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भारतीय मानक प्रारूप

मोटर वाहन - यात्री कारें - चालक का सत्यापन दृश्य
भाग 2 परीक्षण की विधि

Draft Indian Standard

AUTOMOTIVE VEHICLES — PASSENGER CARS — VERIFICATION OF DRIVER'S DIRECT FIELD OF VIEW
PART 2 METHOD OF TEST

ICS: 43.100

Last date for receipt of comments is 15/12/2022

Automotive Braking Systems, Vehicle Testing, Steering and performance Evaluation Sectional Committee, TED 4

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Vehicles Testing and Performance Evaluation Sectional Committee had been approved by the Transport Engineering Division Council.

This standard is in entire agreement with ISO 7397-2: 1993 'Passenger cars - Verification of driver's direct field of view: Part 2 Test method'. Reference has also been made to EEC directive 77/649 Field of vision of motor vehicle drivers.

> NOTE — Part 1 of the standard specifies the vehicle positioning for static measurement as the stage prior to carrying out this test method.

The composition of the Committee responsible for the formulation of this standard is given at **Annex B (will be added later)**

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of test or analysis, shall be rounded off in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

AUTOMOTIVE VEHICLES — PASSENGER CARS — VERIFICATION OF DRIVER'S DIRECT FIELD OF VIEW
PART 2 METHOD OF TEST

1 SCOPE

This standard prescribes the method of test for verifying the compliance of a passenger car for the driver's 180° forward field of view.

It does not preclude the use of other methods, provided that the validity of the results obtained may be proved and that due account is taken of the accuracy of the method employed.

2 REFERENCES

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

IS No.	*Title*
9435 : 2004	Terms and Definitions Relating to Dimensions of Road Vehicles Other than 2 and 3 Wheelers
13749 : 2009	Automotive vehicles - Procedure for determining the "H" point and the torso angle for 50th percentile adult male in seating positions of motor vehicles
14346 (Part 1): 1996	Automotive vehicles — Passenger cars — Verification of driver's direct field of view: Part 1 Vehicle positioning for static measurement

3 TERMINOLOGY

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

3.1 A-pillar (Vehicle) — Roof support forward of the 'R'-point which include all non-transparent items such as windscreen mouldings and door window frames, attached to or contiguous with such support.

3.2 Direct Field of View — View capable of being seen by the driver without the aid of mirrors.

3.3 Eye Points (E Points) — Specific points on the left and right eyellipse contours positioned in the same relative position on each ellipse.

3.4 Eyellipse — Contraction of the words “eye” and “ellipse”, describing the elliptical shape of the driver’s eye range.

NOTES —
1) The term “eyellipse” shall be used solely in this application; and
2) Eyellipse is synonymous with driver’s eye range.

3.5 Eyellipse Template — Two-dimensional design tool consisting of a plan view and a side view of the driver’s left and right eye ranges from which sight lines may be constructed for the purpose of describing the location of objects in the field of view of the seated driver.

3.6 Field of View — Solid angle subtended by sight planes emanating from tangents on the eyellipse contours or from the appropriate vision origin point.

3.7 H-point — Pivot centre of the torso and thigh on the three dimensional H-point machine used for actual Hpoint determination. It is located on the centerline of the device which is between the H-point sight buttons on either side of the H-point machine (*see* IS 13749: 2009).

3.8 Design H-point ; R-point ; Seating Reference Point — Point which:

a) Establishes the rearmost normal driving or riding position of each designate seating position as stipulated by the manufacturer and which accounts for all modes of adjustment (horizontal, vertical and tilt) that are available for the seat;

b) Has coordinates established with respect to the designed vehicle structure;

c) Simulates the position of the pivot centre of the human torso and thigh; and

d) Is the reference point employed to position a two-dimensional template.

3.9 Neck Pivot Point (P-point) — Specific point about which the driver’s head turns on a horizontal plane. The point is about 98.8 mm to the rear of the mid-point between the eye points. It when combined with the eye points, is used in lieu of the complete eyellipse contour.

3.10 Design Back Angle — Angle measured between a true vertical line through the R-point (seating reference point) and the torso line of a two-dimensional template.

3.11 Vision Origin Points — Vision points (V points) and eye points (E points), which rotate around the neck pivot point (P-point).

3.12 Vision Point (V-point) — Specific point on a sight plane, used instead of the complete eyellipse contour in specifying direct field of view requirements and in checking vehicle compliance with these requirements.

3.13 Fiducial Marks — Definition shall be as per **3.1** of IS 14346 (Part 1): 1996 (*see* Fig. 1).

4 VEHICLE POSITIONING

4.1 The vehicle shall be positioned in accordance with the procedure given in IS 14346 (Part 1): 1996.

4.2 The vehicle condition shall be achieved by setting up the vehicle using the fiducial marks indicated by the vehicle manufacturer for that loading condition, taking account of any special characteristics of the vehicle suspension.

