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COUNCIL DIRECTIVE

of 27 September 1977

on the approximation of the laws of the Member States relating to the field of vision of motor vehicle drivers

(77/649/EEC)

(OJ L 267, 19.10.1977, p. 1)

Amended by:

		Official Journal		
		No	page	date
►**M1**	Commission Directive 81/643/EEC of 29 July 1981	L 231	41	15.8.1981
►**M2**	Commission Directive 88/366/EEC of 17 May 1988	L 181	40	12.7.1988
►**M3**	Commission Directive 90/630/EEC of 30 October 1990	L 341	20	6.12.1990

Corrected by:

►**C1** Corrigendum, OJ L 150, 6.6.1978, p. 6 (77/649/EEC)

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COUNCIL DIRECTIVE

of 27 September 1977

on the approximation of the laws of the Member States relating to the field of vision of motor vehicle drivers

(77/649/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament [1],

Having regard to the opinion of the Economic and Social Committee [2],

Whereas the technical requirements which motor vehicles must satisfy pursuant to national laws relate, *inter alia*, to the field of vision of the driver;

Whereas these requirements differ from one Member State to another; whereas it is therefore necessary that all Member States adopt the same requirements, either in addition to or in place of their existing rules, in order, in particular, to allow the EEC type-approval procedure, which was the subject of Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers, to be introduced in respect of each type of vehicle [3];

Whereas it is desirable to draft the technical requirements so that they have the same aim as the work being carried out on the subject in the UN Economic Commission for Europe;

Whereas those requirements apply to motor vehicles in category M_1 (the international classification of motor vehicles is given in Annex I to Directive 70/156/EEC);

Whereas the approximation of national laws relating to motor vehicles entails reciprocal recognition by Member States of the checks carried out by each of them on the basis of the common requirements,

HAS ADOPTED THIS DIRECTIVE:

Article 1

For the purposes of this Directive, ‘vehicle’ means any motor vehicle in category M_1 (defined in Annex I to Directive 70/156/EEC) intended for use on the road, having at least four wheels and a maximum design speed exceeding 25 km/h.

Article 2

No Member State may refuse to grant EEC type-approval or national type-approval of a vehicle on grounds relating to the driver's field of vision if it satisfies the requirements set out in Annexes I, III and IV.

Article 3

No Member State may refuse or prohibit the sale, registration, entry into service or use of any vehicle on grounds relating to the driver's field of vision if it satisfies the requirements set out in Annexes I, III and IV.

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(1) OJ No C 125, 8. 6. 1976, p. 49.
(2) OJ No C 197, 23. 8. 1976, p. 10.
(3) OJ No L 42, 23. 2. 1970, p. 1.

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Article 4

The Member State which has granted type-approval shall take the measures required to ensure that it is informed of any modification of a part or characteristic referred to in section 2.2 of Annex I. The competent authorities of that State shall determine whether it is necessary to carry out further tests on the modified vehicle type and to prepare a new report. If these tests show that the requirements of this Directive have not been complied with, the modification shall not be authorized.

Article 5

Any amendments necessary to adapt the requirements of Annexes I, III, IV and V to technical progress shall be adopted in accordance with the procedure laid down in Article 13 of Directive 70/156/EEC.

However, this procedure shall not apply to amendments introducing provisions relating to a field of vision other than 180º forward field of vision.

Article 6

1. Member States shall bring into force the provisions necessary in order to comply with this Directive within 18 months of its notification and shall forthwith inform the Commission thereof.

2. Member States shall ensure that the texts of the main provisions of national law which they adopt in the field covered by this Directive are communicated to the Commission.

Article 7

This Directive is addressed to the Member States.

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List of Annexes

Annex I:	Scope, definitions, application for EEC type-approval, EEC type-approval, specifications, test procedure ([1]).
(Annex II)	
Annex III:	Procedure for determining the 'H' point and the actual seat-back angle and for verifying the relative positions of the R and H points and the relationship between the design seat-back angle and the actual seat-back angle ([1]).

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Appendix:	Figures 1 and 2.

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Annex IV:	Method for determining the dimensional relationships between the vehicle's primary reference marks and the three-dimensional reference grid ([1]).

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Appendix:	Figures 1 to 7

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Annex V:	Annex to the EEC vehicle type-approval certificate with regard to the driver's field of vision.

([1]) The technical requirements of this Annex are similar to those of the relevant UN Economic Commission for Europe draft Regulation; in particular the breakdown into sections is the same. Where a section of the draft Regulation has no counterpart in the Annexes to this Directive, the number is given in brackets for the record.

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ANNEX I

SCOPE, DEFINITIONS, APPLICATION FOR EEC TYPE-APPROVAL, EEC TYPE-APPROVAL, SPECIFICATIONS, TEST PROCEDURE

1. SCOPE

1.1. This Directive applies to the 180º forward field of vision of the drivers of vehicles in category M_1.

1.1.1. Its purpose is to ensure an adequate field of vision when the windscreen and other glazed surfaces are dry and clean.

1.2. The requirements of this Directive are so worded as to apply to category M_1 vehicles in which the driver is on the left. In category M_1 vehicles in which the driver is on the right these requirements shall be applied by inverting the criteria where appropriate.

2. DEFINITIONS

(2.1.)

2.2. **Vehicle type with regard to the field of vision**

'Vehicle type with regard to the field of vision' means vehicles which do not differ in such essential respects as:

2.2.1. the external and internal forms and arrangements within the area specified in section 1 which may affect visibility; and

2.2.2. the shape and dimensions of the windscreen and its mounting.

2.3. **Three-dimensional reference grid**

'Three-dimensional reference grid' means a reference system which consists of a vertical longitudinal plane X-Z, a horizontal plane X-Y and a vertical transverse plane Y-Z (see Annex IV, Appendix, figure 5); the grid is used to determine the dimensional relationships between the position of design points on drawings and their position on the actual vehicle. The procedure for situating the vehicle relative to the grid is specified in Annex IV; all coordinates referred to ground zero shall be based on a vehicle in running order (as defined in section 2.6 of Annex I to Directive 70/156/EEC) plus one front-seat passenger, the mass of the passenger being 75 kg ± 1 %.

2.3.1. Vehicles fitted with suspension enabling their ground clearance to be adjusted shall be tested under the normal conditions of use specified by the vehicle manufacturer.

2.4. **Primary reference marks**

'Primary reference marks' means holes, surfaces, marks and identification signs on the vehicle body. The type of reference mark used and the position of each mark relative to the X, Y and Z coordinates of the three-dimensional reference grid and to a design ground plane shall be specified by the vehicle manufacturer. These marks may be the control points used for body-assembly purposes;

2.5. **Seat-back angle**

(See Annex III, section 1.3)

2.6. **Actual seat-back angle**

(See Annex III, section 1.4)

2.7. **Design seat-back angle**

(See Annex III, section 1.5)

2.8. **V points**

'V points' means points whose position in the passenger compartment is determined as a function of vertical longitudinal planes passing through the centres of the outermost designated seating positions on the front seat and in relation to the R point and the design angle of the seat-

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back, which points are used for verifying compliance with the field of vision requirements;

2.9. **R point or seating reference point**

(See Annex III, section 1.2)

2.10. **H point**

(See Annex III, section 1.1)

2.11 **Windscreen datum points**

'Windscreen datum points' means points situated at the intersection with the windscreen of lines radiating forward from the V points to the outer surface of the windscreen.

2.12. **Transparent area**

'Transparent area' means that area of a vehicle windscreen or other glazed surface whose light transmittance measured at right angles to the surface, is not less than 70 %.

2.13. **P points**

'P points' means the points about which the driver's head rotates when he views objects on a horizontal plane at eye level.

2.14. **E points**

'E points' means points representing the centres of the driver's eyes and used to assess the extent to which A pillars obscure the field of vision.

