भारतीय मानक **IS 18762 : 2024**

Indian Standard

साइकिल, स्केटबोर्ड, और रोलर स्केट्स के उपयोगकर्ताओं के हेलमेट के परीक्षण के लिए हेडफॉर्म — विशिष्टि

Headforms for Testing of Helmets for Users of Bicycles, Skateboards, and Roller Skates — Specification

ICS 13.340.20

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
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Fire Fighting Sectional Committee, CED 22

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

The Indian Standard IS 7692 : 1993 'Headforms for testing of helmets — Specification (*first revision*)' specifies the size and constructional details of headform for use in testing of protective helmets; which is cross-referred in other helmet standards such as for mountaineers, industrial safety helmets, metal helmets for firefighters, non-metal helmets for police force, and for motorcycle riders.

This standard on headforms is meant for testing of protective helmet for users of bicycles, skateboard, and roller skates. This standard provides definitions, characteristics and headform markings, dimensions, tolerances, and errors to dimensions, etc of 'full headforms', 'half headforms' and 'three-quarter headforms'.

Half headforms are usually rigidly mounted (not falling), so consequently their mass is not important and is, therefore, not specified in this standard.

Three-quarter headforms are also used rigidly mounted but are often used in a falling headform and helmet assembly arrangement for shock absorption tests, where they are typically supported by means of a ball joint and cantilever. In such cases, the falling mass comprises that of the headform and of the supporting system. Some helmet standards specify total falling mass, whereas some specify only the mass of the headform. For this reason, only the dimensions, not the masses, of the three-quarter headforms are specified in this standard.

Headforms that are intended to be used in rigidly mounted or in guided fall or in free fall systems are also covered in this standard.

While, earlier, the headforms having nominal sizes specified in millimetres as 500, 520, 540, ..., 620, the actual circumferences are closer to five millimetres greater or less than nominal. In this standard therefore, the size designations have been specified according to the actual nominal circumference, in increments of ten millimetres (445, 455, 465, ..., 645).

In order to overcome the problems of tolerancing, spherical coordinate system is introduced namely, using point 'R' (the geometric centre) as the datum and then specifying the radius of points on the outer surface of the headform at various angles measured from point 'R'. Appropriate tolerances have also been assigned to the radius and to the angles.

As part of the process, linear regression lines through the existing data sets for head sizes A to O have been established and the spherical coordinates were specified from the equations of these regression lines. The coordinates of the new, smaller heads, sizes 445 to 485, were derived by simple scaling of the corresponding points of head size 495 in proportion to the respective circumferences.

Partly because of the impossibility of assigning these smaller heads code letters less than A, it was decided to abandon the code letter system of identification. Headforms have been classified according to a size designation, which corresponds to their circumference.

The spherical coordinates of head sizes 445 to 645 are given in the normative Annex A. The equations, which define the radii of the spherical coordinates in terms of headform circumference and vertical and horizontal angles, are given in the informative Annex B.

The composition of the Committee responsible for the for formulation of this standard is given in Annex C.

In the formulation of this standard, considerable assistance was derived from:

EN 960 : 2006 'Headforms for use in the testing of protective helmets'.

(*Continued on third cover*)

Indian Standard

HEADFORMS FOR TESTING OF HELMETS FOR USERS OF BICYCLES, SKATEBOARDS, AND ROLLER SKATES — SPECIFICATION

1 SCOPE

1.1 This standard specifies the dimensional and constructional details of headforms for use in the testing of protective helmets used for riders of bicycles, skateboards, and roller skates.

1.2 The headforms for testing other types of helmets are covered in IS 7692 and IS 4151.

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provisions 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 edition of these standards:

IS No.	*Title*
IS 4151 : 2015	Protective helmet for two wheeler riders — Specification (*fourth revision*)
IS 7692 : 1993	Headforms for testing of helmets — Specification (*first revision*)

3 TERMINOLOGY

For the purposes of this standard, the following terms and definitions apply.

3.1 AA' Plane — For a given headform, the horizontal transverse plane located at a vertical distance 12.7 mm above and parallel to the reference plane (*see* Fig. 1).

NOTE — This plane is deemed to correspond to the level of the lower edge of the headband of a helmet. It is the basis upon which the size designation of a helmet may be specified.

3.2 Basic Plane — For a given headform, the horizontal plane located at a vertical distance 'x' below and parallel to the reference plane (*see* Fig. 1).

NOTE — This corresponds to the basic plane of the human head being the longitudinal plane which passes through the lower level of the eye orbits and the upper level of the external opening of the ear canals.

3.3 Central Vertical Axis — Vertical axis lying along the intersection of the vertical longitudinal plane and the vertical transverse plane (*see* Fig. 1).

3.4 Centre of Gravity of the Full Headform Point G — For a given headform, the point on the central vertical axis located at a vertical distance 'z' below the reference plane, as given in Table 1.