5 VERIFICATION OF VEHICLE

5.1 Test Equipment

5.1.1 Device for Projection of Beams In any desired direction, for instance towards the windscreen datum points, which may be mounted relative to the three-dimensional system of the vehicle on the head of a three-dimensional measuring and marking-out machine.

5.1.2 *Device for Projection of Obstruction Angles*

This may be mounted on the head of a three-dimensional measuring machine and may be pivoted around the P-point.

NOTE — The devices described in **5.1.1** and **5.1.2** may bea laser measuring device conforming to Annex A.

5.1.3 *Transparent Overlay*

Transparent overlay to cover the windscreen.

5.2 Test Procedure

5.2.1 After positioning the vehicle on the measuring base plate (*see* Fig. 2) corresponding to the coordinates of the measuring system by use of jacks, the springs are relieved and the vehicle R-point set to zero on the machine. Mount the beam projection device onto the head of the measuring machine, level it and calibrate its X and Y axis.

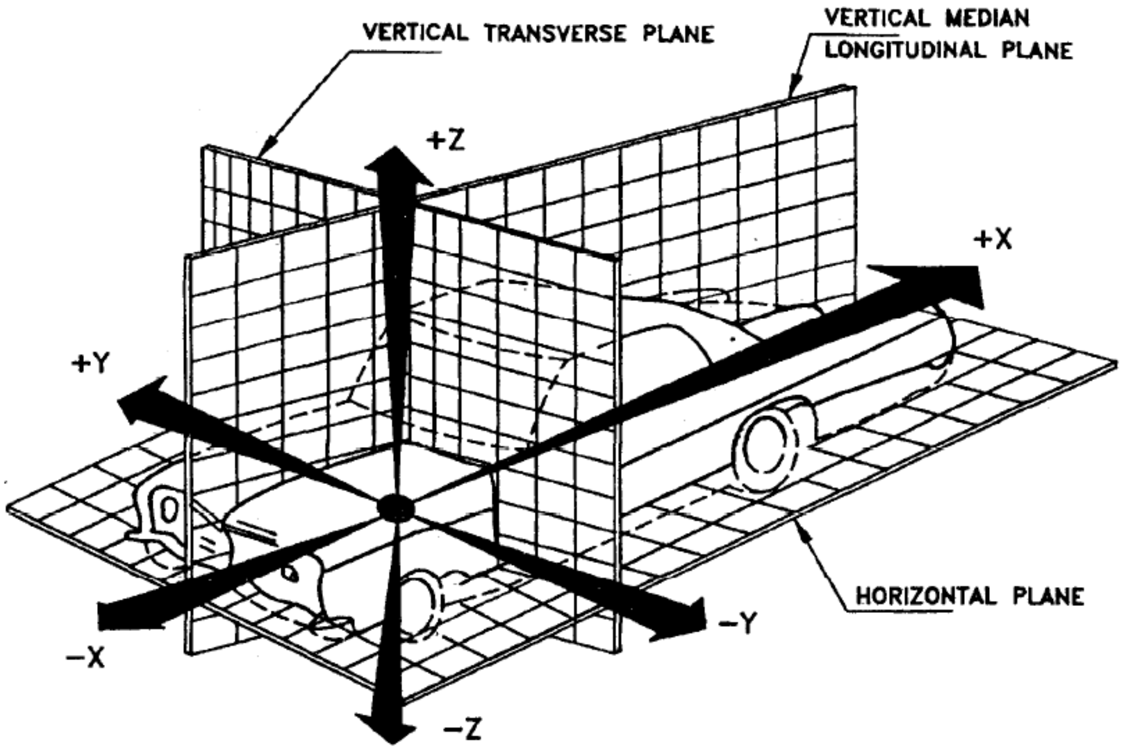


FIG. 1 THREE DIMENSIONAL REFERENCE GRID

5.2.2 Adjust the position of the projection device so that the origin of the beam comes out of V_1 (*see* Table 1 and Table 4).

5.2.3 Cover the windscreen with the overlay and adjust the desired angles either 17° forward and outwards from V_1 or 7° forward and upward from V_1 and mark these points on the overlay (*see* Fig. 3).

5.2.4 Adjust the position of the projection device so that the origin of the beam comes out of V_2 (see Table l), adjust the angle of 5° forward and downwards from V_2 and mark this point on the overlay (*see* Fig. 3).

5.2.5 Verify by measurement that three additional datum points are obtainable symmetrical to the points determined in **5.2.3** and **5.2.4** in relation to the median longitudinal plane of the vehicle.