2.15. **A pillar**

'A pillar' means any roof support forward of the vertical transverse plane located 68 mm in front of the V points and includes non-transparent items, such as windscreen mouldings and door frames, attached or contiguous to such a support.

2.16. **Horizontal seat-adjustment range**

'Horizontal seat-adjustment range' means the range of normal driving positions designated by the vehicle manufacturer for the adjustment of the driver's seat in the direction of the X axis (see 2.3).

2.17. **Extended seat adjustment range**

'Extended seat adjustment range' means the range designated by the vehicle manufacturer for the adjustment of the seat in the direction of the X axis (see 2.3) beyond the range of normal driving positions specified in 2.16 and used for converting seats into beds or facilitating entry into the vehicle.

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3. APPLICATION FOR EEC TYPE-APPROVAL

3.1. The application for EEC type-approval of a vehicle type with regard to the driver's field of vision shall be submitted by the vehicle manufacturer or by his authorized representative.

3.2. It shall be accompanied by the following documents in triplicate, and by the following particulars;

3.2.1. a description of the vehicle with regard to the items mentioned in 2.2, together with dimensional drawings and either a photograph or an exploded view of the passenger compartment. The numbers and/or symbols identifying the vehicle type shall be specified; and

3.2.2. particulars of the primary reference marks in sufficient detail to enable them to be readily identified and the position of each in relation to the others and to the R point to be verified.

3.3. A vehicle representative of the vehicle type to be approved shall be submitted to the technical service conducting the approval tests.

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4. EEC TYPE-APPROVAL

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4.3. A certificate conforming to the model shown in Annex V shall be attached to the EEC type-approval certificate.

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5. SPECIFICATIONS

5.1. **Driver's field of vision**

5.1.1. The transparent area of the windscreen must include at least the windscreen datum points; these are:

5.1.1.1. a horizontal datum point forward of V_1 and 17º to the left (see Annex IV, Appendix, figure 1);

5.1.1.2. an upper vertical datum point forward of V_1 and 7º above the horizontal. However, this angle shall be reduced to 5º until 30 September 1981.

5.1.1.3. a lower vertical datum point forward of V_2 and 5º below the horizontal;

5.1.1.4. to verify compliance with the forward-vision requirement on the opposite half of the windscreen, three additional datum points, symmetrical to the points defined in 5.1.1.1 to 5.1.1.3 in relation to the median longitudinal plane of the vehicle, are obtained.

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5.1.2. The angle of bosdtruction for each 'A' pillar, as described in point 5.1.2.1, shall not exceed 6º (cf. Annex IV, Appendix, Figure 3).

The angle of obstruction of the 'A' pillar on the passenger side, as described in point 5.1.2.1.2, need not be determined if the two pillars are located symmetrically in relation to the median longitudinal vertical plane of the vehicle.

5.1.2.1. The angle of obstruction of each 'A' pillar shall be measured by superimposing in a plane the following two horizontal sections:

Section 1: Starting from the Pm point situated at the location defined in point 5.3.1.1, draw a plane forming an angle of 2º upwards in relation to the horizontal plane passing forward through Pm. Determine the horizontal section of the 'A' pillar starting from the foremost point of the intersection of the 'A' pillar and the inclined plane (cf. Annex IV, Appendix, Figure 2).

Section 2: Repeat the same procedure, taking a plane declining at an angle of 5º downwards in relation to the horizontal plane passing forward through Pm (cf. Annex IV, Appendix, Figure 2).

5.1.2.1.1. The angle of obstruction of the 'A' pillar on the driver's side is the angle formed on the plane view by a parallel, starting from E_2, to the tangent joining E_1 with the outer edge of Section S_2 and the tangent joining E_2 with the inner edge of Section S_1 (cf. Annex IV, Appendix, Figure 3).

5.1.2.1.2. The angle of obstruction of the 'A' pillar on the passenger side is the angle formed on the plane view by the tangent joining E_3 to the inner edge of Section S_1 and a parallel, starting from E_3, to the tangent joining E_4 to the outer edge of Section S_2 (cf. Annex IV, Appendix, Figure 3)

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5.1.2.2. No vehicle shall have more than two A pillars.

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5.1.3. Other than the obstructions created by the 'A' pillars, the fixed or movable vent or side window division bars, outside radio aerials, rear-view mirrors and windscreen wipers, there should be no obstruction in

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the driver's 180º forward direct field of vision below a horizontal plane passing through V_1, and above three planes through V_2, one being perpendicular to the plane X - Z and declining forward 4º below the horizontal, and the other two being perpendicular to the plane Y - Z and declining 4º below the horizontal (see Annex IV, Figure 4).

The following are not considered to be obstructions to the field of vision:

— embedded or printed 'radio aerial' conductors no wider than the following:

  — embedded conductors: 0,5 millimetres,

  — printed conductors: 1,0 millimetres.

  These 'radio aerial' conductors shall not cross zone A, as defined in Directive 78/318/EEC, relating to the wiper and washer systems of motor vehicles [1]. However, three 'radio aerial' conductors may cross zone A if their width does not exceed 0,5 millimetres

— within zone A 'defrosting/demisting' conductors normally in 'zigzag' or sinusoidal form having the following dimensions:

  — maximum visible width: 0,030 millimetres,

  — maximum conductor density:

    — if the conductors are vertical: 8/cm,

    — if the conductors are horizontal: 5/cm.

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5.2. **Position of the V points**

5.2.1. The positions of the V points in relation to the R point, as indicated by XYZ coordinates from the three-dimensional reference grid, are as shown in Tables I and IV.

5.2.1.1. Table I indicates the basic coordinates for a design seat-back angle of 25º. The positive direction for the coordinates is indicated in Annex IV, Appendix, figure 1.

TABLE I

V-point	X	Y	Z
V_1	68 mm	− 5 mm	665 mm
V_2	68 mm	− 5 mm	589 mm

5.3. **Positions of the P points**

5.3.1. The positions of the P points in relation to the R point, as indicated by the XYZ coordinates from the three-dimensional reference grid, are as shown by Tables II, III and IV.

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5.3.1.1. Table II sets out the base coordinates for a design seat-back angle of 25º. The positive direction of the coordinates is set out in Annex IV, Appendix, Figure 1.

The Pm point is the point of intersection between the straight line P_1, P_2 and the longitudinal vertical plane passing through the R point.

TABLE II

Point P	X	Y	Z
P_1	35 mm	− 20 mm	627 mm
P_2	63 mm	47 mm	627 mm
Pm	43,36 mm	0 mm	627 mm

[1] OJ No L 81, 28. 3. 1978, p. 49.

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5.3.1.2. Table III indicates the further corrections to be made to the X coordinates of P_1 and P_2 when the horizontal seat-adjustment range as defined in 2.16 exceeds 108 mm. The positive direction for the coordinates is indicated in Annex IV, Appendix, figure 1.

TABLE III

Horizontal seat-adjustment range	Δ X
108 to 120 mm	− 13 mm
121 to 132 mm	− 22 mm
133 to 145 mm	− 32 mm
146 to 158 mm	− 42 mm
more than 158 mm	− 48 mm

5.4. **Correction for design seat-back angles other than 25º**

Table IV indicates the further corrections to be made to the X and Z coordinates of each P point and each V point when the design seat-back angle is not 25º. The positive direction for the coordinates is indicated in Annex IV, Appendix, figure 1.

