

AUTOMOTIVE INDUSTRY STANDARD

**Automotive Vehicles – Approval of
Devices for Indirect Vision intended for
use on L category with bodywork
vehicles, M and N category -
Installation requirements**

(Revision 1)

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ON BEHALF OF
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER
CENTRAL MOTOR VEHICLE RULES – TECHNICAL STANDING COMMITTEE

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

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INTRODUCTION

0.0 The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the erstwhile Ministry of Surface Transport (MOST) has constituted a permanent Automotive Industry Standards Committee (AISC) vide order No.RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India, (ARAI), Pune, being the Secretariat of the AIS Committee, has published this standard. For better dissemination of this information ARAI may publish this document on their Web site.

0.1 Accordingly AIS-002 covering mandatory requirements regarding installation of rear view mirrors been published in 2001 and has been implemented thereafter in 2003.

0.2 With technological developments in the rear view mirrors and devices for Indirect Vision, AIS-002 was taken up for revision and now is prepared in two parts.

This part covers the requirements for installation of rear view mirrors and devices for indirect vision for L category vehicles with bodywork, M and N category of vehicles.

0.3 This part is based on the following ECE regulation:

ECE R 46, (Supplement 4 to the 02 series of amendment of R46.) Date of entry into force 22 July 2009.	Uniform provisions concerning the approval of devices for indirect vision and of motor vehicles with regard to the installation of these devices
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0.4 While preparing this standard attempts have been made to align with the above ECE regulation. However, certain changes were necessary in the Indian context.

0.5 The following standards contain provisions, which through reference in this text constitute provisions of the standard

AIS-001 (Part 1) (Rev. 1)	Automotive Vehicles - Approval of Devices for Indirect Vision intended for use on M, N category and L category with bodywork vehicles - specification
AIS-007	Information on Technical Specifications to be Submitted by the Vehicle Manufacturer
AIS-053	Automotive Vehicles – Types - Terminology

IS 2553 (Part 2) :1992.	Safety glass - Specification - Part 2 for Road Transport
ISO 6549-1980	Road vehicles - Procedure for H-point determination
ISO 4130-1978	Road vehicles - Three-dimensional reference system and fiducial marks - Definitions
ISO 612-1978	Road vehicles - Dimension of motor vehicles and towed vehicles - Terms and definitions.

- 0.6 The composition of AIS panel and AIS Committee responsible for preparation of this standard is given in Annex N and Annex P respectively.

**Automotive Vehicles – Approval of Devices for Indirect Vision
intended for use on L category with bodywork vehicles, M and
N category - Installation requirements**

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Automotive Vehicles - Approval of Devices for Indirect Vision intended for use on L category with bodywork vehicles M and N category - Installation requirements

1. SCOPE

This standard applies to the installation of devices for indirect vision on vehicles of categories L with bodywork at least partly enclosing the driver, M and N, as defined in AIS-053.

2. to 11 Reserved

12. DEFINITIONS

For the purpose of this standard:

12.1. **"The driver's ocular points"** means two points 65 mm apart and 635 mm vertically above point R of the driver's seat as defined in Annex H. The straight line joining these points runs perpendicular to the vertical longitudinal median plane of the vehicle. The centre of the segment joining the two ocular points is in a vertical longitudinal plane which shall pass through the centre of the driver's designated seating position, as specified by the vehicle manufacturer.

Note: The R point declared by the manufacturer may be used for measurement of field of visions.

12.2. **"Ambinocular vision"** means the total field of vision obtained by the superimposition of the monocular fields of the right eye and the left eye (see Figure 3 below).

Note : Figures 1 and 2 reserved

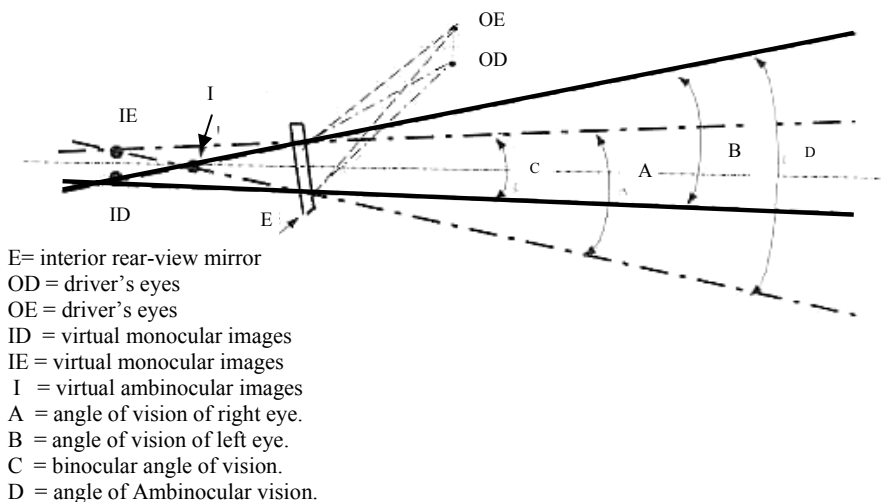


Figure 3
 (See 12.2)
Ambinocular vision

- 12.3. **"Type of vehicle as regards indirect vision"** means motor vehicles which are identical in respect of the following basic features:
- 12.3.1. Type of device for indirect vision;
- 12.3.2. The bodywork features which reduce the field of vision;
- 12.3.3. The coordinates of point R (where applicable);
- 12.3.4. The prescribed positions, and type-approval markings of compulsory and (if fitted) optional devices for indirect vision.
- 12.4. Reserved
- 12.5. **"Forward control"** means a configuration in which more than half of the engine length is rearward of the foremost point of the windshield base and the steering wheel hub in the forward quarter of the vehicle length.
- 12.6. **"Unladen (kerb) mass"** (kg) means the mass of the vehicle in running order, unoccupied and unladen but with the addition of 75 kg for the mass of the driver, the mass of fuel, in the case of liquid fuels, corresponding to 90 per cent of the capacity of the fuel tank specified by the manufacturer, and in the case of gaseous fuels such as CNG, LPG etc. the legally permitted maximum, and the masses of coolant, lubricant, tools and spare wheel, if any.

13. APPLICATION FOR APPROVAL

- 13.1. Information to be submitted at the time of applying for type approval of the devices for indirect vision shall be as given in Annex B
- 13.2. Reserved.
- 13.3. A vehicle representative of the vehicle type to be approved shall be submitted to the testing agency responsible for conducting the approval tests.
- 13.4. Reserved

14. APPROVAL

- 14.1. If the vehicle type submitted for approval in accordance with **13** above meets the requirements of 15 of this standard, approval shall be granted.
- 14.2. Reserved
- 14.3. Reserved

15. REQUIREMENTS

15.1 General

- 15.1.1 The compulsory and optional devices for indirect vision, set out in the table under 15.2.1.1.1, installed on the vehicle shall be classes described in AIS-001 (Part 1) (Rev. 1).
- 15.1.2. Mirrors and other devices for indirect vision shall be fitted in such a way that the mirror or other device does not move so as significantly to change the field of vision as measured or vibrate to an extent which would cause the driver to misinterpret the nature of the image perceived.
- 15.1.3. The conditions laid down in 15.1.2 shall be maintained when the vehicle is moving at speeds of up to 80 per cent of its maximum design speed, but not exceeding 150 km/h.
- 15.1.4. The fields of vision defined below shall be established using ambinocular vision, the eyes being at the "driver's ocular points" as defined in 12.1. The fields of vision shall be determined when the vehicle is in the Unladen kerb mass condition as defined in 12.6, plus for M1 and N1 vehicles one front seat passenger (75 kg). When established through windows the glazing shall have a total light transmission factor in accordance with IS 2553 (Part 2):1992.

15.2. Mirrors

15.2.1. Number

- 15.2.1.1. Minimum number of compulsory mirrors
 - 15.2.1.1.1. The fields of vision prescribed in 15.2.4 shall be obtained from the minimum number of mandatory mirrors set out in the following table. Where the presence of a mirror is not specified on a mandatory base, this means that no other system for indirect vision is to be requested on a mandatory base.

Vehicle category	Interior mirror	Exterior mirrors				
	Interior mirror Class I	Main mirror (large) Class II	Main mirror (small) Class III	Wide-angle mirror Class IV	Close-proximity mirror Class V	Front mirror Class VI
M ₁	Compulsory Unless the vehicle is fitted with anything other than safety glazing material in the field of vision prescribed in paragraph 15.2.4.1. See 15.2.2.10	Optional	Compulsory 1 on the driver's side and 1 on the passenger's side. Class II mirrors may be fitted as an alternative.	Optional 1 on the driver's side and / or 1 on the passenger's side	Optional 1 on the driver's side and 1 on the passenger's side (both shall be fitted at least 2 m above the ground)	Optional (shall be fitted at least 2 m above the ground)
M ₂	Optional (no requirements for the field of view)	Compulsory 1 on the driver's side and 1 on the passenger's side See 15.2.2.11	See 15.2.2.11	Optional 1 on the driver's side and / or 1 on the passenger's side	Optional 1 on the driver's side and 1 on the passenger's side (both shall be fitted at least 2 m above the ground)	Optional (shall be fitted at least 2 m above the ground)
M ₃	Optional (no requirements for the field of view)	Compulsory 1 on the driver's side and 1 on the passenger's side	Not permitted	Optional 1 on the driver's side and / or 1 on the passenger's side	Optional 1 on the driver's side and 1 on the passenger's side (both shall be fitted at least 2 m above the ground)	Mandatory (shall be fitted at least 2 m above the ground) See 15.2.2.7 and 15.2.2.12

