- 2.1.9.4 The edges of the berth may be rounded to radii not exceeding 270 mm.
- 2.1.9.5 In case twin berth have been one above the other, the minimum pitch between the two berths (measured from top face of the lower berth with uncompressed cushion and lower face of the upper berth) shall be as follows (Refer J in Figure-2) –

In case the upper berth is folding type - 490 mm

In case the upper berth is fixed type - 770 mm

- 2.1.9.6 The minimum distance between the roof and the upper berth, measured from top face of the berth with uncompressed cushion shall be 490 mm. Refer ‘I’ and ‘J’ in Figure - 2.
- 2.1.10 **Mudguards / Spray suppression devices :** The tyres of motor vehicles shall be enveloped with effective mudguards. The mudguards may be mounted on cab Floor or sides or any part of the chassis frame. In addition, the vehicles shall be fitted with spray suppression devices in accordance with AIS-013, relevant for the categories of vehicles specified therein.
- 2.1.11 **Driver’s work area :**
- 2.1.11.1 **Reference system for dimensions :** The intersection point (co-ordinate origin) of all the three planes corresponds to the vehicle projected at the heel point of the accelerator pedal. Figure 1 may be referred.
- 2.1.11.2 **Heel point :** Heel point shall be located at a minimum distance of 300 mm from the inner face of the bulkhead. (Refer ‘Z’ in Figure-2)
- 2.1.11.3 **Reference point :** The “H” Point (Reference Point) shall be specified by the chassis manufacturer. The minimum distance of driver partition from the driver seat shall be 15 mm from the rearmost point of the driver seat in its rearmost position with seat back reclined backwards to an angle of 12 degrees. The minimum distance from H – point to roof top measured along the backrest at 12 degree angle shall be 900 mm.(Refer ‘Y’ in Figure-2)
- 2.1.12 **Steering wheel :** The chassis manufacturer shall specify the position of the steering wheel with reference to the heel point. An adjustment range of minimum 60mm shall be provided for the thigh clearance (i.e. the vertical distance measured between the top of seat cushion and bottom of the steering wheel – Refer ‘W’ in Figure - 2). This may be provided by way of adjustment in Seat Position or Steering Wheel position or combination of both. A minimum thigh clearance of 170mm shall be achievable in the adjustment range provided. The minimum distance of lower end of steering wheel from driver seat back shall be 265 mm. (Refer ‘‘’ in Figure - 2)
- 2.1.13 **Placement of instrument panel :** The placement of instrument panel shall be such that the primary instruments and controls are visible unobstructed while viewed from the driver seat. A view of driver information layout is shown in Figure- 4 for reference. The instrument panel shall be non-metallic, fire resistant, energy absorbing material and so constructed that in the event of a collision it shall cause minimum injury to the driver.
- 2.1.14 **Position of controls :** The position of the controls such as accelerator, clutch, gear lever, service brake, parking brake etc. shall be specified by the vehicle manufacturer and should not be altered by the body builder.
- 2.1.15 **Stowage Space :** Storage space, for keeping driver/ co-passenger personal belongings and utility items like tarpaulin, manila rope, assorted tools etc. may be provided in any part of the vehicle or load body. A safe box / cash box may be provided within the cab area for keeping cash and other vehicle related documents. Space for tools and emergency repair items / spare parts may be provided within the Cab.

- 2.1.16 **First aid box :** First Aid kit containing items notified under Rule 138(4) (d) of Central Motor Vehicle Rules, 1989 shall be provided in the truck cab.
- 2.1.17 **Heating, cooling and ventilation for driver :** The driver's work area shall be provided with blowers / ventilators or other suitable devices to ensure proper climate control. The cab shall meet the requirements specified in AIS-056.
- 2.2 **Truck Cab – Technical and safety requirements :**
- 2.2.1 **Truck cab structural strength :** The truck cab shall meet the requirement of survival space as per AIS-029 as amended from time to time. In the case of non-OE built cabs, local body builders shall use type approved cab designs and / or parts only.
- 2.2.2 **Front under - run protective devices (FUPD) :** The front under-run protective devices fitted on the vehicles shall be in accordance with AIS-069 as amended from time to time and as notified under Central Motor Vehicle Rules, 1989.
- 2.2.3 **Cab mounting arrangement and strength requirements :** The mounting arrangement for cab shall ensure adequate rigidity of cab with chassis. For mountings, use shall be made of round holes and suitable bolts with the least possible play, at least at the foremost and rearmost attachment points. The mountings shall ensure adequate resistance against lateral / transverse movement of cab in case of braking or sudden acceleration or while driving on slopes. The cab mountings shall be of shock and vibration dampening type. The joint between the cab and chassis frame shall be provided with rubber cushions or any suitable arrangement. Self-locking fasteners may be used to prevent loosening due to vibrations. The fasteners used must be of suitable strength and shall ensure safety of cab against vibrations due to road irregularities.
- 2.2.3.1 **Fixed cabs :** The cab mountings shall be supported with rubber cushions and/or leaf spring with adequate lateral and longitudinal stiffness. When "U" bolts are employed to secure the cab to the chassis frame, spacers / stiffeners shall be used between the flanges of side-members to prevent buckling.
- 2.2.3.2 **Tiltable cabs - Tilting mechanism, Locking requirements :** Suitable locking arrangement shall be provided to hold the cab in the tilted condition. The provision shall have stopper along with locking arrangement, which can be disengaged with manual intervention only. The stopper shall be able to hold the weight of loaded cab with adequate safety margin. In case where the effort required to lift the cab is high, suitable arrangements shall be provided to assist the lifting. Additional assistance may be provided through hydraulic or mechanical means or any such suitable arrangement. In the case of locally built cabs, OE approved designs and parts shall be used or else the locally developed designs shall be type approved by the authorised agency. Vehicle manufacturer shall provide details of recommended practices for cab mounting including list of approved parts. In any of these cases, no part of chassis shall be altered so as to affect its stability or any other safety aspects including wiring harness, brake circuits etc.

2.2.4 Protection of occupants in the event of lateral collision :

2.2.4.1 Doors : The doors shall be hinged at “A” Pillar. The door hinges, in case of hinged doors and locking mechanism shall be type approved by authorised agencies. The structure of the door shall be able to withstand distortion due to forces induced during its operation and the operability of door components critical to the removal of the driver and co-driver after an accident, shall be ensured. The external side of the door shall not have any projection and the hinges and door handles shall be recessed. Door shall be fitted with weather resistant rubber material like EPDM rubber seals of suitable design to avoid dust and water ingress.

2.2.4.2 Vehicle seats - design and strength requirements : All seat designs and seat anchorage designs shall meet the requirements of standard AIS-023 as amended from time to time. All seat designs shall be type approved as per AIS-023. No part of the seat or seat anchorage, shall be altered by the local body builder , whenever cabs are made outside the control of the vehicle manufacturer.

2.2.4.3 Cab construction material : Wood shall not be permitted to be used in the cab construction until and unless no other suitable material is available. Composite materials that meet the functional requirements may be used.

2.2.4.4 Panels (exterior and interior) : The exterior and interior panel surfaces of cab shall be protected against corrosion. If suitable material is not available then the surfaces shall be coated with corrosion preventing paint.

2.2.4.5 Roof luggage carrier : No luggage shall be permitted to be carried on the roof of the cab. If any provision is to be made, the mounting of the same shall not be provided on the cab. If, for any reason the luggage carrier is made on cab roof, it shall not rest on the roof. It shall be supported on channels that get linked to the “A” and “B” pillars. Any such structure shall meet the following strength requirements.

- Uniformly distributed static load of 150 kgf / m²
- Inertia forces equivalent of 2.5 g.
- Shear force equivalent to 1.5 g.

Further, the maximum load capacity of such a stowage space shall be specified on a plate fitted outside the stowage space. At any point of time, load shall not be transferred to the cab.

2.2.5 Cab mountings for tilting type cabs :

2.2.5.1 Cab in raised position : The cab shall be capable of being held in the raised position either automatically or by means of a retaining device.

2.2.6 Lighting and signaling devices : The lighting and signaling devices on the truck cab shall meet the requirements specified in AIS-008 and as amended from time to time. Only type approved parts or recommended parts and Installation shall be used when the cab is made by local body builders.

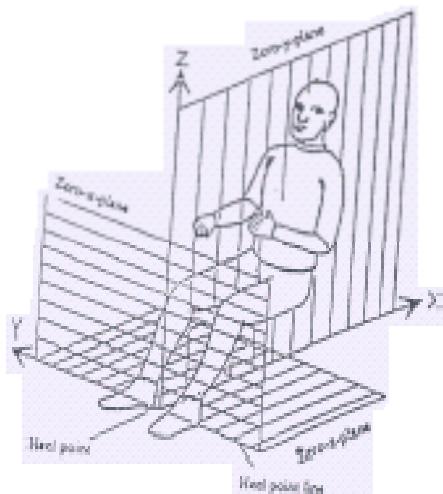
2.2.7 Rear view mirrors : The rear view mirrors shall be provided and shall meet the requirements specified in AIS-001 and AIS-002 as amended from time to time.

- 2.2.7.1 **Interior rear view mirror :** The location, make, type and size of the interior rear view mirror, if fitted, shall be the one which is approved by the test agency.
- 2.2.8 **Driver's work area :** No part of the vehicle's fixed components shall intrude into the Driver's Work Area.
- 2.2.9 **Door locks and hinges :** Door components such as door locks and hinges shall meet the requirements specified in IS : 14225-1995, under Rule 124 of the Central Motor Vehicles Rules, 1989, as amended from time to time.
- 2.2.10 **Window :**
- 2.2.10.1 **Window type :** Cab windows on doors shall be of winding type. Other windows may be sliding type, fixed type or with partial opening type.
- 2.2.10.2 **Window glass :** The window glass shall be made of safety glass as specified in IS : 2553 (Part 2) and shall readily break on impact (such as a stroke of a hammer) in the event of an accident.
- 2.2.10.3 **Thickness of glass :** The minimum glass thickness shall be 3.5 mm for windows.
- 2.2.10.4 **Edges of glazing :** The edge shall be crown edge, satin finish for all the exposed edges that is likely to come in touch with the person's body. This edge specification corresponds to Edge No. 1 specified in SAE J673.
- 2.2.10.5 **Window frames for other than door windows :** The glazing may be mounted on frame; constructed from aluminum extrusions or formed steel / coated sections. Alternately directly, sliding on flocked rubber channels supported by aluminum/steel section. The window frames shall be mounted such that distortions and change of aperture dimensions due to forces on the structure does not deform the guide way. The window glass/glass and frame shall slide smoothly when subjected to normal pull force (50 to 75N). The window frame shall be attached to the structure by weather strips or bonded with adhesive or any other suitable method. The mounting shall meet requirement specified in IS : 13944- 1995 - Window retention and release system for safety Requirement. The window frame glazing and accessories shall meet the performance and durability requirements specified in AIS-068 standard as and when notified.
- 2.2.11 **Ingress of dust and rain water :** All doors, windows and hatches shall not allow ingress of dust and rain water when in the fully closed position, when tested in accordance to IS : 11739 – 1997 as amended from time to time, for recording dust ingress in automotive vehicles, and when tested in accordance to IS: 11865 – 1997 as amended from time to time, for water proofing test for automobiles. Drain holes shall be provided in the window frame such that water shall flow outward and does not flow into the structure cavity or into the passenger compartment.
- 2.2.12 **Wind screen and wind screen wiping system :** Wind Screen to be made of laminated glass meeting the requirements stated in Indian Standard IS 2553: 1992. Wind screen must be provided with windscreen washing and wiping system. The wind screen wiping system shall meet the requirements specified in AIS-011 as amended from time to time. Windscreen de-frosting and de-misting systems is optional and must meet the requirements specified in AIS-084 as amended from time to time and as an when notified under the Central Motor vehicles Rules, 1989.

- 2.2.13 **Fire extinguishers :** The vehicle shall be equipped with one or more fire extinguishers, one being near to the driver's seat. Provision of at least one fire extinguisher shall be compulsory for all kind of trucks. Special provisions should be made for the trucks carrying explosive materials. Halogenated hydrocarbon type of extinguisher shall not be used as extinguishant. The fire extinguishers shall be secured against tampering and shall be easily accessible to incumbent. Also the location shall be marked clearly.
- 2.2.14 **Guidelines for corrosion protection :** The quality of the surface treatment shall be tested according to the test methods specified in JIS:D0202 or equivalent Indian standards. The minimum quality requirements in table below may be met for test criteria specified in Para. 9 of JIS D0202.

Item		Quality		
Surface Condition –Appearance		There must be no surface roughness, pin holes or other harmful defects.		
Corrosion Resistance	Iron Phosphate treatment	72 (Hrs)		
	Zinc Phosphate treatment	96 (Hrs)		
Water and moisture Resistance	Iron Phosphate treatment	36 (Hrs)		
	Zinc Phosphate treatment	48 (Hrs)		
Oil Resistance (40 Deg. 24 hrs)h		No swelling, flaking, peeling, cracking, film softening nor appreciable change in lustre or colour		
Volatile Oil Resistance (Gasoline) (24 hrs)		No swelling, flaking, peeling, cracking, film softening nor appreciable change in lustre or colour		
Pencil Scratch Test		Shall resist HB or Harder		
Checker Mark : No of sections in which film remains intact (without peeling off) Grade 3 shall apply only to Copper and copper alloy bases, Aluminum and aluminum alloy bases and Zinc and Zinc alloy bases		Grade 1	Grade 2	Grade 3
		100	90 or more	60 or more

REFERENCE SYSTEM FOR DIMENSIONS

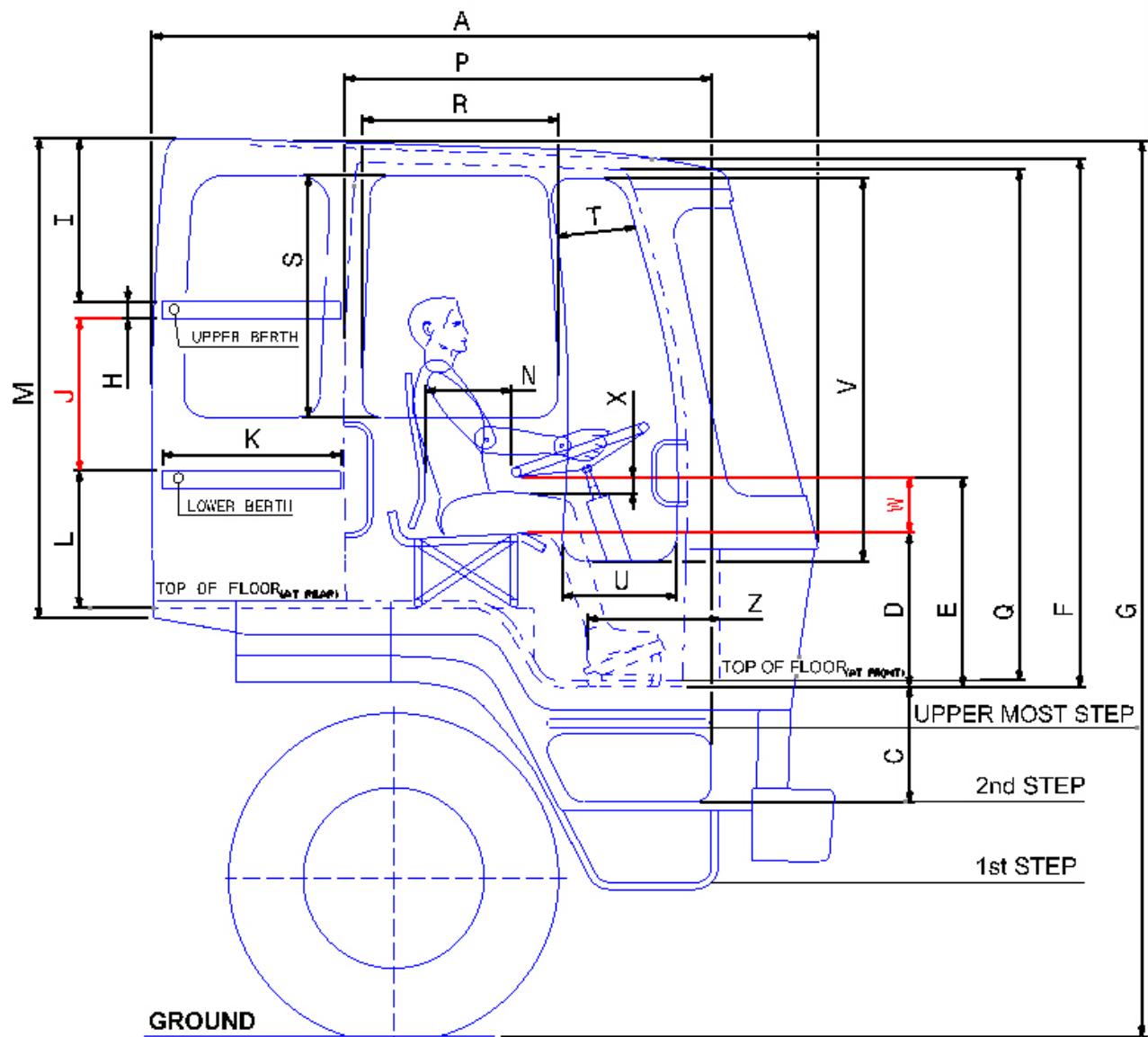


- ZERO-X PLANE, LONGITUDINAL TO THE VEHICLE
- ZERO-Y PLANE, TRANSVERSE TO THE VEHICLE
- ZERO-ZPLANE, VERTICLE TO THE VEHICEL

The intersection point (coordinate origin) of all three plane corresponds to the vehicle projected of the heel point at the accelerator pedal. This is replaced at heel-point.

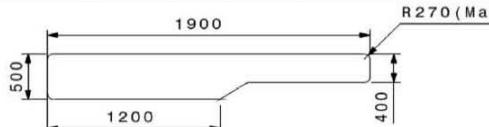
Figure - 1

Reference System for Dimensions

**FIGURE No -2**

Driver's Work Area and Sleeper Berth requirements in Vehicle Unladen Condition

(Refer Annexure-I, clause 17.0 and the Table on next page.)

Driver's Work Area and Sleeper Berth Requirements (In Unladen Condition)			
S.NO	Details of CAB Specifications	SYMBOL (Ref. Fig 2)	VALUE ON-ROAD VEHICLES
1	Overall Length of the CAB, mm	A	*
2	Height of floor from top of 2nd Foot Step	C	
3	Distance from Top of Floor to the Top of cushion of Driver's seat, mm (cushion Uncompressed)	D	
4	Distance from Top of the floor to the bottom of the steering wheel, mm	E	
5	Distance from Top of floor to the Roof Inner, mm	F	
6	Height of the CAB from ground, mm	G	
7	Thickness of the berth, mm	H	
8	Distance between the top of Upper Berth cushion to Roof Inner, mm (Min)	I	490
9	Distance between top of lower berth (Cushion Uncompressed) to Bottom of Upper Berth	J	490
10	Berth width, mm	K	400-500 (500 for at least 1200 length)
			
11	Height of Lower Berth from top of Floor at rear, mm (Cushion Uncompressed)	L	*
12	Height of CAB at Rear, mm	M	
13	Distance between Back Rest of Driver Seat (At Maximum Thickness) to Edge of Steering Wheel	N	265 Min
14	Width of the door (Min)	P	800
15	Height of door, mm (Min)	Q	1050
16	Width of Window, mm (Min)	R	450
17	Height of window, mm (Min)	S	400
18	Width of observation window (On Door) at top, mm	T	*
19	Width of observation window (On Door) at bottom, mm	U	
20	Height of observation Glass, mm	V	
21	Minimum Length of the sleeper berth measured from the longitudinal axis of the berth (Left to Right), mm	----	1750
22	Thigh clearance for the driver-The vertical distance measured from top of the seat cushion of the driver's seat the bottom of the steering Wheel, mm	W (E-D)	170(max) (Considering adjustment range of min 60mm)
23	Heel point -Minimum distance from the inner face of the bulk head, mm	Z	300
24	Adjustment range for the thigh clearance, mm	X	60 (Min)
Notes-	*These dimensions are Design Specific varies with Manufacturer		

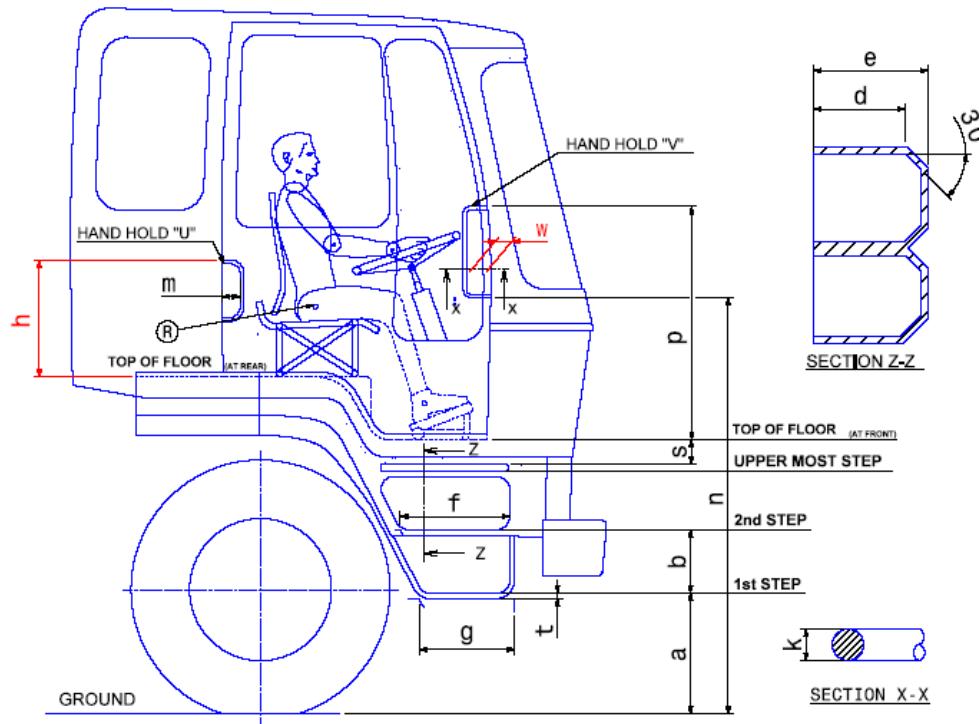


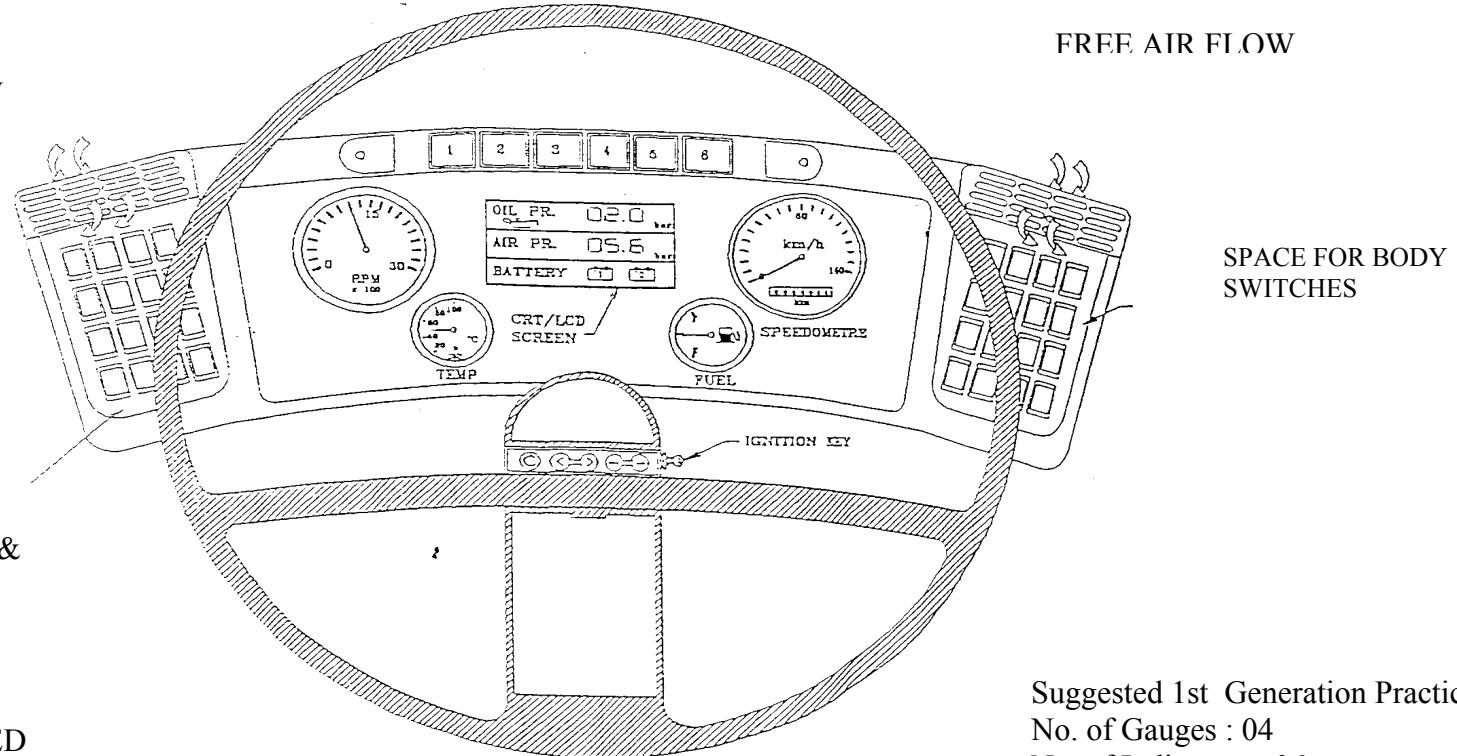
Figure 3

Requirements on climb facility and hand holds (in unladen condition)

S.No	Description	Symbol	Value for on-road vehicles	Value for off -road vehicles
1	Maximum height from ground to surface of first step, mm	a	550	700
2	Maximum vertical distance between top surface of subsequent steps, mm	b	400	500
3	Minimum step depth, mm	d	80	80
4	Minimum step clearance including step depth, mm	e	150	150
5	Minimum step width (other than first step) , mm	f	200	200
6	Minimum step width for lower step, mm	g	100
7	Reference point specified by chassis manufacturer (SGRP) , mm	r
8	Cross section of handle, mm	k	20 Min and 38 Max	
9	Hand clearance to the mounting surface (i.e, the gap for inserting palm) for grab handle on "B pillar", mm	m	30 Min	30 Min
10	Hand clearance to the mounting surface (i.e, the gap for inserting palm) for grab handle on "A pillar", mm	w	30 Min	30 Min
11	First hand hold/ hand rail height from ground level (max) , mm	n	1850	1950
12	Maximum height of the grab handle at Rear-"Hold-U" from bottom of rear floor (B pillar side) , mm	h	650	650
13	Maximum height of the grab handle to floor bottom at front (for hand "Hold-V") (A pillar side) , mm	p	550	550
14	Minimum thickness of the foot step, mm	t	20	20
15	Minimum height of the upper most step to floor, mm	s	120	120

**1ST GENERATION
DRIVER INFORMATION MANAGEMENT SYSTEM**

FREE AIR FLOW



1. LOW PRESSURE, RED
2. EXHAUST BRAKE ON, RED
3. PARKING BRAKE, RED
4. DRAIN FUEL WATER SEPARATOR, AMBER
5. HAZARD WARNING
6. ANY OTHER REQUIRED AS PER APPLICATION

Figure-4

Suggested 1st Generation Practices
 No. of Gauges : 04
 No. of Indicators : 06
 No. of Switches : AS REQUIRED
 For chassis, internal /external lighting and A.C. controls.

SECTION - 3.0
TRUCK LOAD BODY –
GENERAL, TECHNICAL AND SAFETY REQUIREMENTS

LIST OF CONTENTS

- 3.1 Categorisation of Truck Load Bodies
- 3.2 General Requirements
 - 3.2.1 Overall Dimensions
 - 3.2.2 Cab and Body gap
 - 3.2.3 Stowage Space/ Luggage Carrier
 - 3.2.4 Mudguards / Spray Suppression Devices
 - 3.2.5 Rope Hooks and other Provisions
- 3.3 Technical Requirements
 - 3.3.1 Truck Body Stability
 - 3.3.2 Mounting of the Body or Load Platform of Commercial Vehicles
 - 3.3.3 Body Construction requirements
- 3.4 Safety Requirements
 - 3.4.1 Protection of the Occupants of Goods-carrying Power-driven Vehicles against the Shifting of Loads
 - 3.4.2 Securing the Load on the Load body
 - 3.4.3 External Projection
 - 3.4.4 Lighting and Signalling
 - 3.4.5 Retro-Reflective Markings for Heavy and Long Vehicles
 - 3.4.6 Lateral Protection
 - 3.4.7 Rear Under run Protection
 - 3.4.8 Modification of Chassis and / or Chassis related Components
 - 3.4.9 Corrosion Protection
 - 3.4.10 Closed Type Bodies

3.1 Categorization of truck load bodies :

The trucks are categorized on the basis of design namely rigid axle vehicles and tractor trailer combination. Trucks are further sub-categorized on the basis of truck body construction like the following.

HSD – High Side Deck body
 FSD – Fixed Side Deck or Half body
 DSD – Drop Side Deck body
 FB – Flat Bed or Fully open body
 CLB – Closed Body
 ALC – Aluminium Container
 STC – Steel container
 SPB – Special Purpose Body

3.2 General requirements :

3.2.1 Overall dimensions : The overall dimensions of the load body shall comply with the provisions laid down in Rule 93 of the Central Motor Vehicle Rules, 1989 as amended from time to time.

3.2.2 Cab and body gap : Clearances / gaps as recommended by vehicle manufacturer should be ensured in respect of tyre, wheel arch, fuel / oil checking and filling, cab (where applicable). In the case of separate cab and load body, the body shall be separated from cab by at-least 50mm behind as shown in Figure -4. The gap may be covered with gap seal for better aerodynamics.

3.2.3 Stowage space / luggage carrier: Storage space for keeping utility items like tarpaulin, manila rope, assorted tools etc. may be provided in any part of the vehicle or load body. If the same is provided over the load body, it shall meet the following requirements:

- Uniformly distributed static load of 150 kg/m^2
- Inertia forces equivalent of 2.5 g.
- Shear force equivalent to 1.5g.

Further, the maximum load capacity of such a stowage space shall be specified on a plate fitted outside the stowage space.

3.2.4 Mudguards / Spray suppression devices : The tyres of motor vehicles shall be enveloped with effective mudguards. The mudguards may be mounted on body floor or any part of the chassis frame. Non-rigid flap (metallic or non-metallic) shall be provided at rear of mudguards to prevent splashing of water, dust or muck over the vehicles coming from behind. In addition, the vehicles shall be fitted with spray suppression devices in accordance with AIS-013, relevant for the categories of vehicles specified therein.

3.2.5 Rope hooks and other provisions : The load bodies shall be so constructed to allow use of covers, wherever required. Rope hooks or any such feature may be provided on sides, front, rear or base of the load body to facilitate spreading and fastening of covers over the body. Sufficient space must be provided on sides of body to depict vehicle related details as specified by National or State Transport Rules.

3.3 **Technical requirements :**

3.3.1 **Working stability :** The vehicles meant for carrying dangerous and / or hazardous goods shall meet the working stability requirements stated in Section -8 of this Code.

3.3.2 **Mounting of the body or load platform of commercial vehicles :**

3.3.2.1 The mounting arrangement for load body shall ensure adequate rigidity of body with the chassis.

3.3.2.2 The mountings shall ensure adequate resistance against lateral / transverse movement of load body in case of braking or sudden acceleration or cornering or while driving on slopes. The recommendations of the OEM's shall be taken as guidelines.

3.3.2.3 For mountings, use shall be made of round holes and suitable bolts with the least possible play, at least at the foremost and rearmost attachment points.

3.3.2.4 Suitable compressible packing (such as rubberised ballatta duck, or wood) may be used between the chassis and body frame. Thickness of such packing shall be selected to ensure uniform load distribution over chassis frame even in case of minor waviness or twist in the chassis frame / sub-frame.

3.3.2.5 The sub-frame shall be mounted on chassis by means of attachment plates or outrigger brackets or directly on chassis to prevent longitudinal movement of load body in case of braking and sudden acceleration as shown in Figure – 1. Wherever, the U-bolts are used for clamping (in addition to positive mountings as stated above), they shall be used in conjunction with stiffeners to prevent chassis frame from buckling, as shown in Figure – 2.

3.3.2.6 In case of load bodies not made by OEM or as per OEM designs, the mounting arrangement for the load body or platforms shall be as per recommendations provided by the vehicle manufacturers. Details of recommended practices for load body mounting including list of approved parts to be provided by vehicle manufacturer. OE developed and type approved designs may be used by local body builders.

3.3.3 **Body construction requirements :**

3.3.3.1 In constructing the body or load platform, all practicable steps shall be taken to keep the centre of gravity of the vehicle as low as possible.

3.3.3.2 The construction of the body or load platform shall be such as not to impair the soundness and functioning of the wiring and braking circuits.

3.3.3.3 The load body shall be constructed over a sub-frame to distribute the load evenly on the chassis frame and also to create gap between body and tyre / chassis for wheel articulation.

3.3.3.4 The material used for sub-frame construction shall be steel or aluminum alloy or any composite material with adequate strength to bear impact loads.

3.3.3.5 The sub-frame shall be angled, curved or forked in the front as shown in Figure-5.

- 3.3.3.6 The sub-frame shall be mounted on chassis by means of attachment plates or outrigger brackets or directly on chassis to prevent longitudinal movement of load body in case of braking and sudden acceleration. The number and size of hardware used for attaching shall be determined by the payload carried on the vehicle. Self-locking or "Anti-vibration" hardware shall be used for fastening. Some other typical arrangements for mounting the sub-frame and the recommendatory guidelines are as shown in Figure - 6 to Figure -11.
- 3.3.3.7 The floor, head board (also called crash guard or front wall) and side walls are the main load bearing elements of the body. The floor shall be rigidly supported on the sub-frame. The section of floor and floor supports in the sub-frame shall be pitched / spaced to achieve distributed loads even in case of concentrated loads such as steel coils or fork lifts etc.
- 3.3.3.8 The side walls and crash guard shall be constructed to bear a part of load carried on the vehicle in case of braking, turning, travel on slopes etc. as given below, which can also be proved by FEM analysis.
- Side walls : 30 % of load carried
 - Crash guard or head board : 100 % of load carried
 - Rear wall or tail gate : 30% of load carried
- 3.3.3.9 Where the cab and bodywork are integral, account shall be taken of the flexibility of the cab mounting.
- 3.3.3.10 In the case of tank-vehicles, where outrigger brackets are used to fasten the tank to the chassis of the vehicle, the vertical face of the brackets shall not be less in height than the depth of the chassis frame to which they are attached.
- 3.3.3.11 In the case of tipping vehicles, where there is no supplementary under-frame, to distribute the load, the pivot brackets for rearward tipping bodies shall be located as near as possible to the rear spring brackets to minimize additional bending stresses on the chassis frame during tipping.
- 3.3.3.12 In the case of bodies tipping rearwards only, guide plates shall be provided to control the lateral movement of the body when lowered onto the chassis frame.
- 3.3.3.13 In the case of tipping bodies, steps shall be taken to prevent excessive noise caused by the bodywork of the vehicle when it is unladen.

3.4 Safety requirements :

- 3.4.1 Protection of the occupants of goods-carrying power-driven vehicles against the shifting of loads :
- 3.4.1.1 The equipment of vehicles shall be in conformity with provisions calculated to reduce the risks run by the driver and the other occupants of goods-carrying vehicles in the event of a forward shift of the load on sudden braking.
- 3.4.1.2 The occupants of such a vehicle shall be protected by a screen or headboard capable of withstanding without breaking, a uniformly distributed static force of 200 kgf per ton of the vehicle's permissible useful load. This load shall be applied by means of a rigid

barrier perpendicular to the longitudinal median axis of the vehicle, covering at least the whole of the cab rear wall situated above the chassis frame, and moving parallel to that axis. This shall be in accordance with the requirements specified in AIS-029.

- 3.4.1.3 This protective screen or headboard may be detachable. It must meet the following requirements:
 - 3.4.1.3.1 It's width (measured at right angles to the longitudinal median axis of the vehicle) must be at least equal to the width of the space provided for the occupants and where there is a separate cab, at least equal to the width of the cab.
 - 3.4.1.3.2 In height, it must match at least 800 mm above the level of the loading platform where there is a separate cab, or be of the same overall height as the load compartment where there is no separate cab.
 - 3.4.1.3.3 It must be secured directly to the chassis or to the front of the loading platform.
 - 3.4.1.3.4 If it is secured to the loading platform or, where appropriate, to the body, the anchorage of that platform to the chassis must be capable of withstanding the thrust transmitted.
 - 3.4.1.3.5 In cases where the cab is integral with the body, the protective screen or headboard may be secured to, or form part of, the body structure.
 - 3.4.1.3.6 Where a power-driven vehicle or a semi-trailer is designed to carry beams, pipes, girders, sheet metal or similar loads, the protective screen or headboard must have a resistance at least equal to that of steel plate not less than 3 mm thick.
 - 3.4.1.3.7 Where a vehicle is equipped with a trestle or bolster behind the cab for the purpose of supporting long loads, such as steel girders or telegraphic poles, the trestle or bolster must be capable of withstanding the combined effect of two forces, each of 600 daN per ton of permissible load, acting forwards and downwards on the top of the trestle.
 - 3.4.1.3.8 This rule shall not apply to tank-lorries and special-purpose vehicles for the carriage of containers, or to special-purpose vehicles for the carriage of indivisible objects, where the latter vehicles and their operation are subject to special regulations

- 3.4.2 **Securing the load on the load body :** The friction between the load body and the load is not sufficient to prevent movement of load in case of braking, sudden acceleration and during cornering. In fact higher the load, the greater are the chances of shifting of load. It is therefore essential to provide positive lashing of goods being carried in the load body. The body manufacturer shall provide provision for lashing by means of ropes, chains etc. The rope hooks provided below the loading platform shall be considered as anchorage for lashing provided the same are type approved to carry a load of at-least 500 kg. Each anchorage on the body and hook provided on rope / chain for lashing shall be designed and marked to carry a specified load. The lashing points should comply with British Standard BS-EN-12640:2001 or any other equivalent Indian or International standard. The number of hooks to be used shall be determined by the load to be carried and the capacity of the hook. Typical configurations for lashing of goods are shown in Figure - 3.