TABLE IV

Seat-back angle (in º)	Horizontal coordinates Δ X	Vertical coordinates Δ Z
5	− 186 mm	28 mm
6	− 177 mm	27 mm
7	− 167 mm	27 mm
8	− 157 mm	27 mm
9	− 147 mm	26 mm
10	− 137 mm	25 mm
11	− 128 mm	24 mm
12	− 118 mm	23 mm
13	− 109 mm	22 mm
14	− 99 mm	21 mm
15	− 90 mm	20 mm
16	− 81 mm	18 mm
17	− 72 mm	17 mm
18	− 62 mm	15 mm
19	− 53 mm	13 mm
20	− 44 mm	11 mm
21	− 35 mm	9 mm
22	− 26 mm	7 mm
23	− 18 mm	5 mm
24	− 9 mm	3 mm
25	0 mm	0 mm
26	9 mm	− 3 mm
27	17 mm	− 5 mm
28	26 mm	− 8 mm
29	34 mm	− 11 mm
30	43 mm	− 14 mm
31	51 mm	− 18 mm

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Seat-back angle (in º)	Horizontal coordinates Δ X	Vertical coordinates Δ Z
32	59 mm	− 21 mm
33	67 mm	− 24 mm
34	76 mm	− 28 mm
35	84 mm	− 32 mm
36	92 mm	− 35 mm
37	100 mm	− 39 mm
38	108 mm	− 43 mm
39	115 mm	− 48 mm
40	123 mm	− 52 mm

5.5. **Positions of the E points**

5.5.1. E_1 and E_2 are each 104 mm from P_1.

E_2 is 65 mm from E_1 (see Annex IV, Appendix, figure 4).

►M2 5.5.2. The straight line joining E_1 and E_2 is rotated about P_1 until the tangent joining E_1 to the outer edge of Section 2 of the A-pillar on the driver's side is normal to the straight line E_1 - E_2 (cf. Annex IV, Appendix, Figure 3). ◄

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5.5.3. E_3 and E_4 are each 104 mm from P_2. E_3 is 65 mm from E_4. (See Annex IV, Appendix, figure 4).

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5.5.4. The straight line E_3 - E_4 is rotated about P_2 until the tangent joining E_4 to the outer edge of Section 2 of the A-pillar on the passenger's side is normal to the straight line E_3 - E_4 (cf. Annex IV, Appendix, Figure 3)

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6. TEST PROCEDURE

6.1. **Driver's field of vision**

6.1.1. The dimensional relationships between the vehicle's primary reference marks and the three-dimensional reference grid shall be determined by the procedure prescribed in Annex IV.

6.1.2. The position of the points V_1 and V_2 are determined in relation to the R point as indicated by XYZ coordinates from the three-dimensional reference grid and are shown in Table I under 5.2.1.1 and Table IV under 5.4. The windscreen datum points shall then be found from the corrected V points as prescribed in 5.1.1.

6.1.3. The relationship between the P points, the R point, and the centre-line of the driver's seating position, as indicated by XYZ coordinates from the three-dimensional reference grid, shall be determined from Tables II and III in 5.3. The correction for design seat-back angles other than 25º is shown in Table IV under 5.4.

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6.1.4. The angle of obstruction (see 5.1.2) shall be measured in the inclined planes as indicated in Annex IV, Appendix, Figure 2. The relationship between P_1 and P_2, which are connected to E_1 and E_2, and E_3 and E_4, respectively, is shown in Annex IV, Appendix, Figure 5.

6.1.4.1. Straight line E_1 - E_2 shall be set as described in 5.5.2. The angle of obstruction of the A-pillar on the driver's side shall then be measured as specified in point 5.1.2.1.1.

6.1.4.2. Straight line E_3 - E_4 shall be set as described in 5.5.4. The angle of obstruction of the A-pillar on the passenger side shall then be measured as specified in point 5.1.2.1.2.

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6.1.5. The manufacturer may measure the angle of obstruction either on the vehicle or in the drawings. In case of doubt the technical services may require the tests to be carried out on the vehicle.

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ANNEX III

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

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 ([1])

2. DEFINITIONS

For the purposes of this Annex:

2.1. '*Reference data*' means one or several of the following characteristics of a seating position:

2.1.1. the 'H' point and the 'R' point and their relationship,

2.1.2. the actual torso angle and the design torso angle and their relationship.

2.2. '*Three-dimensional "H" point machine*' (3 DH machine) means the device used for the determination of 'H' points and actual torso angles. This device is described in Appendix 1 to this Annex;

2.3. '*"H" point*' means the pivot centre of the torso and thigh of the 3 DH machine installed in the vehicle seat in accordance with paragraph 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 DH machine. The 'H' point corresponds theoretically to the 'R' point (for tolerances see item 3.2.2 below). Once determined in accordance with the procedure described in paragraph 4, the 'H' point is considered fixed in relation to the seat-cushion structure and to move with it when the seat is adjusted;

2.4. '*"R" point*' or '*seating reference point*' means a design point defined by the vehicle manufacturer for each seating position and established with respect to the three-dimensional reference system;

2.5. '*Torso-line*' means the centreline of the probe of the 3 DH machine with the probe in the fully rearward position;

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 DH machine. The actual torso angle corresponds theoretically to the design torso angle (for tolerances see item 3.2.2 below);

2.7. '*Design torso angle*' means the angle measured 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;

2.8. '*Centreplane of occupant*' (C/LO) means the median plane of the 3 DH 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;

2.9. '*Three-dimensional reference system*' means a system as described in Appendix 2 to this Annex;

2.10. '*Fiducial marks*' are physical points (holes, surfaces, marks or indentations) on the vehicle body as defined by the manufacturer;

2.11. '*Vehicle measuring attitude*' means the position of the vehicle as defined by the coordinates of fiducial marks in the three-dimensional reference system.

([1]) 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 competent authority.

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3. REQUIREMENTS

3.1. **Data presentation**

For each seating position where reference data are required in order to demonstrate compliance with the provisions of the present Directive, all or an appropriate selection of the following data shall be presented in the form indicated in Appendix 3 to this Annex:

3.1.1. the coordinates of the 'R' point relative to the three-dimensional reference system;

3.1.2. the design torso angle;

3.1.3. all indications necessary to adjust the seat (if it is adjustable) to the measuring position set out in item 4.3 below.

3.2. **Relationship between measured data and design specifications**

3.2.1. The coordinates of the 'H' point and the value of the actual torso angle obtained by the procedure set out in item 4 below shall be compared, respectively, with the coordinates of the 'R' point and the value of the design torso angle indicated by the vehicle manufacturer.

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 coordinates, 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 5º of the design torso angle.

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 Directive.

3.2.4. If the 'H' point or the actual torso angle does not satisfy the requirements of item 3.2.2 above, 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 item 3.2.3 above shall apply.

3.2.5. If the results of at least two of the three operations described in item 3.2.4 above do not satisfy the requirements of item 3.2.2 above, or if the verification cannot take place 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 Directive.

4. PROCEDURE FOR 'H' POINT AND ACTUAL TORSO ANGLE DETERMINATION

4.1. The vehicle shall be preconditioned at the manufacturer's discretion, at a temperature of 20 ± 10 ºC to ensure that the seat material reaches 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 minutes prior to installation of the 3 DH machine.

4.2. The vehicle shall be at the measuring attitude defined in item 2.11 above.

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.

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4.4. The area of the seating position contacted by the 3 DH 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 cm^2 and weighing 0,228 kg/m^2 or knitted or non-woven fabric having equivalent characteristics.

If a test is run on a seat outside the vehicle, the floor on which the seat is placed shall have the same essential characteristics [1] as the floor of the vehicle in which the seat is intended to be used.

4.5. Place the seat and back assembly of the 3 DH machine so that the centreplane of the occupant (C/LO) coincides with the centreplane of the 3 DH machine. At the manufacturer's request, the 3 DH machine may be moved inboard with respect to the C/LO if the 3 DH machine is located so far outboard that the seat edge will not permit levelling of the 3 DH machine.

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 centreplane of the seat.

4.7. **Adjust the feet and leg position of the 3 DH machine as follows:**

4.7.1. *Designated seating position: driver and outside front passenger*

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 DH machine as the right foot is to the right. The spirit level verifying the transverse orientation of the 3 DH 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.