Vehicle category	Interior mirror	Exterior mirrors				
	Interior mirror Class I	Main mirror (large) Class II	Main mirror (small) Class III	Wide-angle mirror Class IV	Close-proximity mirror Class V	Front mirror Class VI
N ₁	Compulsory Unless the vehicle is fitted with anything other than safety glazing material in the field of vision prescribed in paragraph 15.2.4.1. See 15.2.2.10	Optional	Compulsory 1 on the driver's side and 1 on the passenger's side. Class II mirrors may be fitted as an alternative.	Optional 1 on the driver's side and / or 1 on the passenger's side	Optional 1 on the driver's side and 1 on the passenger's side (both shall be fitted at least 2 m above the ground)	Optional (shall be fitted at least 2 m above the ground)
N ₂ ≤ 7.5 t	Optional (no requirements for the field of view)	Compulsory 1 on the driver's side and 1 on the passenger's side	Not permitted	Compulsory For both sides if a Class V mirror can be fitted. Optional 1 on the driver's side and 1 on the passenger's side	Compulsory see paragraph 15.2.2.7. and 15.2.4.5.5. 1 on the passenger's side. Optional 1 on driver's side (both shall be fitted at least 2 m above the ground) A tolerance of +10 cm may be applied.	Optional 1 front mirror (shall be fitted at least 2 m above the ground)

Vehicle category	Interior mirror	Exterior mirrors				
	Interior mirror Class I	Main mirror (large) Class II	Main mirror (small) Class III	Wide-angle mirror Class IV	Close-proximity mirror Class V	Front mirror Class VI
N ₂ > 7.5 t	Optional (no requirements for the field of view)	Compulsory 1 on the driver's side and 1 on the passenger's side	Not permitted	Compulsory 1 on the driver's side and 1 on the passenger's side	Compulsory, see paragraph 15.2.2.7. and 15.2.4.5.5. 1 on the passenger's side Optional 1 on driver's side (both shall be fitted at least 2 m above the ground)	Compulsory, see paragraph 15.2.1.1.2. 1 front mirror (shall be fitted at least 2 m above the ground) See 15.2.2.7 and 15.2.2.12
N ₃	Optional (no requirements for the field of view)	Compulsory 1 on the driver's side and 1 on the passenger's side	Not permitted	Compulsory 1 on the driver's side and 1 on the passenger's side	Compulsory, see paragraph 15.2.2.7. and 15.2.4.5.5. 1 on the passenger's side Optional 1 on driver's side (both shall be fitted at least 2 m above the ground)	Compulsory, see paragraph 15.2.1.1.2. 1 front mirror (shall be fitted at least 2 m above the ground) See 15.2.2.7 and 15.2.2.12

Note: “Passenger’s” side means the side opposite to where the driver seat is provided.

15.2.1.1.2 In case the described field of vision of a front mirror prescribed in 15.2.4.6 and/or a close proximity mirror described in 15.2.4.5 may be obtained by another device for indirect vision that is approved according to 6.2 of AIS-001 (Part 1) (Rev. 1), and that is installed according to 15, this device may be used instead of the relevant mirror or mirrors.

In case a camera/monitor device is used, the monitor shall exclusively show:

- (a) the field of vision prescribed in 15.2.4.5 when the close proximity mirror has been substituted,
- (b) the field of vision prescribed in 15.2.4.6. when the front mirror has been substituted while the vehicle is moving forward with a speed up to 10 km/h, or
- (c) Simultaneously the fields of vision prescribed in 15.2.4.5 and 15.2.4.6 when the close proximity mirror and the front mirror have been substituted. In the case of the vehicle is moving forward at a higher speed than 10 km/h or moving backwards, the monitor may be used for other information, provided that the field of vision prescribed in 15.2.4.5. is permanently displayed

Note: Requirements of clauses 15.1 to 15.2.1.1.2. are not applicable for L-category vehicles with body work

15.2.1.1.3. Rear view mirrors required for L-category vehicles with body work

Category of vehicle	Interior mirror (Class I)	Main exterior mirror(s) (Classes III or VII)
L category motor vehicles fitted with bodywork which partly or wholly encloses the driver	1 (see note below)	1, if there is an interior mirror; 2, if there is not an interior mirror

Note: No interior rear-view mirror is required if the visibility conditions referred to in 15.2.5.4.1 below cannot be met. In this case two exterior rear-view mirrors are required, one on the left and one on the right hand side of the vehicle.

Where a single exterior rear view mirror is fitted this shall be located on the right hand side of the vehicle

15.2.1.1.4 Optional rear-view mirrors for L-category vehicles with body work

The fitting of an exterior rear-view mirror on the left side of the vehicle is permissible. The rear-view mirror shall meet the requirements of this standard.

- 15.2.1.2. The provisions of this standard do not apply to the surveillance mirrors defined in 2.1.1.3 of AIS-001 (Part 1) (Rev. 1). Nevertheless, the exterior surveillance mirrors shall be mounted at least 2 m above the ground when the vehicle is under a load corresponding to its maximum technical permissible mass.
- 15.2.2. **Position**
- 15.2.2.1. Mirrors shall be so placed that the driver, when sitting on the driving seat in a normal driving position, has a clear view of the road to the rear, side(s) or front of the vehicle.
- 15.2.2.2. Exterior mirrors shall be visible through the side windows or through the portion of the windscreen that is swept by the windscreen wiper. Nevertheless, for design reasons, this last provision (i.e. the provisions relating the cleaned part of the windscreen) shall not apply to:
- (a) exterior mirrors on the passenger side and optional exterior mirrors on the driver side of vehicles of categories M₂ and M₃;
 - (b) Class VI mirrors
- 15.2.2.3. In the case of any vehicle, which is in chassis/cab form when the field of vision is measured, the minimum and maximum body widths shall be stated by the manufacturer and, if necessary, simulated by dummy headboards. All vehicles and mirror configurations taken into consideration during the tests shall be shown in the test report for a vehicle with regard to the installation of mirrors.
- 15.2.2.4. The prescribed exterior mirror on the driver's side of the vehicle shall be so located that an angle of not more than 55° is formed between the vertical longitudinal median plane of the vehicle and the vertical plane passing through the centre of the mirror and through the centre of the straight line 65 mm long which joins the driver's two ocular points. This condition shall be met if the manufacturer certifies so.
- 15.2.2.5. Mirrors shall not project beyond the external bodywork of the vehicle substantially more than is necessary to comply with the requirements concerning fields of vision laid down in 15.2.4.
- 15.2.2.6. Where the lower edge of an exterior mirror is less than 2 m above the ground when the vehicle is loaded to its technically permissible maximum laden mass, this mirror shall not project more than 250 mm beyond the overall width of the vehicle measured without mirrors.
- 15.2.2.7. Class V and Class VI mirrors shall be mounted on vehicles in such a way that, regardless of their position after adjustment, no part of these mirrors or their holders is less than 2 m from the ground when the vehicle is under a load corresponding to its prescribed GVW declared by vehicle manufacturer.

These mirrors shall not, however, be mounted on vehicles the cab height of which is such as to prevent compliance with this requirement. In this case another device for indirect vision is not requested.

Note : In the following cases, fitment of rear view mirror meeting the

conditions of 15.2.2.7 is considered not possible:

Whether the requirement of parts of rear view mirror cannot be fitted above 2m from the ground, to achieve a field of vision, shall be verified as follows:

Vehicles with the ocular point of the driver \leq 2m from the ground under prescribed GVW declared by vehicle manufacturer.

In other cases, manufacturer demonstrates the condition in an appropriate layout sketch.

15.2.2.8. Subject to the requirements of 15.2.2.5, 15.2.2.6 and 15.2.2.7, mirrors may project beyond the permissible maximum widths of vehicles.

15.2.2.9. All Class VII mirrors shall be attached in such a way that they remain in a stable position under normal vehicle driving conditions.

15.2.2.10 If the vehicle is fitted with anything other than safety glazing material in the field of vision prescribed in paragraph 15.2.4.1, fitment of interior mirrors Class I for categories of M1 and N1 is optional. In such cases, the field of vision requirements need not be complied with.

15.2.2.11 Class III exterior mirrors are permitted in the place of Class II exterior mirrors. In such cases, field of vision prescribed for Class III mirror shall be complied with.

15.2.2.12 Fitment of Class VI mirrors is optional on vehicles which are not forward control. (see 12.5)

15.2.3. **Adjustment**

15.2.3.1. The interior mirror shall be capable of being adjusted by the driver from his driving position.

15.2.3.2. The exterior mirror situated on the driver's side shall be capable of being adjusted from inside the vehicle while the door is closed, although the window may be open. The mirror may, however, be locked in position from the outside.

15.2.3.3. The requirements of 15.2.3.2 do not apply to exterior mirrors which, after having been knocked out of alignment, may be returned to their former position without the need for adjustment.

15.2.4. **Fields of vision**

15.2.4.1. **Interior rear-view mirror (Class I)**

The field of vision shall be such that the driver is able to see at least a 20 m wide, flat, horizontal portion of the road centred on the vertical longitudinal median plane of the vehicle and extending from 60 m behind the driver's ocular points (Figure 4) to the horizon.

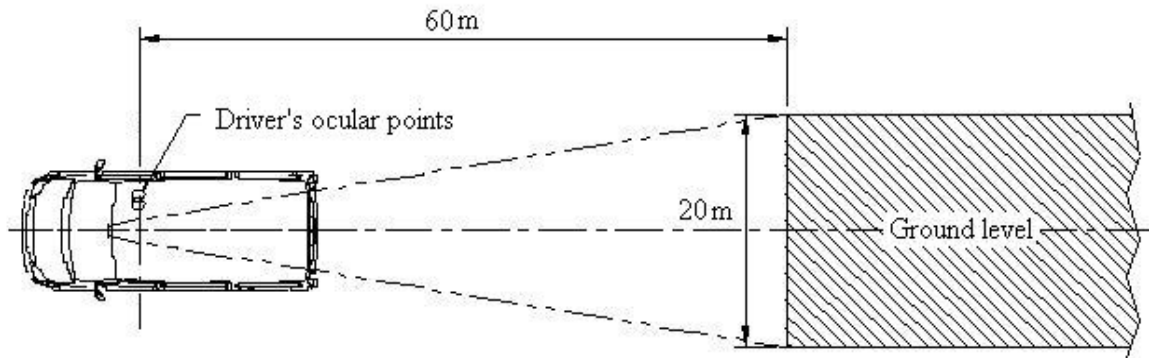


Figure 4

Field of vision of Class I mirror

15.2.4.2 Main exterior rear-view mirrors Class II

15.2.4.2.1 Exterior rear-view mirror on the driver's side

The field of vision shall be such that the driver is able to see at least a 5 m wide, flat, horizontal portion of the road, which is bounded by a plane which is parallel to the median longitudinal vertical plane and passing through the outermost point of the vehicle on the driver's side of the vehicle and extends from 30 m behind the driver's ocular points to the horizon.