5.2.6 Adjust the projection device so that the origin of the beam comes out of Pm (*see* Table 2 and Table 3) with an angle of 2° forward and up- wards, and determine the intersection of the 2° plane with the most forward point of ‘the A-pillar. This intersection point defines the Z-coordinate of S_1 (*see* Fig. 4).

Repeat this procedure with an angle of 5° forward and downwards to get the Z-coordinate of the lower horizontal intersection S_2 of the A-pillar (*see* Fig. 4).

5.2.7 Install the device for ascertaining obscuration on to the projection device and position the origin of the beam coming out horizontally from P_1 with the Z-coordinate of S_2. Rotate the theodolite around Pt so that the beam out of El (*see* Fig. 5) meets the A-pillar at its left side. Fix this theodolite position and change only the Z-coordinate to that of St. Rotate the micrometer screw to meet the A-pillar at its right side. The micrometer gives the construction angle of this A-pillar (in degrees).

5.2.8 Repeat this measurement out of the position of P_2 with a symmetrical device.

5.2.9 Position the projection device as in **5.2.2** and rotate a horizontal beam.

5.2.10 Verily that no obscuration is apparent except that caused by A-pillars, vent window division bars, rear view mirrors, windscreen wipers and radio aerials.

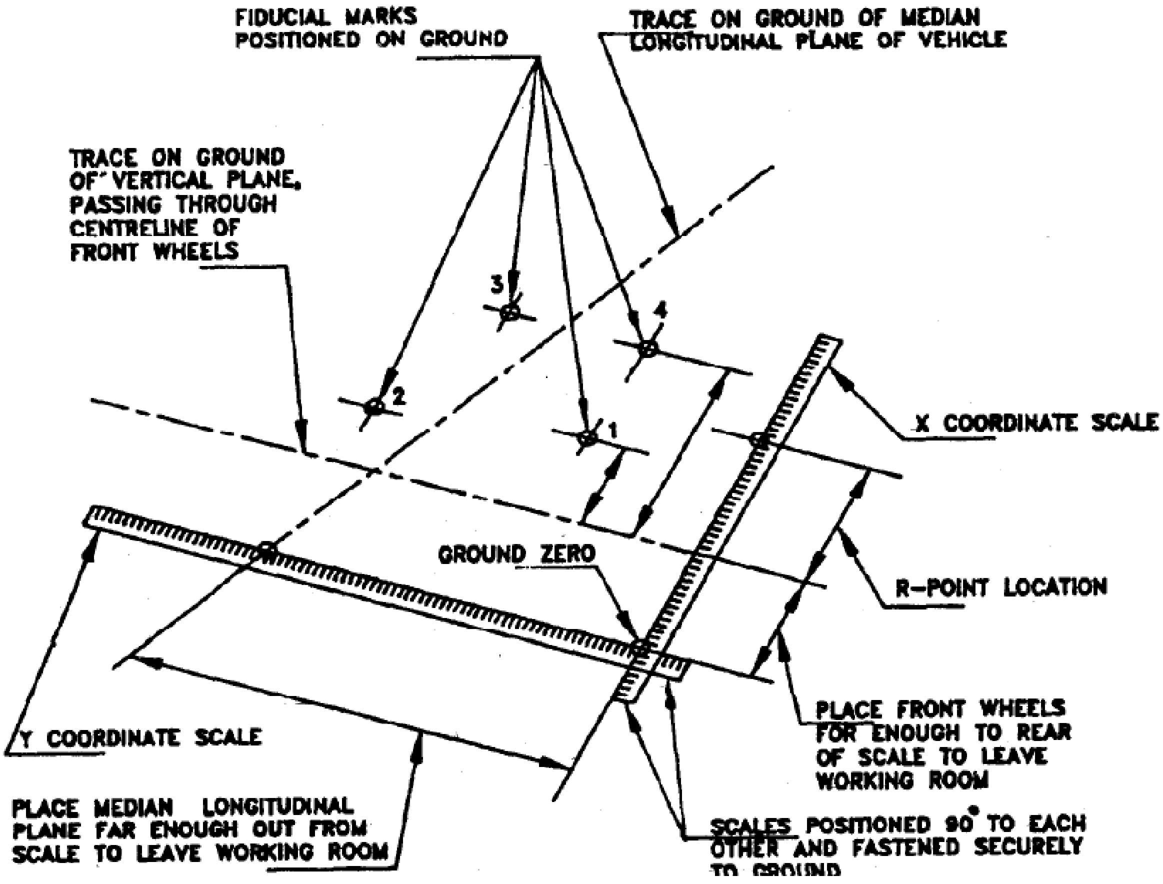
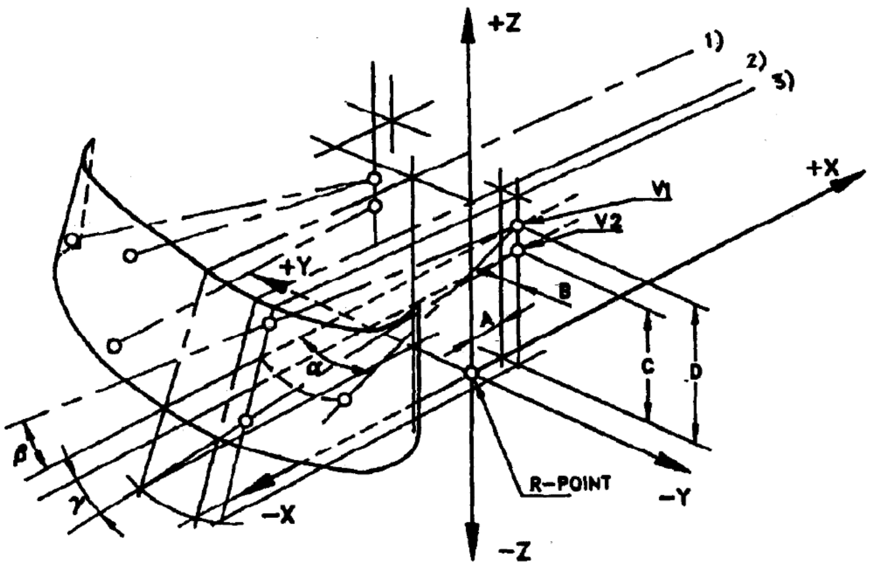


