

13 December 2024

Agreement

Concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations*

(Revision 3, including the amendments which entered into force on 14 September 2017)

Addendum 45 – Regulation No. 46

Revision 7 - Amendment 1

Supplement 1 to the 05 series of amendments – Date of entry into force: 22 September 2024

Uniform provisions concerning the approval of devices for indirect vision and of motor vehicles with regard to the installation of these devices

This document is meant purely as documentation tool. The authentic and legal binding text is: ECE/TRANS/WP.29/2024/11.



UNITED NATIONS

* Former titles of the Agreement:

Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958.

Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, done at Geneva on 5 October 1995 (Revision 2).

Insert new Paragraphs 2.7. to 2.8., to read:

- "2.7. 'external original surface' means the outside of the vehicle including the bonnet, the lid of the luggage compartment, the doors, the wings, the roof, the lighting and light-signalling devices, the visible strengthening components and additional external original design surfaces defined by the manufacturer excluding protruding supports for devices of indirect vision.
- 2.8. 'impact point' is the position of the hammer, described in paragraphs 6.3.2.2.3. and 6.3.2.2.4., independent of where first contact occurs."

Paragraph 5.2., amend to read:

- "5.2. An approval number shall be assigned to each approved type in accordance with Schedule 4 of the Agreement (E/ECE/TRANS/505/Rev.3).

Paragraph 6.1.1.2., amend to read:

- "6.1.1.2. (a) Rear-view mirrors (Classes II to VII)

When the edge of the reflecting surface is enclosed in a protective housing, the radius of curvature 'c' on the housing's perimeter shall be not less than 2.5 mm at all points and in all directions, figure below (i).

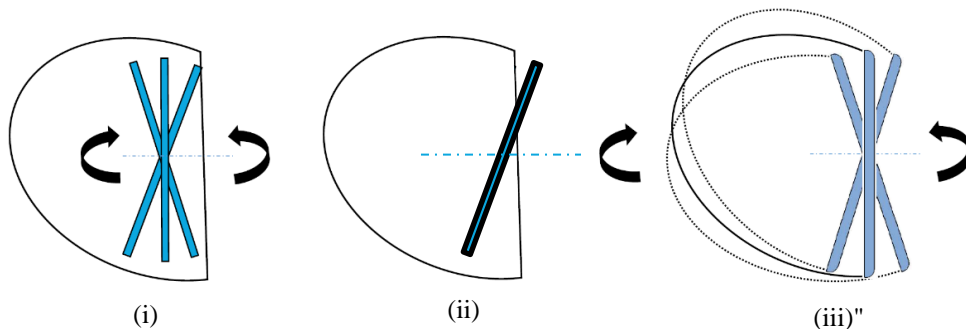
When the reflecting surface projects beyond the protective housing in any adjustment position (figure below (ii)), the radius of curvature 'c' on the edge of the projecting part shall be not less than 2.5 mm and the reflecting surface shall return into the protective housing under a force of 50 N applied to the point of greatest projection, relative to the protective housing, in a horizontal direction, approximately parallel to the longitudinal median plane of the vehicle.

When the edge of the reflecting surface is not enclosed by the protective housing independent from any adjustment position, the radius of curvature 'c' on its perimeter shall be not less than 2.5 mm at all points and in all directions and shall apply to the edge of the projecting part, figure below (iii).

- (i) Edge of the reflecting surface enclosed in a protective housing
- (ii) Reflecting surface projects beyond the protective housing in a specific adjustment position
- (iii) Edge of the reflecting surface not enclosed by the protective housing

- (b) Rear-view mirrors (Class I)

In cases where the edge of the reflecting surface is enclosed in a protective housing (holder, etc.), the radius of curvature 'c' on its perimeter shall be not less than 2.5 mm at all points and in all directions. In cases, where the edge of the reflecting surface projects beyond the protective housing, this requirement shall apply to the edge of the projecting part."



Paragraph 6.1.1.6., amend to read:

"6.1.1.6. The device for the attachment of mirrors to the vehicle shall be so designed that a cylinder with a 70 mm radius (50 mm in the case of an L-category vehicle), having as its axis the axis, or one of the axes, of pivot or rotation which ensures deflection of the mirror in the direction of impact concerned, passes through at least part of the external original surface where the device is protruding from."

Paragraph 6.3.1.1., amend to read:

"6.3.1.1. The test provided for in paragraph 6.3.2. below shall not be required in the case of any Class II to VI exterior device for indirect vision of which no part is less than 2 m from the ground, regardless of the adjustment position, when the vehicle is under a load corresponding to its maximum technically permissible mass.