In addition, the road shall be visible to the driver over a width of 1 m, which is bounded by a plane parallel to the median longitudinal vertical plane and passing through the outermost point of the vehicle starting from a point 4 m behind the vertical plane passing through the driver's ocular points (see Figure 5).

15.2.4.2.2. Exterior rear-view mirror on the passenger's side

The field of vision shall be such that the driver is able to see at least a 5 m wide, flat, horizontal portion of the road, which is bounded on the passenger's side by a plane parallel to the median longitudinal vertical plane of the vehicle and passing through the outermost point of the vehicle on the passenger's side and which extends from 30 m behind the driver's ocular points to the horizon.

In addition, the road shall be visible to the driver over a width of 1 m, which is bounded by a plane parallel to the median longitudinal vertical plane and passing through the outermost point of the vehicle starting from a point 4 m behind the vertical plane passing through the driver's ocular points (see Figure 5).

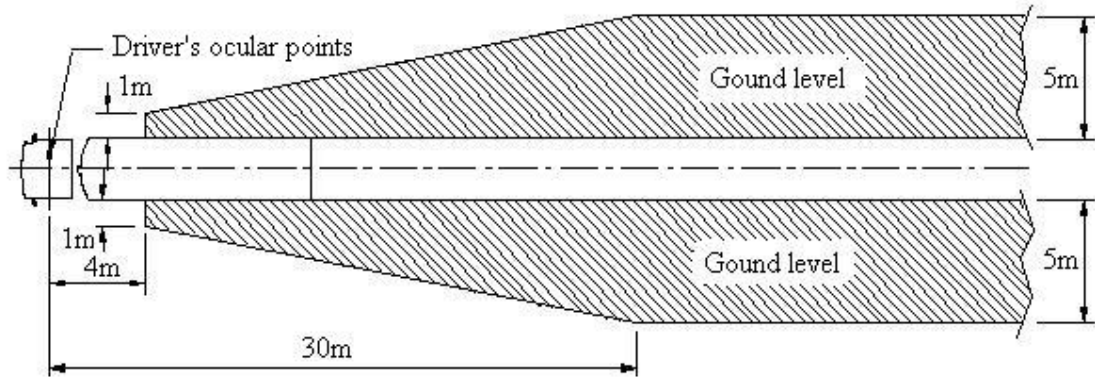


Figure 5

Field of vision of Class II mirrors

15.2.4.3 Main exterior rear-view mirrors Class III

15.2.4.3.1 Exterior rear-view mirror on the driver's side

The field of vision shall be such that the driver is able to see at least a 4 m wide, flat, horizontal portion of the road, which is bounded by a plane parallel to the median longitudinal vertical plane and passing through the outermost point of the vehicle on the driver's side of the vehicle and extends from 20 m behind the driver's ocular points to the horizon (see Figure 6).

In addition, the road shall be visible to the driver over a width of 1 m, which is bounded by a plane parallel to the median longitudinal vertical plane and passing through the outermost point of the vehicle starting from a point 4 m behind the vertical plane passing through the driver's ocular points.

15.2.4.3.2 Exterior rear-view mirror on the passenger's side

The field of vision shall be such that the driver is able to see at least a 4 m wide flat, horizontal portion of the road which is bounded by a plane parallel to the median longitudinal vertical plane passing through the outermost point of the vehicle on the passenger's side and which extends from 20 m behind the driver's ocular points to the horizon (see Figure 6).

In addition, the road shall be visible to the driver over a width of 1 m, which is bounded by a plane parallel to the median longitudinal vertical plane and passing through the outermost point of the vehicle starting from a point 4 m behind the vertical plane passing through the driver's ocular points.

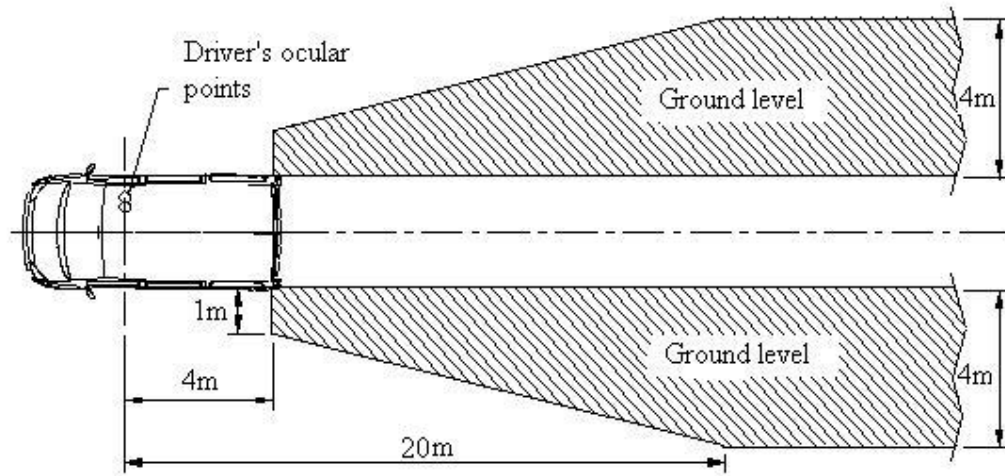


Figure 6
Field of vision of Class III mirrors

15.2.4.4. **"Wide-angle" exterior mirror (Class IV)**

15.2.4.4.1. **"Wide-angle" exterior mirror on the driver's side**

The field of vision shall be such that the driver is able to see at least a 15 m wide, flat, horizontal portion of the road, which is bounded by a plane parallel to the median longitudinal vertical plane of the vehicle and passing through the outermost point of the vehicle on the driver's side and which extends from at least 10 m to 25 m behind the driver's ocular points.

In addition, the road shall be visible to the driver over a width of 4.5 m, which is bounded by a plane parallel to the median longitudinal vertical plane and passing through the outermost point of the vehicle starting from a point 1.5 m behind the vertical plane passing through the driver's ocular points (see Figure 7).

15.2.4.4.2. **"Wide-angle" exterior mirror on the passenger's side**

The field of vision shall be such that the driver is able to see at least a 15 m wide, flat, horizontal portion of the road, which is bounded by a plane parallel to the median longitudinal vertical plane of the vehicle and passing through the outermost point of the vehicle on the passenger's side and which extends from at least 10 m to 25 m behind the driver's ocular points.

In addition, the road shall be visible to the driver over a width of 4.5 m, which is bounded by a plane parallel to the median longitudinal vertical plane and passing through the outermost point of the vehicle starting from a point 1.5 m behind the vertical plane passing through the driver's ocular points (see Figure 7).

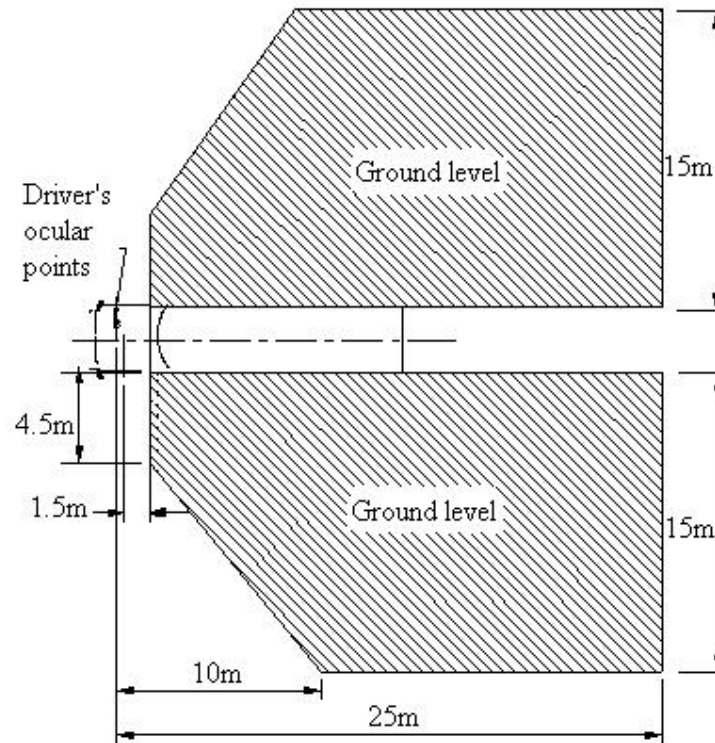


Figure 7

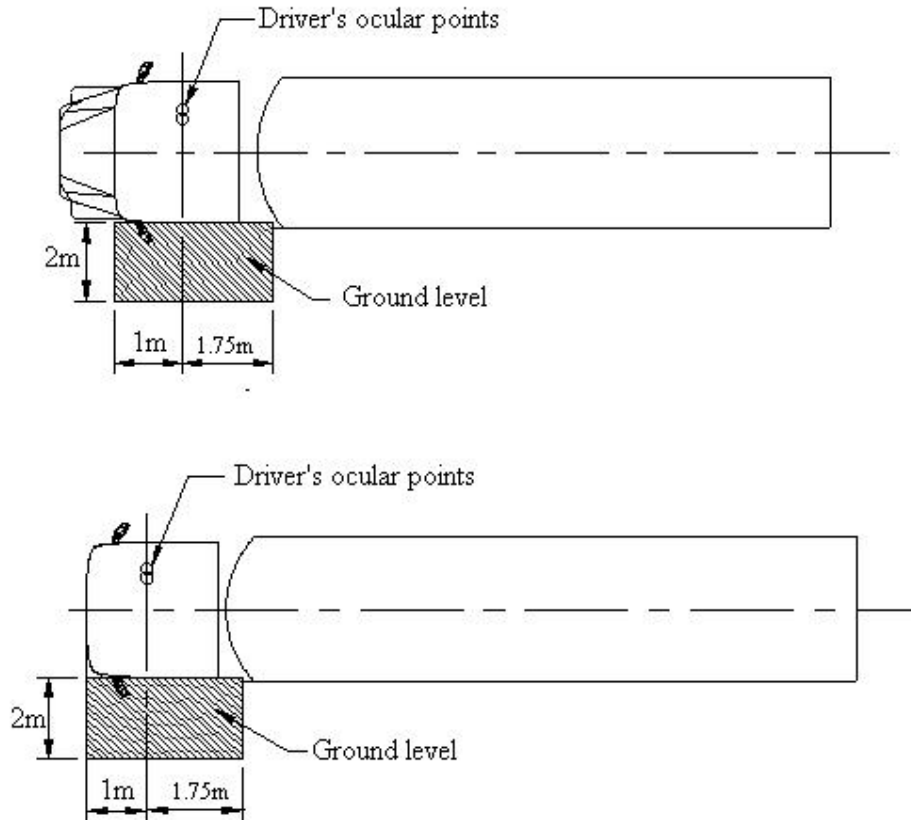
Field of vision of Class IV wide-angle mirrors