4.7.1.2. If the left leg cannot be kept parallel to the right leg and the left foot cannot be supported by the structure, move the left foot until it is supported. The alignment of the sight buttons shall be maintained.

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.

4.7.3. *Other designated seating positions:*

The general procedure indicated in item 4.7.1 above shall be followed except that the feet shall be placed as specified by the vehicle manufacturer.

4.8. Apply lower leg and thigh weights and level the 3 DH machine.

4.9. Tilt the back pan forward against the forward stop and draw the 3 DH machine away from the seat-back using the T-bar. Reposition the 3 DH machine on the seat by one of the following methods:

4.9.1. If the 3 DH machine tends to slide rearward, use the following procedure. Allow the 3 DH 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;

4.9.2. If the 3 DH machine does not tend to slide rearward, use the following procedure. Slide the 3 DH machine rearward by applying a horizontal rearward load to the T-bar until the seat pan contacts the seat-back (see figure 2 of Appendix 1 to this Annex).

4.10. Apply a 100 ± 10 N load to the back and pan assembly of the 3 DH 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 Appendix 1 to this Annex). Then carefully return the back pan to the seat-back. Care must be exercised throughout the

[1] Tilt angle, height difference with a seat mounting, surface texture, etc.

▼M3

remainder of the procedure to prevent the 3 DH machine from sliding forward.

4.11. Install the right and left buttock weights and then, alternately, the eight torso weights. Maintain the 3 DH machine level.

4.12. Tilt the back pan forward to release the tension on the seat-back. Rock the 3 DH machine from side to side through a 10º arc (5º to each side of the vertical centreplane) for three complete cycles to release any accumulated friction between the 3 DH machine and the seat;

During the rocking action, the T-bar of the 3 DH machine may tend to diverge from the specified horizontal and vertical alignment. The T-bar must 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 DH machine to ensure that no inadvertent exterior loads are applied in a vertical or fore and aft direction.

The feet of the 3 DH 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 DH machine, they must 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 DH machine's seat pan on the seat.

4.13. Holding the T-bar to prevent the 3 DH 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 DH machine. If another level adjustment of the 3 DH machine is necessary, rotate the back pan forward, re-level, and repeat the procedure from item 4.12.

4.14. Take all measurements:

4.14.1. The coordinates of the ‘H’ point are measured with respect to the three-dimensional reference system.

4.14.2. The actual torso angle is read at the back angle quadrant of the 3 DH machine with the probe in its fully rearward position.

4.15. If a re-run of the installation of the 3 DH machine is desired, the seat assembly should remain unloaded for a minimum period of 30 min prior to the re-run. The 3 DH machine should not be left loaded on the seat assembly longer than the time required to perform the test.

4.16. If the seats in the same row can be 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 DH machine described in Appendix 1 to this Annex being seated in a place regarded as representative for the row. This place shall be:

4.16.1. in the case of the front row, the driver's seat;

4.16.2. in the case of the rear row or rows, an outer seat.

▼M3

Appendix 1

DESCRIPTION OF THE THREE DIMENSIONAL 'H' POINT MACHINE (1) (3 DH machine)

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' to measure the actual torso angle. An adjustable thigh bar, attached to the set pan, establishes the thigh centreline and serves as a baseline for the hip angle quadrant.

2. *Body and leg elements*

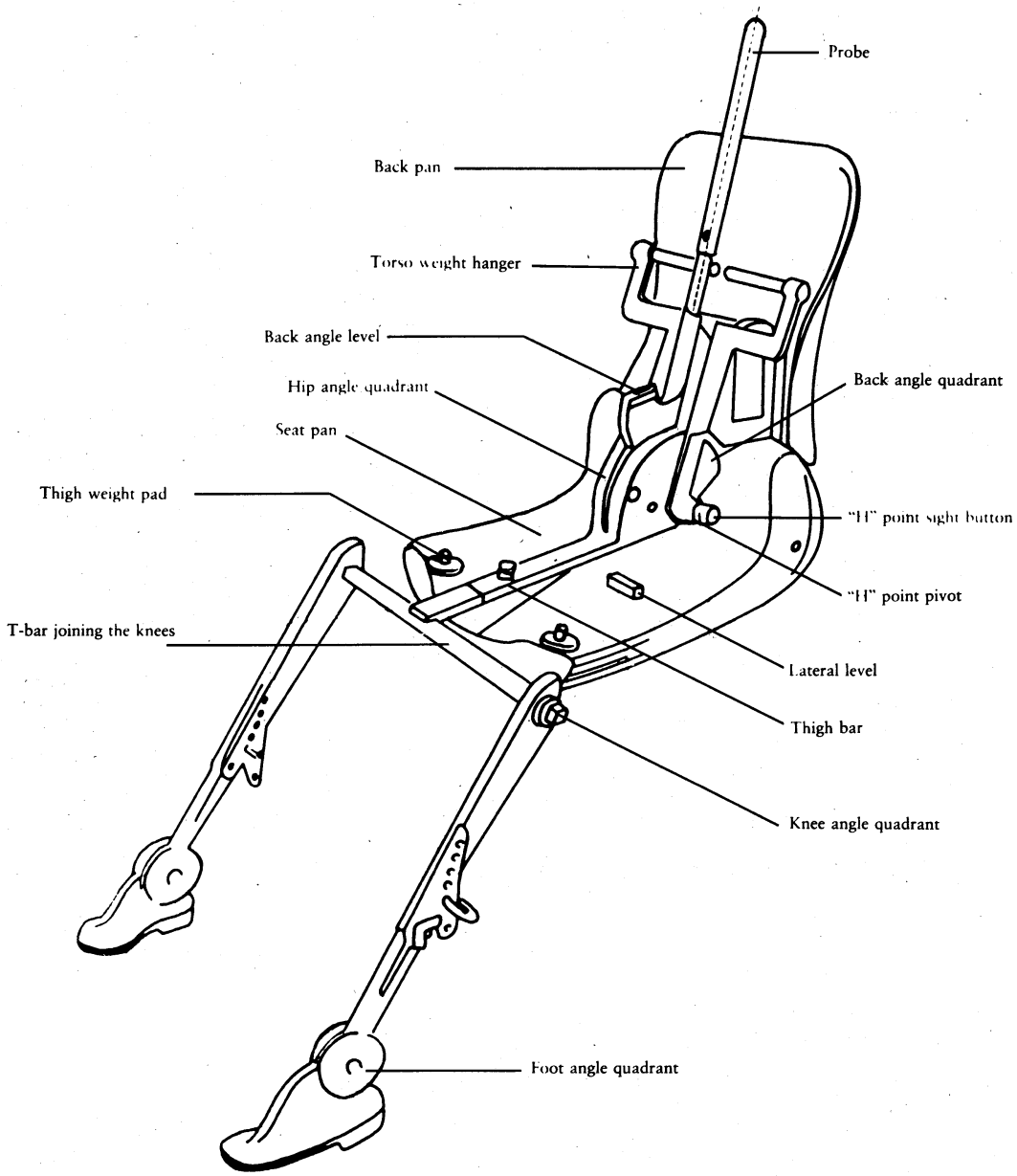
Lower leg segments are connected to the seat pan assembly at the T-bar joining the knees, which is a lateral extension of the adjustable thigh bar. Quadrants are incorporated in the lower leg segments to measure knee angles. Shoe and foot assemblies are calibrated to measure the foot angle. Two spirit 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 DH machine should be checked for free movement without encountering noticeable friction.