3.5 Centre of Gravity of the Three-Quarter Headform Point A — For a given headform, the point on the central vertical axis located in a headform at a vertical distance 12.7 mm above the reference plane.

3.6 Circumference, C — For a given headform, the length of its periphery, measured at the level of the reference plane (*see* Fig. 1).

3.7 Crown — Area on the upper, outer surface of a headform, centred on the central vertical axis.

3.8 Geometric Centre Point R — For a given headform, the point on the central vertical axis, located at its intersection with the reference plane.

NOTE — This point is the datum for all the dimensions given in Annex A.

3.9 Headform — Three-dimensional approximation of part, or all, of the human head, excluding facial features and pinnae. Three general forms are characterized in this standard, namely:

a) *Full Headform* — Extends from the crown downwards to below the chin and includes part of the neck;

b) *Three-Quarter Headform* — Extends from the crown downwards at the sides and rear to below the level of the basic plane; and

c) *Half Headform* — Extends from the crown downwards at the sides and rear to approximately the level of the basic plane.

3.10 Reference Plane — For a given headform, when erect, the horizontal plane located at a vertical distance 'y' measured down the central vertical axis

from the centre of the crown (*see* Fig. 1).

NOTE — All horizontal datum levels are quoted relative to this plane.

3.11 Size Designation — Circumference of a given headform, expressed in mm, as shown in Table 1.

3.12 Vertical Longitudinal Plane — For a given headform, the vertical plane of symmetry, perpendicular to the reference plane and located mid-way between the left hand and right-hand extremities of the headform.

NOTE — This corresponds to the mid-sagittal plane of the human head.

3.13 Vertical Transverse Plane — For a given headform, the vertical plane perpendicular to both the vertical longitudinal plane and the reference plane and located mid-way between the front and rear extremities of the headform.

NOTE — This corresponds to the coronal plane of the human head.

4 REQUIREMENTS

4.1 Materials and General Characteristics

4.1.1 *Headforms for Shock Absorption and Penetration Tests, with Falling Headform/Helmet Assembly*

4.1.1.1 The headforms shall be made of metal and, together with any means for their support, shall exhibit no resonance below a frequency of 2 000 Hz.

4.1.1.2 Full headforms shall have the following characteristics:

a) The centre of gravity shall be located within a 10 mm radius of point G on the central vertical axis;

b) A facility for attaching an accelerometer shall be incorporated such that, with the headform in any angular orientation, the respective sensitive axes of the accelerometer shall pass within 10 mm of point G; and

c) The appropriate mass, is specified in Table 1.

4.1.1.3 Three-quarter headforms shall have the following characteristics:

a) The centre of gravity shall be located within a 10 mm radius of point A on the central vertical axis; and

b) A facility for attaching an accelerometer shall be incorporated within the headform or its means of support, such that, with the headform in any angular orientation, the respective sensitive axes of the accelerometer shall pass within 10 mm of point A.

NOTES

1 For this type of test, full and three-quarter headforms may be specified in the respective helmet standard.

2 The geometry of the half headform does not facilitate its use for this type of test.

3 Care should be taken to ensure that the total mass of the headform, when fitted with the accelerometer and its means of attachment, falls within any tolerances specified in either this standard or the respective helmet standard, as appropriate.

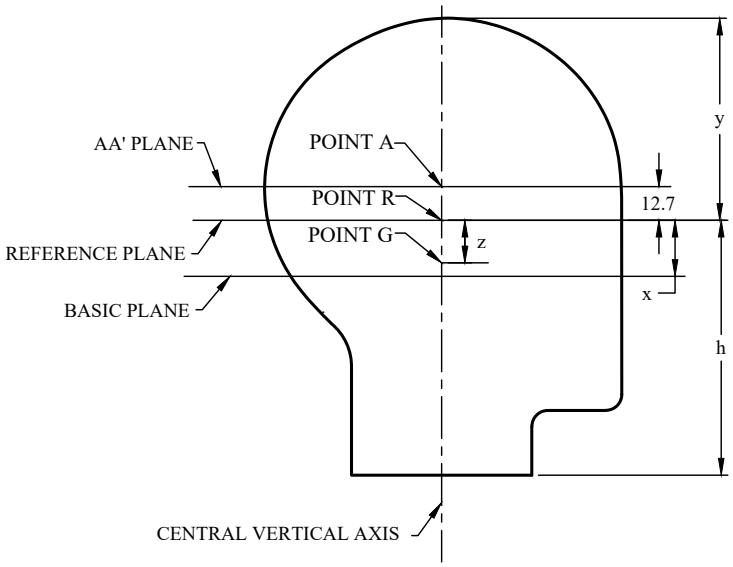

FIG. 1 PRINCIPAL PLANES AND REFERENCE POINTS OF A HEADFORM

Table 1 Dimensions for Figure 1 and Headform Masses

(*Clauses* 3.4, 3.11 *and* 4.1.1.2)