15.2.4.5. "Close-proximity" exterior mirror (Class V)

The field of vision shall be such that the driver is able to see a flat horizontal portion of the road along the side of the vehicle, bounded by the following vertical planes (see Figures 8a and 8b):

- 15.2.4.5.1 The plane parallel to the median longitudinal vertical plane of the vehicle which passes through the outermost point of the vehicle cab on the passenger's side;
- 15.2.4.5.2. in the transverse direction, the parallel plane passing at a distance of 2 m in front of the plane mentioned in 15.2.4.5.1.
- 15.2.4.5.3. to the rear, the plane parallel to the vertical plane passing through the driver's ocular points and situated at a distance of 1.75 m behind that plane;
- 15.2.4.5.4. to the front, the plane parallel to the vertical plane passing through the driver's ocular points and situated at a distance of 1 m in front of that plane. If the vertical transverse plane passing through the leading edge of the vehicle bumper is less than 1 m in front of the vertical plane passing through the driver's ocular points, the field of vision shall be limited to that plane.

- 15.2.4.5.5. In case the field of vision described in Figures 8a and 8b is able to be perceived through the combination of the field of vision from a Class IV wide-angle mirror and that of a Class VI front mirror, the installation of a Class V close proximity mirror is not compulsory.



Figures 8a and 8b
Field of vision of Class V close-proximity mirror

15.2.4.6. **Front mirror (Class VI)**

- 15.2.4.6.1. The field of vision shall be such that the driver is able to see at least a flat horizontal portion of the road, which is bounded by:

- (a) a transverse vertical plane through the outermost point of the front of the vehicle,
- (b) a transverse vertical plane 2000 mm in front of the plane defined in (a),
- (c) a longitudinal vertical plane parallel to the longitudinal vertical median plane going through the outermost side of the vehicle at the driver's side and,

- (d) a longitudinal vertical plane parallel to the longitudinal vertical median plane 2000 mm outside the outermost side of the vehicle opposite to the driver's side.

The front of this field of vision opposite to the driver's side may be rounded off with a radius of 2,000 mm (see Figure 9).

For the defined field of vision, see also 15.2.4.9.2.

The provisions for front mirrors are compulsory for forward controlled (as defined in 12.5) vehicles of categories $N_2 > 7.5$ t and N_3

If vehicles of these categories cannot fulfil the requirements by using a front mirror or a camera/monitor device, a vision support system shall be used. In the case of a vision support system this device shall be able to detect an object of 50 cm height and with a diameter of 30 cm within the field defined in figure 9.

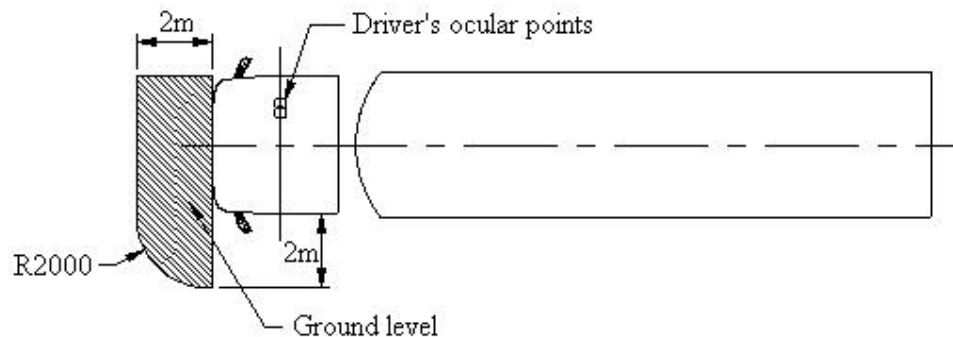


Figure 9
Field of vision of Class VI front mirror

- 15.2.4.6.2. However, if the driver is able to see, taking into account the obstructions by the A-pillars, a straight line 300 mm in front of the vehicle at a height of 1,200 mm above the road surface and which is situated between a longitudinal vertical plane parallel to the longitudinal vertical median plane going through the outermost side of the vehicle at the driver's side and a longitudinal vertical plane parallel to the longitudinal vertical median plane 900 mm outside the outermost side of the vehicle opposite to the driver's side, a front mirror of Class VI is not mandatory.
- 15.2.4.6.3. For the purpose of 15.2.4.6.1 and 15.2.4.6.2 parts permanently attached to the vehicle that are situated both above the driver's eye points and in front of the transverse vertical plane passing through the foremost surface of the vehicle's front bumper shall not be taken into account when defining the front of the vehicle

15.2.4.7. L-category mirror (Class VII).

15.2.4.7.1. Exterior rear-view mirror on the driver's side

The field of vision shall be such that the driver is able to see at least a 2.50 m wide, flat, horizontal portion of the road, which is bounded by a plane parallel to the median longitudinal vertical plane and passing through the outermost point of the vehicle on the driver's side of the vehicle and extends from 10 m behind the driver's ocular points to the horizon (see Figure 10).

15.2.4.7.2. Exterior rear-view mirror on the passenger's side

The field of vision shall be such that the driver is able to see at least a 4 m wide flat, horizontal portion of the road which is bounded by a plane parallel to the median longitudinal vertical plane passing through the outermost point of the vehicle on the passenger's side and which extends from 20 m behind the driver's ocular points to the horizon (see Figure 10).

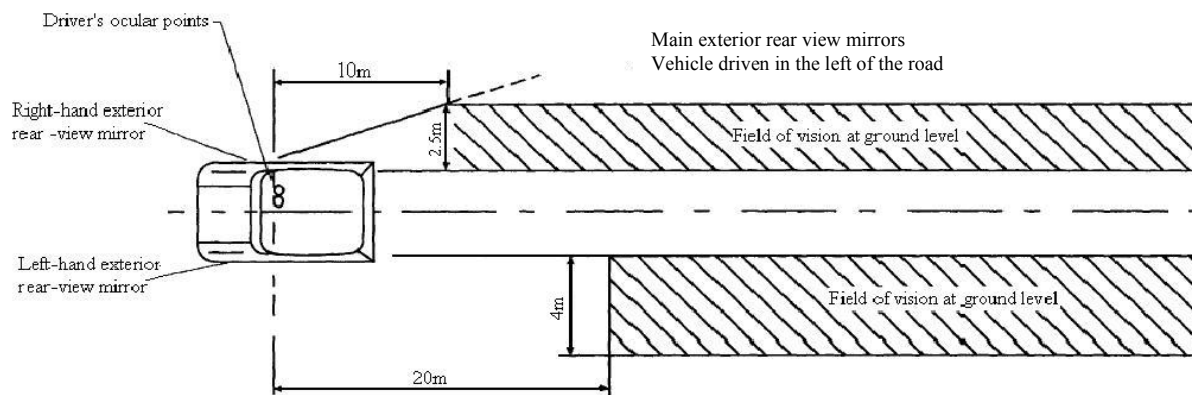


Figure 10

Field of vision of Class VII mirrors

15.2.4.8. In the case of mirrors consisting of several reflecting surfaces which are either of different curvature or make an angle with each other, at least one of the reflecting surfaces shall provide the field of vision and have the dimensions (6.1.2.1.2.2 of AIS-001(Part 1) (Rev. 1)) specified for the class to which they belong.

15.2.4.9. Obstructions**15.2.4.9.1. Interior rear-view mirror (Class I)**

The field of vision may be reduced by the presence of devices such as, sun visors, windscreen wipers, heating elements and stop lamp of category S3, provided that all these devices together do not obscure more than 15% of the prescribed field of vision. Headrest or framework or bodywork such as window columns of rear split doors, rear window frames shall be excluded from the calculations. This requirement shall be tested by projection on to a vertical plane at right angle to the longitudinal centre plane of the the vehicle. The degree of obstruction shall be measured with the sun visors folded back.

15.2.4.9.2. Exterior mirrors (Classes II, III, IV, V, VI and VII)

In the fields of vision specified above, obstruction due to the bodywork and its components, such as mirrors, door handles, outline marker lights, direction indicators and front and rear bumpers, as well as reflective-surface cleaning components, shall not be taken into account if they are responsible for a total obstruction of less than 10 per cent of the specified field of vision. In the case of a vehicle designed and constructed for special purposes where, due to its special features, it is not possible to meet this requirement, the obstruction of the required field of vision of a Class VI mirror caused by the special features may be more than 10 per cent but not more than necessary for its special function.

15.2.4.10 Test procedure

The field of vision shall be determined by placing powerful light sources at the ocular points and examining the light reflected on the vertical monitoring screen. Other equivalent methods may be used.

15.3. Devices for indirect vision other than mirrors

15.3.1. A device for indirect vision shall give such performances that a critical object is observed within the described field of vision, taking into account the critical perception.

15.3.2. Obstruction of the driver's direct view caused by the installation of a device for indirect vision shall be restricted to a minimum.

15.3.3. For the determination of the detection distance in case of camera-monitor devices for indirect vision, the procedure of Annex K shall be applied.

15.3.4. **Installation requirements for the monitor**

The viewing direction of the monitor shall roughly be the same direction as the one for the main mirror.

15.3.5. Vehicles may be equipped with additional devices for indirect vision.

15.3.6. The provisions of this standard do not apply to the surveillance camera-monitor-recording devices defined in 2.1.2.13 of AIS-001(Part 1)(Rev. 1). Exterior surveillance cameras either shall be mounted at least 2 m above the ground when the vehicle is under a load corresponding to its maximum technical permissible mass, or, if their lower edge is less than 2 m from the ground, shall not project more than 50 mm beyond the overall width of the vehicle measured without this device and have a radii of curvature of not less than 2.5 mm

16. MODIFICATIONS OF THE VEHICLE TYPE AND EXTENSION OF TYPE APPROVAL

16.1 Every functional modification in technical specifications pertaining to installation of rear view mirror declared in accordance with 13.1 shall be intimated to the testing agency. Testing agency may then consider, whether,

16.1.1 Vehicle with modifications complies with specified requirements, or,

16.1.2 any testing is required.