FIG. 2 MEASURING BASE LATE



α = 17°	*A* = 68 mm	1) Line Tracing the Median Longitudinal Plane of the Vehicle
β = 7°	*B* = 5 mm	2) Line Tracing the Vertical Plane Passing Through *R*
γ = 5°	*C* = 589 mm	3) Line Tracing the Vertical Plane Through V_1 and V_2
	D = 665 mm	

FIG. 3 DETERMINATION OF V-POINTS

5.2.11 Position the projection device as in 52.4 and adjust it to an angle 4” downward; rotate the device by its vertical axis through the 180° forward range.

5.2.12 Ensure no obstruction is apparent as in5.2.10. When any obstruction is observed, check the direction of the tangent beam in the following manner.

The tangent angle of incidence α or α ' which may pass through glared areas shall be at least:

i) In the driving direction: $(\theta = 0°)$: $\alpha \geq 4°$

ii) In the transverse direction: $(|\theta| = 90°)$: $\alpha \geq 4°$

iii) For $0° < |\theta| < 45°$: $\alpha \geq \arctan(\cos|\theta| \times \tan 4°)$

iv) For $45° \leq |\theta| < 90°$:
$\alpha = \arctan\{\cos[[|\theta| - 2 \times (|\theta| - 45)] \times \tan 4°\}$

5.3 Laser Measuring Device (Additional Test Procedure)

5.3.1 Install the laser theodolite in accordance with the operating instructions of the producer and ensure that the radiation of the low-power beam source may not hit the operator's eyes.
5.3.2 Check calibration by observing the laser spot on a screen by running the machine along the X axis the parallel to the X axis and the theodolite is levelled exactly.

Table 1 V-points - Basic Coordinates for a Design Seat-torso Angle of 25°
(*Clauses* 5.2.2 *and* 5.2.4)

Dimensions in millimetres

V-Point	Coordinate		
	X	Y	Z
V1	68	—5	665
V2	68	—5	589

NOTES —
1) The positions of the V-points of relation to the R-point, as indicated by X, Y and Z coordinates from the three dimensional reference grid (*see* Fig. 1) are as shown in Table 1 and 4; and
2) The positive direction for the coordinates is indicated in Fig. 3.

Table 2 P-points - Basic Coordinates for a Design Seat-torso Angle of 25°
(*Clause* 5.2.6)

All Dimensions in millimetres.

P-point	Coordinate		
	X	Y	Z
P_1	35	—20	627
P_2	63	47	627
P_m	43, 36	0	627

NOTE — The positive direction for the coordinates is indicated in Fig. 3.

Table 3 Corrections to be Made to *X* Coordinates of Pi and P2 when Horizontal Seat-Adjustment Range Exceeds 108 mm
(*Clause* 5.2.6 and Table *2*)

All Dimensions in millimetres.

Horizontal Seat-adjustment Range	ΔX
108 to 120	–13
121 to 132	–22

133 to 145	–32
146 to 158	–42
>168	–48

NOTE — The positive direction for the coordinates is indicated in Fig. 3.