Sl No.	Size Designation	Dimension				Mass
		h mm	x mm	y mm	z mm	g
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	445	108.5	21.0	81.7	9.9	–
ii)	455	110.6	21.5	83.3	10.1	1 970 ± 75
iii)	465	112.7	22.0	84.8	10.4	–
iv)	475	114.8	22.5	86.4	10.6	–
v)	485	116.9	23.0	88.0	10.8	–
vi)	495 (A)	119.0	23.5	89.7	11.1	3 100 ± 100
vii)	505	121.1	24.0	91.2	11.3	–
viii)	515 (C)	123.2	24.5	92.7	11.5	–
ix)	525	125.3	25.0	94.5	11.7	–
x)	535 (E)	127.4	25.5	96.0	11.9	4 100 ± 120
xi)	545	129.5	26.0	97.5	12.1	–
xii)	555 (G)	131.6	26.5	99.1	12.3	–
xiii)	565	133.7	27.0	100.8	12.5	–
xiv)	575 (J)	135.8	27.5	102.4	12.7	4 700 ± 140
xv)	585 (K)	137.9	28.0	103.9	12.9	–
xvi)	595	140.0	28.5	105.4	13.1	–
xvii)	605 (M)	142.1	29.0	107.2	13.3	5 600 ± 160
xviii)	615	144.2	29.5	108.7	13.5	–
xix)	625 (O)	146.3	30.0	110.2	13.7	6 100 ± 180
xx)	635	148.4	30.5	111.8	13.9	–
xxi)	645 (Q)	150.5	31.0	113.5	14.1	–

4.1.2 *Headforms for Shock Absorption and Penetration Tests, with Rigidly Mounted* (*Not Falling*) *Headform/ Helmet Assembly*

The headforms shall be made of a rigid material which does not affect the measurements of shock absorption or penetration (for example, wood). The headforms, together with their means of support, shall exhibit no resonance below a frequency of 2 000 Hz.

NOTE — For this type of test, full, three-quarter and half headforms may be specified in the respective helmet standard.

4.1.3 *Headforms for Geometric Examination or Positional Marking of the Helmet*

The headforms shall be made of any suitable material.

4.1.4 *Headforms for Other Tests*

When a test requires the headform to be made from a specific material or to possess specific material characteristics (for example, thermal or electrical conductivity, thermal capacity, etc), these materials

and characteristics shall be as specified in the relevant helmet standard.

4.2 Dimensions

The outer surface of each headform shall lie within the locus of the coordinates given in Annex A. Between coordinate points, the outer surface of the headform shall be curved and smooth.

NOTE — The exact geometry of the surface between the specified coordinates may be determined, for example, by a fifth order spline function.

5 MARKING

5.1 Headforms for geometric examination or positional marking of the helmet shall be marked with:

a) size designation of the headform;

b) reference plane;

c) basic plane;

d) vertical longitudinal plane; and

e) vertical transverse plane.

5.2 All other headforms shall be marked, at least, with the size designation of the headform.

NOTE — Other marking may be required by specific helmet standards.

5.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the revolving branches may be marked with the Standard Mark.

ANNEX A

(*Foreword*, *clauses* 3.8 *and* 4.2)

SPHERICAL COORDINATES

A-1 The spherical coordinates as given in Table 2 to Table 22 shall apply, *see* Fig. 2 for radii, angle V, and angle H of a headform.