16.2 For considering whether testing is required or not, guidelines given in Annex M shall be followed.

16.3 In case of 16.1.2., checks for those parameters which are affected by the modifications only need to be carried out.

16.4 In the event of 16.1.1. or in the case of 16.1.2 after successful compliance to requirements, the certificate of compliance shall be validated for the modified version.

17. CONFORMITY OF PRODUCTION

Every vehicle approved under this standard shall be so manufactured as to conform to the type approved by meeting the requirements set out in 15 or 21 as applicable

Note : Verification of conformity of production will be applicable when the Whole Vehicle COP procedure is implemented.

18. Reserved

19. Reserved

20. Reserved

21. TRANSITIONAL PROVISIONS

21.1 At the request of the applicant, type approvals for compliance to AIS-002 (Part 1) (Rev.1): 2011, shall be granted by testing agencies from 28th June 2011 (date of adoption of this standard in CMVR-TSC). Such type approvals shall be deemed to be compliance to AIS-002:2001.

21.2 At the request of applicant, type approval to the compliance to AIS-002:2001 shall be granted up to the notified date of implementation of AIS-002 (Part 1) (Rev.1): 2011.

21.3 Type approvals issued for compliance to AIS-002 : 2001 shall:

21.3.1 be extended for L category vehicles without any further verification, for compliance to AIS-002 (Part 1) (Rev.1) : 2011.

21.3.2 not be extended for M and N category vehicles for compliance to AIS-002 (Part 1) (Rev.1) : 2011

Note: Additional verification for the above need not be carried out, if compliance to the above requirements has already been established during the type approval as per AIS-002:2001.

21.4 Extension of Approvals for engineering and administrative changes:

21.4.1 In the case of 21.1, extensions shall be granted subject to the conditions of AIS-002 (Part 1) (Rev.1):2011. Such extensions shall be deemed to be compliance to AIS-002:2001.

21.4.2 In the case of 21.2, extensions shall be granted subject to conditions of AIS-002:2001 till the notified date of implementation of AIS-002 (Part 1) (Rev.1):2011.

22. AMENDMENTS TO ECE REGULATIONS AFTER THE LEVEL DESCRIBED IN 0.3 OF INTRODUCTION

22.1 Supplements

In case of changes in ECE regulation, which are issued as supplements (Supplements do not affect the earlier type approvals) at the request of applicant, approval of compliance to this standard shall be issued taking into account the changes arising out of such supplement(s) to ECE regulation with approval from Chairman AISC.

This shall be incorporated in the test report.

Note: Such changes will be considered for inclusion in this standard at the time of its next amendment /revision.

22.2 Series of amendments

Changes in ECE regulation, which are issued as series of amendments (series of amendments may affect the earlier type approvals) will not be considered for issuing approval to this standard.

However, Chairman, AISC may, on a case to case basis, permit to accept latest series of amendments.

This shall be incorporated in the test report.

Note : Such changes will be considered for inclusion in this standard at the time of its next revision.

ANNEX A

(Reserved)

ANNEX B

(See 13.1)

INFORMATION TO BE SUBMITTED AT THE TIME OF TYPE APPROVAL

B-1 The specification submitted by manufacturer (applicant) at the time of applying for the type approval of the vehicle to this standard shall contain at least the information set out in the following entries of AIS-007(Revision 3):

Table 1	1.1, 1.7.1, 2.1, 2.2, 6.2, 52.1.2, 52.2.2, 52.4 (For L category vehicles only)
Table 2	A1.1, A1.7.1, A.2.1, A.2.1.1, A.2.1.2, A2.2, A2.1.5 (For M and N category vehicles)
Table 3	B1.2, B27.1.3, B27.2.3, B27.1.7, B27.2.6, B27.2.7, B27.3.7.(For M and N category vehicles)

Following additional information shall also be provided along with the type approval application.

1. In case of L-category vehicles – with bodywork / without bodywork.
2. Photograph(s) and/or drawing(s) of a representative vehicle:
3. Optional equipment which may affect the rearward field of vision:
4. A brief description of the electronic components (if any) of the adjustment device:
5. Sketch(es) showing R point, seat back angle and the position of the mirror relative to the vehicle structure, including methods of attachment and relevant dimensions as applicable
6. Devices for indirect vision other than mirrors:
7. Sufficiently detailed drawings of devices for indirect vision other than mirrors, with the installation instructions:

B-2 If the above information is submitted as per AIS-007 for approval of the complete vehicle it is not necessary to submit information in the above format. In addition, the information required in sketch form may be combined with information needed for other standards.

ANNEX C
(Reserved)

ANNEX D
(Reserved)

ANNEX E
(Reserved)

ANNEX F
(Reserved)

ANNEX G
(Reserved)

ANNEX H

(See 12.1.)

**PROCEDURE FOR DETERMINING THE "H" POINT AND THE
ACTUAL TORSO ANGLE FOR SEATING POSITIONS IN
MOTOR VEHICLES**

H-1. PURPOSE

The procedure described in this Annex is used to establish the "H" point location and the actual torso angle for one or several seating positions in a motor vehicle and to verify the relationship of measured data to design specifications given by the vehicle manufacturer.

Note: In any seating position other than front seats where the "H" point cannot be determined using the "Three-dimensional 'H' point machine" or procedures, the "R" point indicated by the manufacturer may be taken as a reference at the discretion of the testing agency.

H-2. DEFINITIONS

For the purposes of this Annex:

- H-2.1. **"Reference data"** means one or several of the following characteristics of a seating position:
- H-2.1.1. the "H" point and the "R" point and their relationship;
 - H-2.1.2. the actual torso angle and the design torso angle and their relationship.
- H-2.2. **"Three-dimensional 'H' point machine"** (3-D H machine) means the device used for the determination of "H" points and actual torso angles. This device is described in Annex HA
- H-2.3. **"'H' point"** means the pivot centre of the torso and thigh of the 3-D H machine installed in the vehicle seat in accordance with H-4 below. The "H" point is located in the centre of the centreline of the device which is between the "H" point sight buttons on either side of the 3-D H machine. The "H" point corresponds theoretically to the "R" point (for tolerances see H-3.2.2). Once determined in accordance with the procedure described in H-4, the "H" point is considered fixed in relation to the seat-cushion structure and to move with it when the seat is adjusted.
- H-2.4. **"'R' point" or "seating reference point"** means a design point defined by a vehicle manufacturer for each seating position and established with respect to the three-dimensional reference system;
- H-2.5. **"Torso-line"** means the centreline of the probe of the 3-D H machine with the probe in the fully rearward position.
- H-2.6. **"Actual torso angle"** means the angle measured between a vertical line through the "H" point and the torso line using the back angle quadrant on the 3-D H machine. The actual torso angle corresponds theoretically to the design torso angle (for tolerances see H-3.2.2.).

- H-2.7. **"Design torso angle"** means the angle measures between a vertical line through the "R" point and the torso line in a position which corresponds to the design position of the seat-back established by the vehicle manufacturer.
- H-2.8. **"Centreplane of occupant"** (C/LO) means the median plane of the 3-D H machine positioned in each designated seating position; it is represented by the co-ordinate of the "H" point on the "Y" axis. For individual seats, the centreplane of the seat coincides with the centreplane of the occupant. For other seats, the centreplane of the occupant is specified by the manufacturer;
- H-2.9. **"Three-dimensional reference system"** means a system as described in Annex HB.
- H-2.10. **"Fiducial marks"** are physical points (holes, surfaces, marks or indentations) on the vehicle body as defined by the manufacturer;
- H-2.11. **"Vehicle measuring attitude"** means the position of the vehicle as defined by the co-ordinates of fiducial marks in the three-dimensional reference system

H-3. REQUIREMENTS

H-3.1. Data presentation

For each seating position where reference data are required in order to demonstrate compliance with the provisions of the present standard, all or an appropriate selection of the following data shall be presented in the form indicated in Annex HC.

- H-3.1.1. the co-ordinates of the "R" point relative to the three-dimensional reference system;
- H-3.1.2. the design torso angle;
- H-3.1.3. all indications necessary to adjust the seat (if it is adjustable) to the measuring position set out in H-4.3.

H-3.2. Relationship between measured data and design specifications

- H-3.2.1. The co-ordinates of the "H" point and the value of the actual torso angle obtained by the procedure set out in H-4 shall be compared, respectively, with the co-ordinates of the "R" point and the value of the design torso angle indicated by the vehicle manufacturer.
- H-3.2.2. The relative positions of the "R" point and the "H" point and the relationship between the design torso angle and the actual torso angle shall be considered satisfactory for the seating position in question if the "H" point, as defined by its co-ordinates, lies within a square of 50 mm side length with horizontal and vertical sides whose diagonals intersect at the "R" point, and if the actual torso angle is within 5 degree of the design of the torso angle.

- H-3.2.3. If these conditions are met, the "R" point and the design torso angle, shall be used to demonstrate compliance with the provisions of this standard.
- H-3.2.4. If the "H" point or the actual torso angle does not satisfy the requirements of H-3.2.2, the "H" point and the actual torso angle shall be determined twice more (three times in all). If the results of two of these three operations satisfy the requirements, the conditions of H-3.2.3 shall apply.
- H-3.2.5. If the results of at least two of the three operations described H-3.2.4 do not satisfy the requirements of H-3.2.2, or if the verification is not to carry out because the vehicle manufacturer has failed to supply information regarding the position of the "R" point or regarding the design torso angle, the centroid of the three measured points or the average of the three measured angles shall be used and be regarded as applicable in all cases where the "R" point or the design torso angle is referred to in this standard.