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

▼M3

Figure 1

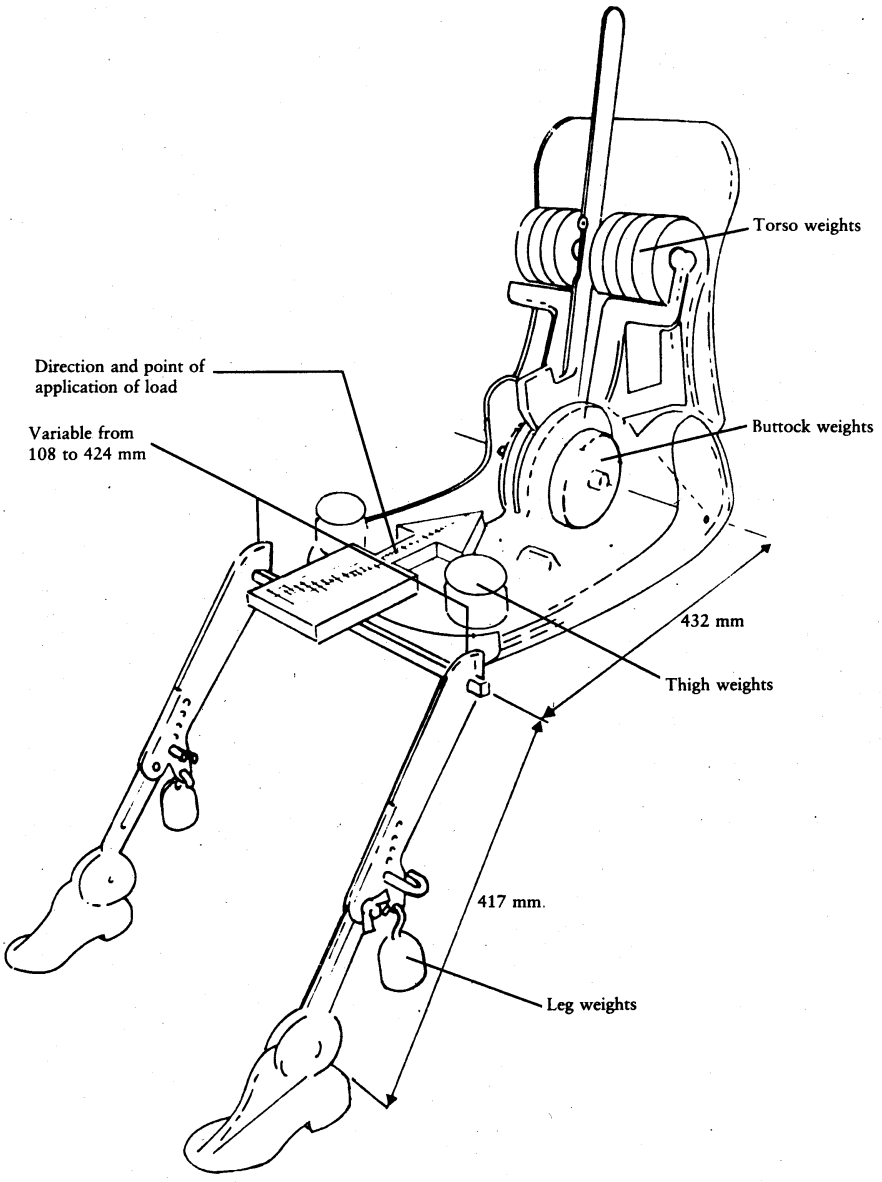
3 DH MACHINE ELEMENTS DESIGNATION



▼M3

Figure 2

DIMENSIONS OF THE 3 DH MACHINE ELEMENTS AND LOAD DISTRIBUTION

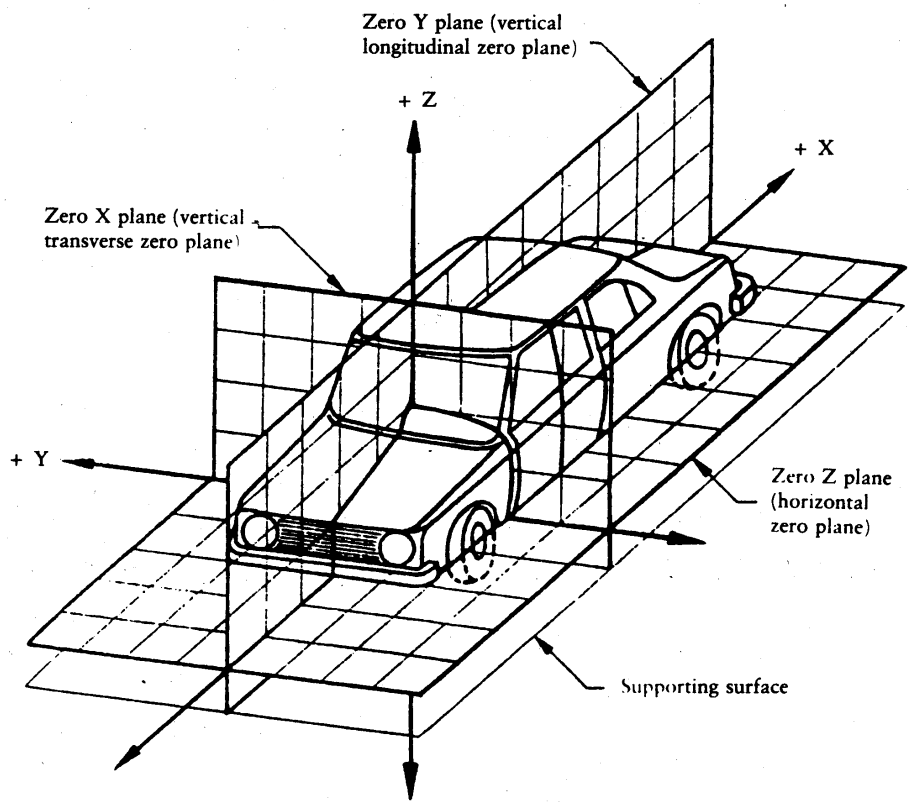


▼M3

Appendix 2

THREE-DIMENSIONAL REFERENCE SYSTEM

1. The three-dimensional reference system is defined by three orthogonal planes established by the vehicle manufacturer (see figure) ([1]).
2. The vehicle measuring attitude is established by positioning the vehicle on the supporting surface such that the coordinates of the fiducial marks correspond to the values indicated by the manufacturer.
3. The coordinates of the 'R' point and the 'H' point are established in relation to the fiducial marks defined by the vehicle manufacturer.



Three-dimensional reference system

([1]) The reference system corresponds to ISO standard 4130-1978.

▼M3

Appendix 3

REFERENCE DATA CONCERNING SEATING POSITIONS

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.

2. *Description of vehicle measuring attitude*

2.1. Coordinates of fiducial marks

X .....

Y .....

Z .....

3. *List of reference data*

3.1. Seating position: .....

3.1.1. Coordinates of "R" point

X .....

Y .....

Z .....

3.1.2. Design torso angle: .....

3.1.3. Specifications for seat adjustment (1)

horizontal: .....

vertical: .....

angular: .....

torso angle: .....

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

(1) Strike out what does not apply.

▼B

ANNEX IV

METHOD FOR DETERMINING THE DIMENSIONAL RELATIONSHIPS BETWEEN THE VEHICLE'S PRIMARY REFERENCE MARKS AND THE THREE-DIMENSIONAL REFERENCE GRID

1. RELATIONSHIP BETWEEN REFERENCE GRID AND VEHICLE PRIMARY REFERENCE MARKS

   To verify specific dimensions on or within a vehicle submitted for type-approval in accordance with this Directive, the relationship between the coordinates of the three-dimensional reference grid, defined in 2.3 of Annex I, which has been laid out at the initial vehicle-design stage, and the positions of the primary reference marks defined in 2.4 of Annex I, must be established accurately so that specific points on the vehicle manufacturer's drawings can be identified on an actual vehicle produced from those drawings.