- 3.4.3 **External projection :** The external projection of the load body shall meet the requirements of IS :13942 as amended from time to time as specified at Sl. No. 11 of Table under Rule 124 of the Central Motor Vehicles Rules, 1989..
- 3.4.4 **Lighting and signaling devices :** The Lighting and signaling devices if provided on the load body shall meet the requirements of AIS-008 as amended from time to time. Only type approved parts or recommended parts shall be used.
- 3.4.5 **Retro reflective markings for heavy and long vehicles :** Retro-reflectors and side marker lamps shall be provided as per the requirements stated in AIS-008. For heavy and long vehicles, the reflective markings shall meet the requirements stated in AIS-089 or AIS-090 as applicable, amended from time to time and as notified under Central Motor Vehicle Rules, 1989.
- 3.4.6 **Lateral protective device :** The lateral protective device shall be as per requirements of IS:14682. The device may be mounted on the load body or the chassis. No other vehicular safety part or the system shall be attached to the lateral protection device. In case of locally built bodies recommended installations and parts shall be used. Recommended installation details and parts shall be supplied by the vehicle manufacturer. Vehicle manufacturer may provide detailed part drawings (including material specifications) of the approved parts for fabrication by the local body builder.
- 3.4.7 **Rear Under-run Protective Device (RUPD) :** The rear under-run protection device shall meet the requirements of IS:14812. as amended from time to time. Vehicle manufacturer shall provide the RUPD as integral part of the fully built-up vehicle. In case of drive-away chassis or incomplete vehicles the RUPD shall be provided by vehicle manufacturer. The local body builder shall not alter the fitment of the rear under-run device at any point of time.
- 3.4.8 **Modification of chassis and / or chassis related components :** Unauthorised alterations shall not be permitted on the chassis or any of its aggregates or components. No part of the braking system, electrical system, steering system or suspension system shall be altered, when the body is made outside the vehicle manufacturer facilities. No part of chassis shall be altered which affects the stability of the vehicle. Any unauthorised modification shall call for fresh type approval of the design and the prototypes.

- 3.4.9 **Corrosion protection :** The quality of the surface treatment shall be tested according to the test methods specified in JIS D0202 or equivalent BIS standard. (General rules of coating films for automotive parts or equivalent Indian Standards using test panels). The minimum quality requirements in table below shall be met for test criteria specified in Para. 9 of JIS D0202.

Item		Quality		
Surface Condition –Appearance		There must be no surface roughness, pin holes or other harmful defects.		
Corrosion Resistance	Iron Phosphate treatment	72 (Hrs)		
	Zinc Phosphate treatment	96 (Hrs)		
Water and moisture Resistance	Iron Phosphate treatment	36 (Hrs)		
	Zinc Phosphate treatment	48 (Hrs)		
Oil Resistance (40 Deg. 24 hrs)h		No swelling, flaking, peeling, cracking, film softening nor appreciable change in lustre or colour		
Volatile Oil Resistance (Gasoline) (24 hrs)		No swelling, flaking, peeling, cracking, film softening nor appreciable change in lustre or colour		
Pencil Scratch Test		Shall resist HB or Harder		
Checker Mark : No of sections in which film remains intact (without peeling off) Grade 3 shall apply only to Copper and copper alloy bases, Aluminum and aluminum alloy bases and Zinc and Zinc alloy bases		Grade 1	Grade 2	Grade 3
		100	90 or more	60 or more

- 3.4.10 **Closed type load bodies :** All the load bodies should be of the closed type. Typical closed body types are as shown in Figure - 12.

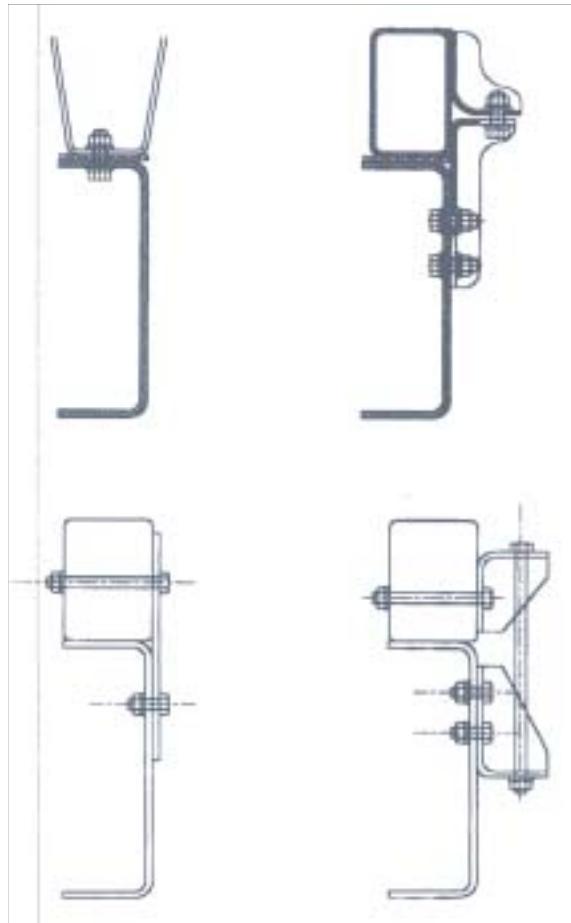


Figure -1
Chassis and Body Frame Mounting

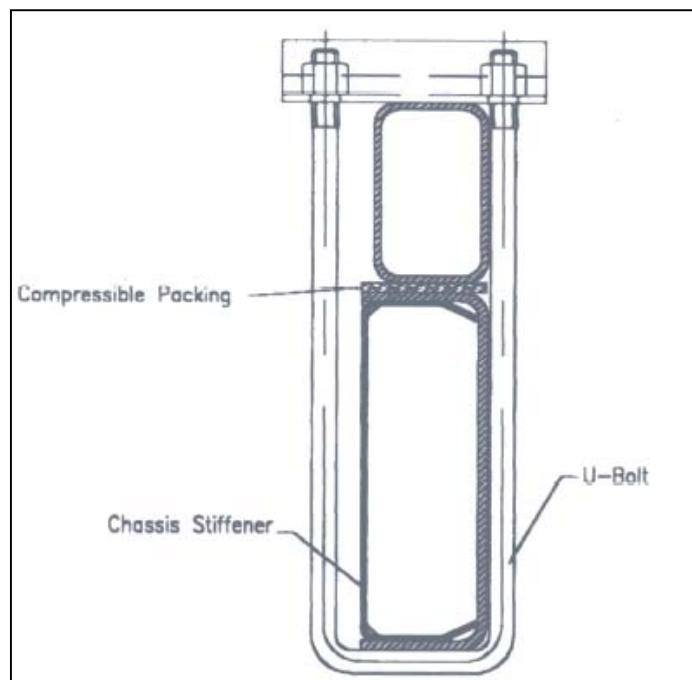


Figure - 2
Typical Load Body Mounting using U-Bolts

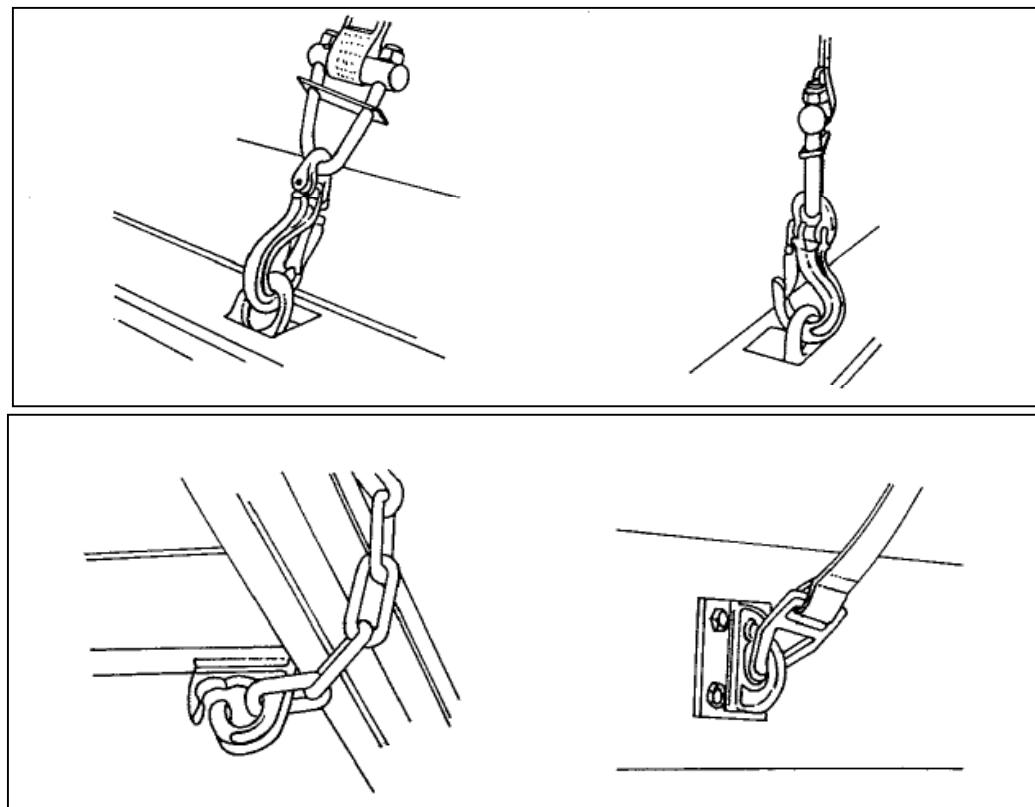


Figure - 3
Typical Hook Configuration for Lashing of Goods

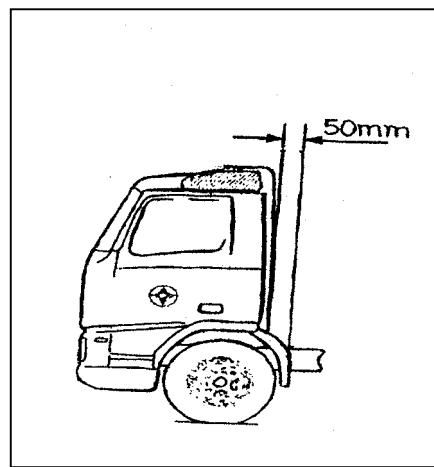


Figure - 4
Cabin and Body Gap

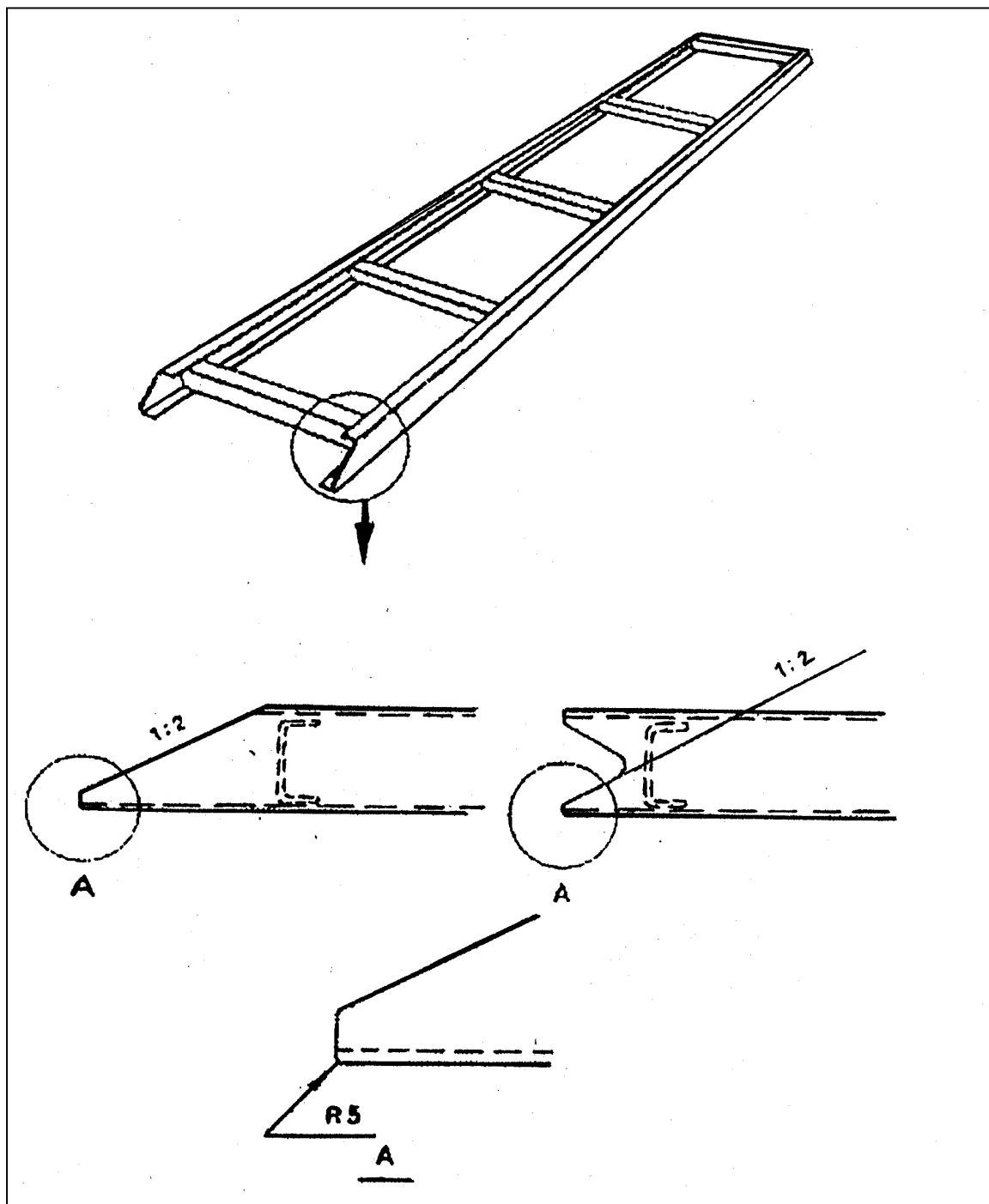


Figure - 5
Front End Configuration of Sub-Frame

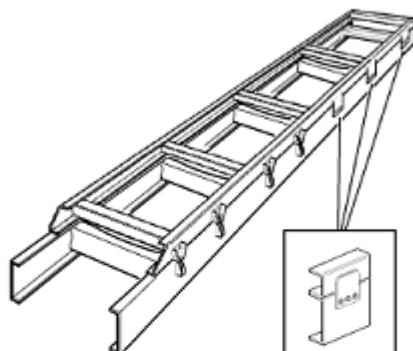
Subframe

General

The subframe is the marriage point between the bodywork and the chassis.

- A part of the bodywork
- Adapted attachments
- Mounting

The subframe itself has low strength requirements and must therefore have flexible attachments at the front. Torsion sensitive bodywork also require a suitable body-front design.



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A part of the bodywork

The subframe distributes the load on the chassis and gives sufficient strength to the bodywork. The subframe is part of the bodywork and does not reinforce the chassis.

Adapted attachments

Depending on the bodywork and driving conditions, the front section of the subframe is secured to the chassis by means of various kinds of jointed fasteners (pivoted, one way flexible etc.) The rear part of the subframe is secured by attachment plates.

Mounting

The attachments and the attachment plates are fixed to the chassis using M14 bolts. The attachments or attachment plates are bolted or welded to the subframe.

Figure - 6
Mounting of Sub-frame

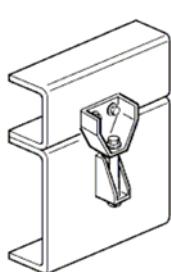
Body attachments, general

The lower front body attachments from the factory will be selected as a function of body stiffness and driving conditions. Five types of attachments are used for securing bodywork:

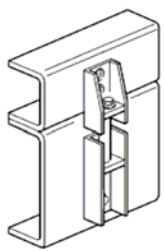
- Pivoted (two types)
- Flexible one-way
- Elastic one-way
- Elastic two-way

The flexible one-way attachment is a pivoted joint using diaphragm springs. The elastic one-way is a pivoted

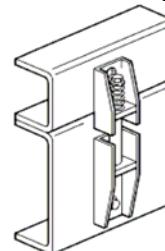
Pivoted



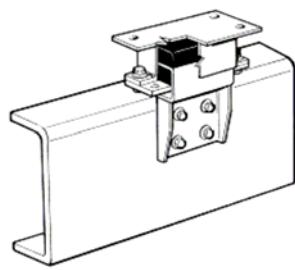
Pivoted



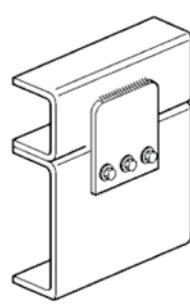
Elastic one-way



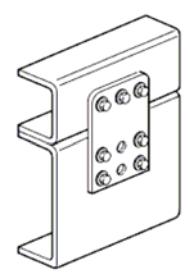
Elastic two-way



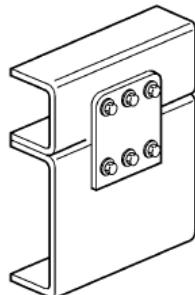
Standard attachment plate (welded)



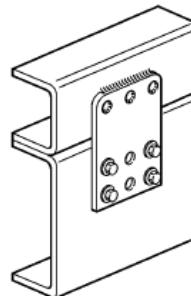
Medium attachment plate (stronger, bolted)



Standard attachment plate (bolted)



Medium attachment plate (stronger, plug-welded)



Strong attachment plate (reinforced, plug-welded)

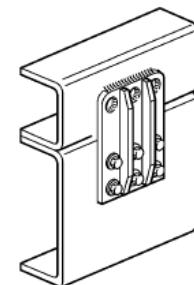
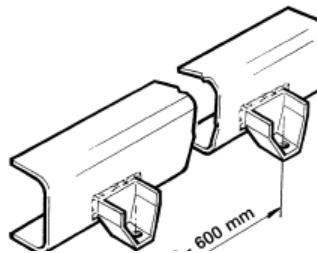


Figure - 7
Body Attachments

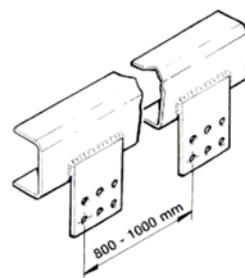
Distance between attachment unit

Below is the recommended distance between hole groups, depending on the vehicle's attachment unit.

2-hole groups 400– 600 mm



4/6-hole groups 800– 1000 mm



Upper part of attachment

The upper part of the pivoted attachments should be fitted to the sub frame so that the lower edge overlaps the chassis frame by:

- 30 ± 1 mm for frames with a height of 300 mm (see illustration).
- 23 ± 1 mm for frames with a height of 266 mm.

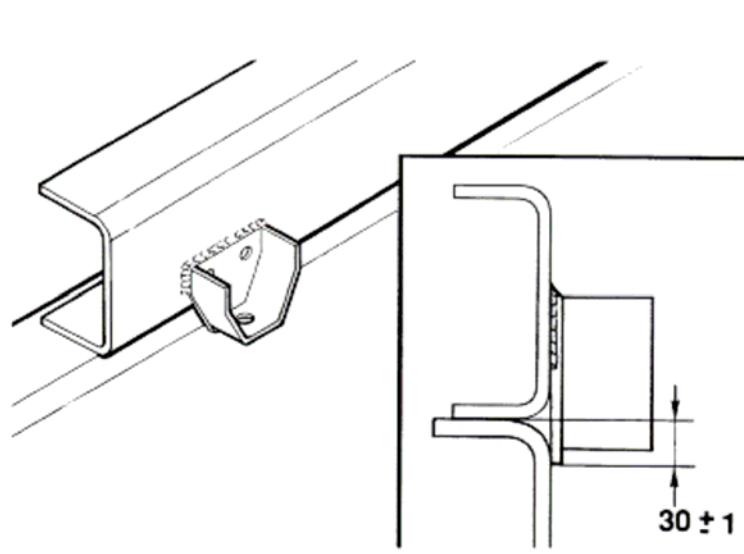


Figure - 8
Distance between Attachment Units

Elastic two-way attachment

The best way of allow upward and downward movements of torsionally stiff structures is to use the two rubber cushions. This is essential as a tank structure has an exceptional torsional rigidity and therefore has great difficulty in following the chassis as it flexes and twists. Volvo recommends that each attachment allows a vertical movement of the chassis frame of at least:

- 5 mm upwards, suitable rubber hardness 70 shore.
- 15 mm downwards, suitable rubber hardness 45 shore.
- Suitable type of rubber EPDM.

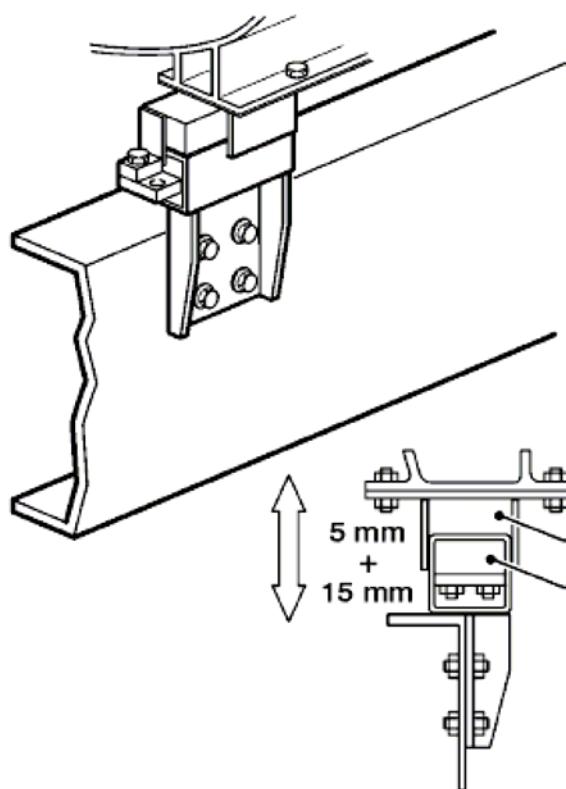
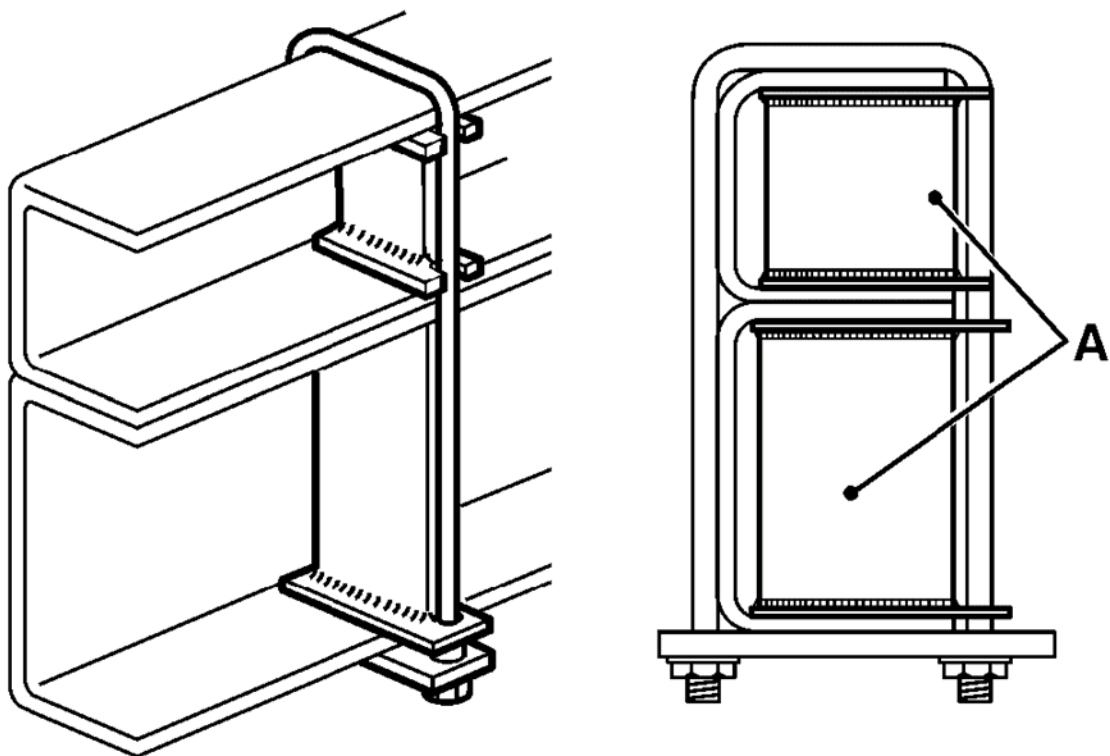


Figure – 9
Elastic Two-way Attachment

Clamps

Clamps can place high bending forces in the chassis flanges. Spacers (A) **must always** be fitted between the chassis/sub/helper-frame flanges, if clamps are used.



Recommended attachments

Bodywork must be secured so that the complete vehicle:

- has good driving characteristics.
- has sufficient stability and strength.
- is capable of carrying out the transport work safely. Twisting and sideways movements are more common behind the cab but diminish the further back along the truck one goes. In addition, lengthways and sideways forces must be absorbed by the attachments. Along the front part of the sub frame / helper-frame, the attachments should be pivoted as much as possible so as to allow maximum chassis movement in relation to the road/ground.

For the most rigid bodywork, flexible two-way attachments are used along the whole length of the frame. The bodywork must have the freedom to move in relation to the chassis frame. The more rigid the bodywork, the greater the movement in the attachment is required. With the exception of the most rigid bodywork, attachment plates are used along the rear section of the sub frame/helper-frame.

Figure - 10
Clamps and Recommended Attachments

Bodywork Torsionally flexible	Attachment			
	Front section		Rear section	
	RC-SMOOTH	RC-ROUGH/VROUG	RC-SMOOTH	RC-ROUGH/VROUG
Concrete mixer Tip Rigid platform Load changer Flat bed with tilt	Pivoted	Flexible one-way	Standard plate	First position pivoted
				Medium thickness or heavy plate
Timber bank Timber and sugar cane platform Timber bed Lift dumper Concrete pumps Skip lifter	Pivoted	Flexible one-way	Standard plate	First position pivoted
				Medium thickness or heavy plate
Concrete pumps Box (very stiff) Refuse collection body (side and front mounted)	Flexible one-way	Elastic one-way	Standard plate	First position pivoted
				Medium thickness or heavy plate
Bulk carrier Refuse truck (i.e. rear end loader)	Elastic two-way	Elastic two-way	Flexible one-way and/or Medium thickness or heavy plate	Elastic two-way
Bodywork Torsionally stiff				
Slurry tanker Tank	Elastic two-way	Elastic two-way	Elastic two-way	Elastic two-way

RC-SMOOTH = Road conditions, smooth conditions

RC-ROUGH/VROUG = Road conditions, rough/very rough conditions

Note: For some of the positions shown in the table above, a choice of attachments can be made. This choice is dependant on the type of bodywork and bogie used.

Note: The above table specifies the minimum requirements. More flexible anchorages or stronger plates can also be selected.

Figure - 11
Body Work and Recommended Attachments



Figure - 12
Typical Types of Closed Bodies.

SECTION - 4.0

REQUIREMENTS OF LIGHTING, ILLUMINATION, ELECTRICAL EQUIPMENT AND WIRING

LIST OF CONTENTS

- 4.1 Lighting, Signalling and Indicating Systems
 - 4.1.1 External
 - 4.1.2 Internal
 - 4.1.3 Position of illumination devices
 - 4.1.4 Type of Bulbs for lamp Assemblies
- 4.2 Driver Cab lighting
- 4.3 Electrical Equipment and Wiring
 - 4.3.1 Electrical cables
 - 4.3.2 Fuse
 - 4.3.3 Terminals, Connectors and Elements
- 4.4 Safety requirements
- 4.5 Batteries
- 4.6 Type Approval

4.1 Lighting, Signalling and Indicating Systems :

4.1.1 External :

4.1.1.1 External lighting, signaling and indicating systems of the truck shall comply with the Rules laid down of the Central Motor Vehicle Rules, 1989, and as amended from time to time.

4.1.1.2 Lighting and signalling equipment fitted shall be as type approved. This shall be checked at the time of registration and subsequently during annual fitness certification by the registering authority.

4.1.1.3 Inspection lamp shall be provided in the engine compartment. This is optional for vehicles with tilttable cab.

4.1.2 Internal :

4.1.2.1 Lighting, signalling and indicating systems shall provide adequate illumination inside the truck for the safe operation by the driver and the co-driver, during darkness and other conditions of reduced visibility.

4.1.3. Position of illumination devices :

4.1.3.1 Cab lamp or courtesy lamp on left and right hand sides shall be placed, preferably above the head level of the occupant. Alternately one lamp in the center of the cab roof may be provided.

4.1.3.2 Exit lamps for the driver and co-driver side may be placed for illumination below the seat level

4.1.3.2 The following optional lamps are to be placed inside the compartment / unit/control.

4.1.3.3.1 Locker lamp

4.1.3.3.2 Electrical distribution centre lamp - Instrument lighting

4.1.3.3.3 Control unit lamps

4.1.4 Type of bulbs for lamp assemblies :

4.1.4.1 The following lamp assemblies can be illuminated either by incandescent bulbs or L.E.D, fluorescent lamps or other types

- Tell-Tale lights
- Instrument lights
- Control unit lamp

4.1.4.2 The following lamp assemblies may be illuminated by incandescent bulbs,

- Electrical distribution centre lamp
- Locker lamp

- 4.1.4.3. The following lamp assemblies may be illuminated by incandescent bulbs or fluorescent bulbs,
- Entrance lamps
 - Cab lamp or courtesy lamp
 - Passenger area lamp
- 4.1.4.4. Photometric Requirements
- 4.1.4.4.1. Lighting requirements of the lighting, signalling and indicating systems for the following sub groups,
- Dash Board Tell-Tale Lighting/Control Lighting
 - Driver Cab Lighting
 - Other Area Lighting
- 4.1.4.4.2. Dash Board Tell -Tale Lighting/Control Lighting
- 4.1.4.4.2.1. Lamps falling in this category -
- Instrument lighting
 - Tell-Tale lighting
 - Control unit lamps
- 4.1.4.4.2.2. The illumination by lighting devices lighting up dash board instruments, tell tales and controls shall be discreet and shall not disturb the driver when driving in the dark.
- 4.1.4.4.2.3. The strength of the instrument lighting shall be capable of regulation through a rheostat or any other suitable means.

4.2 Driver cab lighting

- 4.2.1 The following lamps fall in this category,
- Cab lamp or courtesy lamp
 - Locker lamp
 - Electrical distribution lamp
- 4.2.2 The illumination by lighting devices lighting up the cab interior should be sufficient enough to clearly distinguishing component part of the cab. Driver should be in a position to read signage written on the walls, door of the cab. He should also be in position to read any instructions printed on paper

4.3. Electrical Equipment and Wiring :

4.3.1. Electrical cables :

- 4.3.1.1. All cables used shall be BIS/SAE/JIS/DIN marked. Copper conductors with fire retardant PVC insulation and able to withstand working temperatures.
- 4.3.1.2. All the cables shall be ducted and secured at suitable places in such a manner that during normal use of vehicle the cables are not subjected to any tension, stretching, nicking, cutting, abrasion, or chaffing. Some examples are as given in Figure 1 and Figure 2.

- 4.3.2. **Fuse :**
- 4.3.2.1. Every electrical circuit shall be provided with fuse designed for the circuit. In case of multiple circuits a common fuse may be permitted.
- 4.3.3. **Terminals, Connectors and Elements :**
- 4.3.3.1. **End terminations:** All the ends shall be suitably crimped with lugs / soldered or fixed so as to withstand vehicle vibrations. The interconnection shall be through couplers / junction boxes/ terminal blocks. Some of the correct and incorrect methods of clamping are as indicated in Figures - 1, 2 and 3.
- 4.3.3.2. Weatherproof connectors shall be used for external areas to avoid water/ moisture ingress during use.
- 4.3.3.3. All wiring must be anchored to the chassis at intervals of not more than 600 mm along its length. (Refer Figures 4, 5 and 7)
- 4.3.3.4. All wiring must be insulated at joints and also wiring must be located in such a position that it can neither become overheated nor contact moving parts. Some example of wiring on the cab and body of the vehicle areas indicated in Figures 4 to 7.
- 4.3.3.5. In case of trailers and towing vehicles the 7-pin connector, 12- pin connector or 15-pin connector as indicated in Figures - 8, 9, 10 & 11, shall be used. Guidelines for electrical connections between towing vehicles and trailers may be drawn from IS : 13460, IS : 13461, IS : 13491 and IS : 13499.
- 4.4. **Safety requirements :**
- 4.4.1. Use of relays and other electrical elements shall be adopted where the current rating of the switches is not adequate.
- 4.4.2. The additional circuits shall not draw current more than specified by the manufacturer.
- 4.4.3. Where the voltage exceeds 100 Volts RMS (Root Mean Square) in one or more electrical circuit, a manually operated isolation switch, which is capable of disconnecting the circuit(s) from the main electrical supply, shall be provided and shall be located inside the vehicle in a location easily accessible to the driver.
- 4.4.4. The electrical circuit provided by the vehicle manufacturer which are type approved shall not be modified. However, additional circuits may be made with the concurrence of OEM or as per the recommended practice of OEM. Provisions for tapping / socket / connector be provided for enabling use of external inspection lamp. This will be useful for repairs if the vehicle is stranded on road.
- 4.4.5. Electrical cables shall be located such that no part can make contact with any fuel line or exhaust system subjected to excess heat. Suitable special insulation shall be provided where such electrical circuits are necessary.

4.5. **Batteries :**

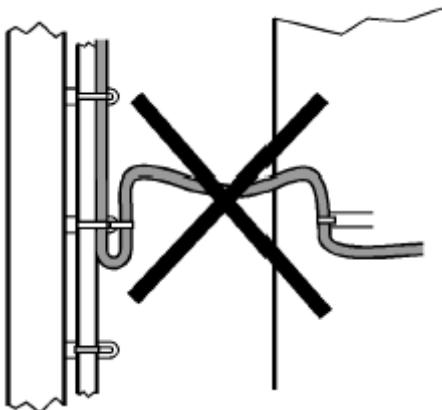
- 4.5.1. All batteries shall be well secured and easily accessible.
- 4.5.2. The battery compartment shall be separated from the driver's compartment and be preferably located outside the cab. It shall be well ventilated.
- 4.5.3. Battery terminals shall be protected against short circuit risk.
- 4.5.4. **Isolation switch :** A manually operated isolation switch, which is capable of disconnecting the battery terminal from the electrical circuit, shall be provided.

4.6. **Type Approval :**

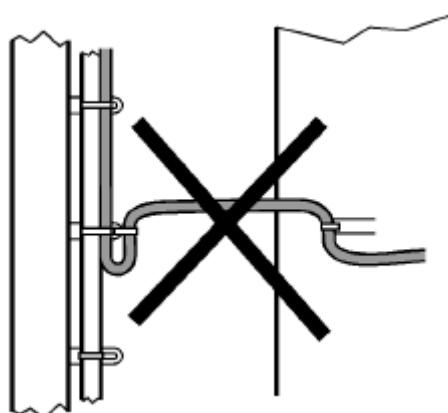
- 4.6.1 The electrical circuit diagram , the number of lamps, their position , type and wattage used in the vehicle shall be type approved.
- 4.6.2 All the above information shall be incorporated in the technical specification submitted for the type approval.
- 4.6.3 The Table below shows the different standards related to the cables used in truck body wiring. These are recommendatory standards provided as guidelines for the vehicle / body manufacturer to select.

Table : Different Standards for Cables

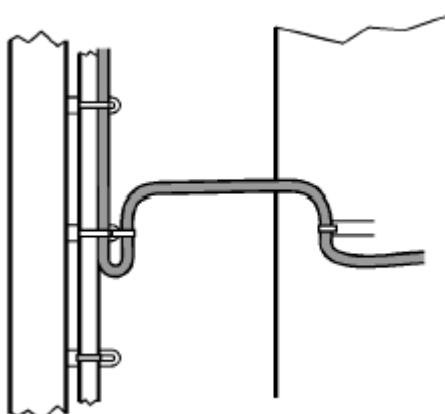
Description	Standard Ref.
Cables for motor vehicles	IS 2465: 1984
Cable Termination for Automobile Wiring Blade Type Connectors	IS 8395: 1977 Part I
Cable Termination for Automobile Wiring Bullet & Tube Type Connectors	IS 8395: 1977 Part II
Low Voltage Fuses	IS 13703 : 1993 Part I
Colour Code of Electrical Wiring	IS 13313 : 1991
Cartridge Fuse links for Automobiles	IS 2577 : 1974
Porcelain (Molded) Fuse links for Automobiles	IS 7528:1974
Fuses for Automobiles	IS 4063 : 1982
Selection of Conductor Size	JASO D0609-75 AV
Piano key type switches for use in automobiles	IS 9433: 1980
Automobile Lamps	IS 1606:1979
Electrical Circuits	IS 14381 : 1996



Cable too long



Cable too short

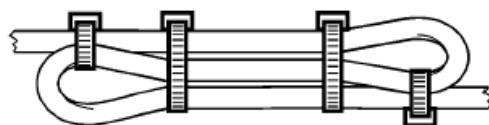
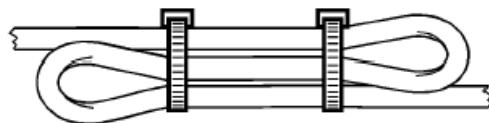


Cable correctly clamped

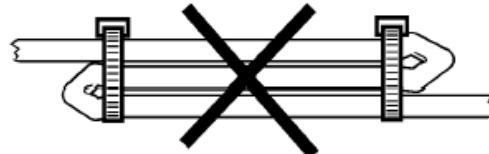
Figure -1
Clamping and Length of Cables

Correct clamping

- Cables which are too long should be clamped together to form a single coil with free ends. The cables are thus still there and can be re-used as necessary.