H-4. PROCEDURE FOR "H" POINT AND ACTUAL TORSO ANGLE DETERMINATION

- H-4.1. The vehicle shall be preconditioned at the manufacturer's discretion, at a temperature of $20 \pm 10^{\circ}\text{C}$ to ensure that the seat material reaches the room temperature. If the seat to be checked has never been sat upon, a 70 to 80 kg person or device shall sit on the seat twice for one minute to flex the cushion and back. At the manufacturer's request, all seat assemblies shall remain unloaded for a minimum period of 30 min prior to installation of the 3-D H machine.
- H-4.2. The vehicle shall be at the measuring attitude defined in H-2.11.
- H-4.3. The seat, if it is adjustable, shall be adjusted first to the rearmost normal driving or riding position, as indicated by the vehicle manufacturer, taking into consideration only the longitudinal adjustment of the seat, excluding seat travel used for purposes other than normal driving or riding positions. Where other modes of seat adjustment exist (vertical, angular, seat-back, etc.) these will be then adjusted to the position specified by the vehicle manufacturer. For suspension seats, the vertical position shall be rigidly fixed corresponding to a normal driving position as specified by the manufacturer.
- H-4.4. The area of the seating position contacted by the 3-D H machine shall be covered by a muslin cotton, of sufficient size and appropriate texture, described as a plain cotton fabric having 18.9 threads per/cm² and weighing 0.228 kg/m² or knitted or non-woven fabric having equivalent characteristics.

If test is run on a seat outside the vehicle, the floor on which the seat is placed shall have the same essential characteristics e.g. tilt angle, height difference with a seat mounting, surface texture, etc, as the floor of the vehicle in which the seat is intended to be used.

- H-4.5. Place the seat and back assembly of the 3-D H machine so that the centreplane of the occupant (C/LO) coincides with the centreplane of the 3-D H machine. At the manufacturer's request, the 3-D H machine may be moved inboard with respect to the C/LO if the 3-D H machine is located so far outboard that the seat edge will not permit levelling of the 3-D H machine.
- H-4.6. Attach the foot and lower leg assemblies to the seat pan assembly, either individually or by using the T-bar and lower leg assembly. A line through the "H" point sight buttons shall be parallel to the ground and perpendicular to the longitudinal centre-plane of the seat.
- H-4.7. Adjust the feet and leg positions of the 3-D H machine as follows:
- H-4.7.1. Designated seating position: driver and outside front passenger
- H-4.7.1.1. Both feet and leg assemblies shall be moved forward in such a way that the feet take up natural positions on the floor, between the operating pedals if necessary. Where possible the left foot shall be located approximately the same distance to the left of the centreplane of the 3-D H machine as the right foot is to the right. The spirit level verifying the transverse orientation of the 3-D H machine is brought to the horizontal by readjustment of the seat pan if necessary, or by adjusting the leg and foot assemblies towards the rear. The line passing through the "H" point sight buttons shall be maintained perpendicular to the longitudinal centreplane of the seat.
- H-4.7.1.2. If it is not possible for the left leg be kept parallel to the right leg and is not possible for the left foot to be supported by the structure, move the left foot until it is supported. The alignment of the sight buttons shall be maintained.
- H-4.7.2. Designated seating position: outboard rear
- For rear seats or auxiliary seats, the legs are located as specified by the manufacturer. If the feet then rest on parts of the floor which are at different levels, the foot which first comes into contact with the front seat shall serve as a reference and the other foot shall be so arranged that the spirit level giving the transverse orientation of the seat of the device indicates the horizontal.
- H-4.7.3. Other designated seating positions:
- The general procedure indicated in H-4.7.1 shall be followed except that the feet shall be placed as specified by the vehicle manufacturer.
- H-4.8. Apply lower leg and thigh weights and level the 3-D H machine.
- H-4.9. Tilt the back pan forward against the forward stop and draw the 3-D H machine away from the seat-back using the T-bar. Reposition the 3-D H machine on the seat by one of the following methods:

- H-4.9.1. If the 3-D H machine tends to slide rearward, use the following procedure. Allow the 3-D H machine to slide rearward until a forward horizontal restraining load on the T-bar is no longer required, i.e. until the seat pan contacts the seat-back. If necessary, reposition the lower leg;
- H-4.9.2. If the 3-D H machine does not tend to slide rearward, use the following procedure. Slide the 3-D H machine rearwards by applying a horizontal rearward load to the T-bar until the seat pan contacts the seat-back (see Figure 2 of Annex HA).
- H-4.10 Apply a 100 ± 10 N load to the back and pan assembly of the 3-D H machine at the intersection of the hip angle quadrant and the T-bar housing. The direction of load application shall be maintained along a line passing by the above intersection to a point just above the thigh bar housing (see Figure 2 of Annex HA). Then carefully return the back pan to the seat-back. Care shall be exercised throughout the remainder of the procedure to prevent the 3-D H machine from sliding forward.
- H-4.11. Install the right and left buttock weights and then, alternately, the eight torso weights. Maintain the 3-D H machine level.
- H-4.12. Tilt the back pan forward to release the tension on the seat-back. Rock the 3-D H machine from side to side through 10° arc (5° to each side of the vertical centreplane) for three complete cycles to release any accumulated friction between the 3-D H machine and the seat.

During the rocking action, the T-bar of the 3-D H machine may tend to diverge from the specified horizontal and vertical alignment. The T-bar shall therefore be restrained by applying an appropriate lateral load during the rocking motions. Care shall be exercised in holding the T-bar and rocking the 3-D H machine to ensure that no inadvertent exterior loads are applied in a vertical or fore-and-aft direction.

The feet of the 3-D H machine are not to be restrained or held during this step. If the feet change position, they should be allowed to remain in that attitude for the moment.

Carefully return the back pan to the seat-back and check the two spirit levels for zero position. If any movement of the feet has occurred during the rocking operation of the 3-D H machine, they shall be repositioned as follows:

Alternately, lift each foot off the floor the minimum necessary amount until no additional foot movement is obtained. During this lifting, the feet are to be free to rotate; and no forward or lateral loads are to be applied. When each foot is placed back in the down position, the heel is to be in contact with the structure designed for this;

Check the lateral spirit level for zero position; if necessary, apply a lateral load to the top of the back pan sufficient to level the 3-D H machine's seat pan on the seat.

- H-4.13. Holding the T-bar to prevent the 3-D H machine from sliding forward on the seat cushion, proceed as follows:
- (a) return the back pan to the seat back;
 - (b) alternately apply and release a horizontal rearward load, not to exceed 25 N, to the back angle bar at a height approximately at the centre of the torso weights until the hip angle quadrant indicates that a stable position has been reached after load release. Care shall be exercised to ensure that no exterior downward or lateral loads are applied to the 3-D H machine. If another level adjustment of the 3-D H machine is necessary, rotate the back pan forward, re-level, and repeat the procedure from H-4.12.
- H-4.14. Take all measurements:
- H-4.14.1. The co-ordinates of the "H" point are measured with respect to the three-dimensional reference system;
 - H-4.14.2. The actual torso angle is read at the back angle quadrant of the 3-D H machine with the probe in its fully rearward position.
- H-4.15. If a re-run of the installation of the 3-D H machine is desired, the seat assembly should remain unloaded for a minimum period of 30 min prior to the re-run. The 3-D H machine should not be left loaded on the seat assembly longer than the time required to perform the test.
- H-4.16. If the seats in the same row are regarded as similar (bench seat, identical seats, etc.) only one "H" point and one "actual torso angle" shall be determined for each row of seats, the 3-D H machine described in Annex HA being seated in a place regarded as representative for the row. This place shall be:
- H-4.16.1. in the case of the front row, the driver's seat;
 - H-4.16.2. in the case of the rear row or rows, an outer seat.

ANNEX HA

(See H-2.2)

**DESCRIPTION OF THE THREE DIMENSIONAL "H" POINT
MACHINE^{*/} (3-D H machine)**

HA-1. Back and seat pans

The back and seat pans are constructed of reinforced plastic and metal; they simulate the human torso and thigh and are mechanically hinged at the "H" point. A quadrant is fastened to the probe hinged at the "H" point to measure the actual torso angle. An adjustable thigh bar, attached to the seat pan, establishes the thigh centreline and serves as a baseline for the hip angle quadrant.

HA-2. Body and leg elements

Lower leg segments are connected to the seat pan assembly at the T-bar joining the knees, which is a lateral extension of the adjustable thigh bar. Quadrants are incorporated in the lower leg segments to measure knee angles. Shoe and foot assemblies are calibrated to measure the foot angle. Two spirit levels orient the device in space. Body element weights are placed at the corresponding centres of gravity to provide seat penetration equivalent to a 76 kg male. All joints of the 3-D H machine should be checked for free movement without encountering noticeable friction.

(*For details of the construction of the 3-D H machine refer to Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, Pennsylvania/15096, United States of America. The machine corresponds to that described in ISO Standard 6549-1980.)