2. METHOD FOR ESTABLISHING RELATIONSHIP OF REFERENCE GRID TO REFERENCE MARKS

   For this purpose, a ground reference plane shall be constructed which is marked with the X-X measurement and the Y-Y measurement. The method of achieving this is set out in figure 6 of the Appendix to this Annex, the reference plane being a hard, flat, level surface upon which the vehicle stands, and which has two measuring scales firmly fixed to its surface; these shall be graduated in millimetres, the X-X scale being not less than eight metres long, and the Y-Y scale not less than four metres long. The two scales must be set at right angles to each other as shown in figure 6 of the Appendix to this Annex. The intersection of these scales is ground zero.

3. EXAMINATION OF THE REFERENCE PLANE

   In order to provide for minor variations in the level of the reference plane or test area, it will be necessary to measure the deviations from ground zero along both the X and Y scales at intervals of 250 mm and to record the readings obtained so that corrections can be made when checking the vehicle.

4. ACTUAL TEST ATTITUDE

   In order to provide for minor changes in suspension height, etc., it will be necessary to have available a means of bringing the primary reference marks to the correct coordinate positions relative to the design attitude before further measurements are taken. In addition, it must be possible to make minor lateral and/or longitudinal adjustments of the vehicle's position so as to place it accurately in relation to the reference grid.

5. RESULTS

   The vehicle having been correctly placed relative to the reference grid and in its design attitude, the site of the necessary points for studying the forward visibility requirements can be readily determined.

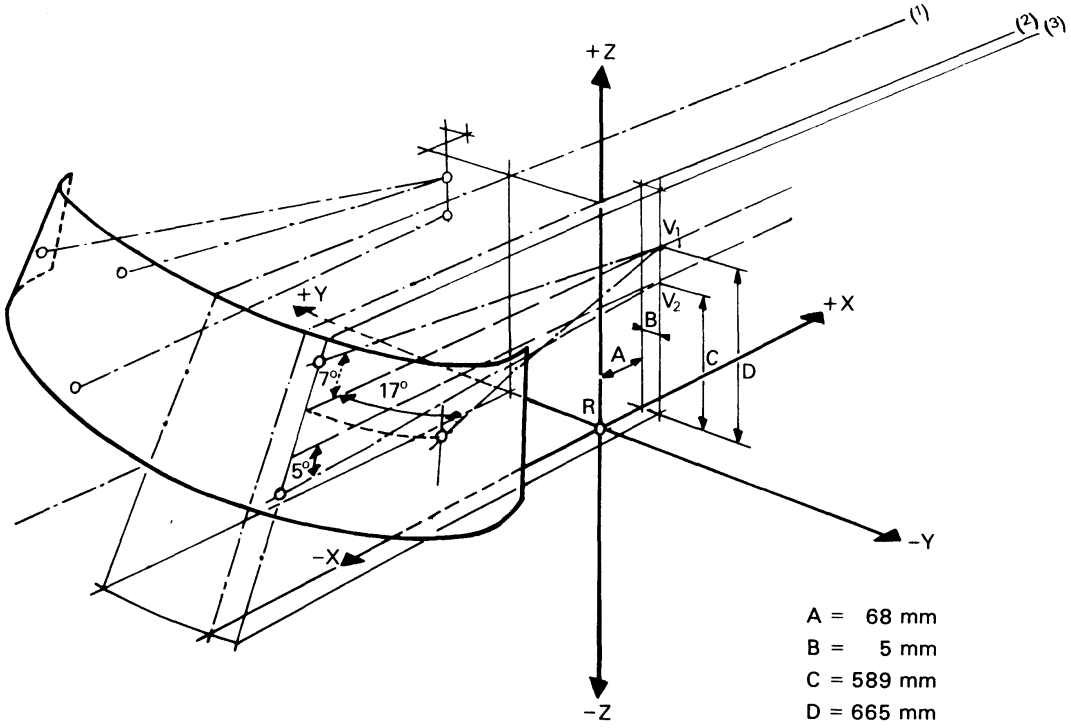
   Test methods to determine these requirements may include the use of theodolites, light sources or shadow devices, or any other method which can be shown to give equivalent results.

▼M2

Appendix

▼B

DETERMINATION OF V POINTS



(1) Line tracing the median longitudinal plane of the vehicle.
(2) Line tracing the vertical plane passing through R.
(3) Line tracing the vertical plane passing through V_1 and V_2.