This derogation also applies to the attachments of devices for indirect vision (attachment plates, arms, swivel joints, etc.) which are situated less than 2 m from the ground and which do not project beyond the overall width of the vehicle, measured in the transverse plane passing through the lowest device for indirect vision attachments or any other point forward of this plane if this configuration produces a greater overall width.

In such cases, a description specifying that the device for indirect vision shall be mounted so as to conform to the above-mentioned conditions for the positioning of its attachments on the vehicle shall be provided.

Where advantage is taken of this derogation, the arm shall be indelibly marked with the symbol

Δ
2m

and the type approval certificate shall be endorsed to this effect."

Paragraph 6.3.2., amend to read:

"6.3.2. Impact test

The test according to this paragraph is not to be carried out for

- (a) exterior devices not projecting beyond the overall width and length of the vehicle and providing a frontal deflecting area of an angle not more than 45° measured in relation to the longitudinal median plane of the vehicle, or
- (b) devices not protruding more than 100 mm measured at the attachment point beyond the circumscribing external original surface of the vehicle according to Regulation No. 26.

See Annex 9. "

Paragraph 6.3.2.2.1., amend to read:

"6.3.2.2.1. Devices for indirect vision shall be positioned on the pendulum impact rig in such a way that the axes which are horizontal and vertical when the device for indirect vision is installed on a vehicle in accordance with the applicant's mounting instructions are in a similar position;"

Paragraph 6.3.2.2.2., amend to read:

"6.3.2.2.2. When a device for indirect vision is adjustable with respect to the base, the test position shall be that in which any pivoting device is least likely to operate, within the limits of adjustment provided by the applicant. When the edge of the reflecting surface is not enclosed by the protective housing according to paragraph 6.1.1.2. (iii) the worst case test positions for both impact directions shall be identified by the Technical Service in consultation with the manufacturer;"

Insert new paragraphs 12.7. to 12.9., to read:

- "12.7. 'Centre-steered vehicle' means a vehicle that is steered from a central driving position."
- 12.8. 'Central driving position' is defined when Y coordinate of the 'R' point¹ is in Y₀ position within ±60 mm.
- 12.9. 'Side-steered vehicle' means a vehicle which is not a centre-steered vehicle."

Paragraph 14.2., amend to read:

- "14.2. An approval number shall be assigned to each approved type in accordance with Schedule 4 of the Agreement (E/ECE/TRANS/505/Rev.3)."

Paragraph 15.2.1.1.1., amend to read:

- "15.2.1.1.1. The fields of vision prescribed in paragraph 15.2.4. below shall be obtained from the minimum number of mandatory mirrors or camera-monitor devices set out in the following table.

A minimum number of camera-monitor systems is undefined, but they shall provide the same field of vision as given in the table below and the provision on the minimum mounting height does not apply.

In the case of camera-monitor systems, the maximum number of monitors shall not exceed the corresponding number of mirrors.

<i>Vehicle category</i>	<i>Rear-view Class I</i>	<i>Main rear-view Class II</i>	<i>Main rear-view Class III</i>	<i>Wide-angle view Class IV</i>	<i>Close-proximity view Class V</i>	<i>Front-view Class VI</i>
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.	Optional	Compulsory 1 on the driver's side and 1 on the passenger's side Class II devices for indirect vision 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 1 device for indirect vision (a front mirror 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	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)	Optional 1 device for indirect vision (a front mirror 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)	Optional 1 device for indirect vision (a front mirror shall be fitted at least 2 m above the ground)
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.	Optional	Compulsory 1 on the driver's side and 1 on the passenger's side Class II devices for indirect vision 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 1 device for indirect vision (a front mirror shall be fitted at least 2 m above the ground)