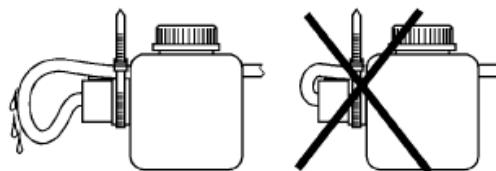


Faulty clamping



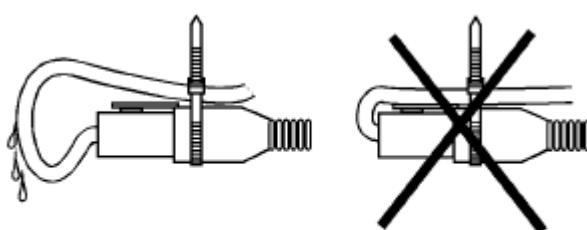
Clamping of cables to solenoid valves and cable joints

- When cables are clamped to components, a loop should be formed. The loop allows components to be changed and stops water from being led into the component via the cable. Make sure that the strip clamp ends up on the protective sheath of the cable. The exception is cables with a corrugated sheath, the so-called "Schlemmer hoses".



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Clamping of cables to solenoid valve



T9007080

Clamping of cable joints

Figure 2

Clamping and joints

Clamping of cables with a corrugated sheath

- Clamping of cables with a corrugated sheath, the so-called "Schlemmer hoses" shall be done as in the illustrations below

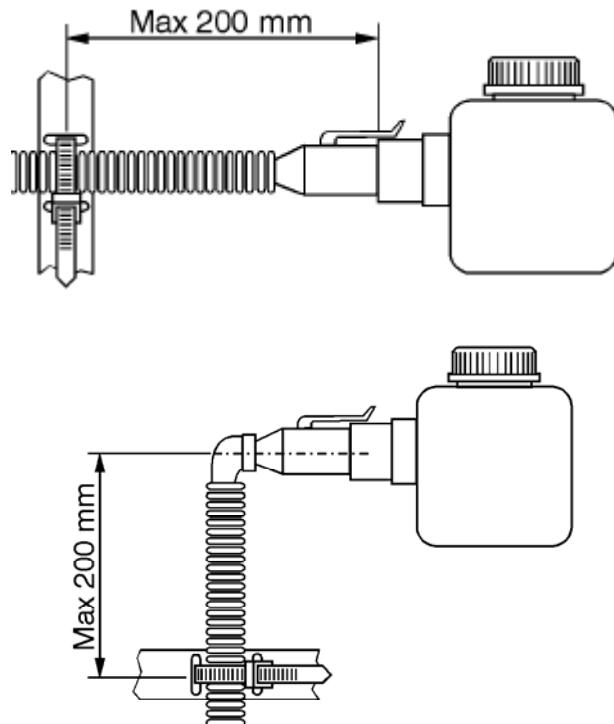


Figure 3
Clamping with Corrugated Sheath

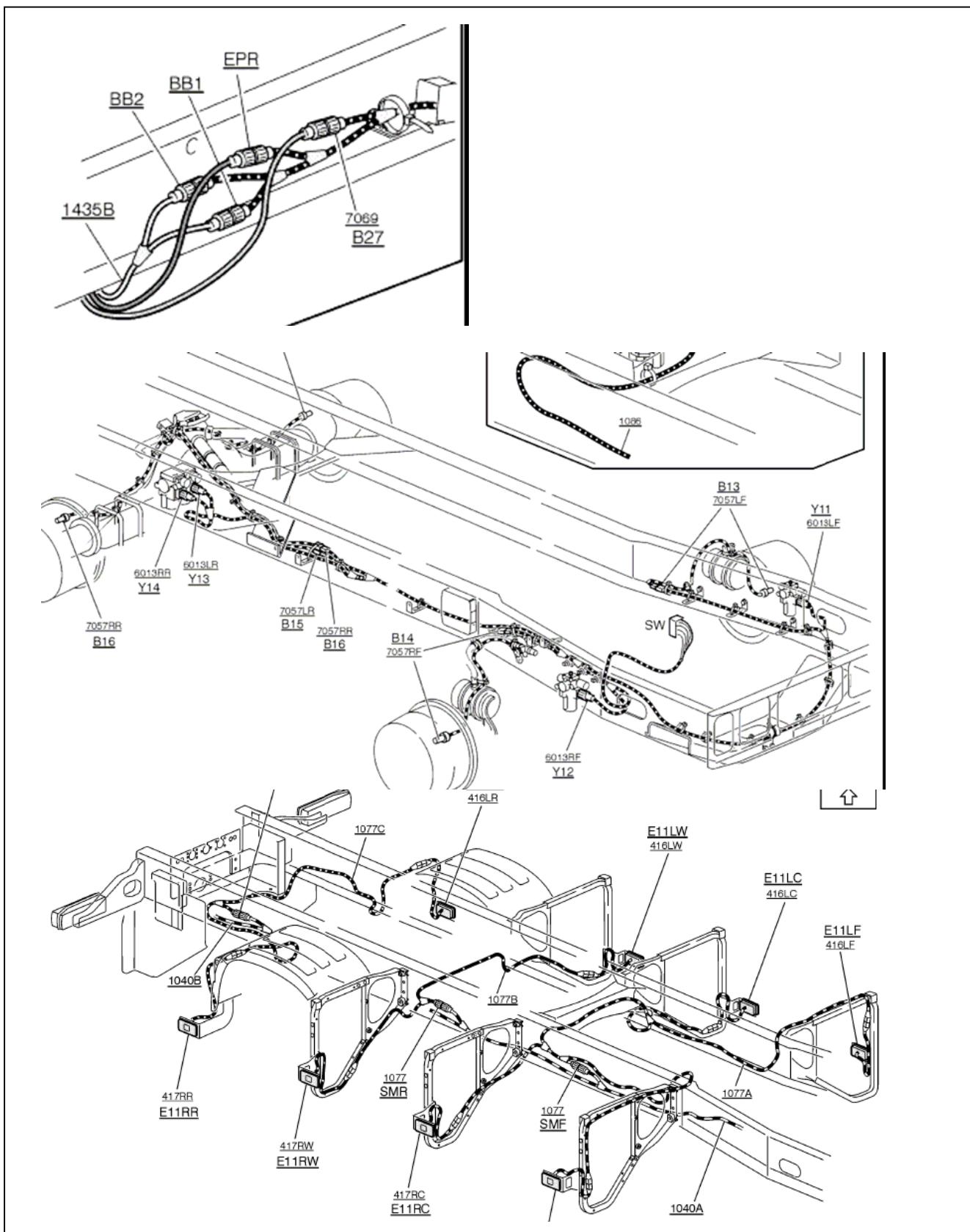


Figure -4
Wiring on the Chassis

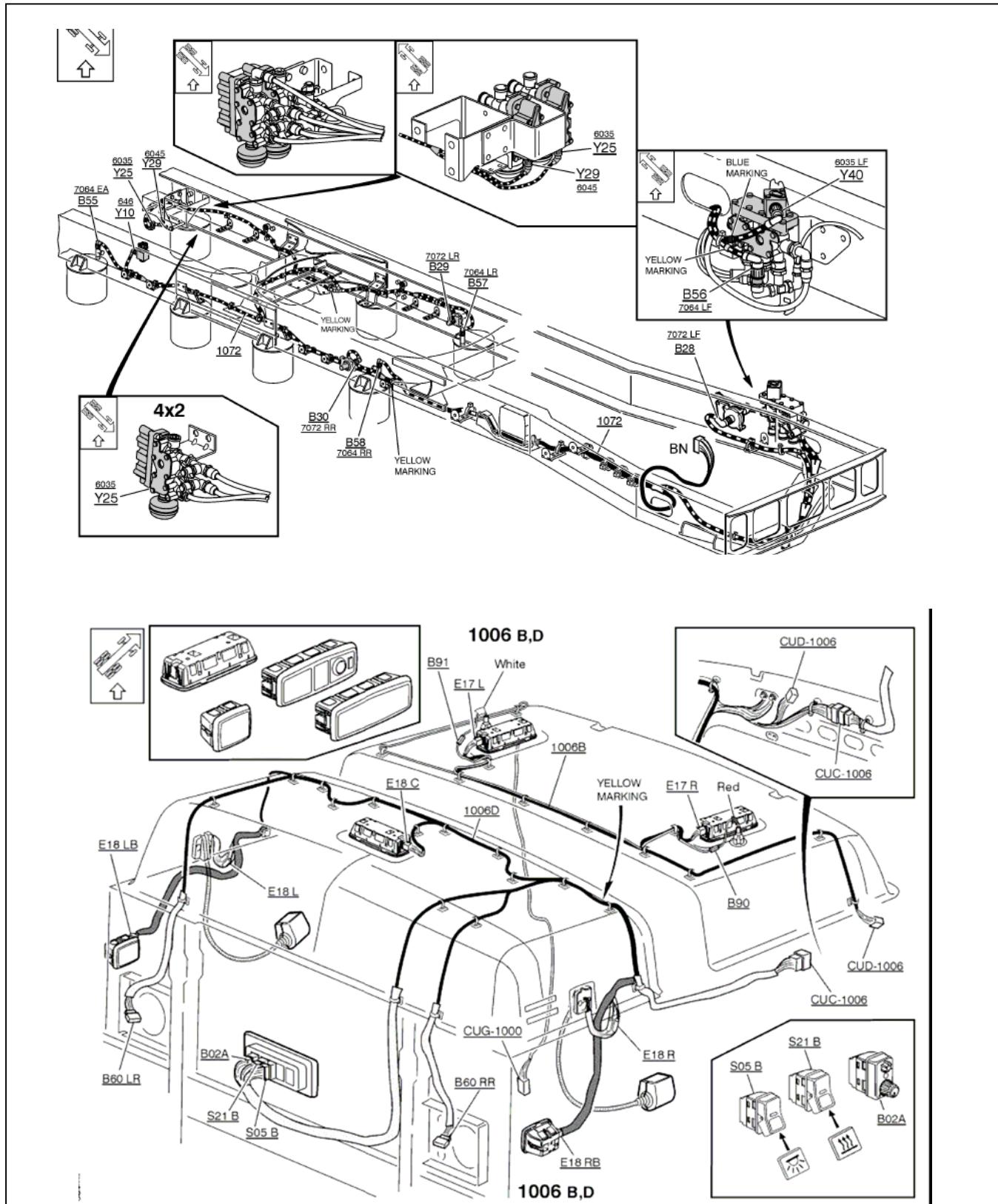


Figure - 5
Wiring on the Cab and Chassis

Illustrations

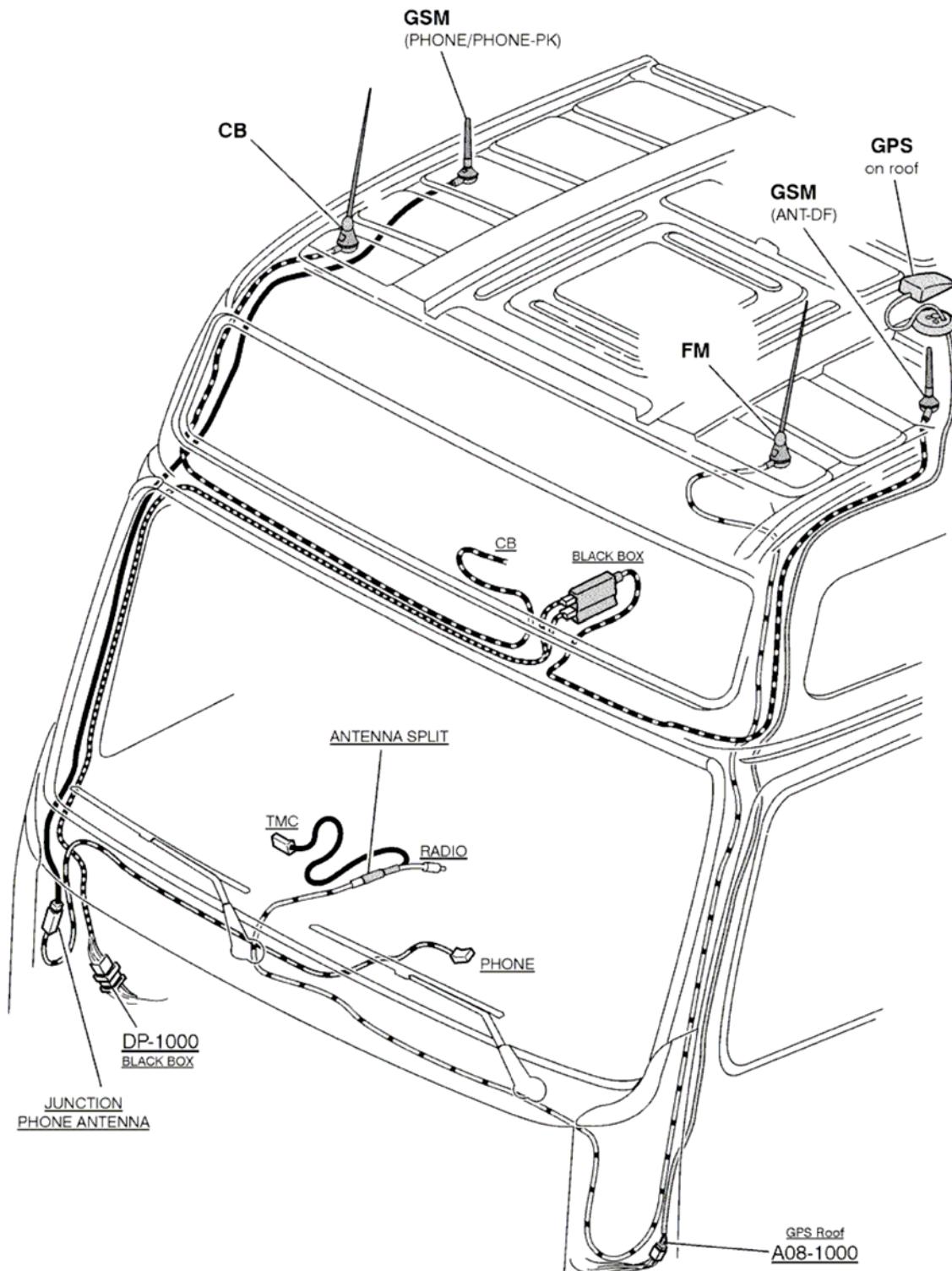


Figure - 6
Wiring on the Cab

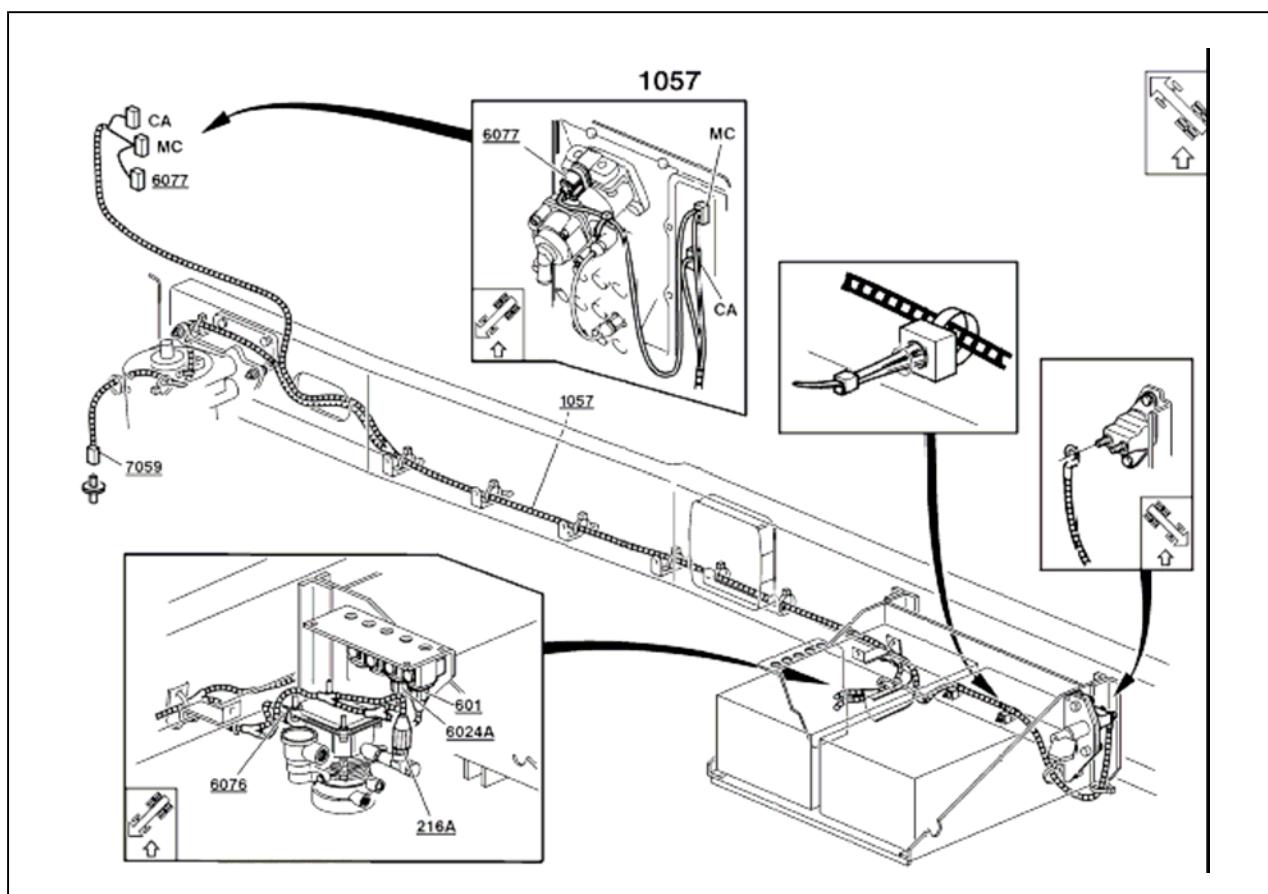


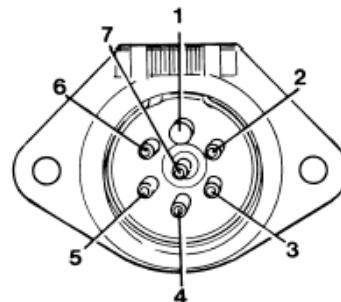
Figure - 7
Wiring on the Chassis

Trailer connectors

There are two different 7-pin trailer connectors, one for trailer connection and the other for auxiliary equipment on the trailer. The appearance of pin 1 differs, please refer to the adjacent illustrations.

Connector 24N (component number 77 in the wiring diagram in the service literature, group 37) ISO1185, is used for trailer connection. The pins are intended for:

- 1 Earth, kl.31.
- 2 Tail lamp, left, 58L, Max 8 A, fuse 34.
- 3 Indicator, left, L, Max 3 x 21 W.
- 4 Brake lamp, 54, Max 6 A, fuse 6.
- 5 Indicator, right, R, Max 3 x 21 W.
- 6 Tail lamp, right, 58R, Max 8 A, fuse 36.
- 7 Unused pin. Cable, marked 54G, connected to the coachbuilder's distribution box, as in the adjacent illustration.



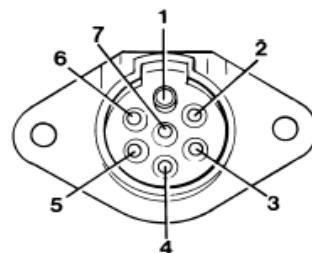
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Connector 24S (component number 78 in the wiring diagram in the service literature, group 37) ISO3731, is used for auxiliary equipment on the trailer. The pins are intended for:

- 1 Earth, kl.31.
- 2 Unused pin.
- 3 Reversing lamp, Max 8 A together with the tractor unit reversing lamp, fuse 44. For connection of extra (reinforced reversing lamp), please refer to Section 4.90 "Reverse gear".
- 4 B+ from battery, Max 8 A together with other equipment connected to the coachbuilder fuse box, fuse 1 in coachbuilder fuse box 56X.
- 5 Unused pin, cable connected to RC12 in right cab transition E:

6 Kl.15 via ignition, Max 8 A together with other equipment connected to the coachbuilder fuse box, fuse 3 in coachbuilder fuse box 56X.

- 7 Rear fog lamp



T9006275

Figure- 8
7- Pin trailer connection and details

Junction box for trailers

Junction boxes for trailers are only installed on RIGID trucks and are installed in the right chassis member, 700 mm in front of the end of the chassis.

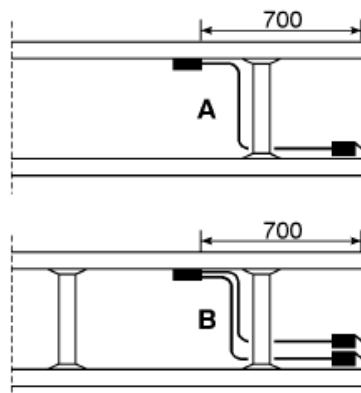
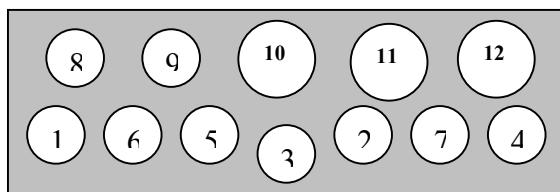


Figure - 9
Junction box for trailers

12 – pin trailer connection



Pin number	Circuit conductor
1	Left-hand turn
2	Reversing signal
3	Earth return
4	Right-hand turn
5	service brakes
6	Stop lamps
7	Rear lamps, clearance and side marker lamps
8	Battery charger/electric winch
9	Auxiliaries, etc/battery feed
10	Earth return
11	Rear fog lamp
12	Auxiliary

Figure-10
12-Pin tractor connection and details

15-pin trailer connection

There are also trucks which have a 15-pin ISO 12098 trailer connection. The standard stipulates the following functionality:

Pin No	Function
1	Indicator, left
2	Indicator, Right
3	Rear fog lamp
4	Earth Connection
5	Parking lamp circuit, left
6	Parking lamp circuit, right
7	Brake lamps
8	Reversing lamps
9	Power Supply (+24 V)
10	sensor, wear, brake linings
11	Pressure sensor, spring brakes
12	Axle lift
13	Return cable, pin no 14 and 15
14	Reserved for data communication
15	Reserved for data communication

Figure -11
Details of 15- Pin trailer connection

SECTION - 5.0

ADDITIONAL REQUIREMENTS FOR VEHICLES CARRYING DANGEROUS AND HAZARDOUS GOODS WITH REGARD TO THEIR SPECIFIC CONSTRUCTIONAL FEATURES

LIST OF CONTENTS

- 5.1 Scope
- 5.2 Definitions
- 5.3 Technical Provisions for Base Vehicles
- 5.4 Technical Provisions for Bodies
- 5.5 Manner of Display of Class Labels and Identification Marks
- 5.6 Essential Equipment and Documents to be carried in the Vehicle
- 5.7 Driver Training Requirements
- 5.8 Periodic Inspection of Vehicles
- 5.9 Type Approval Process

5.1 **SCOPE :** This chapter applies to the construction of motor vehicles of category N and their trailers of categories T3 and T4 which are subject to carriage of dangerous and hazardous goods by road.

5.2 **DEFINITIONS:**

5.2.1 "**Base vehicle**" (hereinafter referred to as "vehicle") means a chassis-cab vehicle, a tractor for semi-trailer, a trailer-chassis or a trailer with a self-supporting body intended for the transport of dangerous and hazardous goods

5.2.2 "**Vehicle type**" means vehicles, which do not differ essentially with regard to the constructional features specified in this chapter.

5.2.3 "**Vehicle**" means any vehicle, whether complete (e.g. one stage built vans, lorries, tractors, trailers), incomplete (e.g. chassis, chassis-cab, trailer-chassis) or, completed (e.g. chassis-cab fitted with a bodywork), intended for the carriage of dangerous and hazardous goods by road.

5.2.4 "**EX / II vehicle**" or "**EX/III vehicle**" means a vehicle intended for the carriage of explosives substances and articles (Class 1).

5.2.5 "**FL vehicle**" means a vehicle intended for the carriage of liquids having a flash-point of not more than 65°C (with the exception of diesel fuel complying with standard EN 590: 1993, gas oil, and heating oil (light) - UN No.1202 - with a flash-point as specified in standard EN 590: 1993) or flammable gases, in tank-containers, portable tanks or MEGCs of more than 3 m³ capacity, fixed tanks or demountable tanks of more than 1 m³ capacity or a battery vehicle of more than 1 m³ capacity intended for the carriage of flammable gases.

5.2.6 "**OX vehicle**" means a vehicle intended for the carriage of hydrogen peroxide, stabilized or hydrogen peroxide, aqueous solution stabilized with more than 60 per cent hydrogen peroxide (Class 5.1, UN No. 2015) in tank-containers or portable tanks of more than 3 m³ capacity, fixed tanks or demountable tanks of more than 1 m³ capacity.

5.2.7 "**AT vehicle**" means a vehicle, other than FL or OX, intended for the carriage of dangerous and hazardous goods in tank containers, portable tanks or MEGCs of more than 3 m³ capacity, fixed tanks or demountable tanks of more than 1 m³ capacity or a battery vehicle of more than 1 m³ capacity other than an FL vehicle.

Note 1 :

- Petroleum Class A - petroleum having a flash-point below 23 degrees centigrade
- Petroleum Class B - petroleum having a flash point of 23 degrees centigrade and above but below 65 degrees centigrade
- Petroleum Class C - petroleum-having flash point of 65 degrees and above

Note 2 :

Explosive means gunpowder, nitroglycerine, nitroglycol, gun-cotton, di-nitro-toluene, tri-nitro-toluene, picric acid, di-nitor-phenol, tri-nitor-resorcinol (styphnic act), cyclo-trimethylene-trinitramine, penta-erythritol-tetranitrate, tetryl, nitroguanidine, lead azide, lead styphnate, fulminate of mercury or any other metal, diazo-di-nitor-phenol, coloured fires or any other substance whether a single

chemical compound or a mixture of substances, whether solid or liquid or gaseous used or manufactured with a view to produce a practical effect by explosion or pyrotechnic effect; and includes fog-signals, fireworks, fuses, rockets, percussion caps, detonators, cartridges, ammunition of all descriptions and every adaptation or preparation of an explosive as defined in this note.

5.3 **Technical provisions for base vehicles :** Vehicles shall, depending on the vehicle designation, comply with the provisions below .

5.3.1 **Electrical equipment :**

5.3.1.1 **General provisions :** The electrical installation as a whole shall meet the following provisions, in accordance with the table of Paragraph 5.3.1.2.1, below.

5.3.1.2 **Wiring :**

5.3.1.2.1 The size of conductors shall be large enough to avoid overheating. Conductors shall be adequately insulated. All circuits shall be protected by fuses or automatic circuit breakers. However, the following cases may be exempted

- from the battery to cold start and stopping systems of the engine
- from the battery to the alternator
- from the battery to the starter motor
- from battery to tachograph
- from the battery to the power control housing of the endurance braking system, if this system is electrical or electromagnetic
- from the battery to the electrical lifting mechanism for lifting the bogie axle the above unprotected circuits shall be as short as possible

Technical Specification	Vehicle Designation				
	EX/II	EX/III	AT	FL	OX
Electrical Equipment					
Wiring		X	X	X	X
Battery master switch		X		X	
Batteries	X	X		X	
Tachographs		X		X	
Permanently energised installations		X		X	
Electrical installation behind cab		X		X	

5.3.1.2.2 Cables shall be securely fastened and positioned in such a way that the conductors are adequately protected against mechanical and thermal stresses.

5.3.1.3 **Battery Master Switch :**

5.3.1.3.1 A switch for breaking the electrical circuits shall be placed as close to the battery as possible.

5. 3.1.3.2 Direct or indirect control devices shall be installed, one in the driver's cab and a second on the outside of the vehicle. They shall be readily accessible and distinctively marked. The control device located in the driver's cab shall be within immediate reach of the driver seated in the driver's seat. It shall be protected against inadvertent operation by either adding a protective cover, or by using a dual movement control device or by other suitable means.
5. 3.1.3.3 It shall be possible to open the switch while the engine is running, without causing any dangerous excess voltage. Operation of the switch shall not constitute a fire hazard in an explosive atmosphere; this can be ensured by using a switch having a casing with protection degree IP65 in accordance with IEC Standard 529.
5. 3.1.3.4 The cable connections on the battery master switch shall have a protection degree IP54. However, this does not apply if these connections are contained in a housing which may be the battery box. In this case it is sufficient to insulate the connections against short circuits, for example with a rubber cap.
5. 3.1.4 **Batteries :** The battery terminals shall be electrically insulated or covered by the insulating battery box cover. If the batteries are not located under the engine bonnet, they shall be fitted in a vented box.
5. 3.1.5 **Tachographs :** Tachographs fitted on vehicles shall comply with the requirements stated in AIS-059 as amended from time to time.
5. 3.1.6 **Permanently Energised Installations :**
5. 3.1.6.1 Those parts of the electrical installation, other than the tachograph, which remain energised when the battery master-switch is open, shall be suitable for use in a hazardous area and shall meet the appropriate requirements of European Standard IEC 60079 and one of IEC 60079-1, 60079-2, 60079-7, 60079-11 and 60079-18. The requirements for the relevant gas group according to the product being carried shall be met.
5. 3.1.6.2 Bypass connections to the battery master switch for electrical equipment which must remain energised when the battery master switch is open shall be protected against overheating by suitable means, such as a fuse, a circuit breaker or safety barrier (current limiter).
5. 3.1.7 **Provisions concerning that part of the electrical installation situated to the rear of the driver's cab :** The whole installation shall be so designed, constructed and protected such that it cannot provoke any ignition or short-circuit under normal conditions of vehicle use and that these risks can be minimised in the event of an impact or deformation. In particular:
5. 3.1.7.1 **Wiring :** The wiring located behind the drivers cab shall be protected against impact, abrasion and chafing during normal vehicle operation. Examples of appropriate protection are given in the Figures 1, 2, 3 and 4. However, the sensor cables of anti-lock braking devices do not need additional protection.
5. 3.1.7.2 **Lighting :** Lamp bulbs with a screw cap shall not be used.

5. 3.1.7.3 **Electrical connections :** Electrical connections between motor vehicles and trailers shall have a protection degree IP54 in accordance with IEC Standard 529 and be designed to prevent accidental disconnection. Examples of appropriate connections are given in ISO 12 098:1994 and ISO 7638:1985.
5. 3.1.7.4 **Electrical lifting mechanism :** The electrical equipment of the mechanism for lifting a bogie axle shall be installed outside the chassis frame in a sealed housing.
5. 3.1.8 **Prevention of fire risks :** Compliance to Petroleum Rules and Explosive Rules shall be ensured by DoE.
5. 3.1.8.1 **Vehicle cab :**
5. 3.1.8.1.1 Only material not readily flammable shall be used in the construction of the driver's cab. This provision will be deemed to be met if, in accordance with the procedure specified in ISO Standard 3795:1989, samples of the following cab components have a burn rate not exceeding 100 mm / min seat cushions, seat backs, safety belts, head lining, opening roofs, arm rests, all trim panels including door, front, rear and side panels, compartment shelves, head restraints, floor coverings, sun visors, curtains, shades, wheel housing covers, engine compartment covers, mattress covers and any other interior materials, including padding and crash-deployed elements, that are designed to absorb energy on contact by occupants in the event of a crash.
5. 3.1.8.1.2 Unless the driver's cab is made of not readily flammable materials, a shield made of metal or other suitable material of the same width as the tank shall be fitted at the back of the cab. Any windows in the back of the cab or in the shield shall be hermetically closed and made of fire resistant safety glass with fire resistant frames. Furthermore, there shall be a clear space of not less than 15 cm between the tank and the cab or the shield.
5. 3.1.8.2 **Fuel tanks :** The fuel tanks for supplying the engine of the vehicle shall meet the following requirements.
5. 3.1.8.2.1 In the event of any leakage, the fuel shall drain to the ground without coming into contact with hot parts of the vehicle or the load.
5. 3.1.8.2.2 Fuel tanks containing petrol shall be equipped with an effective flame trap at the filler opening or with a closure with which the opening can be kept hermetically sealed.
5. 3.1.8.3 **Engine :** The engine propelling the vehicle shall be so equipped and situated to avoid any danger to the load through heating or ignition. In the case of vehicles designated EX/II and EX/III the engine shall be placed forward of the front wall of the load compartment: it may nevertheless be placed under the load compartment, provided this is done in such a way that any excess heat does not constitute a hazard to the load by raising the temperature on the inner surface of the load compartment above 80⁰C. (1)
5. 3.1.8.4 **Exhaust system :** The exhaust system as well as the exhaust pipes shall be so directed or protected to avoid any danger to the load through heating or ignition. Parts of the exhaust system situated directly below the fuel tank (diesel) shall have a

clearance of at least 100 mm or be protected by a thermal shield. The exhaust system of vehicles designated EX/II and EX/III shall be so constructed and situated that any excess heat shall not constitute a hazard to the load by raising the temperature on the inner surface of the load compartment above 80°C. Compliance with these requirements shall be verified on the completed vehicle.

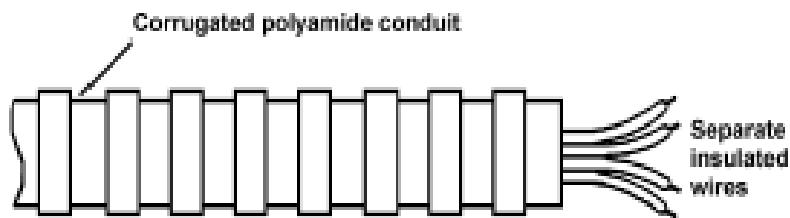


Figure No. 1

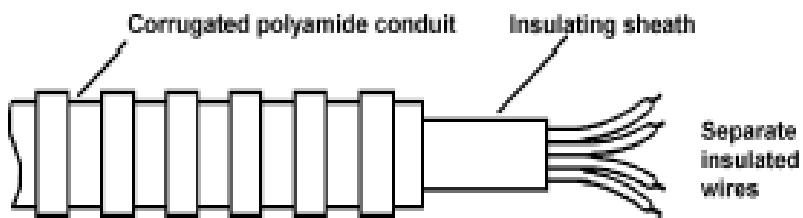


Figure No. 2

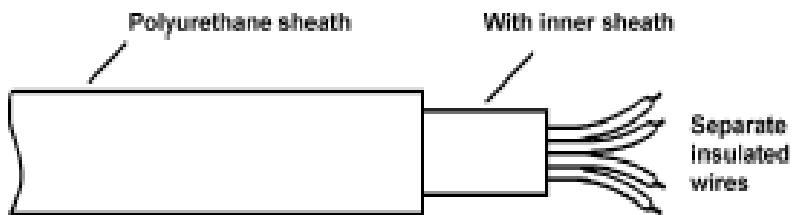


Figure No. 3

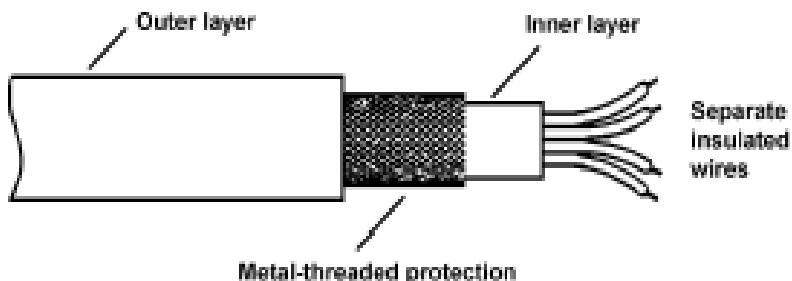


Figure No. 4

5.3.1.8.5 Vehicle endurance braking system :

- 5.3.1.8.5.1 Endurance braking system means a system intended to stabilize vehicle speed on a long descent, without the use of the service, secondary or parking braking systems.
- 5.3.1.8.5.2 Vehicles equipped with endurance braking systems emitting high temperatures placed behind the rear wall of the driver's cab shall be equipped with a thermal shield securely fixed and located between this system and the tank or load so as to avoid any heating, even local, of the tank shell or the load. In addition, the thermal shield shall protect the braking system against any outflow or leakage, even accidental, of the load. For instance, a protection including a twin-shell shield shall be considered satisfactory.
- 5.3.1.8.5.3 Motor vehicles having a maximum mass exceeding 16 tonnes or authorized to tow a trailer with a maximum mass exceeding 10 tonnes shall be fitted with an endurance braking system, which complies with the following requirements.
 - (a) The endurance braking system may be a single device or a combination of several devices. Each device may have its own control.
 - (b) All three endurance braking control options provided in the relevant clauses of IS:11852 shall be permitted, but, in the case of a failure of the anti-lock system, integrated or combined retarders shall be switched off automatically.
 - (c) The effectiveness of the endurance braking system shall be controlled by the anti-lock braking system such that the axle(s) braked by the endurance braking system cannot be locked by the endurance braking system at speeds above 15 km/h. However, this provision shall not apply to that part of the braking system constituted by natural engine braking.
 - (d) The endurance braking system shall comprise several stages of effectiveness, including a low stage appropriate for the unladen condition. Where the endurance braking system of a motor vehicle is constituted by its engine, the different gear ratios shall be considered to provide the different stages of effectiveness.
 - (e) The performance of the endurance braking system shall be such that it fulfils the requirements stated in IS 11852 with a laden vehicle mass comprising the laden mass of the motor vehicle and its authorized maximum towed mass.
 - (f) If the motor vehicle does not fulfill the performance requirements for the endurance braking system as defined in (e) above, it shall at least fulfill the requirements stated in IS 11852, and shall be restricted to being coupled only to a trailer fitted with an endurance braking system. Such a motor vehicle shall be fitted with a control device for the endurance braking system on the trailer.
- 5.3.1.8.5.4 If a trailer is equipped with an endurance braking system it shall fulfill the requirements stated in IS 11852, and the provisions of 5.3.1.8.5.3 (a) to (d) above.

5.3.1.8.6 Emergency braking devices for trailers :

- 5.3.1.8.6.1 Trailers shall be equipped with an effective system for braking or restraining them if they become detached from the motor vehicle towing them.