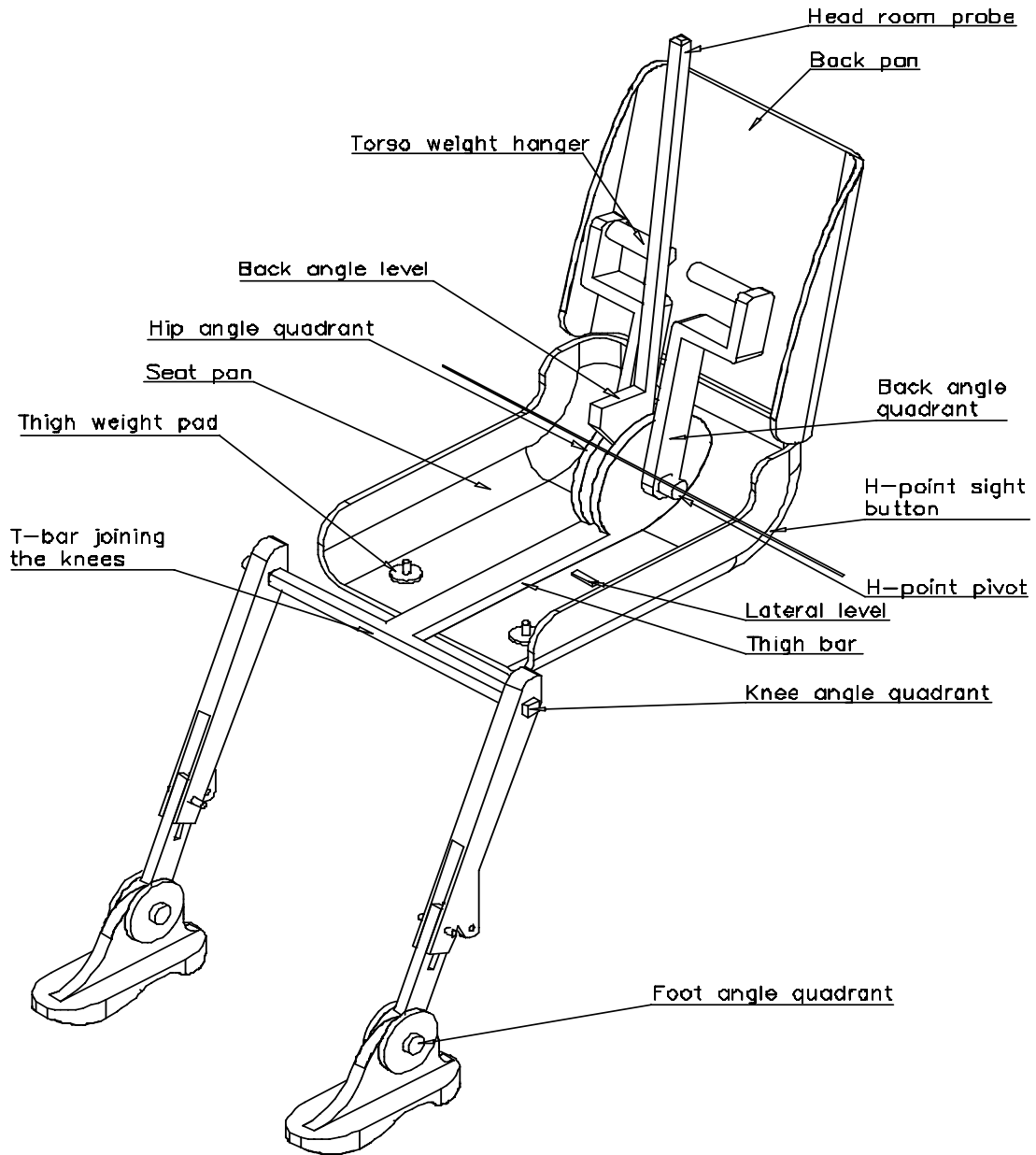


Figure HA-1
3-D H machine elements designation

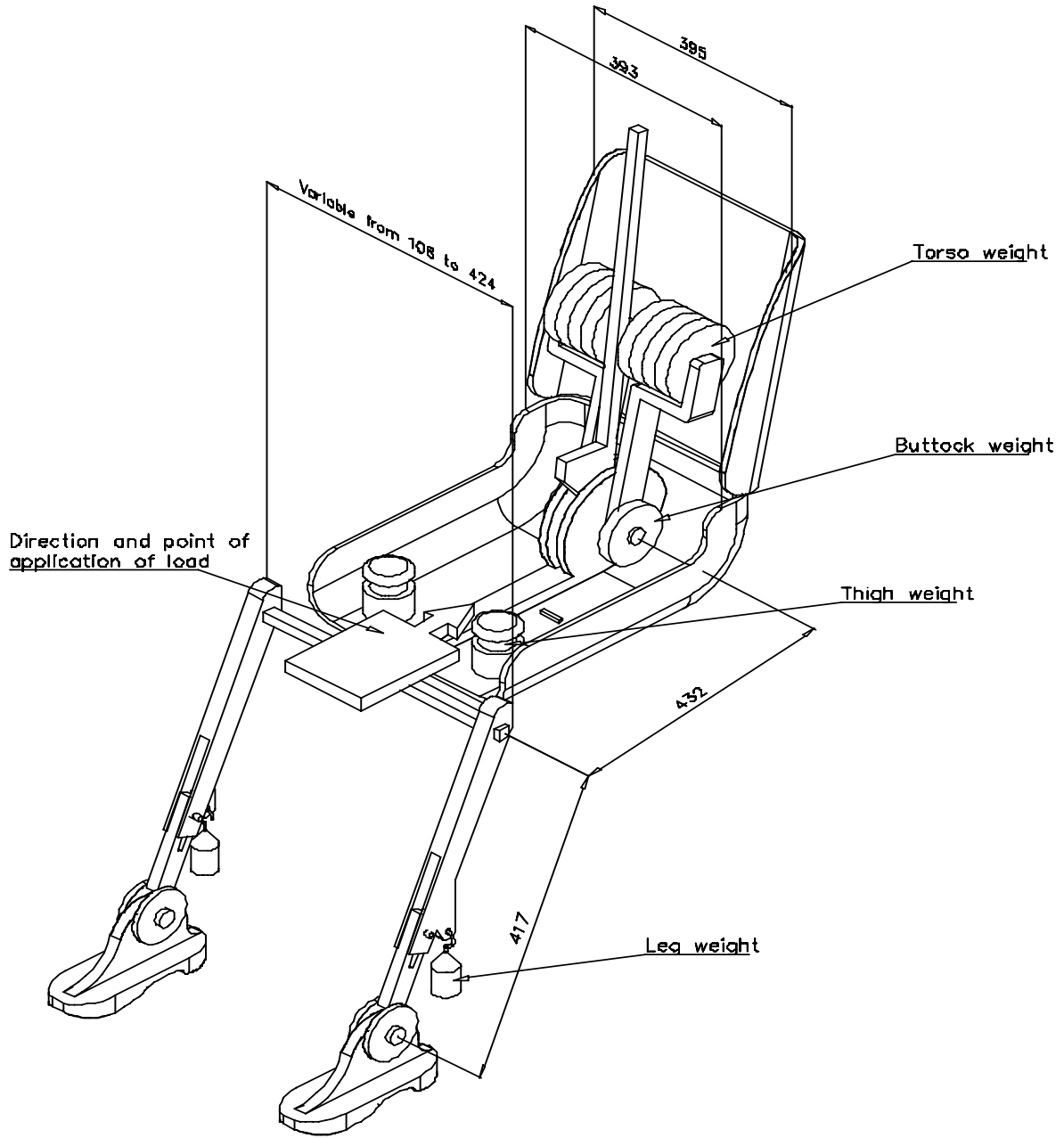


Figure HA-2

Dimensions of the 3-D H machine elements and load distribution

ANNEX HB

(See H-2.9)

THREE-DIMENSIONAL REFERENCE SYSTEM

- HB-1. The three-dimensional reference system is defined by three orthogonal planes established by the vehicle manufacturer (see Figure HB-1 ^{*/})
- HB-2. The vehicle measuring attitude is established by positioning the vehicle on the supporting surface such that the co-ordinates of the fiducial marks correspond to the values indicated by the manufacturer.
- HB-3. The co-ordinates of the "R" point and the "H" point are established in relation to the fiducial marks defined by the vehicle manufacturer.

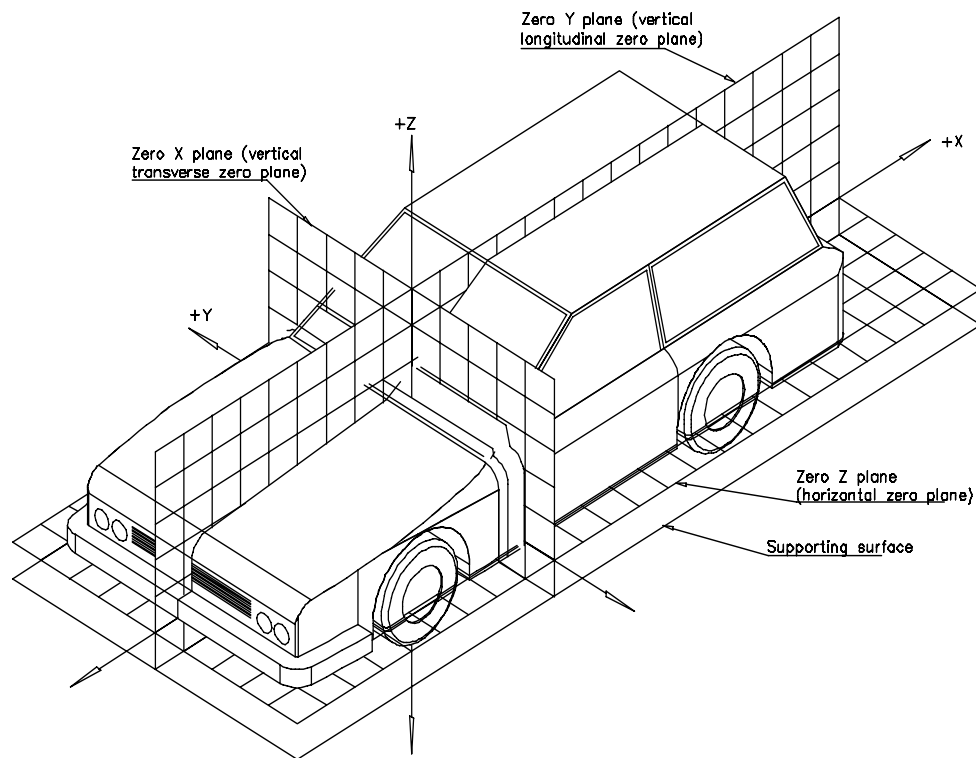


Figure HB-1

Three-dimensional reference system

^{*/} The reference system corresponds to ISO standard 4130, 1978

ANNEX HC

(See H-3.1)

REFERENCE DATA CONCERNING SEATING POSITIONS

HC-1. Coding of reference data

Reference data are listed consecutively for each seating position. Seating positions are identified by a two-digit code. The first digit is an Arabic numeral and designates the row of seats, counting from the front to the rear of the vehicle. The second digit is a capital letter which designates the location of the seating position in a row, as viewed in the direction of forward motion of the vehicle; the following letters shall be used:

- L = left
- C = centre
- R = right

HC-2. Description of vehicle measuring attitude

HC-2.1. Co-ordinates of fiducial marks

- X
- Y
- Z

HC-3. List of reference data

HC-3.1. Seating position:

HC-3.1.1. Co-ordinates of "R" point

- X
- Y
- Z.....

HC-3.1.2. Design torso angle

HC-3.1.3. Specifications for seat adjustment (Strike out what does not apply.)