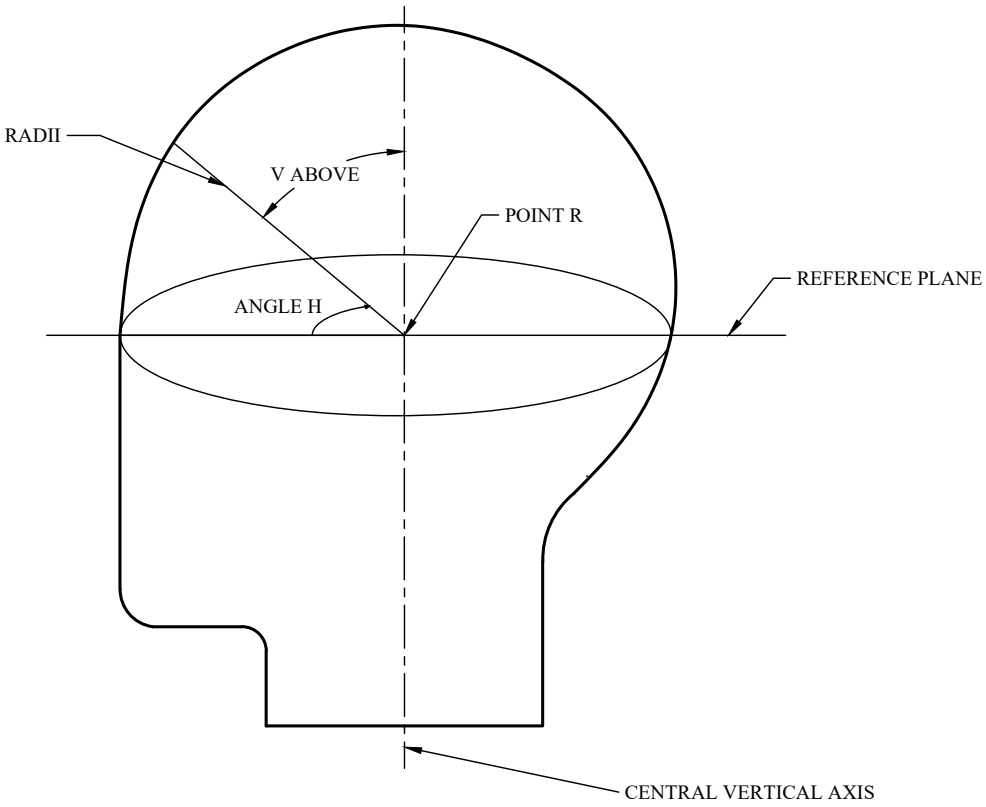

FIG. 2 RADII, ANGLE H, AND ANGLE V OF A HEADFORM

Table 2 Spherical Coordinates for Full Headform of Size 445

(*Clause* A-1)

Sl No.	445		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	80.3	80.3	80.3	80.3	80.3	80.3	80.3	80.3	80.3	80.3	80.3	80.3	80.3
		80°	79.3	79.1	79.1	79.2	79.4	79.8	79.8	80.1	80.8	81.0	81.6	81.7	81.6
		70°	78.9	78.8	78.8	78.8	78.6	78.6	78.7	79.5	80.7	81.9	82.8	83.1	83.0
		60°	79.6	79.6	79.6	78.7	77.5	76.7	76.9	78.1	79.8	82.1	83.6	83.8	83.8
		50°	80.8	80.7	80.8	78.4	75.7	74.2	74.2	75.9	78.2	81.3	83.7	83.8	83.7
		40°	81.3	81.1	81.0	77.1	73.2	71.0	70.9	72.9	75.9	79.7	83.0	83.1	83.1
		30°	80.7	80.5	79.8	74.7	69.9	67.4	67.1	69.4	73.1	77.4	81.4	82.0	82.2
		20°	79.4	79.0	77.5	71.6	66.3	63.6	63.4	66.0	69.8	74.6	79.3	80.8	81.2
		10°	78.5	77.5	75.3	68.8	63.5	60.6	60.5	63.2	66.7	71.7	76.9	79.6	80.1
ii)	Reference plane	0°	79.0	77.4	74.4	67.6	62.4	59.7	59.5	62.0	65.7	70.5	75.3	78.4	79.0
iii)	Angle V below	10°	80.2	79.3	75.4	67.7	62.0	59.9	59.9	61.8	64.8	69.2	72.8	75.3	75.7
		20°	84.0	85.1	77.3	69.2	62.8	59.8	57.5	59.6	62.2	66.1	69.6	71.8	72.3
		30°	91.2	92.5	80.7	71.4	65.9	63.3	57.7	59.1	61.9	65.6	68.8	70.4	69.9
		40°	103.1	104.5	88.6	77.8	70.9	65.1	61.7	62.3	64.5	67.3	69.5	70.4	69.6
		46°	113.7	115.2	93.9	83.4	76.2	68.8	66.3	66.8	68.4	70.4	71.8	72.6	72.3
		50°	110.1	111.2	97.4	87.0	81.2	73.6	70.8	71.5	72.5	74.3	75.2	76.1	76.3

Table 2 (*Concluded*)

Sl No.	445		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		52°	107.2	108.3	97.5	88.6	84.2	76.4	73.5	74.4	75.3	76.9	77.8	78.7	79.2
		55°	103.3	104.3	96.2	89.0	84.2	80.2	78.6	79.7	80.5	82.0	82.8	84.0	84.7
		60°	97.6	98.4	94.4	88.2	89.5	89.6	90.1	91.5	92.6	94.1	95.0	96.6	97.6
		65°	101.7	103.5	100.6	101.9	105.5	105.6	106.8	108.4	109.7	111.6	112.7	114.4	115.3

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 3 Spherical Coordinates for Full Headform of Size 455

(*Clause* A-1)

Sl No.	455		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1
		80°	81.1	80.9	80.9	81.0	81.2	81.6	81.6	81.9	82.6	82.8	83.4	83.5	83.5
		70°	80.6	80.6	80.6	80.6	80.4	80.3	80.5	81.3	82.5	83.7	84.7	84.9	84.9