5.3.1.8.6.2 Trailers shall be fitted with an effective braking device, which acts on all the wheels, is actuated by the drawing vehicle's service brake control and automatically stops the trailer in the event of breakage of the coupling.

5.3.1.8.7 Combustion heaters :

5.3.1.8.7.1 The combustion heaters and their exhaust gas routing shall be designed, located, protected or covered so as to prevent any risk of unacceptable heating or ignition of the load. This requirement shall be considered as fulfilled if the fuel tank and the exhaust system of the appliance conform to provisions similar to those prescribed for fuel tanks and exhaust systems of vehicles in Paragraphs 5.3.1.8.2 and 5.3.1.8.4 respectively.

5.3.1.8.7.2 The combustion heaters shall be put out of operation by at least the following methods :

- (a) Intentional manual switching off from the driver's cab.
- (b) Unintentional stopping of the vehicle engine; in this case the heating device may be restarted manually by the driver.
- (c) Start up of a feed pump on the motor vehicle for the dangerous and hazardous goods carried.

5.3.1.8.7.3 After running is permitted after the combustion heaters have been put out of operation. For the methods of Paragraphs 5.3.1.8.7.2 (b) and (c) above the supply of combustion air shall be interrupted by suitable measures after an after-running cycle of not more than 40 seconds. Only heaters shall be used for which proof has been furnished that the heat exchanger is resistant to the reduced after running cycle of 40 seconds for the time of their normal use.

5.3.1.8.7.4 The combustion heater shall be switched on manually. Programming devices shall be prohibited.

5.3.1.9 **Braking equipment :** In addition to the following technical provisions, to be applied in accordance with the table of 5.3.1.2, motor vehicles and trailers intended for use as transport units for dangerous and hazardous goods shall fulfill all relevant technical requirements of IS :11852 including that of Part 9 as amended from time to time.

5.3.1.10 **Speed limiting devices :** Motor vehicles (rigid vehicles and tractors for semi-trailers) with a maximum mass exceeding 12 tonnes, shall be equipped with a speed limiting device complying to AIS-018. The speed limit value, shall be as that enforced by the State Road Transport Authority.

5.3.2 Additional requirements concerning complete or completed EX/II or EX/III vehicles :

5.3.2.1 **Materials to be used in the construction of vehicle bodies :** No materials likely to form dangerous compounds with the explosive substances carried shall be used in the construction of the body.

- 5.3.2.2 **Combustion heaters :** Combustion heaters shall not be installed in load compartments of EX/II and EX/III vehicles. Combustion heaters shall meet the additional requirements.
- (a) The switch may be installed outside the driver's cab.
 - (b) The device may be switched off from outside the load compartment and
 - (c) It is not necessary to prove that the heat exchanger is resistant to the reduced after running cycle.
- 5.3.2.3 **EX/II vehicles :** The vehicles shall be designed, constructed and equipped so that the explosives are protected from external hazards and the weather. Shall be approved by DoE.
- 5.3.2.4 **EX/III vehicles :** These vehicles shall be closed. The loading surface, including the front wall, shall be continuous.
- 5.3.2.5 **Load compartment and engine :** The engine shall be placed forward of the front wall of the load compartment; it may nevertheless be placed under the load compartment, provided this is done in such a way that any excess heat does not constitute a hazard to the load by raising the temperature on the inner surface of the load compartment above 80°C.
- 5.3.2.6 **Load compartment and exhaust system :** The exhaust system of EX/II and EX/III vehicles or others parts of these complete or completed vehicles shall be so constructed and situated that any excess heat shall not constitute a hazard to the load by raising the temperature on the inner surface of the load compartment above 80 °C.
- 5.3.2.7 **Electrical equipment :**
- 5.3.2.7.1 The electrical installation on EX/III vehicles shall meet the requirements of 5.3.1.2.
 - 5.3.2.7.2 The electrical installation in the load compartment shall be dust-protected.
- 5.4 **Technical Provisions for Bodies :**
- 5.4.1 Additional requirements concerning the construction of the bodies of complete or completed vehicles intended for the carriage of dangerous and hazardous goods in packages (other than EX/II and EX/III vehicles).
- 5.4.1.1 Combustion heaters shall meet the following requirements :
- (a) The switch may be installed outside the driver's cab.
 - (b) The device may be switched off from outside the load compartment and
 - (c) It is not necessary to prove that the heat exchanger is resistant to the reduced after running cycle.

- 5.4.1.2 If the vehicle is intended for the carriage of dangerous and hazardous goods for which a label conforming to the CMV Rules 137, shall be provided. No fuel tank, power source, combustion air or heating air intakes as well as exhaust tube outlets required for the operation of the combustion heater shall be installed in the load compartment. It shall be ensured that the heating air outlet cannot be blocked by cargo. The temperature to which packages are heated shall not exceed 50° C. Heating devices installed inside the load compartments shall be designed so as to prevent the ignition of an explosive atmosphere under operating conditions.
- 5.4.2 Additional requirements concerning the construction of the bodies of complete or completed vehicles intended for the carriage of dangerous solids in bulk.**
- 5.4.2.1 If the vehicle is intended for the carriage of dangerous and hazardous goods for which a label conforming to CMVR rules are provided, no fuel tanks, power sources, combustion air or heating air intakes as well as exhaust tube outlets required for the operation of the combustion heater shall be installed in the load compartment. It shall be ensured that the heating air outlet cannot be blocked by cargo. The temperature to which the load is heated shall not exceed 50°C. This will be inspected and approved by DoE or its authorised agency. Heating devices installed inside the load compartments shall be designed so as to prevent the ignition of an explosive atmosphere under operating conditions.
- 5.4.3 Additional requirements concerning complete or completed vehicles intended for the carriage of temperature controlled self-reactive substances of class 4.1 and organic peroxides of class 5.2.**
- 5.4.3.1 Insulated, refrigerated and mechanically-refrigerated vehicles intended for the carriage of temperature controlled self-reactive substances and organic peroxides shall conform to the following conditions :
- (a) the vehicle shall be such and so equipped as regards its insulation and means of refrigeration, that the control temperature prescribed for the substance to be carried is not exceeded.
 - (b) the vehicle shall be so equipped that vapours from the substances or the coolant carried cannot penetrate into the driver's cab.
 - (c) a suitable device shall be provided enabling the temperature prevailing in the loading space to be determined at any time from the cab.
 - (d) the loading space shall be provided with vents or ventilating valves if there is any risk of a dangerous excess pressure arising therein. Care shall be taken where necessary to ensure that refrigeration is not impaired by the vents or ventilating valves.
 - (e) the refrigerant shall not be flammable; and (f) the refrigerating appliance of a mechanically refrigerated vehicle shall be capable of operating independently of the engine used to propel the vehicle.
- 5.4.3.2 Suitable methods to prevent the control temperature from being exceeded should be provided. Depending on the method used, additional provisions concerning the construction of vehicle bodies may be adopted.

5.4.4 Additional requirements concerning fixed tanks (tank-vehicles) battery-vehicles and complete or completed vehicles used for the carriage of dangerous and hazardous goods in demountable tanks with a capacity greater than 1 m³ or in tank-containers, portable tanks or MEGCs of a capacity greater than 3 m³ (FL, OX and AT vehicles)

5.4.4.1 **General provisions :**

5.4.4.1.1 In addition to the vehicle proper, or the units of running gear used in its stead, a tank-vehicle comprises one or more shells, their items of equipment and the fittings for attaching them to the vehicle or to the running-gear units.

5.4.4.1.2 Once the demountable tank has been attached to the carrier vehicle, the entire unit shall meet the requirements prescribed for tank-vehicles.

5.4.4.2 **Requirements concerning tanks :**

5.4.4.2.1 Fixed tanks or demountable tanks made of metal shall meet the relevant requirements laid down by the Department of Explosives, Nagpur (DoE).

5.4.4.3 **Fastenings :** Fastenings shall be designed to withstand static and dynamic stresses in normal conditions of carriage, and minimum stresses as defined in the case of tank-vehicles, battery-vehicles, and vehicles carrying demountable tanks.

5.4.4.4 **Earthing :** Earthing of FL vehicles Tanks made of metal or of fibre-reinforced plastics material of FL tank-vehicles and battery elements of FL battery vehicles shall be linked to the chassis by means of at least one good electrical connection. Any metal contact capable of causing electrochemical corrosion shall be avoided.

5.4.4.5 **Stability of tank-vehicles :**

5.4.4.5.1 The height of the centre of gravity of the laden vehicle shall not exceed 90% of the overall width of the ground level bearing surface (distance between the outer points of contact with the ground of the right hand tyre and the left hand tyre of the same axle).

5.4.4.5.2 In addition, tank-vehicles with fixed tanks with a capacity of more than 3 m³ intended for the carriage of dangerous and hazardous goods in the liquid or molten state tested with a pressure of less than 4 bar, shall comply with the technical requirements of Section 8.0 of this code, for lateral stability, as amended, in accordance with the dates of application specified therein.

5.4.4.6 **Under run protection :**

5.4.4.6.1 The rear under-run protection and lateral under-run protection devices shall be in accordance with IS 14812 and IS 14682 respectively as amended from time to time.

Note 1: This provision does not apply to vehicles used for the carriage of dangerous and hazardous goods in tank containers, MEGCs or portable tanks. Vehicles with a tilting shell for the carriage of powdery or granular substances and a vacuum operated waste tank with a tilting shell with rear discharge do not require a bumper if the rear fittings of the shell are

provided with a means of protection which protects the shell in the same way as a bumper. These may be exempted where the device is incompatible to the end use.

5.4.4.7 **Combustion heaters :**

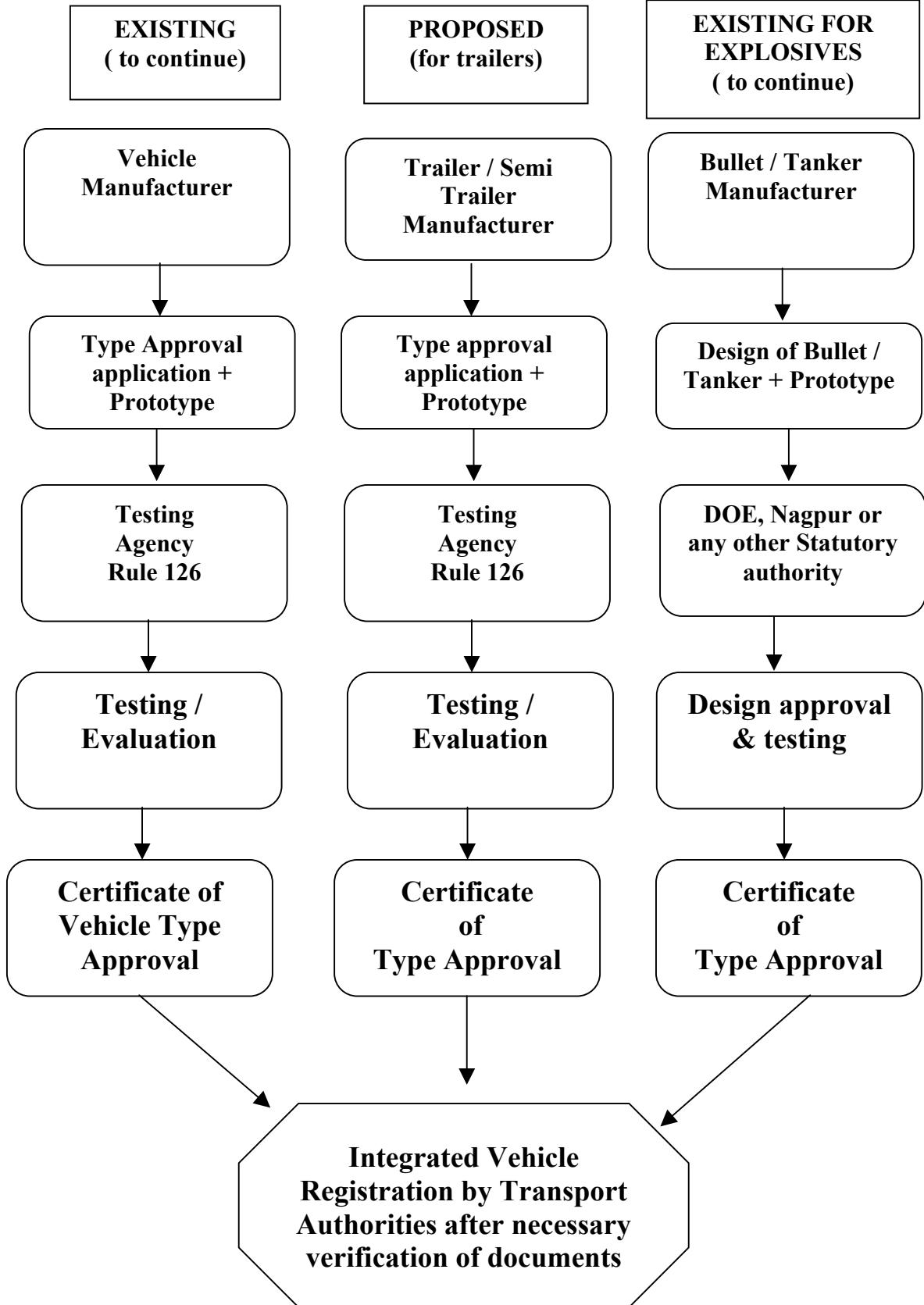
- 5.4.4.7.1 Combustion heaters shall meet the following additional requirements :
 - (a) The switch may be installed outside the driver's cab.
 - (b) The device may be switched off from outside the load compartment; and
 - (c) It is not necessary to prove that the heat exchanger is resistant to the reduced after running cycle.
- In addition for FL vehicles, they shall meet the following requirements :
 - (i) The combustion heaters and their exhaust gas routing shall be designed, located, protected or covered so as to prevent any unacceptable risk of heating or ignition of the load. This requirement shall be considered as fulfilled if the fuel tank and the exhaust system of the appliance conform to provisions similar to those prescribed for fuel tanks and exhaust systems of vehicles in clause nos. 5.3.1.2.2 and 5.3.1.2.4.
 - (ii) The combustion heaters shall be put out of operation by at least one of the following methods:
 - (a) Intentional manual switching off from the driver's cab;
 - (b) Stopping of the vehicle engine; in this case the heating device may be restarted manually by the driver;
 - (c) Start up of a feed pump on the motor vehicle for the dangerous goods carried.
- 5.4.4.7.2 After-running is permitted after the combustion heaters have been put out of operation. For the methods of 5.4.4.7.1, (ii), (b) and (c) the supply of combustion air shall be interrupted by suitable measures after an after-running cycle of not more than 40 seconds. Only heaters shall be used for which proof has been furnished that the heat exchanger is resistant to the reduced after-running cycle of 40 seconds for the time of their normal use.
- 5.4.4.7.3 If the vehicle is intended for the carriage of dangerous and hazardous goods for which a label conforming to CMVR is prescribed, no fuel tanks, power sources, combustion air or heating air intakes as well as exhaust tube outlets required for the operation of the combustion heater shall be installed in the load compartment. It shall be ensured that the heating air outlet cannot be blocked by cargo. The temperature to which the load is heated shall not exceed 50°C. Heating devices installed inside the load compartments shall be designed so as to prevent the ignition of an explosive atmosphere under operating conditions.
- 5.5 **Manner of display of class labels and identification marks :** The display of class labels shall be as per Rule 130 of Central Motor Vehicle Rules, 1989.

- 5.6 Essential equipment and documents to be carried in the vehicle :**
- 5.6.1 The documents to be carried in the vehicle shall be as per the requirements specified in Rules 131 to 136 of CMVR.
- 5.6.1.1 **Placarding and marking :** Transport units carrying dangerous and hazardous goods shall be placarded and marked in conformity with Central Motor Vehicle Rules, 1989 and DoE rules.
- 5.6.1.2 Fire -fighting appliances.**
- 5.6.1.2.1 Every transport unit carrying dangerous and hazardous goods shall be equipped with :
- (a) At least one portable fire extinguisher of minimum capacity 2 kg dry powder (or equivalent rating for suitable extinguishants) suitable for fighting a fire in the engine or cab of the transport unit, and such that, if it is used to fight a fire involving the load, it does not aggravate the fire and, if possible, controls it; however, if the vehicle is - 6 - equipped with a fixed fire extinguisher, automatic or easily brought into action for fighting a fire in the engine, the portable extinguisher need not be suitable for fighting a fire in the engine.
 - (b) In addition to the equipment prescribed under (a) above, at least one portable fire extinguisher of minimum capacity 6 kg dry powder (or equivalent rating for suitable extinguishants) suitable for fighting a tyre/brake fire or one involving the load, and such that, if it is used to fight a fire in the engine or cab of the transport unit, it does not aggravate the fire. Motor vehicles with a maximum permissible mass of 3.5 tonnes or less may be equipped with a portable fire extinguisher of a minimum capacity of 2 kg of powder.
 - (c) For vehicles of category EX (carrying explosives) – two fire extinguishers, one capable of dousing electrical fires and the other capable handling fires due to engine, tyres etc. This is as per Explosive Rules.
- 5.6.1.2.2 The extinguishing agents contained in the fire extinguishers with which a transport unit is equipped shall be such that they are not liable to release toxic gases into the driver's cab or under the influence of the heat of the fire.
- 5.6.1.2.3 The portable fire extinguishers conforming to the provisions above shall be fitted with a seal verifying that they have not been used. In addition, they shall bear a mark of compliance with a standard recognized by a competent authority and an inscription indicating the expiry date (month, year).
- 5.6.1.3 **Miscellaneous equipment :** Every transport unit carrying dangerous and hazardous goods shall be equipped with :
- (a) For each vehicle, at least one wheel chock, of a size suited to the weight of the vehicle and to the diameter of the wheels.
 - (b) The necessary equipment to take the general actions referred to in the safety instructions, in particular :
 - A suitable warning vest or warning clothing for each member of the vehicle crew.
 - A pocket lamp for each member of the vehicle crew.

- 5.7 **Driver training requirements :** Driver training and licensing shall be as per Rule 9 of the Central Motor Vehicle Rules, 1989.
- 5.8 **Periodic Inspection of vehicles :** The periodic inspection of the hazardous or dangerous goods carrying vehicles would be necessary with respect to the following.
- (i) Obtaining the fitness of the vehicle which is required yearly or a lesser period.
 - (ii) Inspection of the vehicle externally, internally and also by ultrasonic inspection.
 - (iii) Inspection of the vehicle for the DoE documents, emergency information panel, hazard class labels etc.
- 5.9 **Type approval process :**
- 5.9.1 **Approvals of PESO (Petroleum & Explosives Safety Organisation) for tankers / trailers :**
- 5.9.1.1 **Tanker / Bullet :** The tanker manufacturer and / or the bullet manufacturer shall approach the Department of Explosives for the approval of the design and the prototype as per the existing procedure.
- 5.9.2 **Vehicle type approval :**
- 5.9.2.1 The type approval of the basic vehicle chassis and bodies for vehicles and or trailers / semi-trailers will be carried out by the testing agencies specified in Rule 126 of Central Motor Vehicle Rules, 1989.
- 5.9.2.2 The vehicle manufacturer shall submit his application with all the necessary documents and also the documents with regard to its specific constructional features given at Annexure III of this code, to the testing agency for compliance to this section in addition to the Central Motor Vehicle Rules, 1989 requirements.
- 5.9.2.3 A vehicle representative of the type to be approved shall be submitted to the testing agency responsible for conducting the approval tests. However it can be only chassis as the body and installations are approved by DoE.
- 5.9.2.4 The testing agency shall issue type approval for the basic vehicle after verifying all the necessary compliance requirements stated in Central Motor Vehicle Rules, 1989 and the provisions stated in this section.
- 5.9.2.5 Similarly, the trailer / semi-trailer manufacturer shall submit his application with all the necessary documents , referred in Section 7.0 of this code to the testing agencies referred in Rule 126 of Central Motor Vehicle Rules, 1989
- 5.9.2.6 The testing agency shall issue type approval for the trailer / semi-trailer after verifying all the necessary compliance requirements stated in Central Motor Vehicle Rules, 1989 and the provisions stated in Section 7.0 of this Code.

5.9.3 Vehicle registration :

- 5.9.3.1 The integrated process of vehicle registration will be carried out by the registering authorities after necessary verification of the documents of vehicle approval and the tanker / bullet approval by DoE or their authorised third party evaluators.
- 5.9.3.2 The system of vehicle registration for dangerous and hazardous goods carrying vehicles are as indicated in the flow chart below.



Flow chart of Vehicle Registration

SECTION - 6.0

REQUIREMENTS OF CONTAINER CARRIERS AND TANKERS

LIST OF CONTENTS

- 6.1 Scope
- 6.2 Definitions of Freight Container
- 6.3 Container Types
- 6.4 Container Size Designations and Sizes Codes
- 6.5 Stacking of Load
- 6.6 Twist Locks
- 6.7 Container securing arrangements
- 6.8 Attaching Sub-frames and Bodies
- 6.9 Tanker Mounting

- 6.1 **SCOPE :** This section would apply to all containers used for the transport of goods by road vehicles which are generally of the type 1AAA, 1AA, 1AX etc.
- 6.2 **Definition of Freight Container :** Freight container is an article of transport equipment,
- i) of a permanent character and accordingly strong enough to be suitable for repeated use.
 - ii) Specially designed to facilitate the carriage of goods by one or more modes of transport, without intermediate reloading of the goods.
 - iii) Fitted with devices permitting its ready handling, particularly its transfer from one mode of transport to another.
 - iv) So designed as to be easy to fill and empty.
 - v) Having an internal volume of 1m³ or more.
- The term freight container includes neither vehicles nor conventional packing. Freight containers coding, Identification, and marking shall be as per IS : 6928 - 2001.
- 6.3 **Container types :** Typical container types are grouped in **Table-1**, and groups are subdivided according to the following concepts,
- mode of transport,
 - categories of cargo and
 - physical characteristics of the container.
- General cargo containers include those containers, which are not specifically or primarily intended for a particular category of cargo. This group is sub-divided according to type of structure and/or means of access for loading (packing) and emptying. Specific cargo containers include those for cargoes, which are temperature sensitive, for liquids and gases, for dry solids in bulk and for particular categories such as automobiles (cars), or livestock. This group is subdivided according to the appropriate physical attributes of the container such as ability to maintain a particular temperature under stated conditions, test pressures, etc.
- 6.3.1 **General cargo containers:** This is a general term applicable to any type of container which is not intended for use in air mode transport and which is not primarily intended for the carriage of a particular category of cargo requiring temperature control, a liquid or gas cargo, dry solids in bulk or cargoes such as automobiles (cars) or livestock.
- 6.3.2 **General purpose containers:** Freight container, totally enclosed and weather-proof having a rigid roof, rigid side walls, rigid walls and a floor, having at least one of its end walls equipped with doors and intended to be suitable for the transport of cargo of the greatest possible variety. General cargo container for general purposes shall meet requirements of IS:13288 (Part1) - 1993.
- 6.3.3 **Specific purpose container:** This is a general term applicable to all general cargo containers having constructional features either for the “special purpose” of facilitating packing and emptying other than by means of doors at one end of the container, or for other specific purposes such as ventilation.

- 6.3.4 **Closed ventilated container:** Container of a closed type, similar to a general purpose container, but specifically designed for carriage of cargo where ventilation, either natural or mechanical is necessary.
- 6.3.5 **Open top container:** Freight container similar in all respects to a general purpose container except that it has no rigid roof but may have flexible and movable or removable cover, for example one made of canvas or plastic or reinforced plastic material normally supported on movable or removable roof bows. Such containers may have movable or removable top end transverse members above their end doors, as shown in Figure – 6.
- 6.3.6 **Platform based container open sided:** This is a general term applied to any general cargo container which does not have rigid side walls or equivalent structures capable of withstanding all of the loads that may be withstood or transmitted by a side wall of a general purpose container and which, for this reason, has a base structure similar to that of a platform. Platform based containers , as shown in Figure 4 and 5, shall comply the requirements of IS 13288 (Part5) -1992.
- 6.3.6.1 **Platform based container open sided with complete superstructure :** Platform based container, having a permanently fixed longitudinal load carrying structure between end at the top.
Note: The term “load” as used refers to a static/dynamic type load, not a cargo load.
- 6.3.6.2 **Platform based container with incomplete superstructure and fixed ends :** Platform based container without any permanently fixed longitudinal load carrying structure between ends other than at the base.
- 6.3.6.3 **Platform based containers with incomplete superstructure and folding ends :** Platform based container with incomplete superstructure but having folded end frames with a complete transverse structural connection between corner posts.
- 6.3.7 **Platform container :** Loadable platform having no superstructure whatever but having the same length and width as the base of a container of the same series and equipped with top and bottom corner fittings, located in the plan view as on containers of series 1, so that some of the same securing and fitting devices can be used.
- 6.3.8 **Specific cargo containers :** This is a general term applied to those types of containers, which are primarily intended for the carriage of particular categories of cargo.
- 6.3.9 **Thermal container :** Freight container built with insulating walls, doors, floor and roof which retard the rate of heat transmission between the inside and the outside of the container. Thermal containers shall meet the requirements of IS:13288 (Part2) 1993.
- 6.3.10 **Insulated container :** Thermal container with the use of devices for cooling and / or heating.

- 6.3.11 **Refrigerated container (expendable refrigerant)** : Thermal container using a means of cooling such as ice, dry ice, with or without sublimation control, or liquefied gases, with or without evaporation control. It is implicit in this definition that such a container requires no external power supply or fuel supply. Refrigerated containers are as shown in Figure 1 and Figure 2.
- 6.3.12 **Mechanically refrigerated container** : Thermal container served by refrigerating appliance (mechanical compressor unit, absorption unit, etc).
- 6.3.13 **Heated container**: These are thermal container served by heat producing appliance.
- 6.3.14 **Refrigerated and heated container** : Thermal container served by refrigerating appliance (mechanical or expendable refrigerant) and heat producing appliance.
- 6.3.15 **Tank Container** : A freight container which includes two basic elements, the tank or tanks and frame work, and complies with the requirements of IS:13288 (Part 3) - 2002 as shown in Figure – 3.
- 6.3.16 **Terminology of Tank Containers :**
- 6.3.17 **Frame work**: The tank mountings, end structure and all load bearing elements not present for the purposes of containing cargo, which transmit static and dynamic forces arising out of the lifting, handling, securement and transporting of the tank container as a whole.
- 6.3.18 **Tank or tanks**: The vessel or vessels, and associated piping and fittings which are designed to confine the goods carried.
- 6.3.19 **Compartment**: Any fluid-tight section of the tank formed by the shell, ends or bulkheads. It should be noted that baffles surge plates to other perforated plates do not form tank compartments within the meaning of this definition.
- 6.3.20 **Dry bulk container** : Container consisting of a cargo-carrying structure, firmly secured within an ISO series 1 frame work, for the carriage of dry solids in bulk without packaging.
- 6.3.21 **Named cargo types**: Various types of containers such as automobile car) containers, live stock containers and others, are built in general accordance with ISO container requirements either solely or primarily for the carriage of a named cargo.
- 6.4 **Container size designations and sizes codes :**
- 6.4.1 Series 1 containers, are intended for intercontinental use. For series 1 containers, the size designations are given in the attached Table-1.
- 6.4.1.1 **Container size codes** : The size codes of the containers shall be as per IS:6928:2001. Normally the size code consists of two Arabic numerals. For containers having a nominal length equal to or greater than 3000 mm, the first numeral denotes length and the second numeral denotes height and the presence or absence of a gooseneck tunnel.

6.4.2 Definitions related to Dimensions and Capacities :

6.4.2.1 External dimensions :

6.4.2.1.1 **Nominal dimensions** : Nominal dimensions are those dimensions, neglecting tolerances, and rounded to the nearest convenient figure, by which a container may be identified.

6.4.2.1.2 **Actual dimensions** : These are maximum overall dimensions (including positive tolerances where these are applicable) for length, width and height measured along the exterior edges of the container.

Note : Diagonal tolerances, applicable to any of the six “faces” of a container are expressed in terms of the allowable differences between the lengths of the diagonal (measured between the centers of the corner fitting apertures) of the face in question. These diagonal tolerances are allowable even when the edge dimensions for the surface in question are at their maximum values.

6.4.2.1.3 **Internal dimensions** : These are the dimensions of the largest unobstructed rectangular parallelepiped, which could be inscribed in the container if inward protrusions of the top corner fittings are neglected. Except where otherwise stated, the term “internal dimensions” is synonymous with the term “unobstructed internal dimensions”.

6.4.2.1.4 **Door opening** : This term is usually reserved for the definition of the size of the door aperture, i.e. the width and height dimensions of the largest unobstructed parallelopiped, which could possibly be entered into the container via the door aperture in question. Minimum door openings of the container shall be as per IS 13288 (Part1): 1993 and IS 13288 (Part2): 2001.

6.4.2.1.5 **Internal volume** : Volume determined by multiplying the internal dimensions, i.e. the product of internal length, width and height. Except when otherwise stated the term “internal volume” is synonymous with the terms “unobstructed internal volume”, “capacity” or “unobstructed capacity”.

6.4.3 Definitions related to the Rating and Masses :

6.4.3.1 **Rating (R)** : This is the maximum permissible combined mass of the container and its contents, i.e. the maximum operating gross mass. Rating shall follow the IS:6566 - 2001.

6.4.3.2 **Tare mass (T)** : The mass of empty container including all fittings and appliances associated with a particular type of container in its normal operating condition, i.e. in the case of a mechanically refrigerated container; with its refrigeration equipment installed and, where appropriate, full of fuel.

6.4.3.3 **Pay load (P)** : Maximum permitted mass of pay load (including such cargo securing arrangements and / or dunnage as are not associated with the container in its normal operating conditions). Pay load is calculated by subtracting the tare mass from rating ($P = R - T$).

6.4.4

General : When being transported by road containers are subjected to forces and vibrations arising from braking, shunting, cornering, acceleration, road surface and wind. Securing methods should take these factors and those factors identified in 9.1 into account. For road transport the container shall not project beyond the front or rear of the carrying vehicle. The ISO standards related to Containers are as given in the following Table-2 for reference and guidelines.

Table 2
ISO Standards Related to Containers

Sr. No	ISO Standards	Description
1	ISO 688: 1995	Series 1 Freight Containers – Classification, dimensions and ratings
2	ISO 830: 1999	Frieght Containers – Vocabulary
3	ISO 1161:1984	Frieght Containers – Corner Fittings Specification
4	ISO 1496-1:1990	Frieght Container – Specification and Testing General Cargo Containers for General Purposes
5	ISO 1496-2: 1996	Frieght Container – Specification and Testing Thermal Containers
6	ISO 1496-3:1995	Frieght Container – Specification and Testing Tank Containers for liquids, gases and pressurized dry bulk
7	ISO 1496-4:1991	Frieght Container – Specification and Testing Non Pressurised container for dry bulk
8	ISO 1496-5: 1991	Frieght Container – Specification and Testing Platform and Platform based containers
9	ISO 3874: 1997	Frieght containers Handling and Securing
10	ISO 6346: 1995	Frieght Containers – coding, identification and marking
11	ISO 8323: 1985	Frieght Containers – Air /surface (intermodal) general purpose Containers – Specification and tests

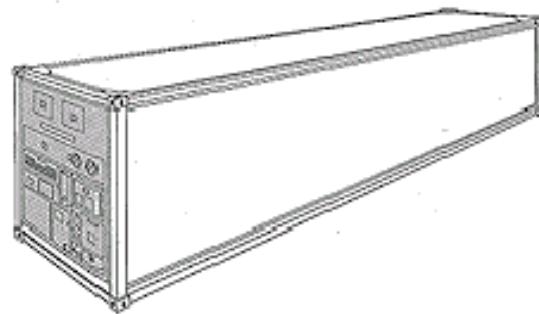


Figure 1
Refrigerated Container

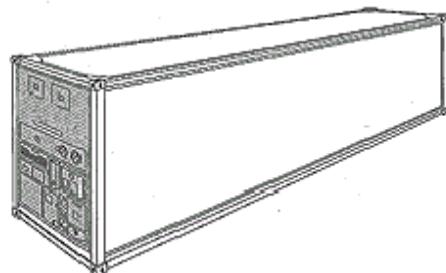


Figure 2
High Cube Refrigerated Container

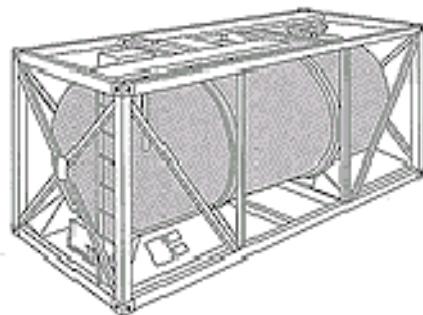


Figure 3
Tank Container

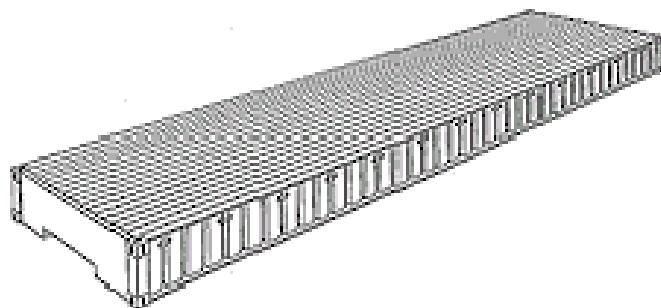


Figure 4
Platform Based Container

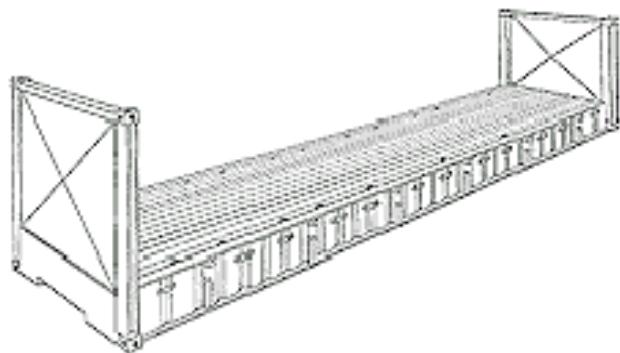


Figure 5
Flat Rack Container

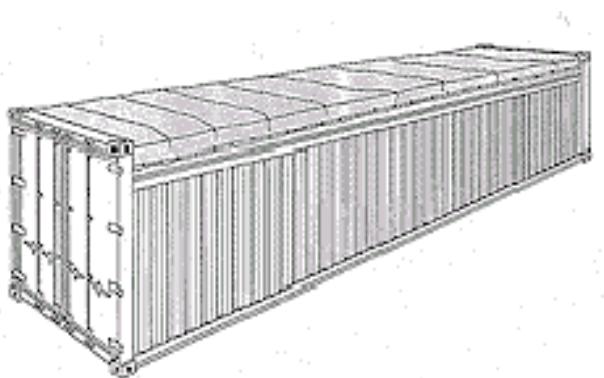


Figure 6
Open Top Container

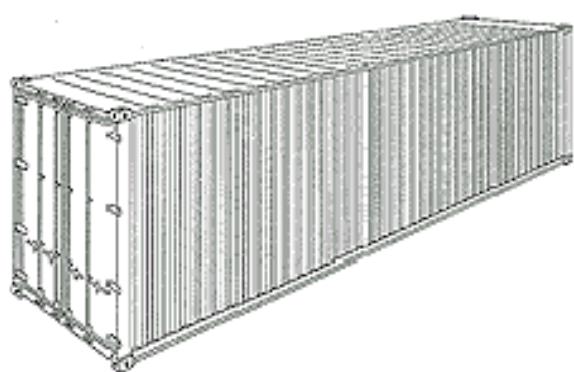


Figure 7
High Cube Container

6.5 Recommendations for Stacking of Load :

6.5.1 **Loads** : The load stacked in vehicles must be secured for protection against the following motions during transport .

- Impact against loading docks
- Braking and acceleration
- Sway on curves
- Coupling impact
- Vibration and shocks

6.5.2 **Loading pattern** : Loading pattern should be planned for each commodity prior to loading to avoid overloading at any one end.

6.5.3 **Loading intensity** : Maximum permissible intensity of loading shall not exceed

- For 20-ft container 4.5 ton/m²
- For 40-ft container 3 ton/m²

6.5.4 **Centre of gravity** : Heavy goods should not be placed on top of the lighter goods. The center of gravity be maintained in lower half of the height. Longitudinally, the centre of gravity shall not be out of the middle by following limits:

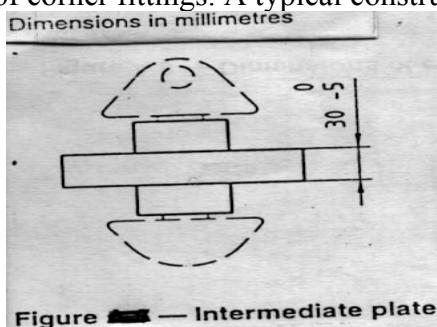
- 20-ft container 0.6 m on both sides
- 40-ft container 0.9 m on both sides

6.6 **Twist locks** : Twist locks shall be provided to hold the containers safely and rigidly on the load body platform of the vehicle, or on the base of a trailer / semi-trailer. These twist locks shall comply with the requirements specified in IS : 7622 – 2001.

6.6.1 Design dimensions of twist locks :

6.6.1.1 **Top and bottom cone** : In fully locked position, load carrying area must be larger than 800 mm². Top and bottom shall not protrude into part of the corner cavity that is required for other lashing equipment.

6.6.1.2 **Intermediate plate** : The thickness of the intermediate plate may be between 29.5 and 30 mm. The load carrying area (flange surface bearing area) of intermediate plate may be at least 4500 mm². It shall be so designed as to have maximum load transfer area towards walls of corner fittings. A typical construction is shown in Figure 8.



**Figure- 8
Intermediate Plate**

- 6.6.1.3 **Handle :** The length of handle measured from centerline of locks to the end may be maximum 160 mm. The bent up tail of handle shall have a length of 25 mm \pm 2mm. A typical construction is shown in Figure 9.