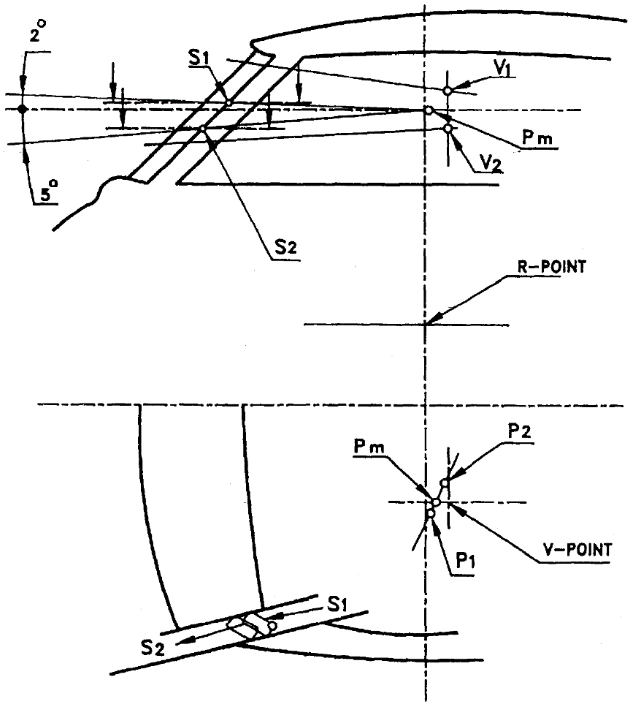


FIG. 4 OBSTRUCTION CAUSED BY A-PILLAR

Table 4 Correction to be made to *X* and *Z* Coordinates of each P-point and each V-point when Design Seat-Back Angle is not 25°
(*Clause* 5.2.2 and Table 1)

All Dimensions in millimetres.

Seat-Back Angle Degrees	AX mm	AZ mm	Seat-Back Angle Degrees	AX mm	AZ mm
5	–186	28	23	–18	5
6	–177	27	24	–9	3
7	–167	27	25	0	0
8	–157	27	26	9	–3
9	–147	26	27	17	–5
10	–137	25	28	26	–8
11	–128	24	29	34	–11
12	–118	23	30	43	–14
13	–109	22	31	51	–18

14	–99	21	32	59	–21
15	–90	20	33	67	–24
16	–81	18	34	76	–28
17	–72	17	35	84	–32
18	–62	15	36	92	–35
19	–53	13	37	100	–39
20	–44	11	38	108	–43
21	–35	9	39	115	–48
22	–26	7	40	123	–52

NOTE — The positive direction for the coordinates is indicated in Fig. 3.

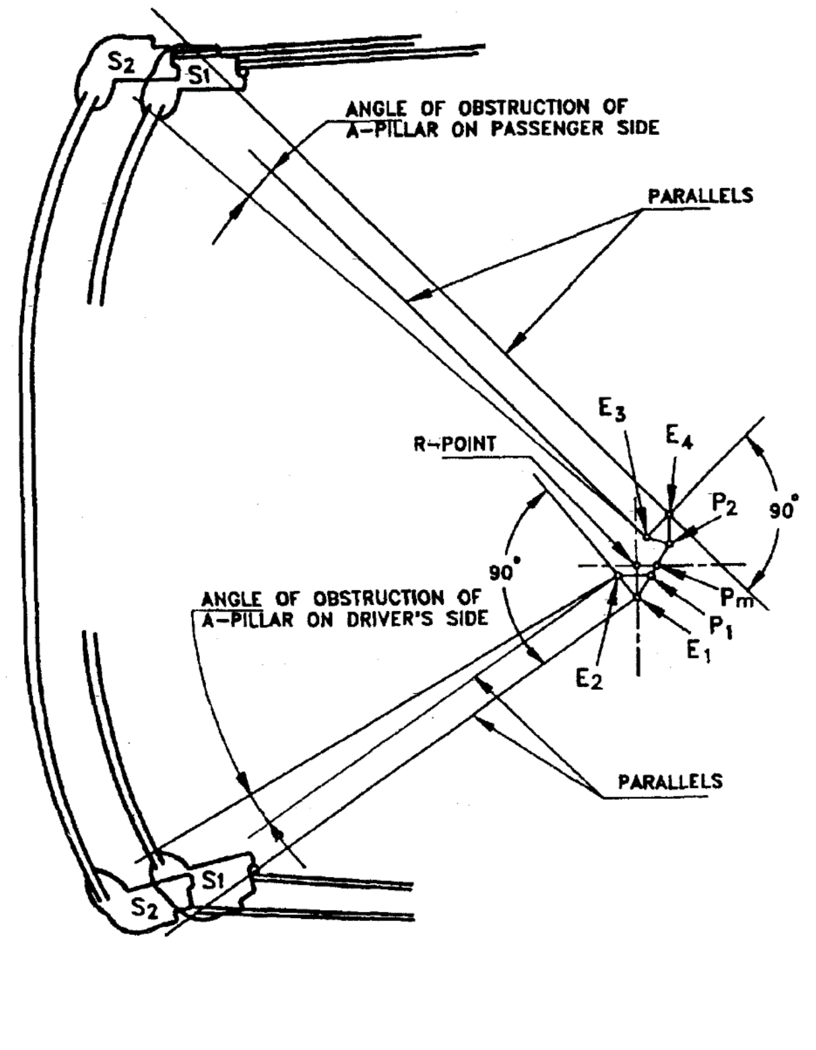


FIG. 5 HORIZONTAL INTERSECTION OF A- PILLAR TO ASZERTAIN OBSTRUCIJON ANGLES

ANNEX A
(*Clause* 5.1.2)