Table 3 (*Continued*)

Sl No.	455		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		60°	81.4	81.4	81.4	80.5	79.2	78.4	78.6	79.9	81.6	83.9	85.5	85.7	85.6
		50°	82.6	82.5	82.6	80.1	77.4	75.9	75.9	77.6	80.0	83.1	85.6	85.7	85.6
		40°	83.1	83.0	82.8	78.9	74.8	72.6	72.5	74.5	77.6	81.5	84.8	85.0	85.0
		30°	82.5	82.3	81.6	76.4	71.5	68.9	68.7	71.0	74.7	79.1	83.2	83.9	84.1
		20°	81.2	80.7	79.3	73.3	67.8	65.1	64.9	67.5	71.4	76.2	81.0	82.6	83.0
		10°	80.3	79.2	77.0	70.3	64.9	62.0	61.9	64.6	68.2	73.3	78.7	81.3	81.9
ii)	Reference plane	0°	80.7	79.1	76.1	69.1	63.8	61.1	60.9	63.4	67.2	72.1	77.0	80.1	80.7
iii)	Angle V below	10°	82.0	81.1	77.1	69.2	63.4	61.2	61.3	63.2	66.2	70.7	74.4	77.0	77.4
		20°	85.9	87.0	79.1	70.7	64.3	61.2	58.7	61.0	63.6	67.6	71.1	73.4	73.9
		30°	93.2	94.5	82.5	73.0	67.3	64.8	59.0	60.5	63.3	67.1	70.4	72.0	71.4
		40°	105.4	106.9	90.6	79.5	72.5	66.6	63.1	63.7	66.0	68.9	71.0	72.0	71.2
		46°	116.2	117.8	96.0	85.3	77.9	70.4	67.8	68.3	69.9	72.0	73.5	74.3	74.0
		50°	112.6	113.7	99.6	89.0	83.1	75.2	72.4	73.1	74.2	75.9	76.9	77.8	78.0
		52°	109.6	110.7	99.7	90.6	86.1	78.1	75.2	76.1	77.0	78.6	79.5	80.5	80.9
		55°	105.6	106.6	98.3	91.0	86.1	82.0	80.4	81.5	82.4	83.8	84.6	85.8	86.6
		60°	99.8	100.6	96.5	90.2	91.5	91.7	92.1	93.5	94.7	96.2	97.2	98.8	99.8
		65°	104.0	105.8	102.9	104.2	107.9	108.0	109.2	110.8	112.2	114.1	115.2	117.0	117.9

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Table 3 (*Concluded*)

Sl No.	455		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°. Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm. The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis. NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.															

Table 4 Spherical Coordinates for Full Headform of Size 465

(*Clause* A-1)

Sl No.	465		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9
		80°	82.9	82.6	82.6	82.8	83.0	83.3	83.4	83.7	84.4	84.6	85.3	85.4	85.3
		70°	82.4	82.3	82.4	82.4	82.2	82.1	82.3	83.0	84.4	85.5	86.6	86.8	86.7
		60°	83.2	83.1	83.2	82.3	81.0	80.2	80.4	81.6	83.4	85.8	87.4	87.6	87.5
		50°	84.4	84.3	84.4	81.9	79.2	77.6	77.6	79.3	81.7	85.0	87.5	87.5	87.5
		40°	84.9	84.8	84.6	80.6	76.5	74.2	74.1	76.2	79.3	83.3	86.7	86.8	86.9
		30°	84.3	84.2	83.4	78.1	73.0	70.4	70.2	72.6	76.3	80.9	85.1	85.7	85.9
		20°	83.0	82.5	81.0	74.9	69.3	66.5	66.3	69.0	72.9	77.9	82.8	84.4	84.8
		10°	82.1	80.9	78.7	71.8	66.3	63.4	63.3	66.1	69.7	75.0	80.4	83.1	83.7
ii)	Reference plane	0°	82.5	80.9	77.7	70.7	65.2	62.4	62.2	64.8	68.7	73.7	78.7	81.9	82.5

Table 4 (*Concluded*)

Sl No.	465		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
iii)	Angle V below	10°	83.8	82.9	78.8	70.7	64.8	62.5	62.6	64.6	67.7	72.3	76.1	78.7	79.1
		20°	87.8	89.0	80.8	72.3	65.7	62.5	60.0	62.3	65.0	69.1	72.7	75.0	75.5
		30°	95.3	96.6	84.3	74.6	68.8	66.2	60.3	61.8	64.7	68.5	71.9	73.5	73.0
		40°	107.7	109.2	92.6	81.3	74.1	68.0	64.4	65.1	67.4	70.4	72.6	73.6	72.7
		46°	118.8	120.4	98.2	87.1	79.6	71.9	69.3	69.8	71.4	73.6	75.1	75.9	75.6
		50°	115.1	116.2	101.8	90.9	84.9	76.9	74.0	74.7	75.8	77.6	78.6	79.5	79.8
		52°	112.0	113.1	101.9	92.6	88.0	79.8	76.9	77.7	78.7	80.4	81.2	82.3	82.7
		55°	107.9	109.0	100.5	93.0	88.0	83.8	82.2	83.3	84.2	85.7	86.5	87.7	88.5
		60°	102.0	102.9	98.6	92.2	93.5	93.7	94.1	95.6	96.7	98.3	99.3	100.9	102.0
		65°	106.3	108.1	105.1	106.5	110.3	110.3	111.6	113.3	114.7	116.6	117.8	119.6	120.5