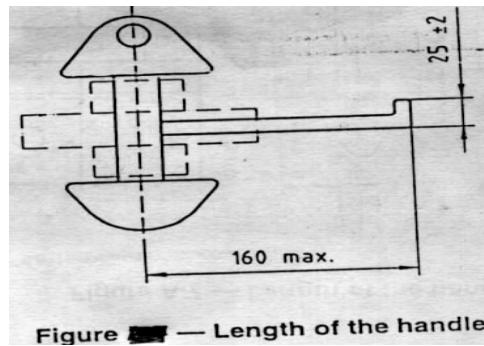


Figure - 9
Length of the Handle

- 6.6.1.4 **Distance between top and bottom locks :** The distance between top and bottom locks should be at least the actual thickness of intermediate plate plus 2 times (33 ± 1) mm.
- 6.6.1.5 **Collar :** In order to fit into corner fitting pertures, the collar may have dimensions as shown in Figure 10.

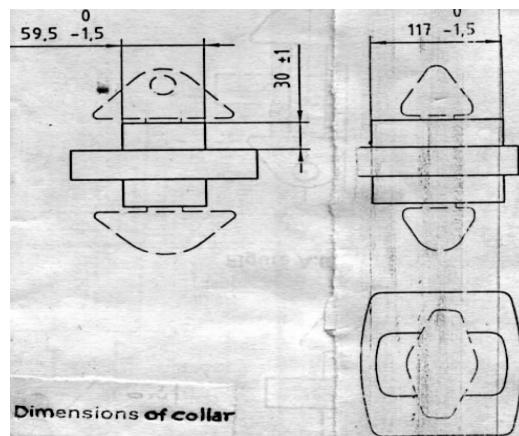


Figure-10
Dimensions of the Collar

6.6.2 Performance specifications :

- 6.6.2.1 **Tensile strength :** Twist locks shall withstand a tensile force of 150 kN without any permanent deformation.
- 6.6.2.2 **Compression strength :** The intermediate plate of the twist lock shall withstand a compression force of 850 kN without any permanent deformation or rendering unsuitable for use. The cones of twist locks shall withstand a compression force of 150 kN without any permanent deformation.

6.6.2.3 **Shear strength :** The collars of twist lock shall withstand a shearing force of 300 kN longitudinally and transversally without permanent deformation or rendering unfit for use.

6.7 **Container securing arrangements :**

6.7.1 **Four twist lock system :** Nominal centre-to-centre distances for positioning twist lock collars will be identical to corresponding dimensions measured between centre points of bottom holes in the bottom corner fittings of the container, and are given below. The nominal centre-to centre distances for positioning of twistlock collars are as indicated in Table-3 below :

Table 3
Nominal Center to Center Distances

Container designation	Longitudinal distance	Lateral distance
1AA/1A/1AX	11985.5	2259
1BB/1B/1BX	8918.5	2259
1CC/1C/1CX	5853.5	2259
1D/1DX	2787	2259

6.7.2 **Tolerances :** Tolerance (T_{st}) on longitudinal centre-to-centre distance between collars and the Tolerance (T_{pt}) on lateral centre-to-centre distance between collars are as indicated in the Table-4 below. The twist lock collar sizes are as indicated in Table-5.

Table 4
Lateral Centre-to-Centre Distance between Collars

For collars for containers of designation -	T_{st}			T_{pt}			Allowable diagonal difference, k		
	Collar size			Collar size			Collar size		
	A	B	C	A	B	C	A	B	C
1AA/1A/1AX	± 2.5	± 3.5	± 4.5	± 2	± 3	± 4	± 4.5	± 8.5	± 10.5
1BB/1B/1BX	± 2.5	± 4.5	± 5.5	± 2	± 3	± 4	± 7	± 9	± 11
1CC/1C/1CX	± 4.0	± 5.5	± 7.0	± 2	± 3	± 4	± 10	± 13	± 14
1D/1DX	± 4.0	± 5.5	± 7.0	± 2	± 3	± 4	± 10	± 12.5	± 13.5

Table 5
Twist Lock Collar Sizes(in mm)

Size	Length (or Diameter)	Width
A	100	57
B	97	56
C	95	55

6.7.3 **Two pins and two twist locks:** In cases where the vehicle is a semi-trailer with a gooseneck, it is a common practice to arrange for one end of the container (gooseneck tunnel end) to be secured by means of pins engaging the end holes of the corner fittings adjacent to the tunnel and to arrange for the other end to be secured by means of twist lock. The dimension of the gooseneck chassis are as indicated in Table-6 below.

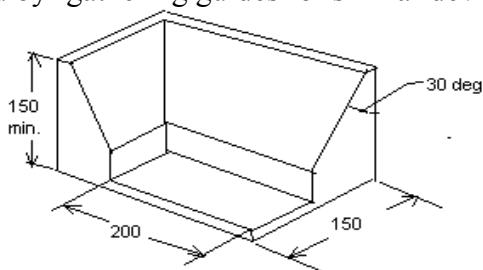
These are commonly used for 1AA, 1A and 1AX containers.

Table 6
Dimensions of Gooseneck Chassis.

Container Designation	Container size	L	K max
1AA/ 1A/ 1AX	12 192	$12\ 098 \pm 6$	16
1BB/ 1B/ 1BX	9 125	$9\ 030 \pm 6$	13
1CC/ 1C/ 1CX	6 058	$5\ 962 \pm 6$	10

In the above figure,
P (Pin penetration) = 32 min.
E (Pin extension) = 67 min.

6.7.4 **Terminal trailer operation:** Terminal trailer operation in this context is container movement on terminal trailers at low speed over short distances within designated areas. For such operation, tie-down devices are not required but the container shall be correctly located on the trailer and prevented from moving horizontally; that is generally achieved by ‘gathering guides’ or similar devices as in Figure - 11.



Example of gathering guide

Figure -11
Gathering Guide

6.8 **Attaching sub-frames and bodies :** Sub-frame and vehicle frame are to be joined using either a thrust-compliant or thrust-resistant arrangement. Depending on the body situation, it is possible, or even necessary, to have both types of joint at the same time (this is then referred to as partially thrust-resistant and the length and range of the thrust-resistant connection are given). The usage of these joints is determined based on their strength. Thrust-resistant connections are to be used if a thrust-compliant connection is no longer sufficient. A check must be made to see whether mounting brackets are strong enough when work implements and machines, lifts, tanker bodies etc., are installed.

6.8.1 **Flexible shim :** Wooden inserts and resilient shims, are not permitted to be used in combination. However, they can be used independently.



Figure-12
Flexible Shim

6.8.2 **Thrust-compliant connections :** Thrust-compliant connections are non-positive /frictional connections. Relative movement between frame and sub frame is possible to a limited degree. All bodies or sub frames that are bolted to the vehicle frame by means of mounting brackets are thrust-compliant connections. For a thrust-compliant connection the mounting points located on the chassis must be used first. These are not sufficient or cannot be used for design reasons, then the additional mountings are to be located at suitable points as peer manufacturers instructions only. When selecting the number of mountings, ensure that the distance between the mounting point centres does not exceed 1200 mm (see Figure - 13 below).

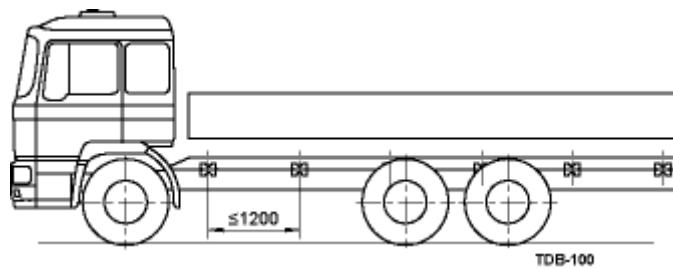


Figure -13
Distance between Sub-frame and Body Mountings TDB-100

6.8.3

Clearance between brackets and frames : The different clearances (gaps) between the mounting brackets and the frame and sub frame are compensated for by inserting shims of appropriate thickness as shown below in Figure-14 to Figure -21. The shims must be made of steel. Grade S235JR (=St37-2) is sufficient. Avoid having more than four shims at any one mounting point.

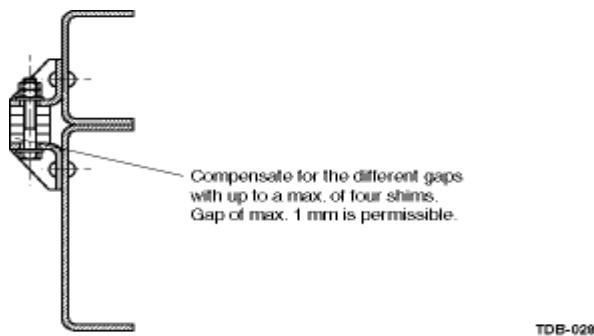


Figure-14
Shims between Mounting Brackets

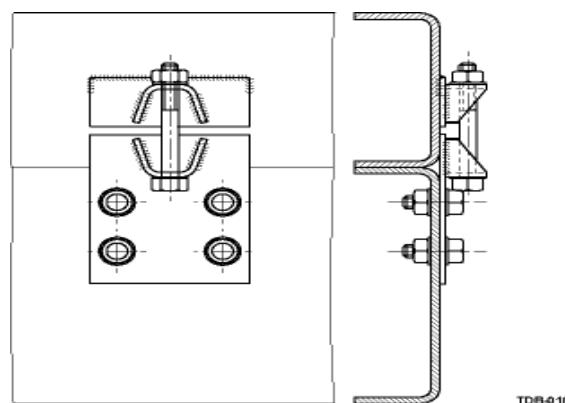


Figure-15
Mounting Bracket for Long Bolts

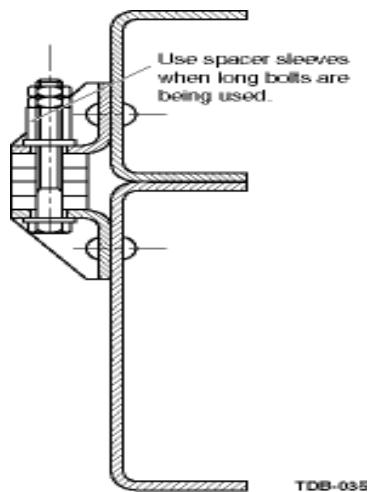


Figure-16
Spacer Sleeves for Long Bolts

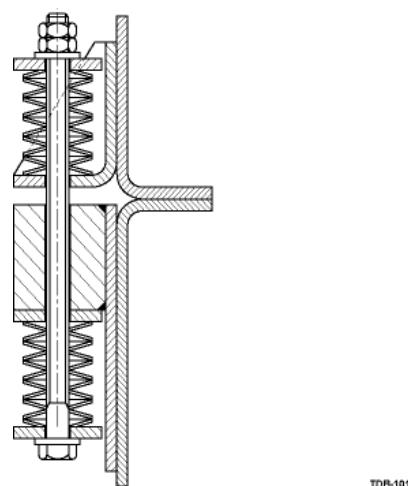


Figure-17
Long Bolts and Cup Springs

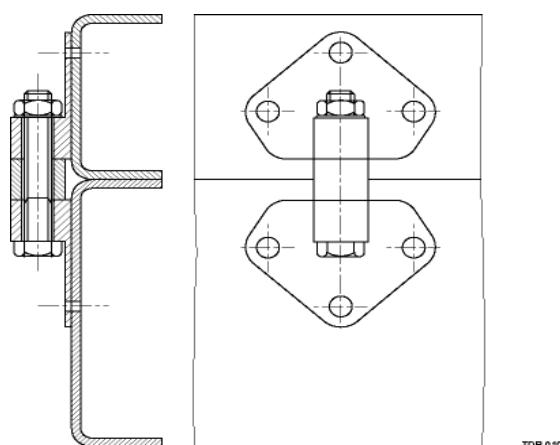


Figure-18
Sub-frame Mounting with Brackets

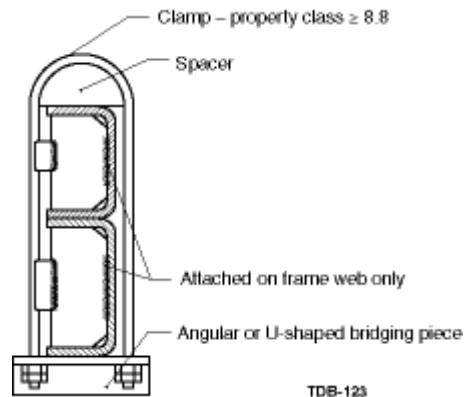


Figure-19
Shackle Mounting

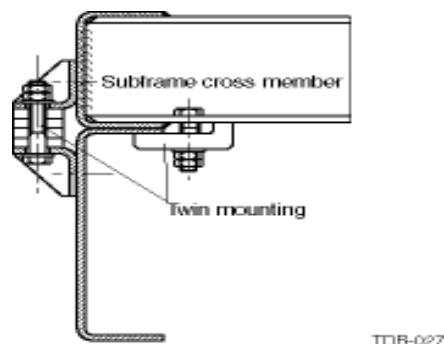


Figure-20
Twin Mounting

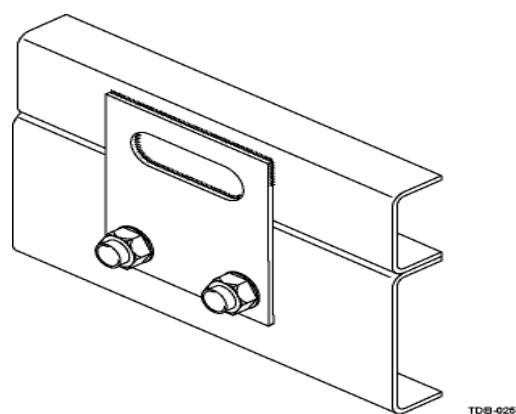


Figure-21
Twin Mounting with Plug Weld

6.8.4

Self-supporting bodies without sub frame : A sub frame is not required if ;

- there is a sufficient moment of resistance (affects the bending stress)
- there is a sufficient geometrical moment of inertia (affects flexing).

If the body is self-supporting and no point loads and rear loads (e.g. lift gate, trailer nose weights) occur, then in some circumstances a sub frame does not need to be fitted if the distance between the body cross members is not more than 600 mm as shown in Figure-22 below. This value of 600 mm may be exceeded only in the area of the rear axles.

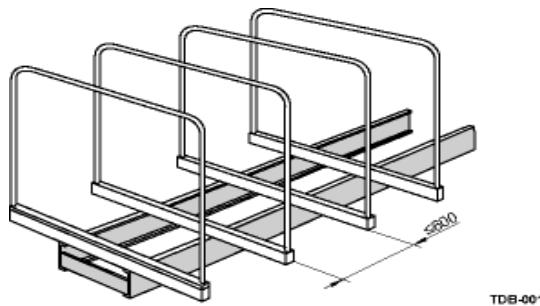


Figure-22
Distances between Cross Members when there is no Sub frame

The supports on the frame must be of the minimum lengths, as calculated using "Hertzian surface pressure". Here, "linear contact of two cylinders" is assumed rather than "linear contact of a cylinder and a plane". The Figure-23 below shows an exaggerated deformation of two U-sections lying on top of each other.

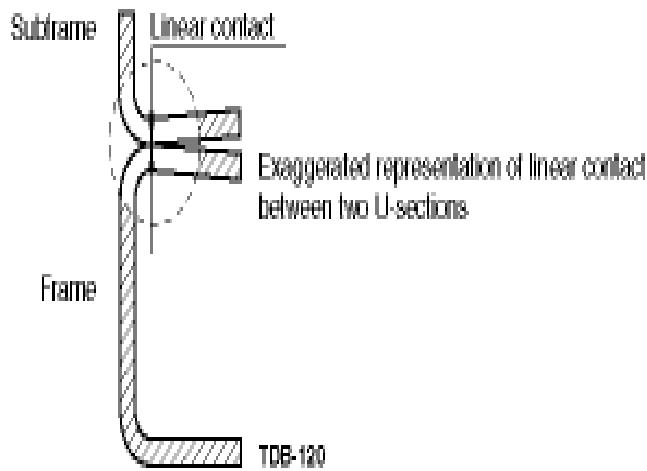


Figure-23
Deformation of Two U-sections

- 6.9 **Tanker mounting :**
- 6.9.1 **General requirements :** The mounting of tanker bodies is the most specialized of all equipment mountings because a stiff body can easily create local high stress points on the chassis frame. It is essential that this construction be allowed to float on the chassis and that chassis flexibility is not affected. Flexible mountings must be superimposed between tanker and chassis frame, as stipulated.
- 6.9.2 **Mounting conditions :**
- 6.9.2.1 Greater strengthened wider brackets to be used.
 - 6.9.2.2 The vertical face of bracket must extend to the full depth of the chassis web. Otherwise an oil-can effect on chassis member may cause cracking of chassis web at lower edge of the bracket.
 - 6.9.2.3 Brackets should not be welded to side member. No holes should be drilled on the top / bottom flange of the chassis.
 - 6.9.2.4 All the brackets should be attached to the frame by fixing bolts with locknuts or nuts and heavy duty stocking spring washers.
 - 6.9.2.5 Simple methods of resilient mounting can be adapted on a vehicle where the tank is able to flex to a degree without affecting the structure as shown in Figure-24.

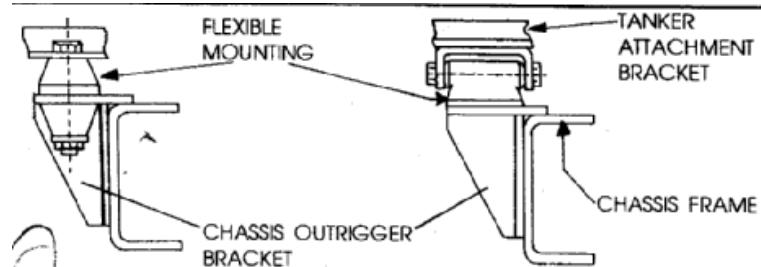


Figure-24
Flexible Mounting used in Tanker Application

- 6.9.2.6 Allowances to be made for variation in deflection on the road spring to avoid drainage sump / pipings of the tank fouling with air pipings and other chassis equipments.

6.9.2.7 The CG of all installations should be kept as low as possible.

6.9.2.7.1 Guidelines for calculation of CG height :

The general procedure to calculate CG height of the tanker is given below for guidance only.

- Location of CG height under unladen condition with 10.00 x 20 tyres

Description	Weight in kg	CG height from the ground in m	Moment in kgm
Cab	450	1.410m	634.5kgm
Engine	546	1.008m	550.37kgm
Gear box	135	0.727m	98.15kgm
Front axle	500	0.508m	254.0kgm
Rear axle	940	0.508m	447.00kgm
Frame & misc	1830	0.887m	1623.2kgm
	4401	--	3607.22kgm

- Location of CG Ht. Of unladen chassis + cab from ground level $3607.22 / 4401 = 0.8196m$
- Location of CG height under laden condition with 10.00 x 20 tyres

Description	Total wt. in kg	CG height from the ground, m	Moment in kgm
Chassis + cab	4401	0.746	3283.12
Tank + payload + canopy + piping	11490	2.185	22116.57
Sub frame	280	1.023	286.44
	16171	--	25686.13

- Location of CG of laden chassis $25686.13 / 16171 = 1.588m$

6.9.2.8 Another important parameter to be considered while building tanker is stability ratio. It should never be more than one. The usual recommended stability ratio is 0.7 to 0.9. The stability ratio can be calculated as below : (Under normal spring deflection of 80mm)

$$\text{Stability ratio} = 2h \times \tan 28^\circ / b$$

h = CG ht. Under laden condition

b = Rear outer tyres center distance in m

$$\text{Stability ratio} = \text{moment W.R.T. ground} / b$$

6.9.2.9 **Spacing between mounting :** Brackets along the side of frame so that there is a mount adjacent to each rear axle spring bracket and a mount at the front of the tank as shown in Figure-25, below. Care must be taken that movement of rear axle is not restricted in any way. This is preferred on tankers operating on / off road, rural delivery.

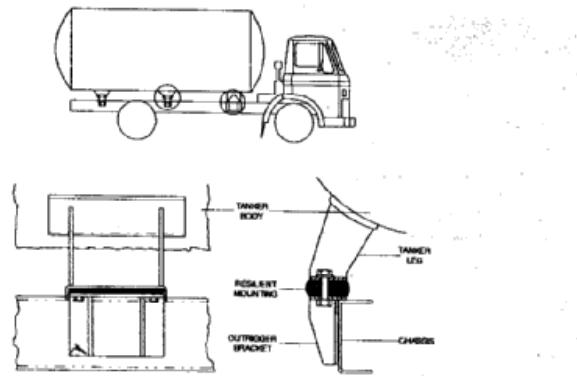


Figure-25
Arrangement of Rear Mounting and Spacing of Mounting

- 6.9.2.10 A greater relative movement between tank and frame can be achieved by incorporating coil springs between the tanker mounting feet and the front mounting brackets as shown in Figure-26.

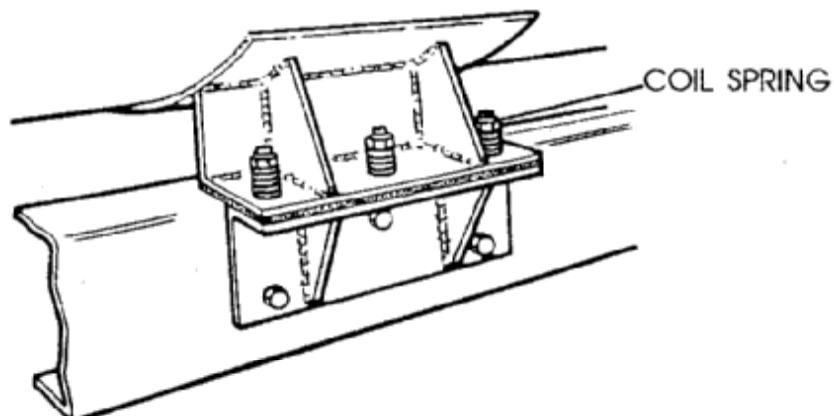


Figure-26
Arrangement of Front Mounting with Coil Springs

Alternatively, trunnion type of front mounting can also be tried. In this case, rear most bracket must be fastened rigidly by bolts, giving a positive constraint between body and chassis during acceleration, road movement, cornering and braking as shown in Figure-27.

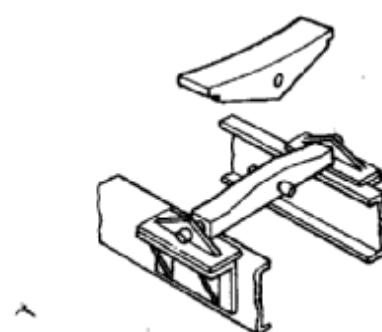


Figure-27
Preferred Arrangement of Front Mounting with Trunnion

- 6.9.2.11 Alternatively "U" bolts / fish plates arrangement with full length body runner as described in the earlier chapter can be fitted as shown in Figure-28. The typical "U" bolt arrangement for a milk tanker with integral tapered runner is shown in following Figure-29. In the tanker is to carry inflammable liquids or gases, petroleum regulations are to be followed. Depending upon the substances being carried, some of the equipments / points have to be fitted / followed as per Schedule (iii) of the Petroleum rules 1976, Rules No. 71 of Petroleum Rule 1976 and Rule No. 71 of 1937.

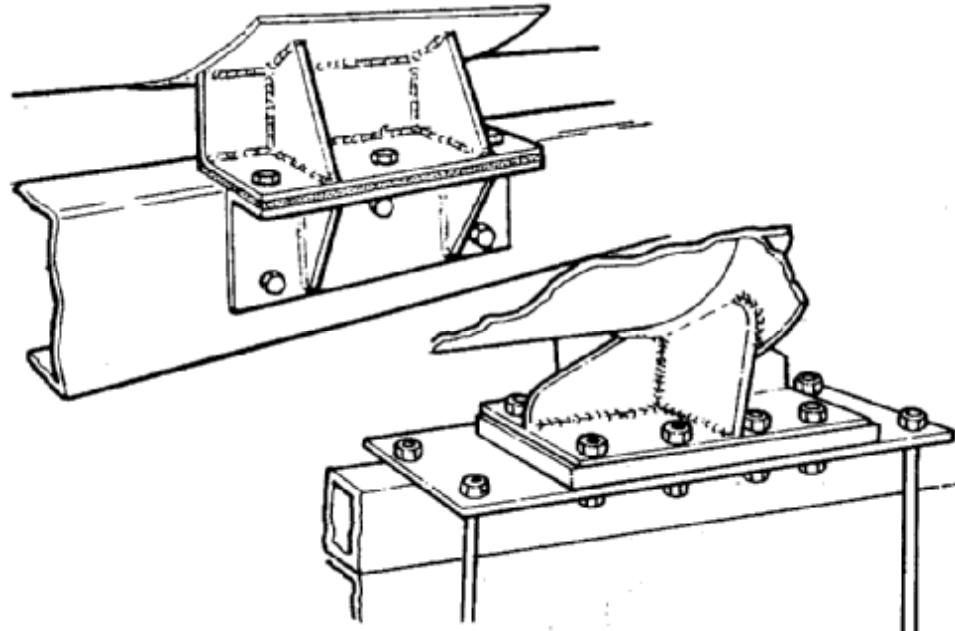


Figure -28
General Method of Tank Mountings

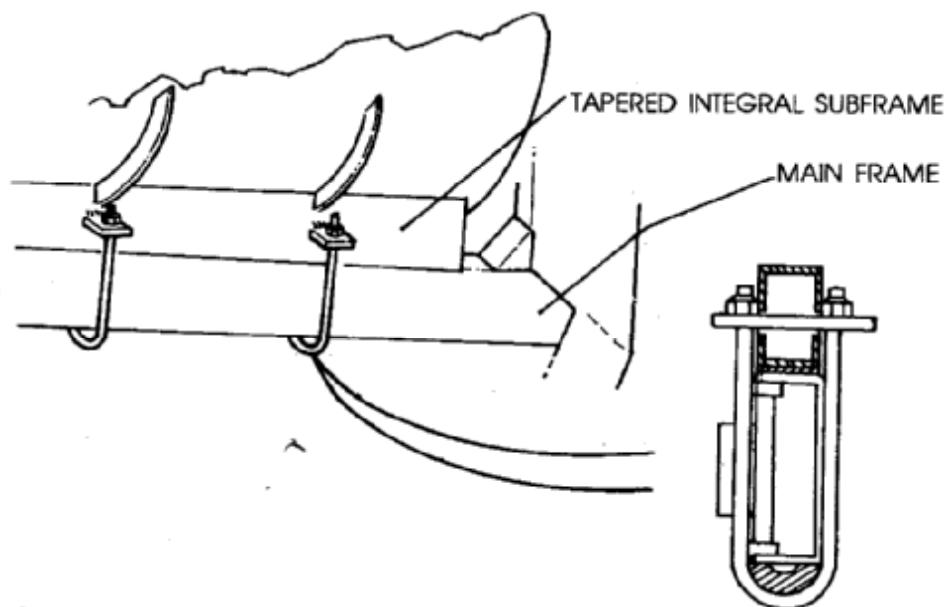


Figure 29
Typical "U" Bolt Arrangement Fitted on Milk Tanker

- Insulated return wiring.
- A battery master switch and batteries enclosed inside the cab.
- A fire screen.
- An exhaust system wholly ahead of firescreen with flame trap or spark arrester.
- Positively retained wired glass or planks for all rear ward facing cab windows.
- Fire extinguishers – foam type.

6.9.3 Other requirements for body fixtures and mountings :

Tank and container bodies require a continuous sub frame, yield point $s_0 > 350 \text{ N/mm}^2$. The connection between the body and chassis in the front area must be designed so that it does not excessively hinder the frame's ability to twist. This can be achieved by having front mountings that are as torsionally compliant as possible, e.g. by having

- Pendulum-type mounting as shown in Figure-30.
- Flexible mounting as shown in Figure-31.

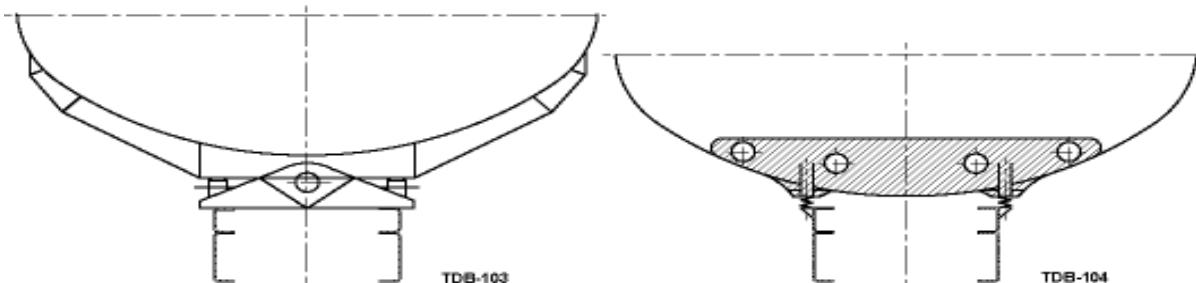


Figure - 30
Front Mounting as a Pendulum Mounting

Figure - 31
Front Mounting as a Flexible Mounting

The front mounting point should be as close as possible to the front axle center line as shown in Figure-31 and Figure-32. The rear, laterally stiff body support must be fitted in the area of the theoretical rear axle center line. There should also be a sufficiently large connection to the frame at this point. The distance between the theoretical rear axle center line and the centre of the support must be $< 1000 \text{ mm}$ as shown in Figure-31 and Figure-32.

6.9.4 Layout of tanker and bulk container mountings : After installing the body it is important that a check be made to see if vibrations or other disadvantageous properties are noticeable. Vibration can be influenced with the correct design of sub frame and the correct layout of the tanker mountings.

6.9.5 Tankers and container bodies without sub-frames : Tanker and container bodies without sub frames can be approved if the conditions described here are observed and there are double or triple mountings on each side of the frame. All supports must be arranged at the specified distances as shown in Figure-32 and Figure-33. If the permissible range is exceeded, this may cause the frame to bend excessively, which is not permitted; a continuous sub frame would then be required as shown in

Figure 33. After installing the body it is important that a check be made to see if vibration or other disadvantageous properties are noticeable. The Table-7, given below would indicate the details of chassis without sub-frames for tanker bodies with double and triple mountings. The mounting arrangement of tankers are also shown in Figure-34 to Figure-37, which may be taken as general guidelines.

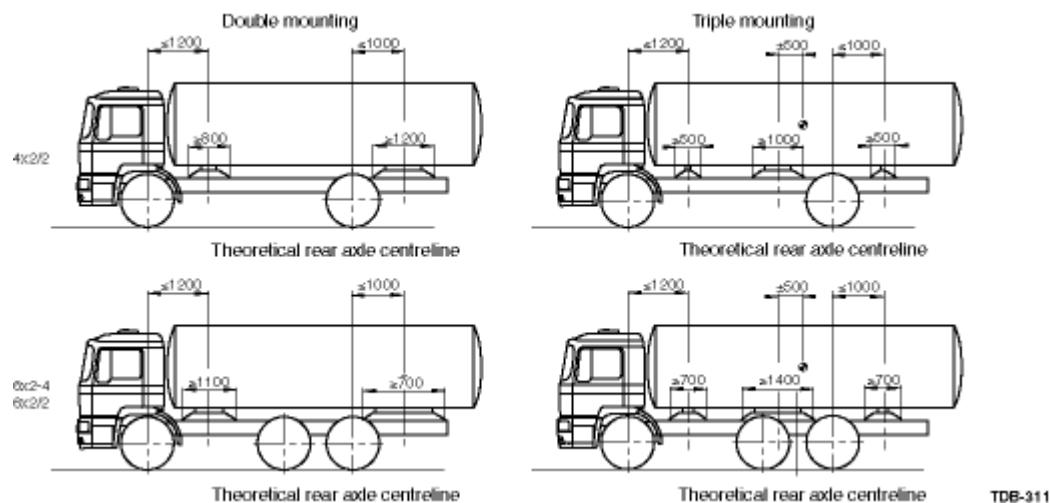


Figure - 32
Requirements for Tank Mountings for Designs without Sub-frames

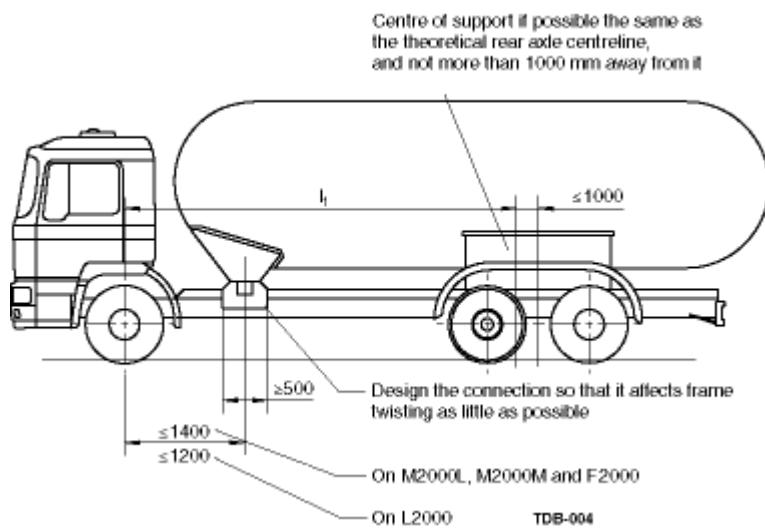


Figure-33
Continuous Sub-frame

Table 7
Chassis without Sub-frames for Tanker Bodies
with Double and Triple Mountings

Vehicle range	Model*	Wheel formula	Suspension	Wheelbases [mm]
M2000L	L74	4x2/2	leaf-leaf	3575... 4250
	L76		leaf-air	"
	L79		full air	"
	L81		leaf-leaf	"
	L84		leaf-air	"
	L86		full air	"
	L87		leaf-leaf	"
	L88		leaf-air	"
	L89		full air	"
M2000M	M38	4x2/2	leaf-leaf	"
	M39		leaf-air	"
	M40		full air	"
F2000	T31	4x2/2	leaf-leaf	3800... 4500
	T32		leaf-air	"
	T33		full air	"
	T36	6x2/2	leaf-air	4100... 4600 ... 1350
	T37	6x2-4	full air	"

* For model allocation, see "General" booklet

Table 1
Size Designations of Freight Containers as per ISO 1669

Freight Container Designation	Nominal Length		Maximum Height			Maximum Width	
	m	ft.	mm	ft.	in.	mm	ft.
1AAA	12	40	2896	9	6	2438	8
1AA	12	40	2591	8	6	2438	8
1A	12	40	2438	8		2438	8
1AX	12	40	2438	8		2438	8
1BBB	9	30	2896	9	6	2438	8
1BB	9	30	2591	8	6	2438	8
1B	9	30	2438	8		2438	8
1BX	9	30	2438	8		2438	8
1CC	6	20	2591	8	6	2438	8
1C	6	20	2438	8		2438	8
1CX	6	20	2438	8		2438	8
1D	3	10	2438	8		2438	8
1DX	3	10	2438	8		2438	8