- horizontal:
- vertical:
- angular:
- torso angle:

Note : List reference data for further seating positions under HC-3.2, HC-3.3, etc.

ANNEX J
(Reserved)

ANNEX K
(See 15.3.3.)

CALCULATION OF THE DETECTION DISTANCE

K-1. CAMERA MONITOR DEVICE FOR INDIRECT VISION

K-1.1. Resolution threshold of a camera

The resolution threshold of a camera is defined by the formula:

$$\omega_c = 60 \frac{\beta_c}{2N_c}$$

where:

- ω_c - resolution threshold of the camera (arc-min)
- β_c - angle of vision of the camera (°)
- N_c - number of video lines of the camera (#)

The manufacturer shall supply the values for β_c and N_c

K-1.2. Determination of the critical viewing distance of the monitor

For a monitor having certain dimensions and properties, a distance to the monitor shall be calculated within which the detection distance is dependent only on the performances of the camera. This critical viewing distance $r_{m,c}$ is defined by:

$$r_{m,c} = \frac{H_m}{N_m \cdot 2 \cdot \tan\left(\frac{\omega_{eye}}{2 \cdot 60}\right)}$$

where:

- $r_{m,c}$ - critical viewing distance (m)
- H_m - height of the monitor image (m)
- N_m - number of video lines of the monitor (-)
- ω_{eye} - resolution threshold of the observer (minutes of arch)
The number 60 is for conversion from minutes of arches to degrees. The manufacturer shall supply the values for H_m and N_m .
 $\omega_{eye} = 1$

K-1.3 Determination of the detection distance

- K-1.3.1. Maximum detection distance within the critical viewing distance where, due to the installation, the distance eye-monitor is less than the critical viewing distance, the maximum attainable detection distance shall be defined by

$$r_d = \frac{D_0}{\tan\left(\frac{f \cdot \omega_c}{60}\right)} = \frac{D_0}{\tan\left(\frac{f \cdot \beta_c}{2 \cdot N_c}\right)}$$

where:

r_d - detection distance [m]
 D_0 - diameter of the object [m]
 f - threshold increasing factor
 ω_c, β_c and N_c according to K-1.1.
 $D_0 = 0.8$ m
 $f = 8$

K-1.3.2. Detection distance greater than the critical viewing distance. Where, due to the installation, the distance eye-monitor is more than the critical viewing distance, the maximum obtainable detection distance shall be defined:

$$r_d = \frac{D_0}{\tan\left[\frac{f \cdot \beta_c}{2N_c} \cdot \frac{N_m}{0,01524 \cdot D_m} \cdot r_m \cdot \tan\left(\frac{\omega_{eye}}{60}\right)\right]}$$

where:

r_m - viewing distance to the monitor (m)
 D_m - diagonal of the monitor screen (inch)
 N_m - number of video lines of the monitor (-)
 β_c and N_c according to K-1.1.
 N_m and ω_{eye} according to K- 1.2.

K-2. SECONDARY FUNCTIONAL REQUIREMENTS

Based on the installation conditions, a determination shall be made to discover whether the entire device still satisfies the functional requirements listed in 6.2.2 of AIS-001 (Part 1) (Rev. 1), especially the glare correction, the maximum and the minimum luminance of the monitor. It shall also be determined the degree to which the glare correction will be addressed and the angle at which sunlight can strike a monitor and these shall be compared to the corresponding measuring results from the system measurements. This may be either based on a CAD-generated model, a determination of the angles of light for the device when mounted on the relevant vehicle, or by carrying out relevant measurements on the relevant vehicle as described in 6.2.2.2 of AIS-001 (Part 1)(Rev. 1).

ANNEX M

(See 16.2.)

CRITERIA FOR EXTENSION OF APPROVAL

M-1 The table lists verifications to be carried out in case of changes in the parameters declared at the time of submitting for the earlier type approval.

These parameters are to be used for selecting a vehicle to represent a range of vehicles.

M-2 Changes other than those listed in the table are considered to have no adverse effect on the indirect vision

1.	Name of the vehicle manufacturer	In case of different vehicle manufacturer, complete type approval to be carried out. In case of changes in the name of manufacturer or trademark for commercial reasons, type approval shall be extended without any testing.
2.	Address of the vehicle manufacturer	No additional tests or verification needed
3.	Address of plant(s) where vehicle is manufactured	No additional tests or verification needed
4.	Vehicle Type and general commercial description(s):	No additional verification needed
5.	Category of vehicle	If it affects the number of compulsory or prohibited mirrors as per 15.2.1.1.1 compliance to this clause and related fields of vision to be checked. However, if the mirrors fitted optionally on the approved type has become mandatory for new type, field of vision need not be re-verified, if they have been verified already during type approval.
6	Driving cab (forward control or bonneted) (only for N2 >7.5t and N3)	If changed to forward control, fitment and field of vision for class VI mirrors to be verified. If changed to bonneted type, no verification required.

7.	Range of vehicle dimensions (overall):	See Sr. No. 8.
8	Maximum bodywork width	Field of vision requirements to be verified if there is an increase in width. If decrease, no additional verification required.
9	Type of device (mirror to other devices or vice versa)	Affected vision requirements to be verified
10	Fitment of additional optional classes of mirrors	Applicable vision requirements of additional mirror to be verified.
11	Name of manufacturer of rear view mirrors used	If the location of mirror wrt. R point is not changed and/or, the dimensions of reflecting surface have not reduced, no verification required. Otherwise the applicable field of vision should be verified.
12	Change of position of mirror with respect to R point	All field of vision requirements to be verified.
13	Description of the electronic components (if any) of the adjustment device	No additional verification needed.
14	Optional equipment which may affect the rearward field of vision:	Affected field of vision requirements to be verified.
15	Devices for indirect vision other than mirrors:	
15.1	Name of manufacturer of devices used	If the location of the sensing device is not changed, no verification required. Otherwise the applicable field of vision should be verified.
16.	Radius of curvature	If increase, field of vision to be checked.

ANNEX N
(See introduction)
COMPOSITION OF AISC PANEL ON
REAR VIEW MIRRORS*

Convener	
Mr. T. M. Balaraman	Hero Honda Motors Ltd., (SIAM)
Members	Representing
Mr. A. S. Bhale	The Automotive Research Association of India (ARAI)
Mr. B. V. Shamsundara	The Automotive Research Association of India (ARAI)
Mr. D. P. Saste	Central Institute of Road Transport (CIRT)
Mr. V. D. Chavan	Central Institute of Road Transport (CIRT)
Dr. Madhusudan Joshi	International Centre for Automotive Technology (ICAT)
Mr. G.R.M. Rao	Vehicle Research & Dev. Estt. (VRDE)
Dr. N. Karuppaiah	National Automotive Testing and R&D Infrastructure Project (NATRIP)
Mr. K. K. Gandhi	Society of Indian Automobile Manufacturers (SIAM)
Mr. G. K. Binani	Society of Indian Automobile Manufacturers (SIAM) (Tata Motors Ltd)
Mr. P. K. Banerjee	Society of Indian Automobile Manufacturers (SIAM) (Tata Motors Ltd)
Mr. R. M. Kanitkar	Society of Indian Automobile Manufacturers (SIAM) (Force Motors Ltd.)
Mr. Z. A. Mujawar	Society of Indian Automobile Manufacturers (SIAM) (Mahindra and Mahindra Ltd)
Mr. Nagendra H. V.	Society of Indian Automobile Manufacturers (SIAM) (Toyota Kirloskar Motor Pvt. Ltd)
Mr. Prakash Vemali	Society of Indian Automobile Manufacturers (SIAM) (Mercedes Benz India Ltd.)
Mr. Jitendra Malhotra	Society of Indian Automobile Manufacturers (SIAM) (Maruti Suzuki India Ltd)
Mr. Sumit Sharma	Society of Indian Automobile Manufacturers (SIAM) (Volkswagen India Private Ltd.)
Mr. Harjeet Singh	Society of Indian Automobile Manufacturers (SIAM) (Hero Honda Motors Ltd)

Mr. Harsh Agrawal	Society of Indian Automobile Manufacturers (SIAM) (Hero Honda Motors Ltd)
Mr. S Ramiah	Society of Indian Automobile Manufacturers (SIAM) (TVS Motor Company Limited)
Mr. T.C. Gopalan,	Tractor Manufacturers Association (TMA)
Mr. K. N. D. Nambudiripad	Automotive Component Manufacturers Association (ACMA)
Mr. G. V. George	FIEM Industries Ltd. (ACMA)
Mr. Rajagopalan	FIEM Industries Ltd. (ACMA)
Mr. Virendra Sachdev	Lumax Industries Ltd. (ACMA)
Mr. Sagar Kulkarni	Rinder India Pvt. Ltd. (ACMA)
Mr. T. V. Singh	Bureau of Indian Standards (BIS)

* At the time of approval of this Automotive Industry Standard (AIS)

ANNEX P
(See introduction)

COMMITTEE COMPOSITION *
Automotive Industry Standards Committee

Chairman	
Shri Shrikant R. Marathe	Director The Automotive Research Association of India, Pune
Members	Representing
Representative from	Ministry of Road Transport & Highways (Dept. of Road Transport & Highways), New Delhi
Representative from	Ministry of Heavy Industries & Public Enterprises (Department of Heavy Industry), New Delhi
Shri S. M. Ahuja	Office of the Development Commissioner, MSME, Ministry of Micro, Small & Medium Enterprises, New Delhi
Shri T. V. Singh	Bureau of Indian Standards, New Delhi
Director Shri D. P. Saste (Alternate)	Central Institute of Road Transport, Pune
Dr. M. O. Garg	Indian Institute of Petroleum, Dehra Dun
Shri C. P. Ramnarayanan	Vehicles Research & Development Establishment, Ahmednagar
Representatives from	Society of Indian Automobile Manufacturers
Shri T.C. Gopalan	Tractor Manufacturers Association, New Delhi
Shri K.N.D. Nambudiripad	Automotive Components Manufacturers Association of India, New Delhi

Member Secretary
Mrs. Rashmi Urdhwareshe
Sr. Deputy Director
The Automotive Research Association of India, Pune

* At the time of approval of this Automotive Industry Standard (AIS)