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 5 Spherical Coordinates for Full Headform of Size 475

(*Clause* A-1)

Sl No.	475		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
i)	Angle V above	90°	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7
		80°	84.7	84.4	84.4	84.6	84.8	85.1	85.2	85.5	86.2	86.5	87.1	87.2	87.2
		70°	84.2	84.1	84.1	84.1	83.9	83.9	84.1	84.8	86.2	87.4	88.4	88.6	88.6
		60°	85.0	84.9	85.0	84.0	82.7	81.9	82.1	83.4	85.2	87.6	89.2	89.5	89.4
		50°	86.2	86.1	86.2	83.7	80.9	79.2	79.2	81.0	83.5	86.8	89.3	89.4	89.4
		40°	86.8	86.6	86.5	82.3	78.1	75.8	75.7	77.8	81.0	85.1	88.6	88.7	88.7
		30°	86.2	86.0	85.2	79.8	74.6	71.9	71.7	74.1	78.0	82.6	86.9	87.6	87.8
		20°	84.8	84.3	82.8	76.5	70.8	67.9	67.7	70.4	74.5	79.6	84.6	86.2	86.6
		10°	83.8	82.7	80.4	73.4	67.7	64.7	64.6	67.5	71.2	76.6	82.1	84.9	85.5
ii)	Reference plane	0°	84.3	82.6	79.4	72.2	66.6	63.8	63.5	66.2	70.2	75.2	80.4	83.6	84.3
iii)	Angle V below	10°	85.6	84.7	80.5	72.3	66.2	63.9	64.0	66.0	69.1	73.8	77.7	80.4	80.9
		20°	89.7	90.9	82.6	73.8	67.1	63.9	61.3	63.7	66.4	70.6	74.3	76.6	77.2
		30°	97.3	98.7	86.1	76.2	70.3	67.6	61.6	63.1	66.1	70.0	73.5	75.1	74.6
		40°	110.1	111.5	94.5	83.0	75.7	69.5	65.8	66.5	68.9	71.9	74.1	75.2	74.3
		46°	121.4	123.0	100.3	89.0	81.3	73.5	70.8	71.3	73.0	75.2	76.7	77.5	77.2
		50°	117.5	118.7	104.0	92.9	86.7	78.5	75.5	76.3	77.4	79.3	80.3	81.3	81.5

Table 5 (*Concluded*)

Sl No.	475		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
		52°	114.4	115.6	104.1	94.6	89.9	81.5	78.5	79.4	80.4	82.1	83.0	84.0	84.5
		55°	110.2	111.3	102.6	95.0	89.9	85.6	83.9	85.0	86.0	87.5	88.3	89.6	90.4
		60°	104.2	105.1	100.8	94.1	95.5	95.7	96.2	97.6	98.8	100.4	101.4	103.1	104.1
		65°	108.6	110.5	107.4	108.8	112.6	112.7	114.0	115.7	117.1	119.2	120.3	122.1	123.1

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 6 Spherical Coordinates for Full Headform of Size 485

(*Clause* A-1)

Sl No.	485		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
i)	Angle V above	90°	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
		80°	86.4	86.2	86.2	86.3	86.5	86.9	87.0	87.3	88.0	88.3	88.9	89.0	89.0

Table 6 (*Continued*)