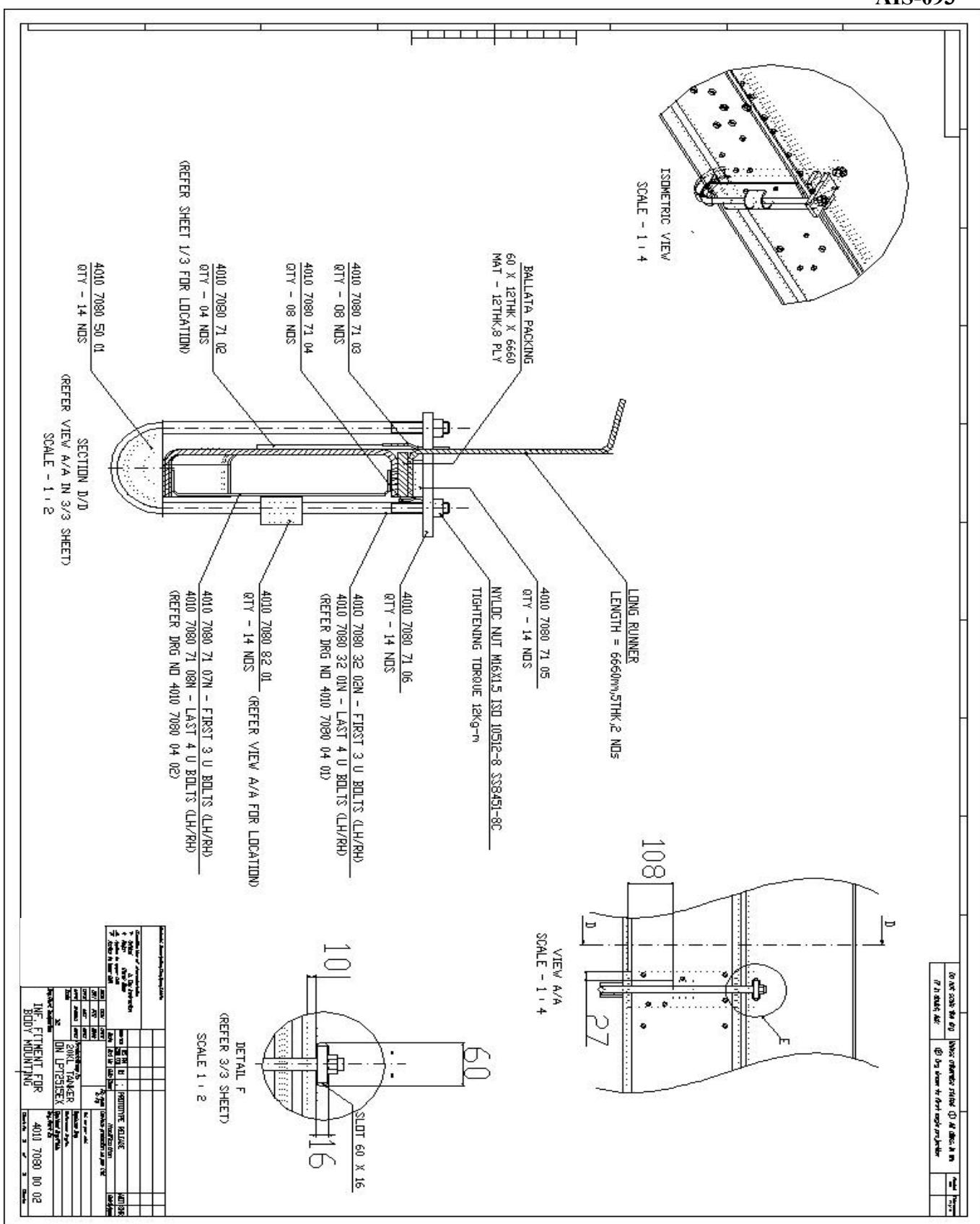


Figure-34
Details of Tanker Mounting

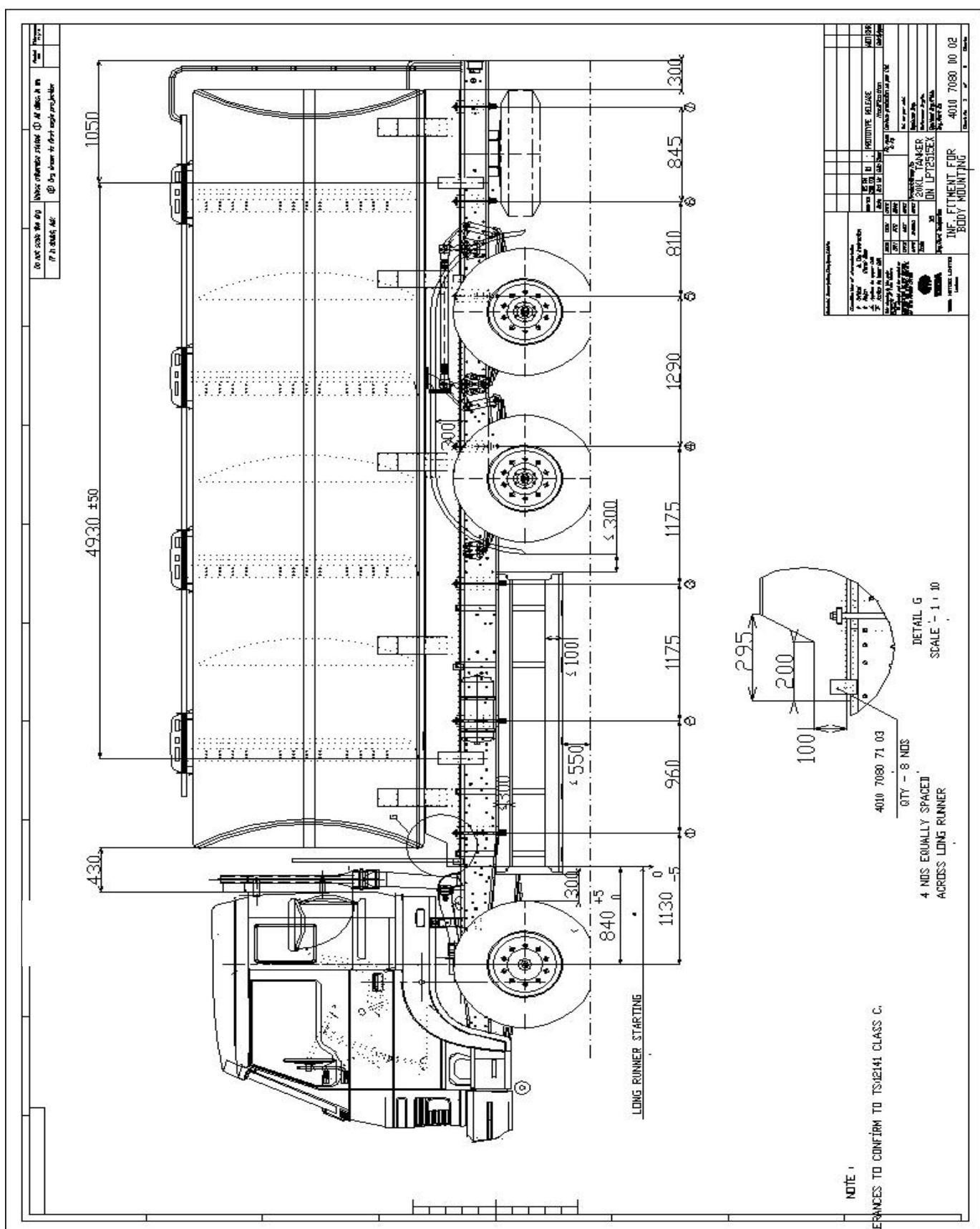


Figure-35
Details of Tanker Mounting

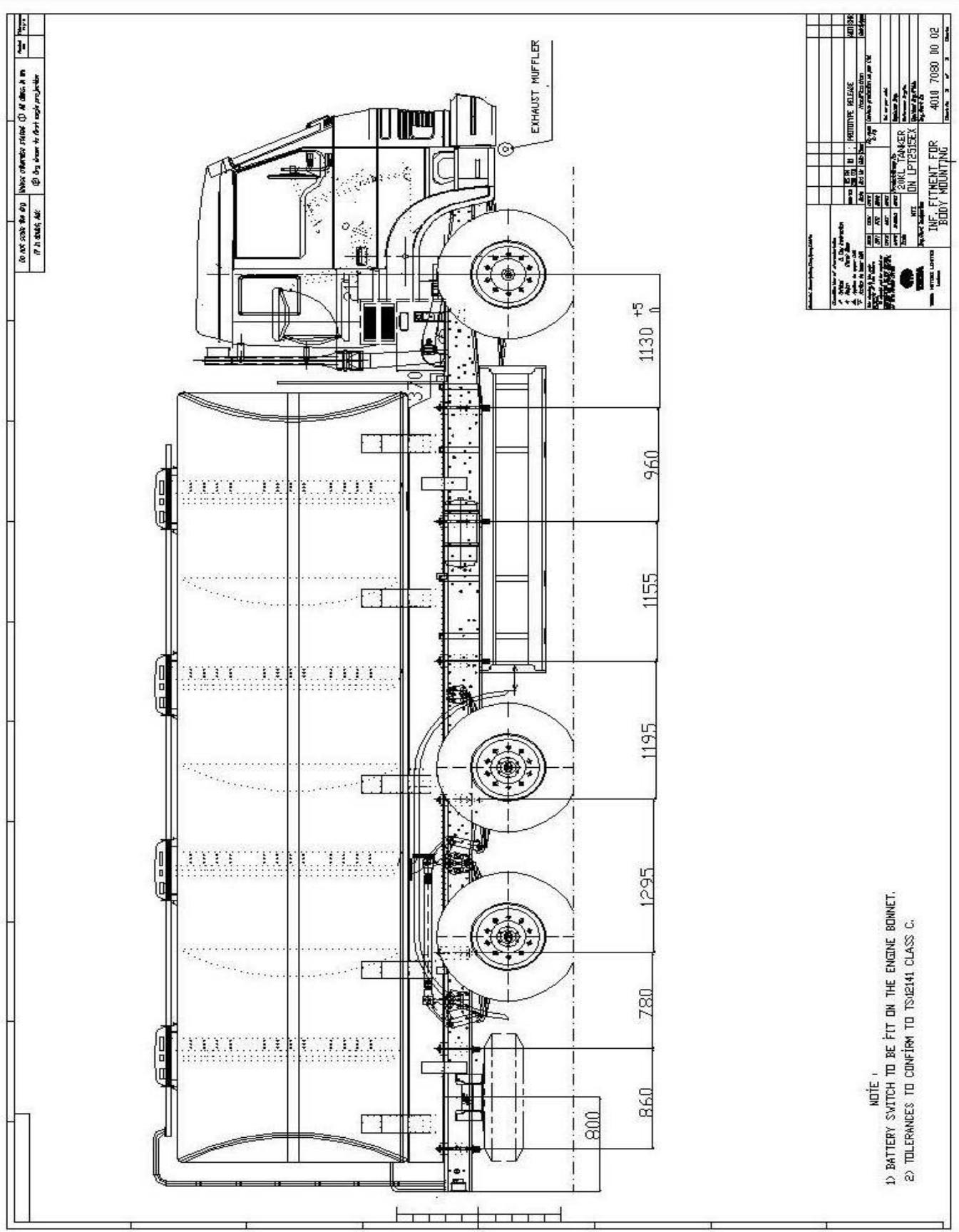


Figure-36
Details of Tanker mounting

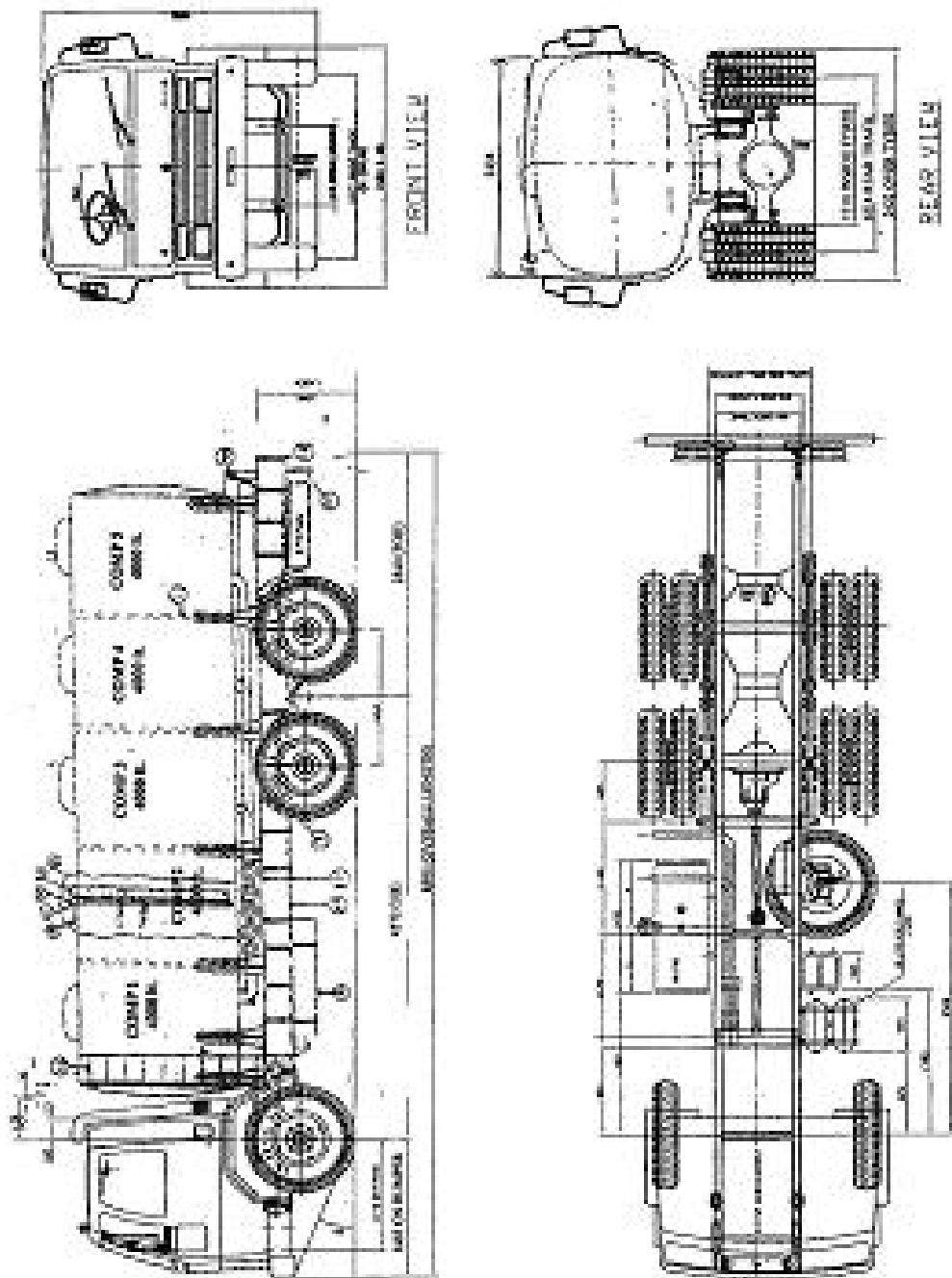


Figure-37
Details of Tanker Mounting

SECTION - 7.0**AUTOMOTIVE TRAILERS****LIST OF CONTENTS**

- 7.1 Scope
- 7.2 Definition
- 7.3 General Requirements
- 7.4 Tipping Stability of Heavy Trucks and Trailers
- 7.5 Electrical System
- 7.6 Applicable Standards for Trailers
- 7.7 Service Brakes for Trailers – Constructional and Functional Requirements
- 7.8 Compatibility between Tractor and Trailer
- 7.9 Safety Critical Items
- 7.10 Interchangeability of Trailers
- 7.11 Type Approval of Trailers

- 7.1 **SCOPE :** This chapter covers the requirements applicable to semi-trailers and trailers of category T3 and T4, coupled with trucks of category N, as are defined in AIS-053. However, the special provisions for carriage of dangerous and hazardous goods are covered in Section -5 of this code.
- 7.2 **DEFINITIONS :**
- 7.2.1 "**T' category**" means towed vehicle with at least two wheels, on account of its design and appointment is intended for carrying goods or persons. Semi-trailers are also included in this category.
- 7.2.2 "**Semi-trailer**" means a truck trailer equipped with one or more axles, and so constructed that the front end and a substantial part of its own weight and that of its load rests upon another vehicle.
- 7.2.3 "**Full trailer**" means a truck trailer constructed so that all of its own weight and that of its load rest upon its own wheels.
- 7.2.4 "**Balanced full trailer**" means a truck trailer in which the load carrying axle(s) is (are) located approximately under the center-line of the cargo body.
- 7.2.5 "**Load-Dividing dolly**" is coupled between a truck tractor and semi-trailer to reduce the load imposed by the semi-trailer on the truck tractor. It is a truck trailer with one or more axles equipped with a fifth wheel, draw bar, and other parts necessary for its use.
- 7.2.6 "**Trailer converter dolly**" means a truck trailer with one or more axles equipped with a fifth wheel, a drawbar, and other parts necessary to convert a semi-trailer to a full trailer.
- 7.2.7 "**Pole trailer**" means a truck trailer, without auxiliary motive power, designed to be drawn by a truck or truck tractor, attached by means of a reach or a pole (or by being boomed or otherwise secured to the drawing motor vehicle), and intended for transporting long or irregularly shaped loads such as poles, logs, pipes, or structural members which are generally capable of sustaining themselves as beams between supporting connections.
- 7.2.8 "**Low bed trailer**" means a trailer with a flat loading platform but with a swan neck or a wheel arch both at the front and at the rear end. The platform height may be lower than the trailer tyre diameter.
- 7.2.9 "**Semi low-bed trailer**" means a trailer with a flat loading platform but with a swan neck or wheel arch at the front end. The height of the platform may be equal to or more than the trailer tyre diameter.
- 7.2.10 "**Double drop frame trailer**" means a trailer where the platform between the wheels is dropped as low as possible to facilitate loading from fitted outboard.
- 7.2.11 "**Single drop frame trailer**" means a trailer where the platform is dropped behind the front wheels for loading either by means of a ramp or other suitable method. The rear wheels are usually fitted outboard.

- 7.2.12 **“Flat platform trailers”** means a trailer with a flat loading platform without any swan necks or wheel arches.
- 7.2.13 **“Swan neck (goose neck)”** means the raised portion of the trailer beyond the loading platform generally used to accommodate its own wheels or wheels of the towing vehicle.
- 7.2.14 **“Wheel arch”** means the raised portion on the platform of a trailer provided to accommodate the vertical travel of its own wheels.
- 7.2.15 **“Tow bar”** means strut or column like device temporarily attached between the rear of a towing vehicle and the front of the vehicle being towed. Its purpose is to maintain the interval or distance between the two.
- 7.2.16 **“Tow eye”** means the trailer part of the mechanical coupling of an independent trailer, normally attached to the pintle hook of the tractor.
- 7.2.17 **“Towing hook (Pintle hook)”** means the tractor part of the mechanical coupling of an independent trailer normally attached to the tow eye of the trailer.
- 7.2.18 **“Fifth wheel coupling”** means a device used to connect a truck tractor to a semi trailer and to permit articulation between the units. It is generally composed of a lower half, mounted on the tractor, consisting of a trunnion, plate and latching mechanism, for connection with a king pin mounted on the semi-trailer.
- 7.2.19 **“King pin”** means the trailer part of the mechanical coupling of a transport tractor-trailer normally attached to fifth wheel of the tractor.
- 7.2.20 **“Towing capacity”** towing capacity of the tow bar is equal to the total weight of the trailer(s) towed.
- 7.2.21 **“Trailer body”** means the structure or fixture especially provided to contain or support the material or property to be transported from one place to other.
- 7.2.22 **“Tandem axles”** means any two or two wheel axles spaced by 2440 mm or more (or as specified under CMV(A)R, 1989) from each other.
- 7.2.23 **“Tandem bogie”** means two axle wheels spaced by more than 1300 mm up to 2440mm from each other with defined load sharing ratio.
- 7.2.24 **“Triple axles”** means three wheel axles with each axle spaced by more than 3000 mm between each other.
- 7.2.25 **“Tridem bogie”** means three axle wheels spaced by 3000 mm or less with defined load sharing ratio.
- 7.3 **General requirements :**
- 7.3.1 **Axle loading :** The permissible load on the axles shall be as per the prescribed limits under the Central Motor Vehicles Rules, 1989.
- 7.3.2 **Dimensional requirements :** The dimensional requirements for trailers shall be in accordance with Rule 93 of the Central Motor Vehicles Rules, 1989.

- 7.3.3 **External Projections :** The requirements for external projections shall be in accordance with IS :13942, as amended from time to time and as specified at SI No. 11 of Table under Rule 124 of the Central Motor Vehicles Rules, 1989.
- 7.3.4 **Rear Under run Protection :** The requirements of Rear under run protection shall be as per IS : 14812, as amended from time to time.
- 7.3.4.1 Rear under run protective device is not required on:
- Vehicles designed with a large clearance above the ground, mainly intended to be used off road.
 - Vehicles used by national or municipal fire brigades for salvaging operations, rescue vehicles, tippers, vehicle with a loose loading platform or with arrangements for a snow plough, road surfacing machine, a gritting device.
- 7.3.5 **Lateral Under run Protection :** The requirements of lateral under run protection shall be as per IS:14682, as amended from time to time. Exemptions for fitment of lateral under run protective devices may be as follows.
- 7.3.5.1 Fire Tenders and other such vehicles like sideway / 3 way tippers, concrete mixers etc., where the body work will be incompatible with fitment of such a device.
- 7.3.5.2 Lateral protection is not however required between tandem or tridem axles if their mutual distance is less than 2.1 m.
- 7.3.5.3 Trailers with moveable rear axles need only fulfill the requirements in these points when the axles are in their forward most position. Extension of the axles must not produce a gap in the lateral protection.
- 7.3.5.4 Trailers with moveable rear axles and extendable trailers may have lateral protection constituted by a strap under the following conditions :
- The strap is fitted with either an automatic or a manual tensioning device which can be tensioned with a torque wrench.
- 7.3.5.5 Semi-trailers with moveable rear axles need not be fitted with lateral protection if the distance from a transverse plane through the centre of the coupling pin in its rearmost position to the centre of the front axle in its most forward position is less than 3.9 m.
- 7.4 **Tipping Stability of Trailers :** Trailers with end-tipping loaded to the total weight with normal tipping goods, must tip an evenly distributed cargo without turning over, with the vehicle across an incline and with all the relevant axles having an incline of at least 5 degrees in relation to the horizontal plane. This can be proved either by calculation or by physical tests.
- 7.5 **Electrical System :**
- 7.5.1 **Connections between tractor and trailer :** The trailer connections and cables shall conform to the provisions laid down in Section 4 of this code.
- 7.5.2 **Lighting and signaling devices :** The lighting and signalling devices provided on trailers shall conform to Rule 102 to 107, of Central Motor Vehicles Rules, 1989.

- 7.5.3 **Bulbs :** The performance requirements of Bulbs shall be as per AIS-034 as amended from time to time and as specified at Sl No. 1 of the Table under Rule 124 of the Central Motor Vehicles Rules, 1989.
- 7.5.4 **Lighting and signalling systems :** Performance requirements for lighting and signaling devices shall be as per AIS-012 as amended from time to time and as specified at Sl. No. 20 of the Table under Rule 124 of the Central Motor Vehicles Rules, 1989.
- 7.5.5 **Installation of light and light-signaling devices :** The requirements of installation of lighting & signaling devices shall be as per AIS-008 as amended from time to time and as specified at Sl. No. 20 of the Table under Rule 124 of the Central Motor Vehicles Rules, 1989.
- 7.5.6 **Electrical coupling :** Seven conductor electrical coupling between tractor & trailer shall meet the requirements stated in IS:10393, as amended from time to time (performance requirements as cross referred under IS :10393, shall be as per IS : 9895). Other type of electrical coupling, if used shall be in accordance with relevant IS or ISO or SAE standards.
- 7.5.7 The guidelines for mounting of electrical connections for truck and trailer may be drawn from IS :13509, as amended from time to time.

7.6 **Applicable standards for trailers :**

- 7.6.1 **Test standards :** The following standards consolidated below are meant for test and measurement purpose, are consolidated below for reference at one point.

Sr. No.	Standard	Title of the Standard
1	IS: 6763(PT 1):1987	Specification and testing of fifth wheel king pin, Part 1 size 50(first revision)
2	IS:6763(PT 2):1987	Specification and testing of fifth wheel king pin, Part 2 size 90(first revision)
3	IS:7774(PT 1):1975	Glossary of terms relating to transport tractors and trailers. Part 1 basic terms
4	IS:7774(PT 2):1975	Glossary of terms relating to transport tractors and trailers. Part 2 dimensions and weight
5	IS:8007:1976	Dimension of fifth wheel coupling between transport tractor and semi/articulated trailers for interchangeability
6	IS:8297:1976	Towing jaw for use between trailers of up to 16 tonnes gross mass and transport tractor
7	IS:8298:1976	Towing jaw for use between trailers of up to 5 tonnes gross mass and transport tractor
8	IS:8299:1976	Towing hook for use between trailers of up to 16 tonnes gross mass and transport tractor
9	IS:8300:1976	Towing hook for use between trailers of up to 35 tonnes gross mass and transport tractor
10	IS:8752:1978	Towing hook for use between trailers of up to 5 tonnes gross mass and transport tractor

Sr. No.	Standard	Title of the Standard
11	IS:9895:1981	Electrical connection between towing vehicles and trailers- Test methods and requirements
12	IS:9942:1981	T-Sign plate for trailers
13	IS:10393:1982	Specification for electrical connector for tractor trailers jumper cable
14	IS:10752:1983	Dimension and testing requirement of landing gears for mounting on semi-trailers
15	IS:10792:1984	Testing and acceptance criteria of pneumatic coupling between tractors and trailers
16	IS:12807:1989	Specification for drawbar eyes for mechanical connections between towing vehicles and trailers
17	IS:13284:1992	Automotive vehicle-Drawbar coupling and hinged drawbar-method of test for strength
18	IS:11852 (Part 1):2001	Automotive vehicles-Brake and braking system: Part 1 - Terminology (first revision)
19	IS:11852 (Part 2):2001	Automotive vehicles-Brake and braking system: Part 2 - General function and features (first revision)
20	IS:11852 (Part 3):2001	Automotive vehicles-Brake and braking system: Part 3 - Performance requirements and evaluation (first revision)
21	IS:11852 (part 4):2001	Automotive vehicles-Brake and braking system: Part 4 - Compressed air and air assisted brakes special requirement (first revision)
22	IS:11852 (part 5):2001	Automotive vehicles-Brake and braking system: Part 5 - Compressed air and air assisted brakes pressure test connections (first revision)
23	IS:11852 (part 6):2001	Automotive vehicles-Brake and braking system: Part 6 - Vacuum braking systems- Special requirements (first revision)
24	IS:11852 (part 7):2001	Automotive vehicles-Brake and braking system: Part 7 - Inertia dynamometer test method for brake linings
25	IS:11852 (part 8):2001	Automotive vehicles-Brake and braking system: Part 8 - Test procedures (first revision)
26	IS:13942:1994	Automotive vehicles-External projections- Performance requirements
27	IS:14682:1999	Automotive vehicles-lateral protection (side guards)-Technical requirements
28	IS:14812:2000	Automotive vehicles-Rear under run protection device-General Requirements
29	IS:12222:1987	Method of measurement of turning circle of automotive vehicle
30	IS:10792:1984	Testing and acceptance criteria of pneumatic coupling between tractors and trailers
31	IS:15101:2002	Transport tractors and trailers – Fifth wheel coupling strength tests

7.6.2 Guideline standards : The following standards consolidated below are meant for general guideline purpose , are consolidated below for reference at one point..

Sr. No	Standard	Title of the Standard
1	IS:8037:1976	General requirement for transport tractors-trailers
2	IS:8274:1976	Drawbar eyes and fore carriage pins for connection between trailers of up to 35 tonnes gross mass and transport tractor
3	IS:8903:1978	Specification for drawbars the trailers of up to 5 tonnes gross mass
4	IS:9760:1981	Dimensions for coupling arrangement between towing vehicle and trailer
5	IS:9905:1981	Pneumatic coupling between tractors and trailers
6	IS:10766:1983	Mounting dimension for fifth-wheel coupling
7	IS:12358:1988	Dimension for contact type coupling for vacuum and pressure braking system on trailers and semi-trailers
8	IS:13544:1992	Trailers-mounting of ball bearing turn table-Dimensions
9	IS:13579:1992	Transport trailers-Method of test
10	IS:14880:2000	Trailers-Drawbars coupling and eye for rigid drawbar-method of strength test
11	IS:13460:1992	Automotive vehicles-Electrical connections between towing vehicles and trailers with 6 or 12 V electrical equipment-Type 12 S (supplementary)
12	IS:13461:1992	Automotive vehicles-Electrical connections between towing vehicles and trailers with 6 or 12 V electrical equipment-Type 12 S (Normal)
13	IS:13491:1992	Automotive vehicles-Electrical connections between towing vehicles and towed vehicles with 24 V electrical equipment-Type 24 S (Normal)
14	IS:13499:1992	Automotive vehicles-Electrical connections between towing vehicles and trailers with 24 V electrical equipment-Type 24 S (Normal)
15	IS:13509:1992	Automotive vehicles-Towing vehicles-Mounting of electrical connections on rear cross members

7.7 Service Brakes for Trailers – Constructional and Functional requirements :

- 7.7.1 The service brake must work on all wheels of the vehicle.
- 7.7.2 Brake pipes must be designed and positioned that corrosion is avoided as much as possible.
- 7.7.3 Brake pipes made of plastic used in compressed air or vacuum systems must be strong and durable. This shall comply with the requirements stated in BIS Doc. TED 13 (266). The finalised Indian Standard on this subject by TED-13 may then be referred.
- 7.7.4 The requirement regarding strength and durability is regarded as having been met if the plastic brake pipes meet the requirements in DIN 74324 (July 1987) or SAE J8444 as amended from time to time.
- 7.7.5 A brake that is connected to the brake system of the towing vehicle shall be such that the connection does not detrimentally affect the brake system of the towing vehicle. A hydraulic trailer brake may only be connected to the hydraulic system of the towing vehicle in combination with a vacuum unit or similar, such that the brake fluid in the brake system of the towing vehicle is only used for governing the vacuum unit or similar and where the hydraulic system of the governing unit is separated from the rest of the hydraulic system.
- 7.7.6 In a service brake, the operation of which is dependent on stored power, the storage containers shall have a total volume that is at least eight times, but no more than twelve times as large as the combined swept volume of the brake cylinders, using two-thirds of the maximum movement of the piston rod or similar.
- 7.7.7 The vacuum and compressed air system shall be connected to the towing vehicle by means of two lines, one feed line and one operating line.
- 7.7.8 The brake system shall comply to Central Motor Vehicle Rules, 1989 requirements stated vide IS : 11852 as amended from time to time or other standard as amended from time to time notified under Rule 96 of the Central Motor Vehicles Rules, 1989.
- 7.7.9 Further reference to be made with SAE J 702 as amended from time to time for location of hose connection. This is indicative and may be used as a guideline only. Figure -1 and Figure - 2 may be referred.
- 7.7.10 Brake palm couplings shall meet the requirement of IS :9905 for dimensions. The performance shall be as per IS:10792. If any other type of advanced coupling meeting IS:12358 or others standards is available, that may be considered on case to case basis.
- 7.7.11 Compatibility between tractor and trailer brakes must be determined as per Clause 7.8.1.

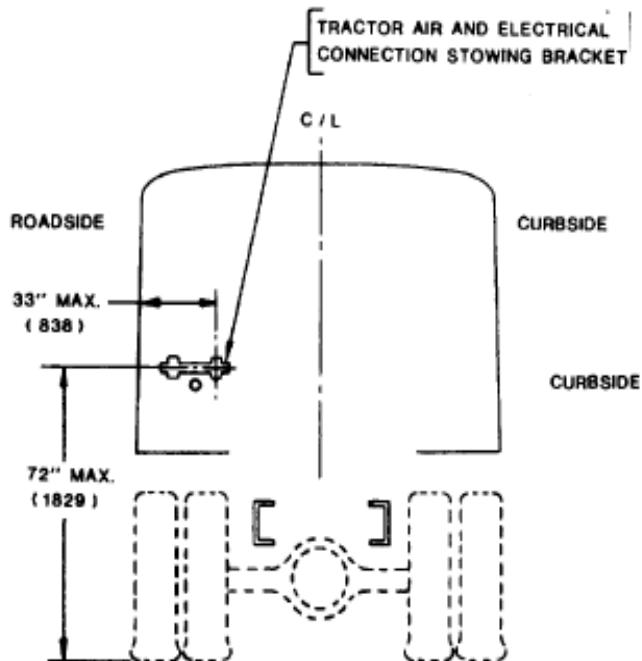


FIGURE 1—

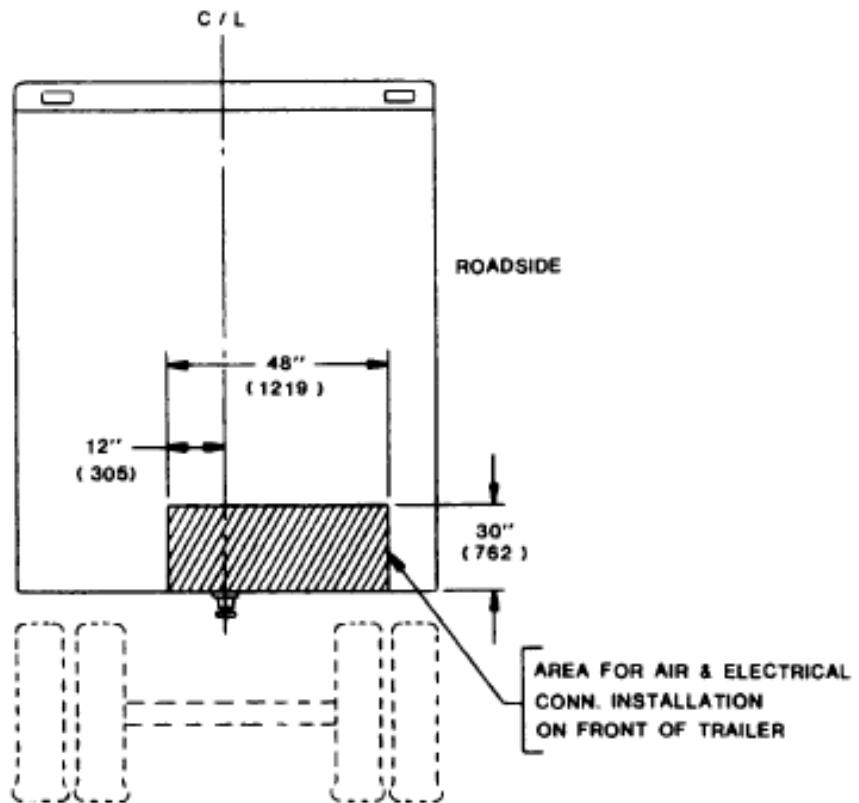
Location of Air hose and Electrical Connection

FIGURE 2—

Area for Air and Electrical Connection

7.8 **Compatibility between tractor and trailer :**

7.8.1 **Brake system compatibility :** The requirements of braking shall be as per IS : 11852 as amended from time to time including that of brake adhesion utilisation for trailer axles.

7.8.1.1 **Guidelines for calculating the trailer brake system requirements-An illustrative example**

- The Actual Brake Force values can be arrived from the Sample Calculation, shown below.

Actual Brake Force on Tractor	→	Force available at the tractor wheels
Actual Brake Force on Trailer	→	Force available at the trailer wheels
Total Actual Brake Force	→	Sum of tractor and trailer forces

- Details required to find out the Brake Forces on Trailer :

- Tyre Size / Rolling Radius.
- Brake Drum diameter.
- Brake Chamber Type. (Eg: 20 or 24 or 30)
- Pressure at Brake Chamber.
- Brake Lever Length / Slack Adjuster Length.
- Brake Cam's Radius.
- Gross Trailer weight with Load Distribution at King Pin and Trailer Axles.

3Axe Tractor with 3 Axle Trailer - Sample Calculation					
	Units	Front Axle	1st RA	2nd RA	Trailer Axle
Rolling Radius	m	0.475	0.475	0.475	0.475
Brake Cylinder Size (Area)	Sq In	24	24	24	24
Pressure	Peff bar	6.5	6.5	6.5	6.5
Lever Travel Length	m	0.2	0.2	0.2	0.2
Effective Brake Pressure in Brake Cylinder	Peff kPa	650	650	650	650
Brake Constant	k	0.29	0.29	0.29	0.29
Lever Travel Lenth	I m	0.2	0.2	0.2	0.2
Brake Cylinder Area	A m ²	0.0155	0.0155	0.0155	0.0154838
Brake Drum Dia	D m	0.35	0.35	0.35	0.35
Brake Cam's Cam Radius	e m	0.0127	0.0127	0.0127	0.0127
Wheel Rolling Radius	r m	0.475	0.475	0.475	0.475
Brake Force (Bn), per axle	N	$\frac{P_{eff} \times k \times I \times A \times D \times 2 \times 1000}{e \times r}$			
Brake Force (Bn), per axle		67736	67736	67736	67736
Actual Brake Force					
Actual Brake Force in Tractor	N	203209			
Actual Brake Force in Trailer	N	203209			Sample Calculation
Total Actual Brake Force	N	406417			
Actual Brake Force should always be greater than highest of the Theoretical Brake Forces calculated as shown below					

- Theoretical brake force can be taken as the Total Weight (GCW). For a 3 axle tractor with 3 axle trailer, for instance, if we calculate

Laden Weight of Tractor → 25000 kgs
 Laden Weight of Trailer → 24000 kgs
 Tractor brake force Weight → $2,50,000 * 0.8 \text{ N}$
 Trailer brake force → $2,40,000 * 0.8 \text{ N}$
 Total Brake force required → $4,90,000 * 0.8 \text{ N}$
 Where 0.8 is the tyre to test surface adhesion as prescribed in the standard.

- The Theoretical Brake Force values can also be found using the formula $F=ma$.

m = Maximum laden of tractor or trailer, and $a = 4.4 \text{ m/sec}^2$. For example, considering a 3 axle tractor with 3 axle trailer

Required Force on Tractor : $m*a = 25000 * 0.44 = 1,10,000 \text{ N}$

Required Force on Trailer : $m*a = 24000 * 0.44 = 1,05,600 \text{ N}$

Total force required : Tractor force + Trailer force

- Always Actual force available at the wheels calculated must be greater than theoretical forces.

- Brake Torque Calculations for Trailer :

Trailer Laden Wt	m	32000	Kgs
Deceleration	a	4.4	m/sec^2
Force Reqd to stop the vehicle	$F = m \cdot a$	140800	N
Force reqd per Brake (6 brakes in 3 axle veh.)		23467	N
Rolling Radius (for 11x20 size tyre)	R	0.52	m
Torque reqd per brake	$T = F \cdot R$	12203	Nm

- The above calculation can be used to select the suitable Brake Components. (ie) For 3 Axle trailer with laden weight of 32,000 kgs and deceleration of $4.4 m/sec^2$, the Brake Torque required per brake is 12203 Nm.
- Hence it is absolutely necessary to select the Brake, which can meet the torque requirement of 12203 Nm.

- 7.8.2 **Communication system compatibility :**
- 7.8.2.1 All lighting and signaling devices shall comply with Central Motor Vehicle Rules, 1989 requirements
- 7.8.2.2 Driver's instrument panel shall have separate indication for tractor and trailer direction indicators. The driver, in his normal operating position, must be able to be aware of the proper functioning of the tractor as well as trailer direction indicators individually.
- 7.8.2.3 External markings shall be as per AIS-089 and AIS-090 as amended from time to time and as notified under Central Motor Vehicle Rules, 1989.
- 7.8.2.4 T-sign for trailer shall be provided in accordance with IS : 9942, specified at Sl. No. 4 of the Table under Rule 124 of the Central Motor vehicles Rules, 1989.
- 7.8.3 **Tractive effort and power compatibility :** The tractive effort and power compatibility requirements shall comply with the necessary haulage requirements on the road. This shall be ensured by the vehicle manufacturer..
- 7.8.4 **Manoeuvrability requirements :**
- 7.8.4.1 The vehicle shall be able to manoeuvre on either lock inside a circle of 12.5 m radius without any of its outermost points projecting outside the circumference of the circle.
- 7.8.4.2 When the outermost points of the vehicle are moving on either lock on a circle of 12.5 m radius the vehicle shall be able to move within the limits of a circular track 7.2 m wide (see sketch below).
- 7.8.4.3 With the vehicle stationary, a vertical plane tangential to the side of the vehicle and facing outwards from the circle shall be established by marking a line on the ground. In the case of an articulated vehicle the two rigid portions shall be aligned with the plane. When the vehicle moves from a straight line approach into the circular area described in the sketch below. No part of it shall move outside of this vertical plane by more than 1.2 m (Refer Figure-3 below).
- 7.8.4.4 In the case of a vehicle fitted with an axle unloading device, these requirements shall in each case be fulfilled with the axle in the most unfavourable condition.