<i>Vehicle category</i>	<i>Rear-view Class I</i>	<i>Main rear-view Class II</i>	<i>Main rear-view Class III</i>	<i>Wide-angle view Class IV</i>	<i>Close-proximity view Class V</i>	<i>Front-view Class VI</i>
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 For both sides together if not In addition according to paragraphs 15.2.4.5.6. to 15.2.4.5.11. for vehicles with a mounting height of the Class V mirror of not less than 2.4 m (see paragraph 15.2.4.5.12.): the required field of vision (paragraphs 15.2.4.5.6. to 15.2.4.5.9.) may be viewed using a combination of direct view and indirect vision devices (of Classes IV, V, VI).	Compulsory (see paragraphs 15.2.2.7. and 15.2.4.5.5.) 1 on the passenger's side For centre-steered vehicles (see paragraphs 15.2.2.7. and 15.2.4.5.5.) on both sides Optional 1 on the driver's side (both shall be fitted at least 2 m above the ground). A tolerance of +10 cm may be applied In addition according to paragraphs 15.2.4.5.6. to 15.2.4.5.11. for vehicles with a mounting height of the Class V mirror of not less than 2.4 m (see paragraph 15.2.4.5.12.): the required field of vision (paragraphs 15.2.4.5.6. to 15.2.4.5.9.) may be viewed using a combination of direct view and indirect vision devices (of Classes IV, V, VI).	Optional 1 device for indirect vision (a front mirror shall be fitted at least 2 m above the ground) In addition according to paragraphs 15.2.4.5.6. to 15.2.4.5.11. for vehicles with a mounting height of the Class V mirror of not less than 2.4 m (see paragraph 15.2.4.5.12.): the required field of vision (paragraphs 15.2.4.5.6. to 15.2.4.5.9.) may be viewed using a combination of direct view and indirect vision devices (of Classes IV, V, VI).

<i>Vehicle category</i>	<i>Rear-view Class I</i>	<i>Main rear-view Class II</i>	<i>Main rear-view Class III</i>	<i>Wide-angle view Class IV</i>	<i>Close-proximity view Class V</i>	<i>Front-view Class VI</i>
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 In addition according to paragraphs 15.2.4.5.6. to 15.2.4.5.11. for vehicles with a mounting height of the Class V mirror of not less than 2.4 m (see paragraph 15.2.4.5.12.): the required field of vision (paragraphs 15.2.4.5.6. to 15.2.4.5.9.) may be viewed using a combination of direct view and indirect vision devices (of Classes IV, V, VI).	Compulsory (see paragraph 15.2.2.7. and 15.2.4.5.5) 1 on the passenger's side For centre-steered vehicles (see paragraphs 15.2.2.7. and 15.2.4.5.5.) on both sides Optional 1 on Driver's side (both shall be fitted at least 2 m above the ground) In addition according to paragraphs 15.2.4.5.6. to 15.2.4.5.11. for vehicles with a mounting height of the Class V mirror of not less than 2.4 m (see paragraph 15.2.4.5.12.): the required field of vision (paragraphs 15.2.4.5.6. to 15.2.4.5.9.) may be viewed using a combination of direct view and indirect vision devices (of Classes IV, V, VI).	Compulsory (see paragraph 15.2.1.1.2) 1 device for indirect vision (a front mirror shall be fitted at least 2 m above the ground) In addition according to paragraphs 15.2.4.5.6. to 15.2.4.5.11. for vehicles with a mounting height of the Class V mirror of not less than 2.4 m (see paragraph 15.2.4.5.12.): the required field of vision (paragraphs 15.2.4.5.6. to 15.2.4.5.9.) may be viewed using a combination of direct view and indirect vision devices (of Classes IV, V, VI).

<i>Vehicle category</i>	<i>Rear-view Class I</i>	<i>Main rear-view Class II</i>	<i>Main rear-view Class III</i>	<i>Wide-angle view Class IV</i>	<i>Close-proximity view Class V</i>	<i>Front-view Class VI</i>
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 In addition according to paragraphs 15.2.4.5.6. to 15.2.4.5.11. for vehicles with a mounting height of the Class V mirror of not less than 2.4 m (see paragraph 15.2.4.5.12.): the required field of vision (paragraphs 15.2.4.5.6. to 15.2.4.5.9.) may be viewed using a combination of direct view and indirect vision devices (of Classes IV, V, VI).	Compulsory (see paragraph 15.2.2.7. and 15.2.4.5.5) 1 on the passenger's side For centre-steered vehicles (see paragraphs 15.2.2.7. and 15.2.4.5.5.) on both sides Optional 1 on driver's side (both shall be fitted at least 2 m above the ground) In addition according to paragraphs 15.2.4.5.6. to 15.2.4.5.11. for vehicles with a mounting height of the Class V mirror of not less than 2.4 m (see paragraph 15.2.4.5.12.): the required field of vision (paragraphs 15.2.4.5.6. to 15.2.4.5.9.) may be viewed using a combination of direct view and indirect vision devices (of Classes IV, V, VI).	Compulsory (see paragraph 15.2.1.1.2) 1 device for indirect vision (a front mirror shall be fitted at least 2 m above the ground) In addition according to paragraphs 15.2.4.5.6. to 15.2.4.5.11. for vehicles with a mounting height of the Class V mirror of not less than 2.4 m (see paragraph 15.2.4.5.12.): the required field of vision (paragraphs 15.2.4.5.6. to 15.2.4.5.9.) may be viewed using a combination of direct view and indirect vision devices (of Classes IV, V, VI).