LASER MEASURING DEVICES

A-l TYPE

A laser measuring device consists of either the type described in **A-l.1** or **A-1.2.**

A-1.1 A laser device pivoting about a fixed vertical and horizontal axis typical axis system of a theodolite [*see* Fig. 6 (a)] or beam splitter, mounted on to the laser device, to obtain E-point [*see* Fig (b)].

A-l.2 A laser device fitted on a pivoting axis normal to a fixed horizonal pivoting axis (*see* Fig. 7).

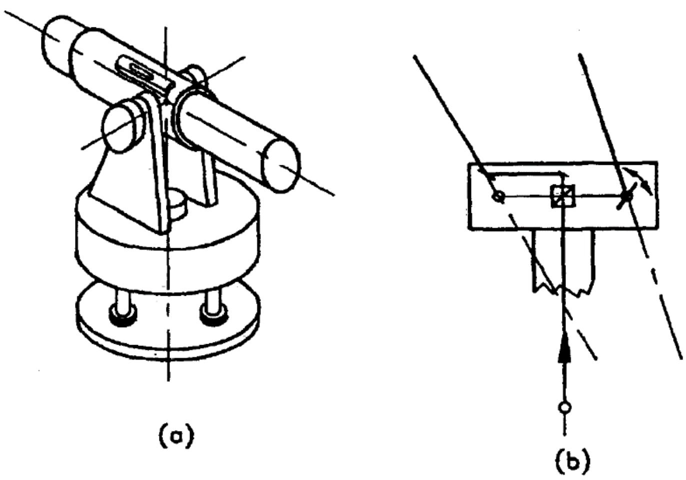


FIG. 6 TYPICAL AXIS SYSTEM OF THEODOLITE

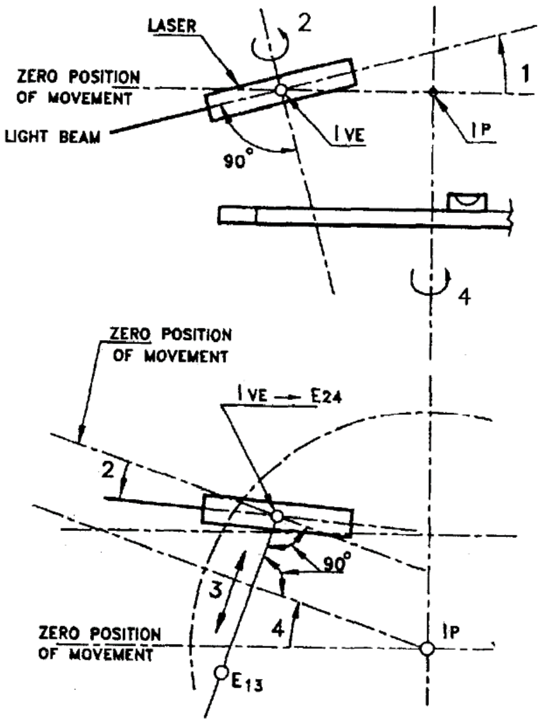


FIG. 7 LAKER DEVICE FITTED ON PIVOTING AXIS NORMAL TO FIXED HORIZONTAL PIVOTING AXIS

A-2 ANGULAR CORRECTIONS

A-2.1 The laser positions obtained after pivot the devices in **A-l** of the same angle values for α and β in the case of **A-1.1** and for v and h in the case **A-l.2** are not identical. The differences are due:

i) In **A-1.1** when the laser pivots about the vertical axis (*α*) of a given value with respect to the horizontal axis (*β*), the laser beam describes a cone with a semi-angle vertex (π/2 - β).

ii) In **A-1.2**, when the laser pivots about the horizontal axis of a value *v*, then of a value *h* as the other axis, the laser beam remains in a plan.

A-2.2 When the laser measuring device is not provided with an automatic adjusting system, the angle correction tables (Tables 5 to 14) shall be used.