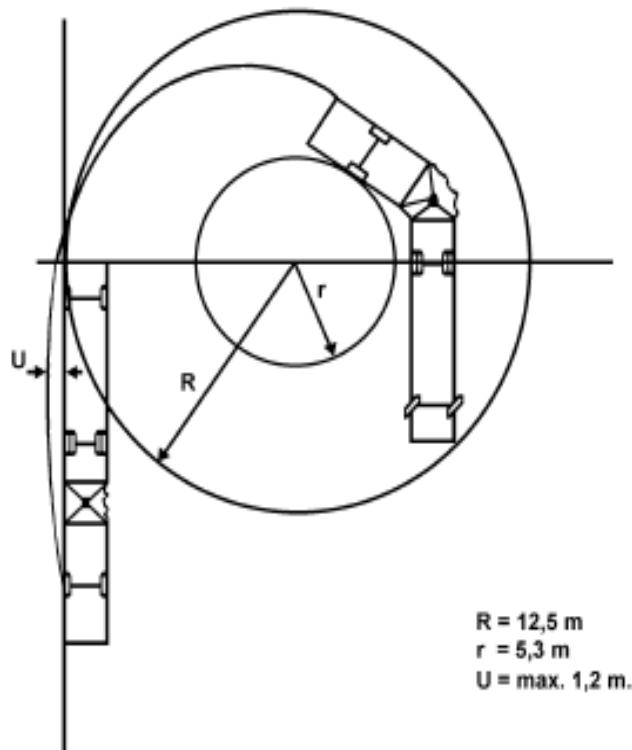


Figure-3
Vehicle Manoeuvrability

- 7.8.4 .5 **Alternate method :** Alternately the Turning Circle Diameter of the combination may be theoretically established adopting the method narrated in SAE J 695 as amended from time to time. This may be used for approving a tractor with various trailers and vice versa without physically measuring.
- 7.9 **Safety Critical Items :** These are components / parts that are critical to safe operation of the vehicle and combination. The following components / systems are identified as critical to the safety of the vehicle. Only certified items as per relevant Indian Standards shall be used in the trailer.
- 7.9.1 **Fifth Wheel coupling :** The fifth wheel coupling provided on the tractor shall comply with the requirements of IS: 15101 as amended from time to time. Besides IS:10766 may also be referred as a guideline standard for mounting of the fifth wheel coupling.
- 7.9.2 **Fifth Wheel king pin :** The specifications and other requirements for fifth wheel king pin shall comply with IS:6763 (Part 1 & 2).
- 7.9.3 **Draw bar and Draw bar Coupling :** The draw bar and draw bar coupling shall comply with the requirements specified in IS :13284 as amended from time to time.
- 7.9.4 **Landing gears :** To comply with requirements stated in IS :10752 as amended from time to time.

- 7.9.5 **Tow hook :** To comply with requirements stated in IS: 8299, IS: 8300 & IS : 8752 as amended from time to time.
- 7.9.6 **Draw bar coupling :** Guidelines may be drawn for IS :8274 for trailers above 5 ton Gross mass. For trailers of less than 5 ton Gross mass, guidelines may be drawn from IS : 8903 as amended from time to time.
- 7.9.7 **Towing jaw :** The towing jaw shall comply with requirements stated in IS : 8297 and IS :8298 as amended from time to time.
- 7.9.8 **Draw bar couplings :** The dimensions of draw bar couplings for interchangeability may be referred to IS : 9760 as guidelines.
- 7.9.9 **Draw bar eye :** The draw bar eye shall meet the requirements of IS : 12807 for dimensions and IS :13284 for performance. However for centre axle trailers, the requirements shall be as per IS :14880.
- 7.9.10 **Wheel rims and wheel nuts :** Wheel rims and wheel nuts used on the trailer shall meet the requirements of Sl. No. 8 and Sl. No. 14 of table under Rule 124 of the Central Motor Vehicles Rules, 1989 respectively.
- 7.9.11 **Tyres :** The tyres fitted on semi-trailers and trailers shall comply with the requirements specified under Rule 95 of Central Motor Vehicles Rules, 1989.
- 7.10 **Interchangeability of trailers :** The interchangeability between tractors and trailers shall be ensured by verifying compliance to IS: 8007 as amended from time to time.
- 7.11 **Type approval for trailers :**
- 7.11.1 The trailer manufacturers shall have their prototype model of trailer approved from any of the test agencies referred in Rule 126 of Central Motor Vehicle Rules, 1989.
- 7.11.2 The trailer manufacturer shall submit the necessary technical details of the trailers to the test agencies as per Annexure – III of this Code. Other necessary details regarding compliance to the relevant Indian Standards for the safety critical components shall also be submitted to the testing agencies.
- 7.11.3 The type approval shall be offered by the testing agencies after necessary compliance to the requirements stated in this section.

SECTION - 8.0**WORKING STABILITY OF VEHICLES MEANT FOR
CARRIAGE OF HAZARDOUS GOODS****LIST OF CONTENTS**

- 8.1 Terms and Definitions
- 8.2 Application for Approval
- 8.3 Approval
- 8.4 Approval Tests and Specifications.
- 8.5 Stability Criteria
- 8.6 Modification of the Vehicle Type and Extension of Approval

ANNEXURES

- Annexure - 1 Roll Over Stability / Tilt Table Test Procedure
- Annexure - 2 Lateral Stability Calculation
- Annexure - 3 Model Calculation Report

8.1 TERMS AND DEFINITIONS :

For reference in this chapter :

8.1.1 **"Approval of a vehicle"** means approval of a vehicle type with regard to rollover stability.

8.1.2 **"Vehicle type"** means a category of vehicle, which does not differ in such essential respects as:

- Vehicle category, (as per IS :14272) and type (truck, prime mover/tractor, full trailer, semi-trailer, centre-axle trailer etc)
- Maximum mass
- Cross-section profile of the tank (circular, elliptical, maxi-volume)
- Maximum height of the centre of gravity of the unladen vehicle
- Distribution of mass among the axles (including fifth wheel)
- Number and arrangement of the axles (including axle spacing)
- Suspension arrangements in relation to roll characteristics
- Tyre size and structure (radial ply, diagonal ply or bias belted)
- Track width
- Wheel base

8.1.3 **"Laden vehicle"** except where otherwise stated, means a vehicle so laden as to attain its "maximum mass".

8.1.4 **"Maximum mass"** means the technically permissible maximum mass stated by the vehicle manufacturer.

8.1.5 **"The distribution of mass among the axles"** means the proportion of the maximum permissible mass borne by each axle, as declared by the vehicle manufacturer.

8.1.6 **"Suspension trim height"** means the distance between the wheel centre and a fixed point on the chassis as declared by the vehicle manufacturer.

8.2 Application for approval :

The type approval application shall be accompanied by the following.

8.2.1 The application for approval of a vehicle type with regard to rollover stability shall be submitted by the vehicle manufacturer / body builder or his duly accredited representative.

8.2.2 A detailed description of the vehicle type with regard to the items specified Classes.

8.2.3 Photographs and/or diagrams and drawings of the vehicle showing the vehicle type in front, side, and rear elevation

8.2.4 Particulars of the vehicle's mass.

8.2.5 A vehicle, representative of the vehicle type to be approved, shall be submitted to the Technical Service conducting the approval tests.

8.3 **Approval :**

8.3.1 If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of Paragraph 8.4 below, approval of that vehicle type shall be granted by the authorized test agencies.

8.4 **Approval Test and Specifications :**

8.4.1 The vehicle shall undergo a tilt table test in accordance with Annexure-1 to this section, which simulates a non-vibratory steady-state turn. As an alternative a calculation method in accordance with Annexure-2 to this section may be used to prove the stability. If there is any doubt or dispute a tilt table test shall be used.

8.4.2 The result of the tilt table test or the calculation method shall be considered satisfactory if the conditions set out in Paragraphs 8.5 below are satisfied.

8.5 **Stability Criteria :**

8.5.1 The criteria, using the corresponding Annexure-1 or Annexure-2, must fulfill one of the following conditions, subject to Paragraph 8.5.1.2.

8.5.1.1. **Tilt table test:** The static rollover stability of the vehicle shall be such that the point at which overturning occurs would not be passed if a tilt table angle of 23° has been reached for all tests in both tilt directions. If the vehicle fails in one of the three tests for a specific direction (right or left), it is allowed to do one consecutive (re) test.

8.5.1.2. **Calculation method:** The rollover stability of the vehicle shall be such that the point at which overturning occurs would not be passed if a lateral acceleration of 4 m/s^2 has been reached.

8.5.1.3. **Particular requirements :** No contact between parts of the vehicle shall occur which are not intended to come into contact during normal use.

8.6 **Modification of the Vehicle Type and Extension of Approval :** Every modification which affects the vehicle type as defined in Paragraph 8.1 above (for instance the chassis, body, suspension, axle configuration, etc.) shall be notified to the approving agency which approved the vehicle type. The agency may then either:

- 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, or
- Require a further test report from the Technical Service responsible for conducting the tests.

Annexures to Section 8.0

Annexure - 1 of Section 8.0 :

ROLL OVER STABILITY / TILT TABLE TEST PROCEDURE

"Rollover threshold" means the instant when all the wheels on one side of the vehicle have lost contact with the tilt table surface.

A. General conditions :

A 1. The Tilt Table

A rigid surface should be used. The tyres may rest against a safety block or step during the test to prevent sideways slipping, provided that the safety block does not influence the test result.

A2. Wind Conditions

If the tilt table test rig is placed outside, the lateral wind velocity shall not exceed 3 m/s and the total wind velocity shall not exceed 5 m/s.

A3. Tyres

The tyres shall be inflated to pressures as specified by the vehicle manufacturer for the test vehicle at the laden condition. The tolerance for the inflation pressure in a cold state is $\pm 2\%$.

A4. Operating Components

- A.4.1.** All operating components likely to influence the results of this test (e.g. condition and setting of springs and other suspension components and suspension geometry) shall be as specified by the manufacturer.
- A.4.2.** Height-leveling systems should be deactivated (held at static values) during the actual tilt to avoid inflation/deflation of suspension during the tilt. Cross-coupling from side to side may need to be deactivated. An exception can be made for levelling systems with very short response time of less than one second.

B. Measuring accuracy :

The tilt table angle shall be measured with an accuracy of better than 0.3° .

C. Non power-driven vehicles :

- C.1.** If the vehicle is a centre-axle trailer, the vehicle may be tested with a power-driven vehicle. Any power-driven vehicle, substitute or support which has the appropriate coupling system and height may be used, as this will not influence the results.
- C.2.** If the vehicle is a semi-trailer, the vehicle shall be tested with a tractor or a substitute. The tractor/substitute will influence the results and therefore a [reference tractor/substitute] shall be used.

D. Vehicle loading condition :

The standard test condition is the maximum loaded condition; the laden vehicle. In this maximum loading condition, the tank vehicle shall be fully loaded, without exceeding the maximum authorised mass and maximum authorised axle loads.

If the normal load to be carried by the tank vehicle is classified as being of a dangerous type, it may be replaced by water or another non-dangerous test load. If the standard test conditions, (a) fully laden or (b) maximum mass, cannot be fulfilled with this test load then:

- (a) a filling factor of the tank between 100% and 70% is acceptable. If at the minimum filling factor of 70% the total mass and/or axle loads still exceed the maximum authorised mass and maximum authorised axle loads, a test load with a lower density shall be used. The distribution of mass of the tank (including the test load) among the axles shall be proportional to the maximum loaded condition. Tanks provided with compartments shall be differentially loaded so that the centre of gravity height at each axle or axle group is as close as possible to the real centre of gravity height.
- (b) a calculation shall be issued by the vehicle manufacturer (1) to provide a new required maximum tilt table angle for the lighter test load.

E. Safety :

Restraints shall be used to prevent final rollover but these shall be arranged so as not to interfere with the test.

F. Test procedure :

This procedure consists of a very gradual increase in the tilt table angle up to the required maximum angle or the rollover threshold. The vehicle shall be tested with all units in a straight line parallel to the tilt table axis such that no axle longitudinal centre line is off line by more than 25 mm. All steerable axles of the vehicle shall be locked to prevent axle lateral movement and/or turning of the wheels in a steering direction. Also the vehicle shall be fixed in the longitudinal direction to prevent forward and rearward movement, provided that the method of fixing does not influence the test result. The vehicle shall be tilted at very low rates of 0.25 °/s or less. The vehicle shall be gradually tilted three times each to the right and left of the vehicle longitudinal centre line. Due to the influences of stick-slip in the vehicle's suspension systems and coupling components, the vehicle shall be removed from the table between the tests and driven around to "randomise" and "equalise" the influences of stick-slip and hysteresis.

Annexure - 2 of Section 8.0
LATERAL STABILITY CALCULATION

A. General :

The lateral stability of tank vehicles is calculated by simulation of a steady state circular test (constant radius, constant speed and consequently constant lateral acceleration). The calculation method take into account the main factors which influence the stability, such as the height of the centre of gravity, the track width and all factors which result in a lateral shift of the centre of gravity (axle roll stiffness, suspension roll stiffness, etc.). In case of semi-trailers the tractor will be simulated with a reference kingpin roll stiffness.

The specifications of the calculation method are:

1. axle roll centre is at ground level;
2. vehicle structure is assumed to be rigid;
3. vehicle is symmetrical about its center line;
4. tyre and suspension deflections are linear;
5. lateral deflection of suspensions is zero.

B. Definitions :

For the purposes of this calculation:

"Bogie" means an axle group with compensatory load distribution, in which zero load is attained on all wheels on a given side simultaneously.

C. Symbols (See also Figure 1 below) :

i (-) = axle/bogie index

(i = 1 - n, front to - axle/bogie;

i = T, all axles/bogies;

i = M, stiffest axle/bogie; and

for semi-trailers only i = K, kingpin)

mi = nominal suspension roll axis height

Ai (kN) = axle/bogie load

C_{DGi} (kNm/rad) = suspension roll stiffness at axle roll axis

C_{DGMi} (kNm/rad) = equivalent suspension roll stiffness at ground level

C_{DRi} (kNm/rad) = axle/bogie roll stiffness

C_{DRESi} (kNm/rad) = resolved combined suspension roll stiffness at ground level

F_{RVi} (kN/m) = vertical tyre rate for each axle/bogie

(inclusive the double effect of twin tyres)

Ui (kN) = unsprung weight

T_{Ni} (m) = nominal track width

Ti (m) = theoretical track width for axle/bogie with twin tyres

F_E (-) = effective mass factor of stiffest axle/bogie

H_G (m) = centre of gravity height of complete vehicle

H_N (m) = centre of gravity height of sprung mass

M_A (m) = twin tyre width

$q_c g$ = corrected lateral acceleration at overturn

$q_M g$ = lateral acceleration at first wheel lift

$q_T g$ = maximum optimal lateral acceleration at overturn

g (m/s^2) = acceleration due to gravity;

$g = 9.81 m/s^2$

$\dot{\epsilon}_i$ (rad) = vehicle pseudo-roll angle at wheel lift

β (deg) = equivalent tilt table angle

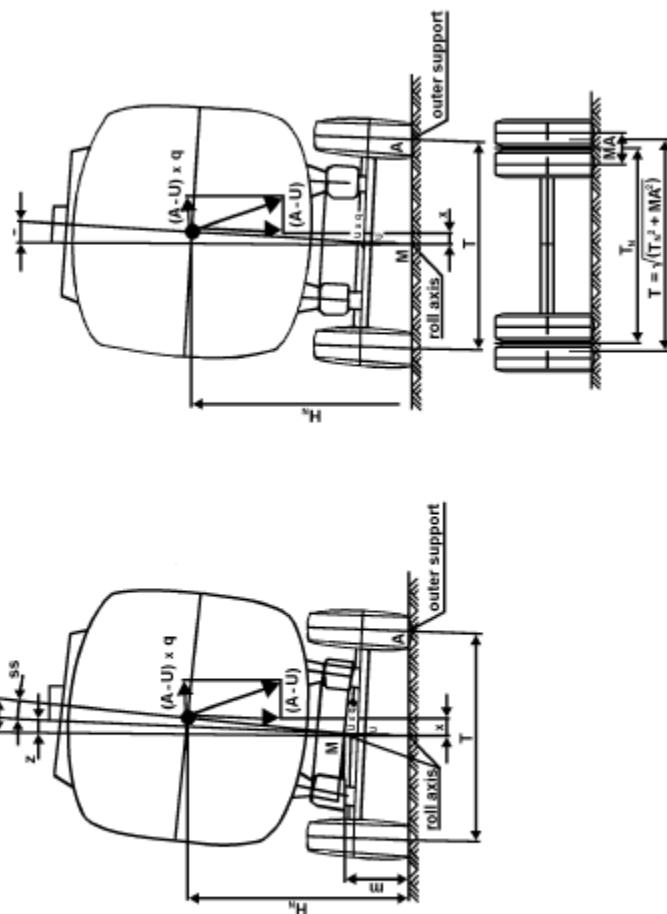


Figure 1
Cross-section of a Tank vehicle

D. General conditions :

Height-leveling systems are not taken into account (held at static values).

E. Trailers :

E1. If the trailer is a full trailer or a central axle trailer the calculation does not have to include the coupling with the towing vehicle.

E2. If the trailer is a semi-trailer, the tractor will be simulated with a reference kingpin roll stiffness, which represents the tractor suspension, tyres, chassis & fifth wheel flexibility at ground level.

F. Vehicle loading condition :

The test condition is the maximum loaded condition; laden vehicle. In this maximum loading condition, the tank vehicle shall be fully loaded, without exceeding the maximum authorized mass and maximum authorised wheel loads.

G. Calculation method :

G1. Calculation of the combined roll stiffness and the pseudo vehicle roll angle at wheel lift of each axle/bogie with the formulae:

G1.1 Axles/bogie with single tyres:

axle/bogie roll stiffness:

$$C_{DRI} = \frac{F_{RVi} \times T_{Ni}^2}{2}$$

equivalent suspension roll stiffness ground level :

$$C_{DGMI} = C_{DGi} \times \left(\frac{H_N}{H_N - m} \right)^2$$

combined roll stiffness to simulate lateral CG shift :

$$C_{DRESi} = \frac{C_{DGMI} \times C_{DRI}}{C_{DGMI} + D_{DRI}}$$

pseudo vehicle roll angle at wheel lift :

$$\theta_i = \frac{A_i \times T_{Ni}}{2 \times C_{DRESi}}$$

G1.2. Axles/bogie with twin tyres:

theoretical track width for twin tyres :

$$T_i = \sqrt{T_{Ni}^2 + MA^2}$$

axle/bogie roll stiffness :

$$C_{DRI} = \frac{F_{RVi} \times T_i^2}{2}$$

equivalent suspension roll stiffness ground level

$$C_{DGMI} = C_{DGi} \times \left(\frac{H_N}{H_N - m} \right)^2$$

combined roll stiffness to simulate lateral CG shift

$$C_{DRESi} = \frac{C_{DGMI} \times C_{DRI}}{C_{DGMI} + D_{DRI}}$$

vehicle pseudo roll angle at wheel lift

$$\theta_i = \frac{A_i \times T_i}{2 \times C_{DRESi}}$$

G2 In case of semi-trailers, calculation of the kingpin effects with the following formulae:

$$\text{track width : } T_k = \frac{\sum_{i=1}^n T_i}{n}$$

$$\text{roll stiffness : } C_{DRESK} = A_k \times 4$$

G3. After the resolved combined stiffness and pseudo roll angle for each axle/bogie are calculated the totals for the complete vehicle are determined:

$$\begin{aligned} \text{total vehicle weight}^{(1)}: \quad A_T &= \sum_{i=1}^n A_i + A_k \\ \text{total unsprung weight : } U_T &= \sum_{i=1}^n U_i \\ \text{effective track width}^{(1)}: \quad T_T &= \frac{\sum_{i=1}^n (T_i \times A_i)}{A_T} + \frac{T_k \times A_k}{A_T} \\ \text{total roll stiffness}^{(1)}: \quad C_{DREST} &= \sum_{i=1}^n C_{DRESi} + C_{DRESk} \end{aligned}$$

G4. Select the axle/bogie with the lowest value of $\dot{\theta}$, for this indicates that first wheel lift will occur. To distinguish this axle/bogie from the other axles/bogies, allocate the following:

$$\begin{aligned} A_M &= \text{axle load of axle/bogie with lowest } \dot{\theta} \\ U_M &= \text{Unsprung weight of axle/bogie with lowest } \dot{\theta} \\ T_M &= \text{Track width of axle/bogie with lowest } \dot{\theta} \\ C_{DRESM} &= \text{roll stiffness axle of axle/bogie with lowest } \dot{\theta} \end{aligned}$$

G5. Lateral Stability Calculation

G5.1. The effective mass factor of the stiffest axle/bogie FE:

$$F_E = \frac{C_{DRESM}}{C_{DREST}}$$

G5.2. The lateral acceleration at first wheel lift q_M :

$$q_M = \frac{A_M \times T_M}{2x \left[(F_E \times A_T \times H_G) + \frac{((A_T - U_T) \times F_E \times H_N)^2}{C_{DRESM} - (A_T \times F_E \times H_N)} \right]}$$

G5.3. The maximum optimal theoretical lateral acceleration at overturn q_T :

$$q_T = \frac{A_T \times T_T}{2x \left((A_T \times H_G) + \frac{((A_T - U_T) \times H_N)^2}{C_{DREST} - (A_T \times H_N)} \right)}$$

G5.4. Linear interpolation between the lateral acceleration at first wheel lift and the Maximum theoretical lateral acceleration gives the correlated lateral acceleration at overturn q_C :

$$q_C = q_T - (q_T - q_M) \times \frac{A_M}{A_T}$$

Annexure 3 of Section 8.0
MODEL CALCULATION REPORT
Calculation Report

1. Trade name or mark of the vehicle:.....
2. Vehicle type:.....
3. Manufacturer:.....
4. Height of the centre of gravity of the spring mass:.....
5. Unsprung weight of all axles:.....
6. Nominal suspension roll axis height of all axles:.....
7. Suspension roll stiffness of all axles:.....
8. Vertical tyre rate (inclusive double effect of twin tyres):.....
9. In case of twin tyres, the twin tyre width:.....
10. Calculation results, $q_c =$
11. Technical service which carried out the calculation:.....
12. Date:.....
13. Signature:.....

SECTION - 9.0

TYPE APPROVAL AND COP PROCEDURE

9.1 SCOPE :

9.1.1 The Type Approval Procedure specified in this code is applicable to truck Cab body including dangerous goods carriers with GVW greater than 3.5 tonnes and trailers / semi-trailers.

9.1.2 The requirements of this code also apply to vehicles of N2, N3, T3 and T4 categories.

The requirements of this section as well as the Code would only apply to organizations who construct cabs / bodies on chassis supplied by vehicle manufacturers. It will not apply to the vehicle / chassis manufacturers who are currently under the type approval and CMVR certification system within the scope of this procedure.

9.1.3. The system for approval of Prototype (Rule 126) and Conformity to Production (Rule 126A) to comply with provisions with respect to the safety, strength and technical requirements specified in this “**Code of Practice for Construction and approval for Truck Cab, Truck Body and Trailers**” and Trailer manufacturing (TM)” shall be based on the standards notified from time to time.

9.2 Procedure for Type Approval :

9.2.1 Design of Truck Cab and Body Building / Trailer Manufacturing and other Aggregates / Units :

9.2.1.1 Truck Cab and Body Builders (TCBB) / Trailer Manufacturers (TM) may follow their own design complying with the provisions of this Code. They shall follow the designs / recommendations of the vehicle / chassis manufacturers, wherever necessary and applicable.

9.2.2 Prototype Type Approval of Vehicle / Trailer and other Aggregates / Units :

9.2.2.1 TCBB / TM shall submit application for Type Approval of prototype built as per 9.2.1.1 above.

9.3 Application for Type Approval :

9.3.1

The application for type approval of the vehicle type shall be submitted to the Test Agency by the TCB / TM with a description of the Vehicle type(s) accompanied by the following documents, as applicable to the provisions for which such compliance is sought:

- a) List of provisions for which compliance is sought to be established.
- b) The Truck body builder shall submit all the relevant information as given in Annexure - I.
- c) The Truck Body Builder shall submit additional information on Trucks meant for carrying dangerous and hazardous goods as given in Annexure – II.
- d) The Trailer manufacturer shall submit the technical information as given in Annexure – III.
- e) Copies of certificates or test reports of compliance to various provisions, which may have already been obtained from other recognized Testing Agencies.
- f) Copies of test reports for other models/variants, if any, which can be used for establishing compliance of the model to be type approved, with a note explaining the details.
- e) Copy of certificate of incorporation of the organisation, if not already submitted.
- f) Publications available.

9.4 Type Approval of Safety Components / Sub-assemblies :

9.4.1

In addition to the safety components notified under Rule 124 of Central Motor Vehicle Rules, 1989 the Type Approval of passenger seats and seat mountings, window sub-assembly, power operated service door, door components like locks and hinges, luggage rack assembly, wheel rims (in the case of Trailers) etc., and any other components notified from time to time shall be obtained separately and copies of such certificates / reports shall be furnished in addition to the requirements stipulated in 9.3.1 above.

9.5 Methods of Establishing Compliance :

9.5.1.

Depending upon the provision, the compliance can be established by either comparison of the values declared in the Technical Specifications with those in the provisions of Central Motor Vehicle Rules, 1989, or checking the fitment of part(s) on the vehicle or by testing, as applicable. Applicability of rules, method of establishing the compliance and details of the test procedures shall be as specified in this code.

9.6 Certificate of Compliance for Type Approval :

9.6.1

After compliance is established for all the provisions, applicable to that model/variant(s), a Certificate of Compliance consolidating all applicable provisions shall be issued by the Testing Agency. The Technical Specifications as declared by the manufacturer shall be counter signed by the Testing Agency and shall be attached to the certificate of compliance.

9.7 **Conformity of Production (CoP) :**

9.7.1 CoP shall be carried out at least once in 12 months by any of the testing agencies notified under Rule 126 of Central Motor Vehicle Rules, 1989, or any other agency authorized by the Government. A minimum of one unit shall be subjected to COP.

9.8 **Non-Conformity of Production :**

9.8.1 The accreditation granted to the truck cab and body building unit / trailer manufacturing unit may be suspended or withdrawn in case of non conformity. The unit may be re-evaluated as per directives of the Government.

SECTION - 10.0

ACCREDITATION SYSTEM FOR TRUCK CAB AND BODY BUILDERS (TCBB) / TRAILER MANUFACTURERS (TM)

Truck Cab and Body Building as well as trailer / semi-trailer manufacturing is being carried out by a large number of small and medium scale organizations spread throughout the country. Truck Cab and Body Builder (TCBB) organizations construct the bodies on chassis procured from vehicle / chassis manufacturers. Presently, only the vehicle / chassis manufactured by vehicle manufacturers undergo a formal type approval and certification procedure as per the various provisions of CMVR.

The Committee feels that there is a need to set up a formal institutional mechanism to monitor the manufacturing and process conformity and compliance of CMVR provisions of the above said TCBB / TM units. For example, in respect of items like petroleum tankers and certain other hazardous goods carriers, there is an established control procedure administered by the Chief Controller of Explosives. The Committee recommends that a procedure on the above lines is instituted in respect of truck and body building as well as trailer manufacturing.

The Committee also recommends creation of a cadre of technical personnel to effectively implement the procedure in order to ensure that all truck cabs / bodies as well as trailers comply with all the relevant provisions of the CMVR as well as the Code of Practice for Truck Body / Trailer formulated in this document.

The Ministry of Shipping, Road Transport and Highways (MoSRT&H) , is presently evolving a system for the Accreditation of the Bus Body Builders in the country. The Committee also recommends that the same system be extended for the truck body building and trailer manufacturing activity as well. MoSRT&H may separately notify the administrative mechanism for the Accreditation of Truck Body Builders and Trailer Manufacturers.

Annexure – I**(See 9.3.1(b))**

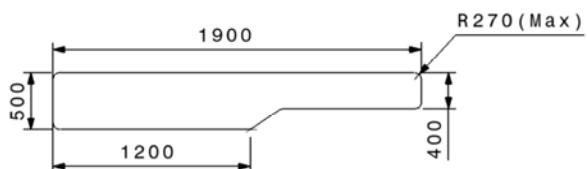
(To be submitted by the Vehicle Manufacturer / Body Builder to the Test Agency)

TECHNICAL INFORMATION ON TRUCK CAB, LOAD BODY & RELATED TECHNICAL FEATURES

1.0	Details of Vehicle Manufacturer
1.1	Name & address of the vehicle manufacturer
1.2	Telephone No.
1.3	Fax. No.
1.4	E-mail address
1.5	Contact person
1.6	Plant(s)of manufacture
2.0	Details of Truck Body / Tanker Builder
2.1	Name & address of the body builder
2.2	Telephone No.
2.3	Fax. No.
2.4	E-mail address
2.5	Contact person
3.0	Name of model and variants (if any)
3.1	CMVR certificate reference(s)
3.2	Type and General commercial description (s)
4.0	Vehicle type
4.1	Type of vehicle (rigid / articulated / combination)
4.2	Usage (goods / passenger / tractor / trailer / others)
4.3	Control (forward / semi-forward / normal / others)
4.4	Drive (4x2 / 4x4 / 6x4 / others)
4.5	Cab type (fully built cab/sleeper cab/cowl/front end structure/with wind shield/without wind shield)
4.6	Load body, type and drawing
5.0	Category of vehicle
5.1	As per IS:14272 (Part 1)
5.2	As per IS:11852 (Part 2)
6.0	Vehicle Details
6.1	Chassis types approved for body installation
6.2	Type of Control (normal control / full forward control etc.)
6.3	Number of axles and wheels
6.4	Chassis (overall drawing)
6.5	Frame type
6.6	Cross section and view drawing
6.7	Dimensions mm: length and width
6.8	Position and arrangement of engine

7.0	Vehicle Dimensions (Specify drawing reference)
7.1	Length mm
7.1.1	Total length mm (for articulated/combination vehicles)
7.2	Width mm
7.3	Height (Unladen) mm
7.4	Wheel base mm
7.5	Minimum axle spacing, mm (for articulated/combination vehicles)
7.6	Wheel track mm
7.6.1	Front
7.6.2	Rear
7.6.3	Other axles (for articulated/combination vehicles)
7.7	Body overhang mm
7.7.1	Front end
7.7.2	Rear end
7.8	Frame overhang mm(in case of vehicles without complete body)
7.8.1	Front end
7.8.2	Rear end
7.9	Inner dimensions of room or platform (For goods carriage vehicles only)
7.9.1	Length
7.9.2	Width
7.9.3	Height
7.10	Lateral projection
8.0	Weights
8.1	Vehicle kerb weight kg
8.1.2	Front axle
8.1.3	Rear axle
8.1.4	Trailer axle (applicable for articulated / combination vehicles)
8.1.5	Total
8.2	Gross vehicle weight kg
8.3	Maximum permissible axle weights kg
8.3.1	Front axle
8.3.2	Rear axle
8.4	Gross combination weight (applicable for articulated / tractor-trailer combination vehicles)
8.4.1	Front axle
8.4.2	Rear axle
8.4.3	Trailer axle / other axle
8.5	Reference mass kg
9.0	Body
9.1	Type of Truck / Tanker
9.2	Comfort Category
9.3	Dimension drawing and photograph of the vehicle with representative body
9.4	Range of vehicle dimension (overall)
9.5	Dimensional drawings of the body depicting chassis connecting members
9.6	Material used for construction
9.7	Material used for Cab
9.8	Structure Material (as per ISO : 3795)

9.9	Size of sections (A Table with details of cross sectional dimensions of the sections be enclosed)	
9.10	Material used for cab other than Structural (ISO :3795)	
9.11	Method of construction	
9.12	(Brief construction method)	
9.13	Area for Cab (m^2)	
9.14	Number of Seats	
9.14.1	Driver Seat	
9.14.2	Co-Driver Seat	
9.15	Number of sleeper berths, layout with dimensions (As per Seat Layout)	
9.16	Number of Service doors, layout with dimensions	
9.17	Number of emergency exit, layout with dimensions	
9.18	Number of escape hatches, layout with dimensions	
9.19	Area of luggage Transportation on roof (m^2), layout with dimensions	
10.0	Clearance	
10.1	Minimum road clearance	
10.2	Road clearance from floor	
10.3	Approach angle	
10.4	Departure angle	
10.5	Ramp-over angle	
11.0	Seating capacity	
11.1	Maximum (including driver) for completely built vehicles	
11.2	Sketch showing layout of seats with appropriate dimensions of seats & their location on the vehicle platform	
12.0	Maximum Stable inclination	
12.1	Left	
12.2	Right	
13.0	Body Panels	
13.1	Outer Panels	
13.1.1	Material	
13.1.2	Thickness	
13.2	Inner Panels	
13.2.1	Material	
13.2.2	Thickness	
13.3	Roof Panels (If closed type load carrier)	
13.3.1	Material	
13.3.2	Thickness	
13.4	Floor Panels	
13.4.1	Material	
13.4.2	Thickness	
13.5	Type of anti-slip coating	
14.0	Step well Guard	
14.1	Height from the floor	
14.2	Projection from the side wall	
15.0	Cab Luggage Rack	
15.1	Width from sidewall	
15.2	Height from Roof	

16.0	Driver Partition	
16.1	Dimension of partition with respect to rear edge of driver seat (Rear most position of driver seat)	
17.0	Driver's Work Area (Refer Figure-2 of Section -2) A separate figure or drawing be attached	
17.1	Overall length of the cab, mm	
17.2	Height of floor from 2nd foot step top, mm	
17.3	Distance from floor to the driver's seat top, mm	
17.4	Distance from the floor to the bottom of the steering wheel, mm	
17.5	Distance from the roof to the floor, mm	
17.6	Height of the cab from ground, mm	
17.7	Thickness of the berth, mm	
17.8	Roof to upper berth gap, mm (Min)	
17.9	Lower berth top to upper berth top, mm (Min)	
	 <p>Berth width, mm</p>	
17.10	Lower berth height from the floor at rear, mm	
17.11	Height of cab at rear, mm	
17.12	Seat to steering wheel gap, mm	
17.13	Width of the door , mm (Min)	
17.14	Height of door, mm (Min)	
17.15	Width of window, mm (Min)	
17.16	Height of window, mm (Min)	
17.17	Width of observation window (on door) at top, mm	
17.18	Width of observation window (on door) at bottom, mm	
17.19	Height of observation glass, mm	
17.20	Minimum length of the sleeper berth measured from the longitudinal axis of the berth (left to right), mm	
17.21	Minimum distance from H point to roof measured along the back rest at 12 degree angle, mm (head room)	
17.22	Thigh clearance for the driver-The vertical distance measured from top of the seat cushion of the driver's seat the bottom of the steering Wheel, mm	
17.23	Heel point –Minimum distance from the inner face of the bulk head, mm	
17.24	Overall length of the cab, mm	
18.0	Hand hold / Climb facility (Refer Figure –3 of Section -2) A separate figure or drawing shall be attached.	
18.1	Maximum height from ground to surface of first step, mm	
18.2	Maximum vertical distance between top surface of subsequent steps, mm	
18.3	Minimum step depth, mm	
18.4	Minimum step clearance including step depth, mm	
18.5	Minimum step width (other than first step) , mm	
18.6	Minimum step width for lower step, mm	
18.7	Reference point specified by chassis manufacturer (SGRP) , mm	
18.8	Cross section of handle, mm	
18.9	Width of grab handle on "B pillar", mm	

18.10	Width of grab handle on "A pillar", mm
18.11	First hand hold/ hand rail height from ground level (max) , mm
18.12	Maximum height of the grab handle at Rear-"Hold-U" from bottom of rear floor (B pillar side) , mm
18.13	Maximum height of the grab handle to floor bottom at front (for hand "Hold-V") (A pillar side) , mm
18.14	Minimum thickness of the foot step, mm
18.15	Minimum height of the upper most step to floor, mm
18.16	Compliance to AIS-046 established (Yes / No)
19.0	External Projections
19.1	Ornaments
19.2	Projection for headlight
19.3	Radiator grills (Applicable of on external surface)
19.4	Gap between individual elements
19.5	Radius of curvature of individual element
19.6	Body Panel (In case of radius of curvature of folds in body panels are less than 2.5mm
19.7	The scaled drawing of folds contour and H value as per Annex A of SS29/IS 13942 is required (to be submitted)
19.8	Radius of curvature of lateral Rain/Air deflector
19.9	Hinges
19.10	Handles
20.0	Rear Under run Protective device (RUPD)
20.1	Height of lower edge of the device from the ground (mm)
20.2	Width of the device (mm)
20.3	Drawing of the rear under-run protective device with dimensions.
20.4	Material (Metal/Fibre/etc.)
21.0	Lateral Protection (Side Guards)
21.1	Height of the lower edge of the Side Guard.
21.2	Drawing of the lateral protection device fitted on the vehicle with dimensions
21.3	Material (Metal/Fiber/etc.)
22.0	Driver / Co-driver door
22.1	Make & identification
22.2	Name of the producer
22.3	Position of controls
22.4	Control Circuit (schematic diagram)
23.0	Door locks and hinges
23.1	Doors
23.1.1	No. of doors
23.1.2	Position and type of door
23.2	Door lock
23.2.1	Name of manufacturer
23.2.2	Identification mark
23.3	Door hinge
23.3.1	Name of manufacturer
23.3.2	Identification mark

24.0	Hood latch
24.1	Name of manufacturer
24.2	Type
24.3	Identification mark
25.0	Windows on driver / co-driver door
25.1	Winding type provided (Yes/No)
26.0	Windows other than door windows
26.1	Type and description
26.2	Drawing with dimensions
27.0	Safety glass
27.1	Front windshield (laminated)
27.1.1	Make and identification
27.1.2	Type (flat/curved, clear/tinted)
27.1.3	Thickness mm
27.1.4	No. of pieces
27.1.5	Radius of curvature (If curved)
27.2	Side Windows
27.2.1	Make and identification
27.2.2	Type (flat/curved, clear/tinted, toughened)
27.2.3	Thickness mm
27.2.4	Radius of curvature (If curved)
27.3	Rear Window
27.3.1	Make and identification
27.3.2	Type (flat/curved, clear/tinted, toughened)
27.3.3	Thickness mm
27.3.4	Radius of curvature (If curved)
28.0	Rear view mirror
28.1	Left
28.1.1	Name of producer
28.1.2	Type
28.1.3	Class of mirror
28.1.4	Manufacturer's ID number
28.1.5	Trade name or mark location
28.1.6	Dimension & radius of curvature
28.2	Right
28.2.1	Name of producer
28.2.2	Type
28.2.3	Class of mirror
28.2.4	Manufacturer's ID number
28.2.5	Trade name or mark location
28.2.6	Dimension & radius of curvature
28.3	Inside
28.3.1	Name of producer
28.3.2	Type
28.3.3	Class of mirror
28.3.4	Manufacturer's ID number
28.3.5	Trade name or mark location
28.3.6	Dimension & radius of curvature