Sl No.	485		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
		70°	86.0	85.9	85.9	85.9	85.7	85.6	85.8	86.6	88.0	89.2	90.3	90.5	90.5
		60°	86.8	86.7	86.8	85.8	84.5	83.6	83.8	85.1	87.0	89.4	91.1	91.3	91.3
		50°	88.0	87.9	88.0	85.4	82.6	80.9	80.9	82.7	85.2	88.6	91.2	91.3	91.3
		40°	88.6	88.4	88.3	84.1	79.8	77.4	77.3	79.5	82.7	86.9	90.4	90.6	90.6
		30°	88.0	87.8	87.0	81.5	76.2	73.4	73.2	75.7	79.6	84.3	88.7	89.4	89.6
		20°	86.6	86.0	84.5	78.1	72.3	69.3	69.1	71.9	76.1	81.3	86.4	88.0	88.4
		10°	85.6	84.4	82.1	74.9	69.2	66.1	66.0	68.9	72.7	78.2	83.8	86.7	87.2
ii)	Reference plane	0°	86.0	84.4	81.1	73.7	68.1	65.1	64.9	67.6	71.6	76.8	82.1	85.4	86.0
iii)	Angle V below	10°	87.4	86.5	82.2	73.8	67.6	65.2	65.3	67.4	70.6	75.4	79.3	82.1	82.6
		20°	91.6	92.8	84.3	75.4	68.5	65.2	62.6	65.0	67.8	72.1	75.8	78.2	78.8
		30°	99.4	100.8	87.9	77.8	71.8	69.0	62.8	64.4	67.5	71.5	75.0	76.7	76.2
		40°	112.4	113.9	96.5	84.8	77.3	71.0	67.2	67.9	70.3	73.4	75.7	76.8	75.9
		46°	123.9	125.6	102.4	90.9	83.0	75.0	72.3	72.8	74.5	76.8	78.3	79.2	78.8
		50°	120.0	121.2	106.2	94.9	88.5	80.2	77.1	77.9	79.1	81.0	82.0	83.0	83.2
		52°	116.8	118.0	106.3	96.6	91.8	83.2	80.2	81.1	82.1	83.8	84.7	85.8	86.3
		55°	112.5	113.7	104.8	97.0	91.8	87.4	85.7	86.8	87.8	89.4	90.2	91.5	92.3
		60°	106.4	107.3	102.9	96.1	97.6	97.7	98.2	99.7	100.9	102.6	103.6	105.3	106.3
		65°	110.9	112.8	109.6	111.1	115.0	115.1	116.4	118.1	119.6	121.7	122.8	124.7	125.7

Table 6 (*Concluded*)

Sl No.	485	Radii (in mm) for the Angle H												
		0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 7 Spherical Coordinates for Full Headform of Size 495

(*Clause* A-1)

Sl No.	495		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	89.3	89.3	89.3	89.3	89.3	89.3	89.3	89.3	89.3	89.3	89.3	89.3	89.3
		80°	88.2	88.0	88.0	88.1	88.3	88.7	88.8	89.1	89.8	90.1	90.8	90.9	90.8
		70°	87.7	87.7	87.7	87.7	87.5	87.4	87.6	88.4	89.8	91.1	92.1	92.4	92.3
		60°	88.5	88.5	88.6	87.6	86.2	85.3	85.6	86.9	88.8	91.3	93.0	93.2	93.2
		50°	89.8	89.8	89.8	87.2	84.3	82.6	82.6	84.4	87.0	90.4	93.1	93.2	93.2
		40°	90.4	90.3	90.1	85.8	81.4	79.0	78.9	81.1	84.4	88.7	92.3	92.4	92.5
		30°	89.8	89.6	88.8	83.1	77.8	74.9	74.7	77.2	81.3	86.1	90.5	91.3	91.5

Table 7 (*Concluded*)

Sl No.	495		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		20°	88.4	87.8	86.2	79.7	73.8	70.8	70.6	73.4	77.6	82.9	88.2	89.9	90.3
		10°	87.4	86.2	83.8	76.5	70.6	67.4	67.3	70.3	74.2	79.8	85.6	88.5	89.0
ii)	Reference plane	0°	87.8	86.1	82.7	75.2	69.5	66.4	66.2	69.0	73.1	78.4	83.8	87.2	87.8
iii)	Angle V below	10°	89.2	88.2	83.9	75.3	69.0	66.6	66.6	68.8	72.0	77.0	81.0	83.8	84.3
		20°	93.5	94.7	86.0	77.0	69.9	66.6	63.9	66.3	69.2	73.5	77.4	79.8	80.4
		30°	101.4	102.9	89.8	79.4	73.3	70.5	64.1	65.8	68.9	73.0	76.5	78.3	77.7
		40°	114.7	116.2	98.5	86.5	78.9	72.4	68.6	69.3	71.8	74.9	77.3	78.4	77.4
		46°	126.5	128.2	104.5	92.8	84.8	76.6	73.7	74.3	76.0	78.4	79.9	80.8	80.5
		50°	122.5	123.7	108.4	96.8	90.4	81.9	78.7	79.5	80.7	82.6	83.7	84.7	84.9
		52°	119.3	120.4	108.5	98.6	93.7	85.0	81.8	82.7	83.8	85.5	86.5	87.6	88.1
		55°	114.9	116.0	107.0	99.0	93.7	89.2	87.5	88.6	89.6	91.2	92.1	93.4	94.2
		60°	108.6	109.5	105.0	98.1	99.6	99.7	100.2	101.8	103.0	104.7	105.7	107.5	108.5
		65°	113.2	115.1	111.9	113.4	117.4	117.5	118.8	120.6	122.1	124.2	125.4	127.3	128.3