Figure 1

▼M2

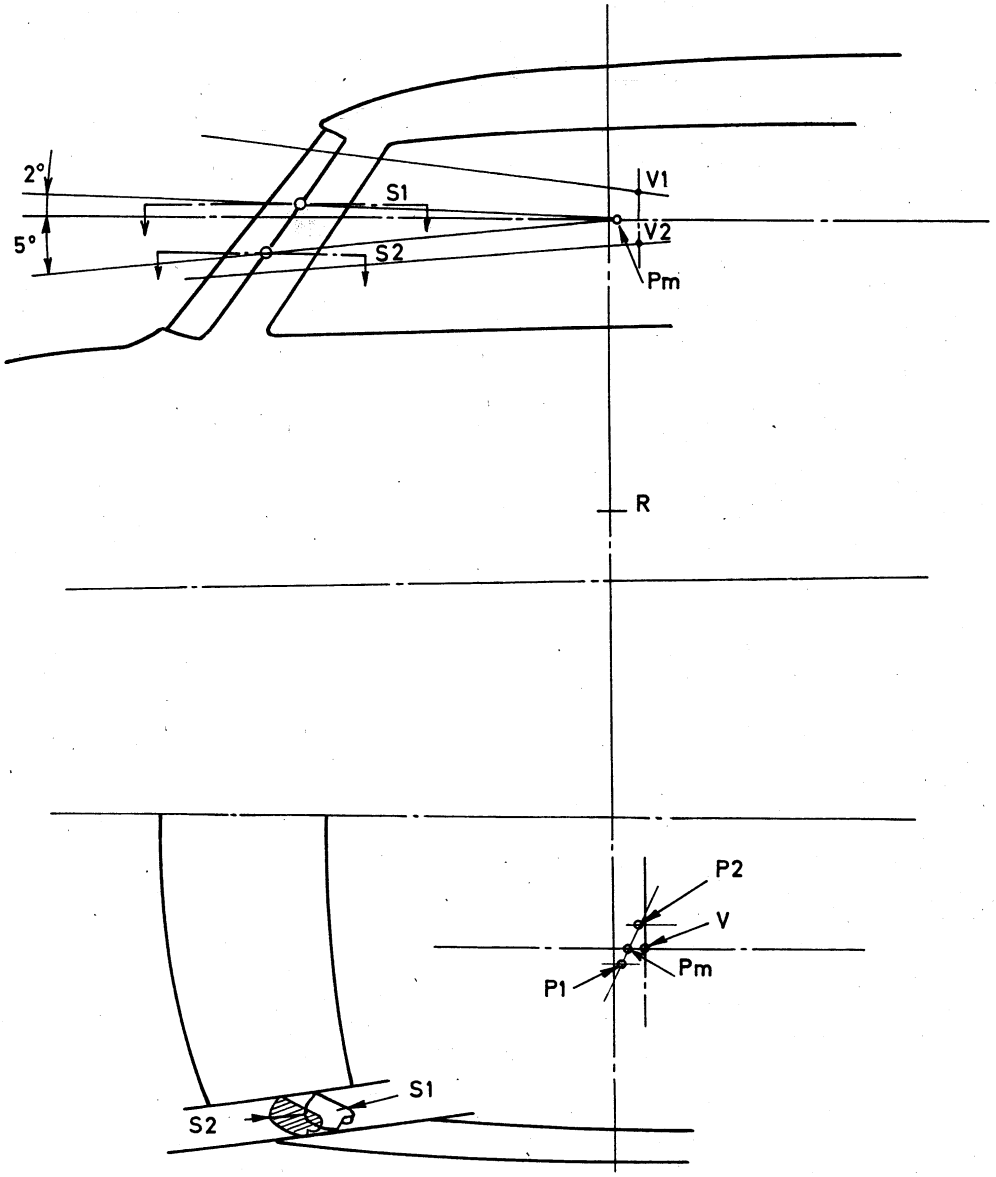


Figure 2

▼M2

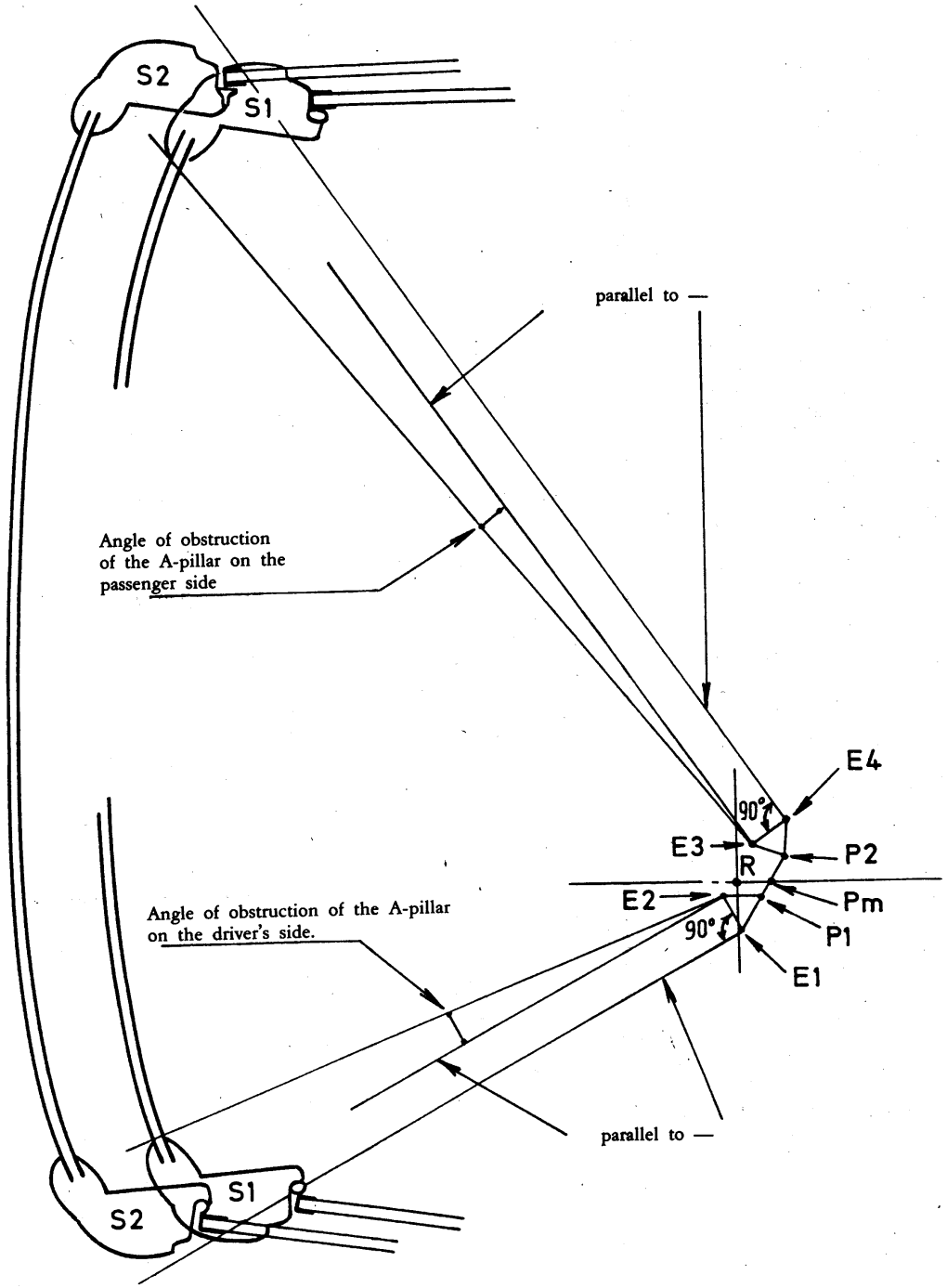
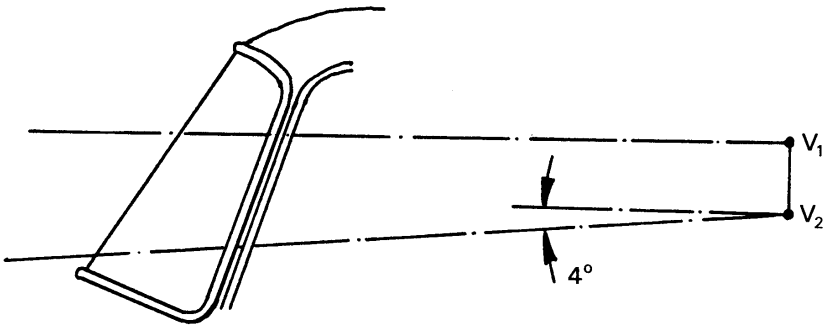

S2
S1
parallel to —
Angle of obstruction
of the A-pillar on the
passenger side
E4
90°
E3
R
P2
E2
Pm
90°
P1
E1
Angle of obstruction of the A-pillar
on the driver's side.
parallel to —
S1
S2