Paragraph 15.2.1.1.2., re-positioned after the tables and amend to read:

"15.2.1.1.2. In the case a camera-monitor system is used for rendering (the) field(s) of vision, the relevant field(s) of vision shall be permanently visible to the driver when the ignition is on or the vehicle master control switch is activated (whichever is applicable) and if the camera-monitor system is available (see paragraph 16.1.2.), and not used for other information. However, when the vehicle is moving forward at a speed above 10 km/h or backwards, the monitor or the part of the monitor intended for rendering the Class VI field of vision may be used for other information. Multiple images may be used or displayed provided that the monitor has been approved in this mode."

Paragraphs 15.2.1.1.3., remain unchanged and re-positioned after the tables

Paragraph 15.2.2.6., amend to read:

"15.2.2.6. Where the lower edge of a Classes II to VII device for indirect vision is less than 2 m above the ground when the vehicle is loaded to its technically permissible maximum laden mass, this device shall not project more than 250 mm beyond the overall width of the vehicle measured without ~~mirrors~~ these devices."

Paragraph 15.2.3.2., amend to read:

"15.2.3.2. If a Class II, III, IV or VII mirror is fitted on the driver's side, it 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. In case of a centre-steered vehicle this provision applies to mirrors on both sides."

Paragraph 15.2.4.5.12., amend to read:

"15.2.4.5.12. The field of vision prescribed in paragraphs 15.2.4.5.1. to 15.2.4.5.4. may be viewed using a combination of a close-proximity view device (Class V) and a wide-angle view device (Class IV).

In such cases the close-proximity view device for indirect vision (Class V) shall provide at least 90 per cent of the field of vision prescribed in paragraphs 15.2.4.5.1 to 15.2.4.5.4. and the device for indirect vision (Class IV) shall be adjusted in a way that it simultaneously provides the field of vision prescribed in paragraph 15.2.4.4.2."

Paragraph 15.2.4.6.1., amend to read:

"15.2.4.6.1. The field of vision shall be such that the driver can see at least a flat horizontal portion of the road, which is for side-steered vehicles bounded by:

- (a) A transverse vertical plane through the outermost point of the front of the vehicle;
- (b) a transverse vertical plane 2,000 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;
- (d) a longitudinal vertical plane parallel to the longitudinal vertical median plane 2,000 mm outside the outermost side of the vehicle opposite to the driver's side; and
- (e) 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 9.1).

The field of vision shall be such that the driver can see at least a flat horizontal portion of the road, which is for centre-steered vehicles bounded by:

- (f) A transverse vertical plane through the outermost point of the front of the vehicle;
- (g) a transverse vertical plane 2,000 mm in front of the plane defined in (a);
- (h) a longitudinal vertical plane parallel to the longitudinal vertical median plane 2,000 mm outside the outermost side of both sides of the vehicle; and
- (i) the front of this field of vision on both sides may be rounded off with a radius of 2,000 mm (see Figure 9.2).

For the defined field of vision, see also paragraph 15.2.4.9.2. below.

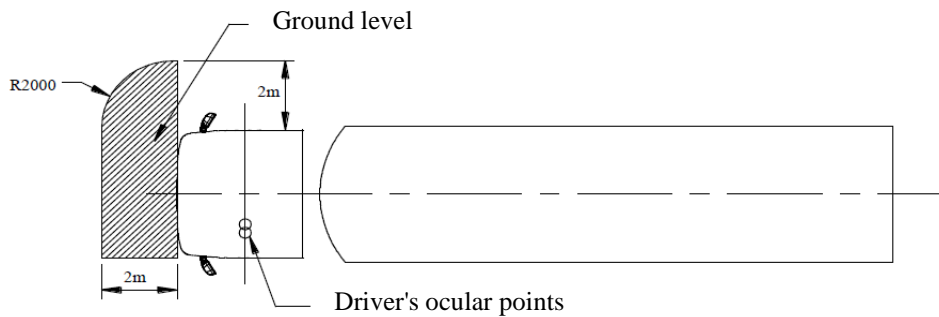
The provisions for Class VI front-view devices are compulsory for forward controlled (as defined in paragraph 12.5. of this Regulation) vehicles of categories $N_2 > 7.5$ t and N_3 .

If vehicles of these categories cannot fulfil the requirements by using a front-view 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 9.1 and Figure 9.2."