Table 5 Angle Corrections for *h* Variants from 0 to 30° with *v* at 4° Inclined Plane
(*Clause* A-2.2)

Values in degrees.

v	h	α	β
4	0	4	0
4	1	4	1
4	2	4	2
4	3	3.99	3.01
4	4	3.99	4.01
4	5	3.98	5.01
4	6	3.98	6.01
4	7	3.97	7.02
4	8	3.96	8.02
4	9	3.95	9.02
4	10	3.94	10.02
4	11	3.93	11.03
4	12	3.91	12.03
4	13	3.9	13.03
4	14	3.88	14.03
4	15	3.86	15.03
4	16	3.84	16.04
4	17	3.82	17.04
4	18	3.8	18.04
4	19	3.78	19.04
4	20	3.76	20.04
4	21	3.73	21.05
4	22	3.71	22.05
4	23	3.68	23.05
4	24	3.65	24.05
4	25	3.62	25.05
4	26	3.59	26.06
4	27	3.56	27.06
4	28	3.53	28.06
4	29	3.5	29.06
4	30	3.46	30.06

Table 6 Angle Corrections for *β* Variants from 0 to 30° with v at 4° Inclined Plane
(*Clause* A-2.2)

Values in degrees.

v	h	α	β
4	0	4	0
4	1	4	1
4	2	4	2
4	2.99	3.99	3
4	3.99	3.99	4
4	4.99	3.98	5
4	5.99	3.98	6
4	6.98	3.97	7
4	7.98	3.96	8
4	8.98	3.95	9
4	9.98	3.94	10
4	10.97	3.93	11
4	11.97	3.91	12
4	12.97	3.9	13
4	13.97	3.88	14
4	14.97	3.86	15
4	15.96	3.84	16
4	16.96	3.82	17
4	17.96	3.8	18
4	18.96	3.78	19
4	19.96	3.76	20
4	20.95	3.73	21
4	21.95	3.71	22
4	22.95	3.68	23
4	23.95	3.65	24
4	24.95	3.62	25
4	25.95	3.59	26
4	26.94	3.56	27
4	27.94	3.53	28
4	28.94	3.5	29
4	29.94	3.46	30[1)]

NOTE — [1)] Limit angular values for 4” inclined planes.

Table 7 Angle Corrections for *h* Variants from 31° to 60° with v at 4° Inclined Plane
(*Clause* A-2.2)

Values in degrees.

v	h	α	β
4	31	3.43	31.06
4	32	3.39	32.06
4	33	3.35	33.06
4	34	3.32	34.06
4	35	3.28	35.07
4	36	3.24	36.07
4	37	3.19	37.07
4	38	3.15	38.07
4	39	3.11	39.07
4	40	3.06	40.07
4	41	3.02	41.07
4	42	2.97	42.07
4	43	2.92	43.07
4	44	2.88	44.07
4	45	2.83	45.07
4	46	2.78	46.07
4	47	2.73	47.07
4	48	2.68	48.07
4	49	2.62	49.07
4	50	2.57	50.07
4	51	2.52	51.07
4	52	2.46	52.07
4	53	2.41	53.07
4	54	2.35	54.07
4	55	2.29	55.07
4	56	2.24	56.06
4	57	2.18	57.06
4	58	2.12	58.06
4	59	2.06	59.06
4	60	2	60.06

Table 8 Angle Corrections for *β* Variants from 31° to 60° with *v* at 4° Inclined Plane
(*Clause* A-2.2)

Values in degrees.

v	h	α	β
4	30.94	3.43	31
4	31.94	3.39	32
4	32.94	3.35	33
4	33.94	3.32	34
4	34.93	3.28	35
4	35.93	3.24	36
4	36.93	3.19	37
4	37.93	3.15	38
4	38.93	3.11	39
4	39.93	3.06	40
4	40.93	3.02	41
4	41.93	2.97	42
4	42.93	2.92	43
4	43.93	2.88	44
4	44.93	2.83	45
4	45.93	2.78	46
4	46.93	2.73	47
4	47.93	2.68	48
4	48.93	2.62	49
4	49.93	2.57	50
4	50.93	2.52	51
4	51.93	2.46	52
4	52.93	2.41	53
4	53.93	2.35	54
4	54.93	2.29	55
4	55.94	2.24	56
4	56.94	2.18	57
4	57.94	2.12	58
4	58.94	2.06	59
4	59.94	2	60

Table 9 Angle Corrections for *h* Variants from 61° to 90° with v at 4° Inclined Plane
(*Clause* A-2.2)

Values in degrees.