28.4	Sketch showing mounting arrangement of mirrors	
29.0	Wind Screen Wiper	
29.1	Type	
29.2	No. of wipers	
29.3	Wiper motor	
29.3.1	Name of manufacturer	
29.3.2	Type and identification	
29.3.3	Rated voltage	
29.3.4	Frequency of wiping	
29.4	Wiper arm	
29.4.1	Length	
29.4.2	Manufacturer and Identification	
29.5	Wiper blade	
29.5.1	Length	
29.5.2	Manufacturer and Identification	
29.5.3	Rubber material	
29.5.4	Type of fixing (as per IS:7827)	
29.6	Drawing indicating the seat back angle, seat travel, H point, Rake angle ,F dimension And steering wheel position (Ref document ARAI005CMVR101(2) December 1992)	
30.0	Wind Screen Washer	
30.1	Name of producer	
30.2	Type	
30.3	Number of nozzles	
30.4	Spray Area	
31.0	Equipment for occupant's safety	
31.1	Driver Seat belt	
31.1.1	Name of producer	
31.1.2	Identification Type	
31.1.3	Number	
31.2	Head restraint	
31.2.1	Name of producer	
31.2.2	Type	
31.3	Passenger Seat	
31.3.1	Name of producer	
31.3.2	Type	
31.3.3	Frame structure Material	
31.3.4	Section size	
31.3.5	Pad material	
31.3.6	Upholstery	
32.0	Super Structure (Load body)	
32.1	Type and description	
32.2	Floor Height from the ground (unladen)	
32.3	Slope of floor	
32.4	Material used for Floor construction	
32.5	No. of Cross sections used	
32.6	(If more than two tabulate in a table)	
32.7	Details of the Load Body Carrier	
32.8	Maximum Height	

32.9	Maximum Width
32.10	Maximum Length
33.0	Bumper
33.1	Size
33.1.1	Front
33.1.2	Rear
33.2	External Projection
33.3	Clearance between bumper & body
34.0	Spray Suppression System
34.1	Make, Country of origin (If imported)
34.2	Type (Water seperator / Pulveriser)
34.3	Identification No. / Part No.
34.4	Size
34.5	Drawing / Photographs showing the mounting details with dimensions
35.0	Fuel filler
35.1	Aperture
35.2	Position
36.0	Fire Extinguisher
36.1	Number
36.2	Type
36.3	Capacity
36.4	Name of Producer
37.0	First Aid Equipment
37.1	Number
37.2	Contents
38.0	Towing devices
38.1	Type
38.2	Name of manufacturer
38.3	Capacity
39.0	Horn :
39.1	Make and Country of origin (if imported)
39.2	Type (As per IS 1884 – 1993)
39.3	Operating voltage
39.4	Identification No. / Part No.
39.5	Number
39.6	Sketch showing mounting of horn
39.7	The shape and material of the body work at the front of the horn, which might affect the level of the sound, emitted by the horn and have a masking effect
39.8	Maximum vehicle speed for continuous operation, km/h.
40.0	Lighting Installation requirements :
40.1	External shape of the vehicle
40.2	Head lamp leveling system
40.3	Initial inclination
40.4	Tell-Tale
40.5	Description and sketch showing the detail positions of Tell-Tale and seating layout (for M category vehicles)

41.0	Head lamp :	
41.1	Main beam	
41.1.1	Make and Country of origin (if imported)	
41.1.2	Type of lens (Glass / Plastic)	
41.1.3	Identification No. / Part No.	
41.1.4	Number and Colour of Lens	
41.2	Dipped beam	
41.2.1	Make and Country of origin (if imported)	
41.2.2	Type of lens (Glass / Plastic)	
41.2.3	Identification No. / Part No.	
41.2.4	Number and Colour of Lens	
42.0	Front Fog Lamp :	
42.1	Make and Country of origin (if imported)	
42.2	Type of lens (Glass / Plastic)	
42.3	Identification No. / Part No.	
42.4	Number and Colour of Lens	
43.0	Rear Fog Lamp :	
43.1	Make and Country of origin (if imported)	
43.2	Type of lens (Glass / Plastic)	
43.3	Identification No. / Part No.	
43.4	Number and Colour of Lens	
44.0	Side Marker lamps :	
44.1	Make and Country of origin (if imported)	
44.2	Type of lens (Glass / Plastic)	
44.3	Identification No. / Part No.	
44.4	Number and colour of Lens	
45.0	Registration Plate lamp :	
45.1	Make and Country of origin (if imported)	
45.2	Type of lens (Glass / Plastic)	
45.3	Identification No. / Part No.	
45.4	Number and colour of Lens	
46.0	Position lamp / Parking Lamp - Front	
46.1	Front Position Lamp	
46.1.1	Make and Country of origin (if imported)	
46.1.2	Type of lens (Glass / Plastic)	
46.1.3	Identification No. / Part No.	
46.1.4	Number and colour of Lens	
46.2	Front Parking Lamp	
46.2.1	Make and Country of origin (if imported)	
46.2.2	Type of lens (Glass / Plastic)	
46.2.3	Identification No. / Part No.	
46.2.4	Number and colour of Lens	
47.0	Position lamp / Parking Lamp - Rear	
47.1	Rear Position Lamp	
47.1.1	Make and Country of origin (if imported)	
47.1.2	Type of lens (Glass / Plastic)	

47.1.3	Identification No. / Part No.
47.1.4	Number and colour of Lens
47.2	Rear Parking Lamp
47.2.1	Make and Country of origin (if imported)
47.2.2	Type of lens (Glass / Plastic)
47.2.3	Identification No. / Part No.
47.2.4	Number and colour of Lens
48.0	Stop lamp (S1 / S2)
48.1	Make and Country of origin (if imported)
48.2	Type of lens (Glass / Plastic)
48.3	Identification No. / Part No.
48.4	Number and colour of Lens
49.0	Reversing lamp :
49.1	Make and Country of origin (if imported)
49.2	Type of lens (Glass / Plastic)
49.3	Identification No. / Part No.
49.4	Number and colour of Lens
50.0	Direction indicator Lamp :
50.1	Front
50.1.1	Make and Country of origin (if imported)
50.1.2	Type of lens (Glass / Plastic)
50.1.3	Identification No. / Part No.
50.1.4	Number and colour of Lens
50.2	Rear
50.2.1	Make and Country of origin (if imported)
50.2.2	Type of lens (Glass / Plastic)
50.2.3	Identification No. / Part No.
50.2.4	Number and colour of Lens
50.3	Side
50.3.1	Make and Country of origin (if imported)
50.3.2	Type of lens (Glass / Plastic)
50.3.3	Identification No. / Part No.
50.3.4	Number and colour of Lens
50.4	Type of flasher
51.0	Hazard warning signal :
51.1	Front
51.1.1	Make and Country of origin (if imported)
51.1.2	Type of lens (Glass / Plastic)
51.1.3	Identification No. / Part No.
51.1.4	Number and colour of Lens
51.2	Rear
51.2.1	Make and Country of origin (if imported)
51.2.2	Type of lens (Glass / Plastic)
51.2.3	Identification No. / Part No.
51.2.4	Number and colour of Lens
51.3	Side
51.3.1	Make and Country of origin (if imported)

51.3.2	Type of lens (Glass / Plastic)	
51.3.3	Identification No. / Part No.	
51.3.4	Number and colour of Lens	
52.0	Reflector :	
52.1	Front	
52.1.1	Make and Country of origin (if imported)	
52.1.2	Type	
52.1.3	Identification No. / Part No.	
52.1.4	Number and colour of Lens	
52.1.5	Area	
52.1.6	Shape	
52.2	Rear	
52.2.1	Make and Country of origin (if imported)	
52.2.2	Type	
52.2.3	Identification No. / Part No.	
52.2.4	Number and colour of Lens	
52.2.5	Area	
52.2.6	Shape	
52.3	Side	
52.3.1	Make and Country of origin (if imported)	
52.3.2	Type	
52.3.3	Identification No. / Part No.	
52.3.4	Number and colour of Lens	
52.3.5	Area	
52.3.6	Shape	
53.0	End – outline marker lamp (Top light)	
53.1	Front	
53.1.1	Make and Country of origin (if imported)	
53.1.2	Type of lens (Glass / Plastic)	
53.1.3	Identification No. / Part No.	
53.1.4	Number and colour of Lens	
53.2	Rear	
53.2.1	Make and Country of origin (if imported)	
53.2.2	Type of lens (Glass / Plastic)	
53.2.3	Identification No. / Part No.	
53.2.4	Number and colour of Lens	
53.3	Diagram of vehicle indicating location, reference axis, mark of apparent surface, contour of vehicle parts limiting geometric visibility of all lights and light signaling devices, location of extreme outer edges and longitudinal median plane of vehicle including following dimensions in mm.	
53.4	Along width of vehicle-horizontal distance between inner illuminating surfaces, distance between inner illuminating surfaces and outer most part of vehicle and distance between nearest point of illuminating surfaces of indicators and dipped-beam head lamp	
53.5	Along length of vehicle (where applicable)- distance between the transverse plane corresponding to the longitudinal rearmost extremity to center of reference of rear indicators	

53.6	Heights of highest and lowest point of illuminating surfaces	
54.0	Automotive bulbs :	
54.1	Head lamp bulb (main and dip)	
54.1.1	Make and Country of origin (if imported)	
54.1.2	Designation as per AIS-034	
54.2	Parking Lamp bulb – Front	
54.2.1	Make and Country of origin (if imported)	
54.2.2	Designation as per AIS-034	
54.3	Parking Lamp bulb - Rear	
54.3.1	Make and Country of origin (if imported)	
54.3.2	Designation as per AIS-034	
54.4	Direction indicator lamp bulb - front	
54.4.1	Make and Country of origin (if imported)	
54.4.2	Designation as per AIS-034	
54.5	Direction indicator lamp bulb - rear	
54.5.1	Make and Country of origin (if imported)	
54.5.2	Designation as per AIS-034	
54.6	Direction indicator lamp bulb - side	
54.6.1	Make and Country of origin (if imported)	
54.6.2	Designation as per AIS-034	
54.7	Front Position Lamp bulb	
54.7.1	Make and Country of origin (if iimparted)	
54.7.2	Designation as per AIS-034	
54.8	Rear Position Lamp (tail lamp)Bulb	
54.8.1	Make and Country of origin (if imported)	
54.8.2	Designation as per AIS-034	
54.9	Stop lamp bulb	
54.9.1	Make and Country of origin (if imported)	
54.9.2	Designation as per AIS-034	
54.10	Number plate lamp bulb	
54.10.1	Make and Country of origin (if imported)	
54.10.2	Designation as per AIS-034	
54.11	End out Marker bulb	
54.11.1	Make and Country of origin (if imported)	
54.11.2	Designation as per AIS-034	
54.12	Reversing lamp bulb	
54.12.1	Make and Country of origin (if imported)	
54.12.2	Designation as per AIS-034	
54.13	Stop Lamp Bulb (S3)	
54.13.1	Make and Country of origin (if imported)	
54.13.2	Designation as per AIS-034	
54.14	Front Fog Lamp Bulb	
54.14.1	Make and Country of origin (if imported)	
54.14.2	Designation as per AIS-034	
54.15	Rear Fog Lamp Bulb	
54.15.1	Make and Country of origin (if imported)	
54.15.2	Designation as per AIS-034	
54.16	Side Marker Lamp Bulb	

54.16.1	Make and Country of origin (if imported)	
54.16.2	Designation as per AIS-034	
55.0	Internal Lighting & Illumination	
55.1	Driver Cab lighting :	
55.1.1	Type :	
55.1.2	Name of producer :	
55.1.3	Number :	
55.1.4	Illumination intensity :	
55.2	Passenger Compartment Lighting	
55.2.1	Type :	
55.2.2	Name of producer :	
55.2.3	Number :	
55.2.4	Illumination intensity :	
56.0	Other Area Lighting	
56.1	Type :	
56.2	Name of producer :	
56.3	Number :	
56.4	Illumination intensity :	
57.0	Electrical Circuit	
57.1	Circuit Diagram (attach details):	
58.0	Electrical Cables	
58.1	Name of producer :	
58.2	Conductor Cross section :	
58.3	Insulation Class :	
59.0	Fuse	
59.1	Type & Make	
59.2	Name of producer	
60.0	Master switch for electrical	
60.1	Type & Make	
60.2	Name of producer	

Annexure - II

(See 9.3.1 (c))

(To be submitted by the Vehicle Manufacturer / Body Builder to the Test Agency)

INFORMATION ON VEHICLES CARRYING HAZARDOUS GOODS

1.0	Details of Vehicle Manufacturer
1.1	Name & address of the vehicle manufacturer
1.2	Telephone No.
1.3	Fax. No.
1.4	E-mail address
1.5	Contact person
1.6	Plant(s)of manufacture
2.0	Details of Truck / Tanker / Bullet Manufacturer
2.1	Name & address of Truck / Tanker / Bullet Manufacturer
2.2	Telephone No.
2.3	Fax. No.
2.4	E-mail address
2.5	Contact person
3.0	Name of model and variants (if any)
3.1	CMVR certificate reference(s)
3.2	Type and General commercial description (s)
4.0	Vehicle type
4.1	Type of vehicle (rigid / articulated / combination)
4.2	Usage (goods / passenger / tractor / trailer / others)
4.3	Control (forward / semi-forward / normal / others)
4.4	Drive (4x2 / 4x4 / 6x4 / others)
4.5	Cab type (fully built cab/sleeper cab/cowl/front end structure/with wind shield/without wind shield)
4.6	Load body, type and drawing
5.0	Wiring
5.1	Make
5.2	Protection type
6.0	Battery master switch
6.1	Make
6.2	Type
6.3	Model & Identification
7.0	Battery insulation
7.1	Make
7.2	Type
7.3	Model & Identification
7.4	Material
7.5	Nominal thickness
8.0	Electrical connection
8.1	Protection degree IP 54 (Yes / No)

9.0	Tachograph
9.1	Make
9.2	Type
9.3	Model & Identification
10.0	Exhaust pipe protection
10.1	Maximum exhaust temperature $^{\circ}\text{C}$
10.2	Description (with a general arrangement drawing of exhaust system along with its routing indicating the lengths of exhaust pipe, tail pipe and exhaust outlet location)
10.3	Minimum distance between exhaust pipe(s) and the fuel line
11.0	Speed limitation devices (Governor)
11.1	Make(s)
11.2	Type(s)
11.3	Cut off point under load
11.4	Max. speed without out load
11.5	Idle Speed
12.0	Combustion heater
12.1	Method of putting off
13.0	Brakes
13.1	Type and Brief Description
13.2	Service brakes
13.2.1	Name of producer
13.2.2	Type (Mechanical/hydraulic/air assisted/ vacuum assisted/others)
13.2.3	Control system & braking wheel
13.2.4	Schematic layout indicating method of split of brake system, location of valves, reservoirs etc.
13.3	Anti-Lock braking system Provided (Yes/No)
13.3.1	If yes, details
13.3.2	ABS make
13.4	Electronic Control Unit (ECU)
13.4.1	Make
13.4.2	Identification mark
13.5	Wheel Speed Sensor
13.5.1	Make
13.5.2	Identification mark
13.5.3	No. of sensors used
13.6	Hydraulic Modulator
13.6.1	Make
13.6.2	Identification mark
13.7	Solenoid Valve
13.7.1	Make
13.7.2	Identification mark
13.7.3	Max. designed pressure, kg/cm^2
13.7.4	Max. working pressure, kg/cm^2

13.8	Safety lamp provided (Yes/No)
13.9	Schematic layout of the ABS system
13.10	If ASR is used, give details
13.11	Brake lining (or) Pad
13.11.1	Nominal Dimensions, (mm) (Length x Width x thickness)
13.11.1.1	Front wheel
13.11.1.2	Rear wheel
13.11.1.3	Others (in case of Tandem axle, give axle wise data)
13.11.2	Effective area per axle (cm^2)
13.11.2.1	Front axle
13.11.2.2	Rear axle
13.11.2.3	Others (in case of Tandem axle, give axle wise data)
13.11.3	Material
13.11.4	Make and Designation
13.11.4.1	Front wheel / axle
13.11.4.2	Rear wheel / axle
13.11.4.3	Others (In case of Tandem axle provide data for each axle)
13.11.5	Whether asbestos or asbestos-free?
13.12	Brake drum or disc
13.12.1	Effective diameter, mm
13.12.1.1	Front wheel
13.12.1.2	Rear wheel
13.12.1.3	Others (in case of tandem axle or articulated trailers)
13.12.2	Material (if the braking surface is non ferrous)
13.12.2.1	Front
13.12.2.2	Rear
13.12.2.3	Others
13.13	Master cylinder or brake valve
13.13.1	Make
13.13.2	Type
13.13.3	Inner diameter of the master cylinder, mm
13.13.4	Operating stroke mm
13.14	Type of supply tank
13.15	Wheel cylinder diameter, mm
13.15.1	Front
13.15.2	Rear
13.15.3	Others
13.16	Wheel cylinder type (single acting/double acting)
13.16.1	Front
13.16.2	Rear
13.16.3	Others
13.17	Booster
13.17.1	Name of producer
13.17.2	Type
13.17.3	Boost ratio
13.17.4	Size of the booster, mm (diameter)

13.17.5	Vacuum or air assistance			
13.17.6	Pressure kg/cm ²			
13.17.6.1	Nominal (P2 as per IS:11852)			
13.17.6.2	Cut in			
13.17.6.3	Cut out			
13.18	Type of vacuum pump or air compressor			
13.19	Type of pressure regulator			
13.20	No. of tanks			
13.20.1	Tank Capacity, lit.	Description	Capacity	
13.20.1.1	Tank 1			
13.20.1.2	Tank 2			
13.20.1.3	Tank 3			
13.20.1.4	Tank 4			
13.21	Brake Chamber	Front	Rear	Parking
13.21.1	Make and type			
13.21.2	Size, mm			
13.21.3	Internal diameter, mm			
13.21.4	Stroke, mm			

Annexure – III

(See 7.11.2)

(To be submitted by the Trailer Manufacturer to the Test Agency)

TECHNICAL INFORMATION ON TRAILERS

1.0	Details of Trailer manufacturer	
1.1	Name & address of the trailer manufacturer	
1.2	Telephone No.	
1.3	Fax. No.	
1.4	E-mail address	
1.5	Contact person	
1.6	Plant(s)of manufacture	
1.7	Type and Brief Description of Trailer	
2.0	Trailer Dimensions, mm	
2.1	Length	
2.1.1	With draw bar (for independent trailer)	
2.1.2	Without draw bar (for independent trailer)	
2.1.3	Length (in case of semi trailer)	
2.2	Distance between kingpin and rear end	
2.3	Height at front end (unladen condition), mm	
2.3.1	Height of floor from ground at rear	
2.3.2	Overall Height at rear	
2.4	Width, mm	
2.5	Wheel Track, mm	
2.5.1	Front(in case of draw bar trailer)	
2.5.2	Rear	
2.6	Body overhang, mm	
2.6.1	Front (from fifth wheel in case of semi trailer)	
2.6.2	Rear (from the rearmost axle)	
2.7	Wheel base (from fifth wheel in case of semi trailer)	
2.8	Center of gravity (height of CG from ground & distance from one end) If applicable	
2.9	Dimensional drawing No.	
3.0	Fifth Wheel Coupling	
3.1	Height from ground (laden tractor), mm	
3.2	Location of Fifth wheel from the front end of the Tractor, mm	
3.3	Dimensional drawing of the fifth wheel coupling and mounting arrangement.	
4.0	T-sign (as per IS:9942)	
4.1	Make	
4.2	Identification mark	

5.0	Axles				
5.1	No. of Axles				
5.2	First axle				
5.2.1	Type				
5.3	Second axle				
5.3.1	Type				
5.4	Third axle				
5.4.1	Type				
5.5	Axle spacing (provide drawing)				
6.0	Trailer Weights				
6.1	Unladen weight of the trailer				
6.2	Total unladen vehicle weight (TUVW)	TUVW	Front axle /Kingpin weight	Rear axle(s) weight	FAW / RAW
6.3	Gross Vehicle LadenWeight (GLW)	GLW	Max. Permissible FAW/Kingpin weight	Max. Permissible RAW	
6.4	Gross Combination Vehicle Weight (GCVW) (Applicable for articulated vehicle)				
6.5	Payload details				
6.5.1	Type				
6.5.2	Weight				
6.5.3	Location details(to be shown in drawing)				
7.0	Tyres				
7.1	No. and arrangement of wheels				
7.1.1	1 st axle				
7.1.2	2 nd axle				
7.1.3	3 rd axle				
7.1.4	Others (for articulated/combination trailer)				
7.2	Tyre type (Radial/cross ply), size & ply rating				
7.3	Rolling radius, mm				
7.3.1	Static				
7.3.2	Dynamic (if data is available)				
7.4	Inflation pressure – Unladen in kg/cm ² / kPa				
7.4.1	1 st axle				
7.4.2	2 nd axle				
7.4.3	3 rd axle				
7.4.4	Other axle(s)				
7.5	Inflation pressure-Laden in kg/cm ² /kPa				
7.5.1	1 st axle				
7.5.2	2 nd axle				
7.5.3	Other axle(s)				
7.6	Make				
7.7	Tread Wear Indicator, Provided (Yes/No)				
7.8	Month & Year code of manufacture, Provided (Yes/No)				

7.9	Maximum loading capacity, Provided (Yes/No)		
8.0	Suspension		
8.1	Type and description (Leaf / Air / Semi-pneumatic / Hydraulic)		
8.1.1	Front		
8.1.2	Rear		
8.2	Make		
8.2.1	Front		
8.2.2	Rear		
8.3	Type of spring		
8.4	If leaf spring		
8.4.1	Main spring		
8.4.1.1	Stack height		
8.4.1.2	Width at the center point / stack point		
8.4.1.3	Thickness at the center point / stack point		
8.4.1.4	Flat length		
8.4.1.5	Free camber		
		Left	Right
8.4.1.6	No. of leaves		
8.4.1.7	No. of spacers		
8.4.2	Auxiliary Spring		
8.4.2.1	Stack height		
8.4.2.2	Width at the center point / stack point		
8.4.2.3	Thickness at the center point / stack point		
8.4.2.4	Flat length		
8.4.2.5	Free camber		
		Left	Right
8.4.2.6	No. of leaves		
8.4.2.7	No. of spacers		
8.5	If air suspension or semi pneumatic		
8.5.1	Ride height		
8.5.2	Suspension stroke		
8.5.3	Size of the air bellows		
8.5.4	Make of air bellows		
8.5.5	Type of Height control valve		
8.5.6	Make of height control valve		
8.6	If Hydraulic suspension		
8.6.1	Size of cylinder		
8.6.2	Ride height of suspension		
8.6.3	Suspension stroke		
8.7	Suspension-Shock absorber		
8.7.1	Type and Number		
8.7.1.1	Front		
8.7.1.2	Rear		
8.8	Suspension configuration-Single/Tandem/Tridem		
8.9	Any load equalizing device provided		

9.0	Rear Under run Protective device	
9.1	Height of lower edge of the device from the ground (mm)	
9.2	Width of the device (mm)	
9.3	Drawing of the rear under-run protective device with dimensions. (Including part drawing)	
9.4	Material (Metal/Fiber/etc.)	
10.0	Lateral Protection (Side Guards)	
10.1	Height of the lower edge of the Side Guard.	
10.2	Drawing of the lateral protection device fitted on the vehicle with dimensions	
10.3	Material (Metal/Fiber/etc.)	
11.0	Chassis Frame	
11.1	Type	
11.2	Drawing with dimensions	
11.3	Type of platform	
12.0	Brakes	
12.1	Type and Brief Description	
12.2	Service brakes	
12.2.1	Name of producer	
12.2.2	Type (Mechanical/hydraulic/air assisted/ vacuum assisted/others)	
12.2.3	Control system & braking wheel	
12.2.4	Schematic layout indicating method of split of brake system, location of valves, reservoirs etc.	
12.3	Anti-Lock braking system Provided (Yes/No)	
12.3.1	If yes, details	
12.3.2	ABS make	
12.4	Electronic Control Unit (ECU)	
12.4.1	Make	
12.4.2	Identification mark	
12.5	Wheel Speed Sensor	
12.5.1	Make	
12.5.2	Identification mark	
12.5.3	No. of sensors used	
12.6	Hydraulic Modulator	
12.6.1	Make	
12.6.2	Identification mark	
12.7	Solenoid Valve	
12.7.1	Make	
12.7.2	Identification mark	
12.7.3	Max. designed pressure, kg/cm ²	
12.7.4	Max. working pressure, kg/cm ²	
12.8	Safety lamp provided (Yes/No)	
12.9	Schematic layout of the ABS system	
12.10	If ASR is used, give details	
12.11	Brake lining (or) Pad	

12.11.1	Nominal Dimensions, (mm) (Length x Width x thickness)	
12.11.1.1	Front wheel	
12.11.1.2	Rear wheel	
12.11.1.3	Others (in case of Tandem axle, give axle wise data)	
12.11.2	Effective area per axle (cm ²)	
12.11.2.1	Front axle	
12.11.2.2	Rear axle	
12.11.2.3	Others (in case of Tandem axle, give axle wise data)	
12.11.3	Material	
12.11.4	Make and Designation	
12.11.4.1	Front wheel / axle	
12.11.4.2	Rear wheel / axle	
12.11.4.3	Others (In case of Tandem axle provide data for each axle)	
12.11.5	Whether asbestos or asbestos-free?	
12.12	Brake drum or disc	
12.12.1	Effective diameter, mm	
12.12.1.1	Front wheel	
12.12.1.2	Rear wheel	
12.12.1.3	Others (in case of tandem axle or articulated trailers)	
12.12.2	Material (if the braking surface is non ferrous)	
12.12.2.1	Front	
12.12.2.2	Rear	
12.12.2.3	Others	
12.13	Master cylinder or brake valve	
12.13.1	Make	
12.13.2	Type	
12.13.3	Inner diameter of the master cylinder, mm	
12.13.4	Operating stroke mm	
12.14	Type of supply tank	
12.15	Wheel cylinder diameter, mm	
12.15.1	Front	
12.15.2	Rear	
12.15.3	Others	
12.16	Wheel cylinder type (single acting/double acting)	
12.16.1	Front	
12.16.2	Rear	
12.16.3	Others	
12.17	Booster	
12.17.1	Name of producer	
12.17.2	Type	
12.17.3	Boost ratio	
12.17.4	Size of the booster, mm (diameter)	
12.17.5	Vacuum or air assistance	
12.17.6	Pressure kg/cm ²	
12.17.6.1	Nominal (P2 as per IS:11852)	
12.17.6.2	Cut in	
12.17.6.3	Cut out	

12.18	Type of vacuum pump or air compressor			
12.19	Type of pressure regulator			
12.20	No. of tanks			
12.20.1	Tank Capacity, lit.	Description	Capacity	
12.20.1.1	Tank 1			
12.20.1.2	Tank 2			
12.20.1.3	Tank 3			
12.20.1.4	Tank 4			
12.21	Brake Chamber	Front	Rear	Parking
12.21.1	Make and type			
12.21.2	Size, mm			
12.21.3	Internal diameter, mm			
12.21.4	Stroke, mm			
12.22	Slack adjuster – Manual/Automatic			
12.22.1	Make			
12.22.2	Lever length in mm			
12.22.3	Load sensing valve			
12.22.3.1	Make			
12.22.3.2	Model No.			
12.22.4	Set pressure, unladen in kg/cm ²			

13.0	Safety Critical Components	
13.1	Wheel rim	
13.1.1	Size	
13.1.1.1	1 st axle	
13.1.1.2	2 nd axle	
	3 rd axle	
13.1.1.3	Other axle(s)	
13.1.2	Name of manufacturer	
13.1.3	Identification mark	
13.1.4	Pitch circle diameter of mounting bolts, mm	
13.1.5	Number of mounting bolts	
13.1.6	Material (Steel/Aluminum alloy etc.)	
13.2	Wheel nut, Wheel cap and Hub cap	
13.2.1	Wheel Nut	
13.2.1.1	Name of manufacturer	
13.2.1.2	Size	
13.2.1.3	No. of nuts Per wheel	
13.2.1.4	Tightening torque	
13.2.2	Wheel cap / wheel disc	
13.2.2.1	Name of manufacturer	
13.2.2.2	Size	
13.2.2.3	Material (Plastic / Metal)	
13.2.2.4	Method of fitment (Press/bolted/others)	
13.2.3	Hub cap	
13.2.3.1	Name of manufacturer	
13.2.3.2	Size	
13.2.3.3	Method of fitment (Press/bolted/others)	
13.3	Fifth wheel coupling	
13.3.1	Size	
13.3.2	Drawings with dimensions	
13.3.3	Compliance to IS 15101 (Yes/ No)	
13.4	Fifth wheel king pin	
13.4.1	Size	
13.4.2	Drawings with dimensions	
13.4.3	Compliance to IS : 6763 (Yes/ No)	
13.5	Draw bar and Draw bar coupling	
13.5.1	Size	
13.5.2	Drawings with dimensions	
13.5.3	Compliance to IS : 13284 (Yes/ No)	
13.6	Landing gear	
13.6.1	Size	
13.6.2	Drawings with dimensions	
13.6.3	Compliance to IS 10752(Yes/ No)	
13.7	Tow hook	
13.7.1	Size	
13.7.2	Drawings with dimensions	
13.7.3	Compliance to IS : 8299 / 8300/ 8752 (Yes/ No)	

13. 8	Towing jaw
13. 8.1	Size
13. 8.2	Drawings with dimensions
13. 8.3	Compliance to IS :8297 / 8298 (Yes/ No)
13. 9	Draw bar eye
13. 9.1	Size
13. 9.2	Drawings with dimensions
13. 9.3	Compliance to IS :12807 (Yes/ No)
13. 10	Turn table
13. 10.1	Size
13. 10.2	Drawings with dimensions
13. 10.3	Compliance to IS :13544 (Yes/ No)
13. 11	Towing devices, if any
13. 11.1	Type
13. 11.2	Name of manufacturer
13. 11.3	Capacity
13. 12	Coupling devices, if any
13. 12.1	Name of the manufacturer
13. 12.2	Identification mark
13. 12.3	Type of coupling device for mechanical
13. 12.4	Type of coupling device for electrical
13. 12.5	Type of coupling device for brake
13.13	Any other Accessories provided
13.13.1	Compliance to any Standard
14.0	Electrical items
14.1	Rear Fog Lamp :
14.1.1	Make and Country of origin (if imported)
14.1.2	Type of lens (Glass / Plastic)
14.1.3	Identification No. / Part No.
14.1.4	Number and Colour of Lens
14.2	Registration Plate lamp :
14.2.1	Make and Country of origin (if imported)
14.2.2	Type of lens (Glass / Plastic)
14.2.3	Identification No. / Part No.
14.2.4	Number and colour of Lens
14.3	Rear Position Lamp
14.3.1	Make and Country of origin (if imported)
14.3.2	Type of lens (Glass / Plastic)
14.3.3	Identification No. / Part No.
14.3.4	Number and colour of Lens
14.4	Rear Parking Lamp
14.4.1	Make and Country of origin (if imported)
14.4.2	Type of lens (Glass / Plastic)
14.4.3	Identification No. / Part No.
14.4.4	Number and colour of Lens

14.5	Stop lamp (S1 / S2)	
14.5.1	Make and Country of origin (if imported)	
14.5.2	Type of lens (Glass / Plastic)	
14.5.3	Identification No. / Part No.	
14.5.4	Number and colour of Lens	
14.7	Reversing lamp :	
14.7.1	Make and Country of origin (if imported)	
14.7.2	Type of lens (Glass / Plastic)	
14.7.3	Identification No. / Part No.	
14.7.4	Number and colour of Lens	
14.8	Direction indicator Lamp :	
14.8.1	Rear	
14.8.1.1	Make and Country of origin (if imported)	
14.8.1.2	Type of lens (Glass / Plastic)	
14.8.1.3	Identification No. / Part No.	
14.8.1.4	Number and colour of Lens	
14.8.2	Side	
14.8.2.1	Make and Country of origin (if imported)	
14.8.2.2	Type of lens (Glass / Plastic)	
14.8.2.3	Identification No. / Part No.	
14.8.2.4	Number and colour of Lens	
14.8.3	Type of flasher	
14.9	Hazard warning signal :	
14.9.1	Rear	
14.9.1.1	Make and Country of origin (if imported)	
14.9.1.2	Type of lens (Glass / Plastic)	
14.9.1.3	Identification No. / Part No.	
14.9.1.4	Number and colour of Lens	
14.9.2	Side	
14.9.2.1	Make and Country of origin (if imported)	
14.9.2.2	Type of lens (Glass / Plastic)	
14.9.2.3	Identification No. / Part No.	
14.9.2.4	Number and colour of Lens	
14.10	Reflector :	
14.10.1	Rear	
14.10.1.1	Make and Country of origin (if imported)	
14.10.1.2	Type	
14.10.1.3	Identification No. / Part No.	
14.10.1.4	Number and colour of Lens	
14.10.1.5	Area	
14.10.1.6	Shape	
14.10.2	Side	
14.10.2.1	Make and Country of origin (if imported)	
14.10.2.2	Type	
14.10.2.3	Identification No. / Part No.	
14.10.2.4	Number and colour of Lens	
14.10.2.5	Area	

14.10.2.6	Shape	
14.11	End – outline marker lamp (Top light)	
14.11.1	Rear	
14.11.1.1	Make and Country of origin (if imported)	
14.11.1.2	Type of lens (Glass / Plastic)	
14.11.1.3	Identification No. / Part No.	
14.11.1.4	Number and colour of Lens	
14.12	Diagram of vehicle indicating location, reference axis, mark of apparent surface, contour of vehicle parts limiting geometric visibility of all lights and light signaling devices, location of extreme outer edges and longitudinal median plane of vehicle including following dimensions in mm.	
14.13	Along width of vehicle-horizonal distance between inner illuminating surfaces, distance between inner illuminating surfaces and outer most part of vehicle and distance between nearest point of illuminating surfaces of indicators and dipped-beam head lamp	
14.14	Along length of vehicle (where applicable)- distance between the transverse plane corresponding to the longitudinal rearmost extremity to center of reference of rear indicators	
14.15	Heights of highest and lowest point of illuminating surfaces	
14.16	Automotive bulbs :	
14.16.1	Parking Lamp bulb – Rear	
14.16.1.1	Make and Country of origin (if imported)	
14.16.1.2	Designation as per AIS-034	
14.16.2	Direction indicator lamp bulb - rear	
14.16.2.1	Make and Country of origin (if imported)	
14.16.2.2	Designation as per AIS-034	
14.16.3	Direction indicator lamp bulb - side	
14.16.3.1	Make and Country of origin (if imported)	
14.16.3.2	Designation as per AIS-034	
14.16.4	Rear Position Lamp (tail lamp)Bulb	
14.16.4.1	Make and Country of origin (if imported)	
14.16.4.2	Designation as per AIS-034	
14.16.5	Stop lamp bulb	
14.16.5.1	Make and Country of origin (if imported)	
14.16.5.2	Designation as per AIS-034	
14.16.6	Number plate lamp bulb	
14.16.6.1	Make and Country of origin (if imported)	
14.16.6.2	Designation as per AIS-034	
14.16.7	End out Marker bulb	
14.16.7.1	Make and Country of origin (if imported)	
14.16.7.2	Designation as per AIS-034	
14.16.8	Reversing lamp bulb	
14.16.8.1	Make and Country of origin (if imported)	
14.16.8.2	Designation as per AIS-034	
14.16.9	Stop Lamp Bulb (S3)	
14.16.9.1	Make and Country of origin (if imported)	

14.16.9.2	Designation as per AIS-034	
14.16.10	Rear Fog Lamp Bulb	
14.16.10.1	Make and Country of origin (if imported)	
14.16.10.2	Designation as per AIS-034	
14.16.11	Side Marker Lamp Bulb	
14.16.11.1	Make and Country of origin (if imported)	
14.16.11.2	Designation as per AIS-034	

Annexure - IV

**COMPOSITION OF THE SUB-COMMITTEE OF
CMVR-TECHNICAL STANDING COMMITTEE**

Shri. Shrikant R. Marathe Chairman, Automotive Industry Standards Committee &

Shri B. Bhanot Former Chairman, CMVR-Technical Standing Committee

Sr. No.	Name	Designation	Organisation
1.	Shri. A. Akbar Badusha	Senior Assistant Director	The Automotive Research Association of India
2.	Ms. Bhuvaneswari Jayaraman	Assistant Director	Society of Indian Automotive Manufacturers
3.	Shri. B. Ramesh	Head Design	M/s. PL Haulwel Trailers Limited
4.	Shri. C. B. S. Menon	Deputy General Manager	M/s. Ashok Leyland Limited
5.	Shri. K. K. Gandhi	Executive Director (Technical)	Society of Indian Automotive Manufacturers
6.	Shri. M. K..Thareja	Senior Manager	M/s. Eicher Motors Limited
7.	Shri. P. K. Kamat	Deputy Manager (CUBU) ERC	M/s. Tata Motors Limited
8.	Shri. Ram Mohan	Consultant	M/s. Ino – Tech
9.	Shri. R. Devarajan	Special Director	M/s. Ashok Leyland Limited
10.	Shri. Sumit Sharma	Executive officer	Society of Indian Automotive Manufacturers
11.	Shri. S. V. Suderson	Manager	M/s. Volvo India Private Limited
12.	All other members who have contributed in the sub-group discussions.		