Figure 3

▼B

EVALUATION OF OBSTRUCTIONS IN THE 180º FORWARD DIRECT FIELD OF VISION OF THE DRIVER



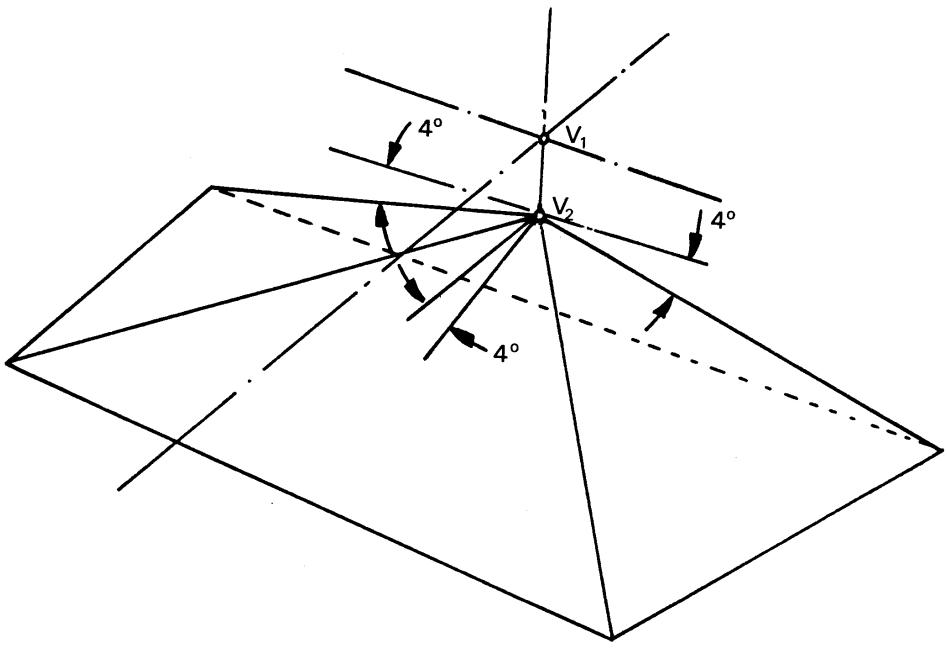


Figure ►M2 *4* ◄

▼B

DIMENSIONAL DIAGRAM SHOWING RELATIVE POSITIONS OF E POINTS AND P POINTS

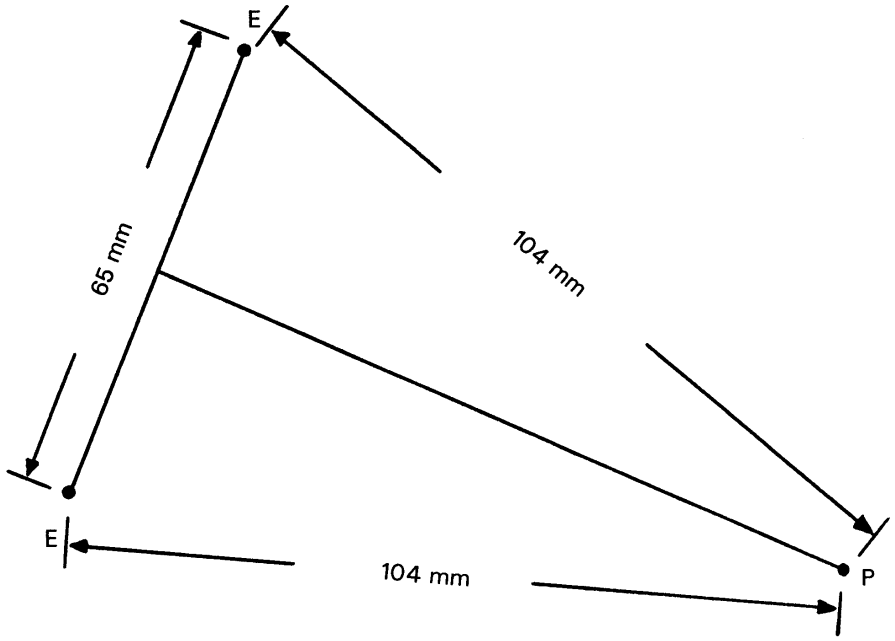


Figure ►**M2** *5* ◄

▼B

THREE-DIMENSIONAL REFERENCE GRID

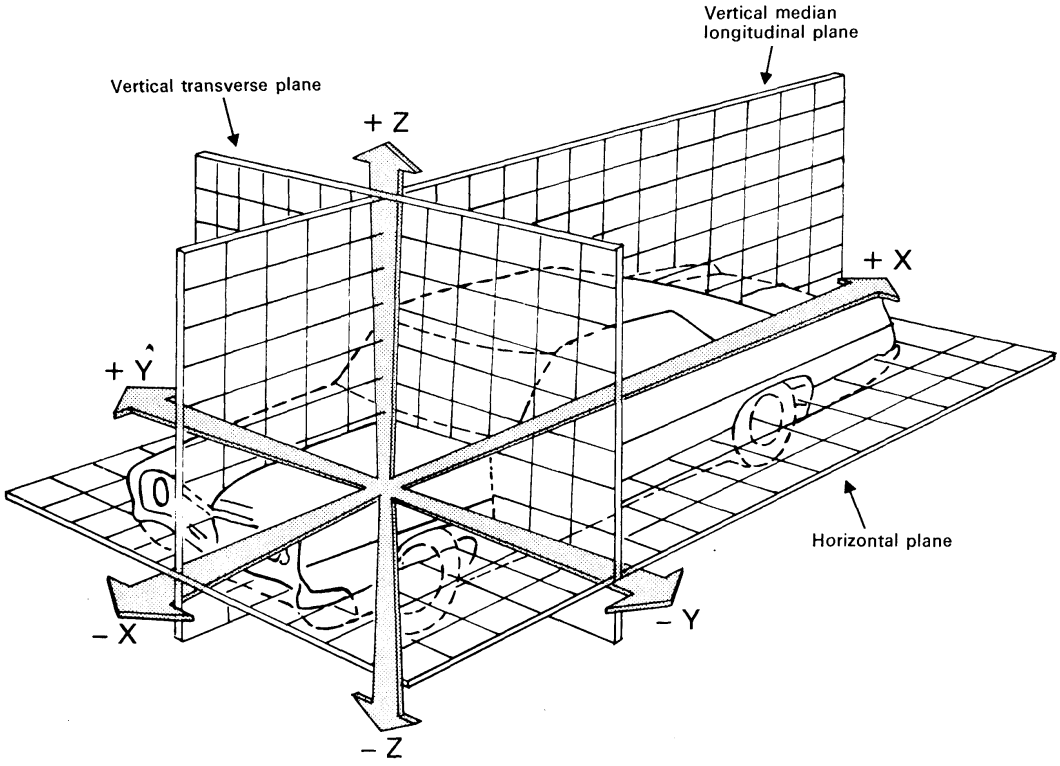


Figure ►M2 *6* ◄

▼C1

LEVEL WORK SPACE

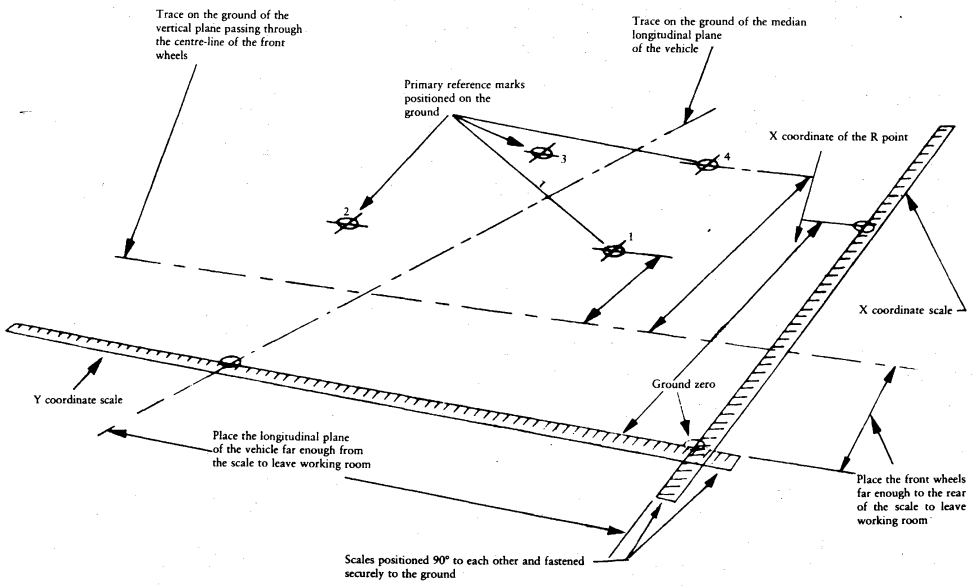


Figure ►**M2** *7* ◄

▼B

ANNEX V

MODEL

(Maximum format: A 4 (210 x 297 mm))

Name of administration

ANNEX TO THE EEC VEHICLE TYPE-APPROVAL CERTIFICATE WITH REGARD TO THE DRIVER'S FIELD OF VISION

(Article 4 (2) and Article 10 of the Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers)

EEC type-approval No .....

1. Trade name or mark of the vehicle .....
2. Vehicle type .....
3. Manufacturer's name and address .....
4. Where applicable, name and address of manufacturer's authorized representative .....
   .....
5. Brief description of the vehicle .....
6. Identification data for R point of driver's designated seating position in relation to position of primary reference marks.....
   .....
7. Identifications, sites and relative positions of primary reference marks .....
8. Vehicle submitted for type-approval on .....
9. Technical service conducting type-approval tests .....
10. Date of report issued by that service.....
11. Number of report issued by that service .....
12. Type-approval in respect of the driver's field of vision is granted/refused (1)
13. Place .....
14. Date .....
15. Signature .....
16. The following documents, bearing the type-approval number shown above, are annexed to this certificate:
    ..... dimensional drawings
    ..... exploded view of photograph(s) of the passenger compartment
17. Remarks .....

(1) Delete as applicable.