v	h	α	β
4	61	1.94	61.06
4	62	1.88	62.06
4	63	1.81	63.06
4	64	1.75	64.06
4	65	1.69	65.05
4	66	1.63	66.05
4	67	1.56	67.05
4	68	1.5	68.05
4	69	1.43	69.05
4	70	1.37	70.04
4	71	1.3	71.04
4	72	1.24	72.04
4	73	1.17	73.04
4	74	1.1	74.04
4	75	1.03	75.03
4	76	0.97	76.03
4	77	0.9	77.03
4	78	0.83	78.03
4	79	0.76	79.03
4	80	0.69	80,02
4	81	0.63	81.02
4	82	0.56	82.02
4	83	0.49	83.02
4	84	0.42	84.01
4	85	0.35	8501
4	86	0.28	86.01
4	87	0.21	87.01
4	88	0.14	88
4	89	0.07	89
4	90	0	90

Table 10 Angle Corrections for *β* Variants from 61° to 90° with *v* at 4° Inclined Plane
(*Clause* A-2.2)

Values in degrees.

v	h	α	β
4	60.94	1.94	61
4	61.94	1.88	62
4	62.94	1.81	63
4	63.95	1.75	64
4	64.95	1.69	65
4	65.95	1.63	66
4	66.95	1.56	67
4	67.95	1.5	68
4	68.95	1.43	69
4	69.96	1.37	70
4	70.96	1.3	71
4	71.96	1.24	72
4	72.96	1.17	73
4	73.96	1.1	74
4	74.97	1.03	75
4	75.97	0.97	76
4	76.97	0.9	77
4	77.97	0.83	78
4	78.97	0.76	79
4	79.98	0.69	80
4	80.98	0.63	81
4	81.98	0.56	82
4	82.98	0.49	83
4	83.99	0.42	84
4	84.99	0.35	85
4	85.99	0.28	86
4	86.99	0.21	87
4	88	0.14	88
4	89	0.07	89
1)	90	0	90

NOTE — 1) Not determined.

Table 11 Angle Corrections for *h* Variants from 0° to 17° with *v* at 5° Inclined Plane
(*Clause* A-2.2)

Values in degrees.

v	h	α	β
5	0	5	0
5	1	5	1
5	2	5	2.01
5	3	4.99	3.01
5	4	4.99	4.02
5	5	4.98	5.02
5	6	4.97	6.02
5	7	4.96	7.03
5	8	4.95	8.03
5	9	4.94	9.03
5	10	4.92	10.04
5	11	4.91	11.04
5	12	4.89	12.04
5	13	4.87	13.05
5	14	4.85	14.05
5	15	4.83	15.05
5	16	4.81	16.06
5	17	4.78	17.06

Table 12 Angle Corrections for *β* Variants from 0° to 17° with *v* at 5° Inclined Plane
(Clause A-2.2)

Values in dergees.

v	h	α	β
5	0	5	0
5	1	5	1
5	1.99	5	2
5	2.99	4.99	3
5	3.98	4.99	4
5	4.98	4.98	5
5	5.98	4.97	6
5	6.97	4.96	7
5	7.97	4.95	8
5	8.97	4.94	9
5	9.96	4.92	10
5	10.96	4.91	11
5	11.96	4.89	12
5	12.95	4.87	13
5	13.95	4.85	14
5	14.95	4.83	15
5	15.94	4.81	16
5	16.94	4.78	17[1)]

NOTE — [1)] Upper external edge of area B.

Table 13 Angle Corrections for *h* Variants from 0° to 17° with *v* at 7° Inclined Plane

(*Clause* A-2.2)

Values in degrees.

v	h	α	β
7	0	7	0
7	1	7	1.01
7	2	7	2.02
7	3	6.99	3.02
7	4	6.98	4.03
7	5	6.97	5.04
7	6	6.96	6.04
7	7	6.95	7.05
7	8	6.93	8.06
7	9	6.91	9.07
7	10	6.89	10.07
7	11	6.87	11.08
7	12	6.85	12.09
7	13	6.82	13.09
7	14	6.79	141
7	15	6.76	15.11
7	16	6.73	16.11
7	17	6.69	17.12

Table 14 Angle Corrections for *β* Variants from 0° to 17° with *v* at 7° Inclined Plane

(*Clause* A-2.2)

Values in degrees.

v	h	α	β
7	0	7	0
7	0.99	7	1
7	1.99	7	2
7	2.98	6.99	3
7	3.97	6.98	4
7	4.96	6.97	5
7	5.96	6.96	6
7	6.95	6.95	7
7	7.94	6.93	8
7	8.93	6.91	9
7	9.93	6.89	10
7	10.92	6.87	11
7	11.91	6.85	12
7	12.91	6.82	13
7	13.9	6.79	14
7	14.89	6.76	15
7	15.89	6.73	16
7	16.88	6.69	17[1)]

NOTE — [1)] Lower external edge of area B.

ANNEX B
(*Foreword*)

COMMITTEE COMPOSITION

AUTOMOTIVE BRAKING SYSTEMS, VEHICLE TESTING, STEERING AND PERFORMANCE EVALUATION SECTIONAL COMMITTEE, TED 4

(will be added later)