Figure 9, renumber as Figure 9.1. and amend to read:

"Figure 9.1

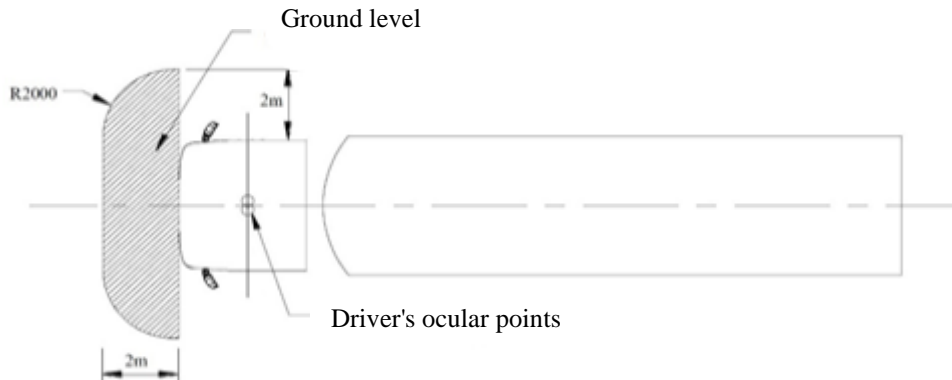
Class VI field of vision for side-steered vehicle"



"

Insert a new figure 9.2., to read:

"Figure 9.2
Class VI field of vision for centre-steered vehicle"



"

Paragraph 15.2.4.6.2., amend to read:

"15.2.4.6.2. However, if the driver can 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 in case of a side steered vehicle 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 and for centre-steered vehicles a longitudinal vertical plane parallel to the longitudinal vertical median plane 900 mm outside the outermost side of the vehicle on both sides, a Class VI device for indirect vision is not mandatory."

Paragraph 15.2.4.9.2., amend to read:

"15.2.4.9.2. Classes II, III, IV, V, and VI devices for indirect vision and Class VII mirrors

In the fields of vision specified above, obstruction due to the bodywork and its components, such as other cab devices for indirect vision, 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 device for indirect vision caused by the special features may be more than 10 per cent but not more than necessary for its special function."

Paragraph 16.1.3.1., amend to read:

"16.1.3.1. Magnification factor

The minimum and the average magnification factors of the CMS, in both horizontal and vertical directions shall not be lower than the magnification factors indicated below."

Insert new paragraphs 16.1.3.1.1. to 16.1.3.1.3., to read:

"16.1.3.1.1. The minimum magnification factor for side-steered vehicles of classes M and N shall not be less than:

- (a) For Class I: 0.31;
- (b) For Class II (driver's side): 0.26;
- (c) For Class III (driver's side): 0.29;
- (d) For Class IV (driver's side): 0.054;
- (e) For Class II (passenger's side): 0.13;
- (f) For Class III (passenger's side): 0.19;
- (g) For Class IV (passenger's side): 0.016.

The average magnification factor for side-steered vehicles shall not be less than:

- (h) For Class I: 0.33;
- (i) For Class II (driver's side): 0.31;
- (j) For Class III (driver's side): 0.31;
- (k) For Class IV (driver's side): 0.091;
- (l) For Class II (passenger's side): 0.16;
- (m) For Class III (passenger's side): 0.20;
- (n) For Class IV (passenger's side): 0.046.

16.1.3.1.2. The minimum magnification factor for centre-steered vehicles of classes M₁ and N₁ shall not be less than:

- (a) For Class I: 0.31;
- (b) For Class II (driver centre): 0.26;
- (c) For Class III (driver centre): 0.29;
- (d) For Class IV (driver centre): 0.054.

The average magnification factor for centre-steered vehicles shall not be less than:

- (e) For Class I: 0.33;
- (f) For Class II (driver centre): 0.31;
- (g) For Class III (driver centre): 0.31;
- (h) For Class IV (driver centre): 0.046.

16.1.3.1.3. The minimum magnification factor for centre-steered vehicles of classes M₂, M₃, N₂ and N₃ shall not be less than:

- (a) For Class I: 0.31;
- (b) For Class II (driver centre): 0.22;
- (c) For Class IV (driver centre): 0.043.

The average magnification factor for centre-steered vehicles shall not be less than:

- (d) For Class I: 0.33;
- (e) For Class II (driver centre): 0.23;
- (f) For Class IV (driver centre): 0.068."

Paragraph 16.1.4., amend to read:

"16.1.4 Magnification aspect ratio

In the required field of view, the difference between the average magnification factor for horizontal and vertical direction of a CMS shall satisfy the following equations depending on the individual classes.

..."

Annex 9, amend to read:

"Figure 1