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 8 Spherical Coordinates for Full Headform of Size 505

(*Clause* A-1)

Sl No.	505		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
i)	Angle V above	90°	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9
		80°	89.8	89.6	89.6	89.7	90.0	90.3	90.4	90.8	91.4	91.7	92.4	92.5	92.5
		70°	89.3	89.3	89.3	89.3	89.1	89.0	89.2	90.0	91.4	92.7	93.8	94.0	94.0
		60°	90.1	90.1	90.1	89.2	87.8	87.0	87.2	88.5	90.4	92.9	94.6	94.9	94.8
		50°	91.4	91.4	91.4	88.8	85.9	84.2	84.2	86.0	88.6	92.0	94.7	94.8	94.8
		40°	92.0	91.9	91.7	87.4	83.0	80.6	80.5	82.7	86.1	90.3	93.9	94.1	94.1
		30°	91.4	91.2	90.4	84.8	79.4	76.6	76.4	78.9	82.9	87.7	92.2	92.9	93.1
		20°	90.0	89.4	87.9	81.3	75.5	72.4	72.2	75.0	79.3	84.6	89.8	91.5	91.9
		10°	89.0	87.8	85.4	78.1	72.2	69.1	69.0	72.0	75.9	81.4	87.2	90.1	90.7
ii)	Reference plane	0°	89.4	87.7	84.4	76.8	71.1	68.1	67.8	70.5	74.7	80.0	85.4	88.8	89.4
iii)	Angle V below	10°	90.9	89.9	85.4	76.7	70.2	67.8	67.9	70.0	73.3	78.3	82.4	85.3	85.8
		20°	95.2	96.4	87.6	78.3	71.2	67.8	65.1	67.5	70.4	74.9	78.8	81.3	81.9
		30°	103.3	104.7	91.4	80.8	74.6	71.7	65.3	67.0	70.1	74.3	77.9	79.7	79.1
		40°	116.8	118.3	100.3	88.1	80.3	73.8	69.8	70.6	73.1	76.3	78.7	79.8	78.8
		46°	128.8	130.5	106.4	94.4	86.3	77.9	75.1	75.7	77.4	79.8	81.3	82.3	81.9

Table 8 (*Concluded*)

Sl No.	505		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
		50°	124.6	125.6	110.3	98.5	92.0	83.3	80.1	81.0	82.1	84.1	85.2	86.2	86.4
		52°	121.3	122.3	110.4	100.3	95.4	86.4	83.3	84.3	85.3	87.1	88.0	89.1	89.6
		55°	116.8	117.7	108.9	100.7	95.3	90.8	89.0	90.3	91.2	92.9	93.7	95.0	95.9
		60°	110.4	111.1	106.9	99.8	101.3	101.5	102.0	103.6	104.8	106.5	107.6	109.4	110.5
		65°	114.9	116.6	113.9	115.3	119.4	119.6	120.9	122.8	124.3	126.4	127.6	129.5	130.6

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 9 Spherical Coordinates for Full Headform of Size 515

(*Clause* A-1)

Sl No.	515		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5
		80°	91.4	91.2	91.2	91.3	91.6	92.0	92.0	92.4	93.1	93.4	94.0	94.1	94.1
		70°	90.9	90.9	90.9	90.9	90.7	90.6	90.8	91.6	93.0	94.3	95.4	95.6	95.6
		60°	91.7	91.7	91.7	90.8	89.5	88.6	88.8	90.1	92.0	94.5	96.3	96.5	96.4
		50°	93.0	93.0	93.0	90.4	87.5	85.8	85.8	87.7	90.3	93.7	96.4	96.4	96.4
		40°	93.6	93.5	93.3	89.0	84.7	82.3	82.2	84.4	87.7	91.9	95.5	95.7	95.7
		30°	93.0	92.8	92.0	86.4	81.0	78.2	78.0	80.5	84.6	89.3	93.8	94.5	94.7
		20°	91.6	91.0	89.5	83.0	77.1	74.1	73.9	76.7	80.9	86.2	91.4	93.1	93.5
		10°	90.6	89.4	87.1	79.8	73.9	70.8	70.6	73.6	77.5	83.1	88.9	91.7	92.3
ii)	Reference plane	0°	91.1	89.4	86.0	78.4	72.7	69.7	69.4	72.1	76.3	81.6	87.0	90.4	91.1
iii)	Angle V below	10°	92.5	91.5	86.9	78.0	71.4	69.0	69.1	71.2	74.6	79.7	83.9	86.8	87.3
		20°	96.9	98.1	89.1	79.7	72.4	69.0	66.2	68.7	71.7	76.2	80.2	82.7	83.3
		30°	105.2	106.6	93.0	82.3	75.9	73.0	66.5	68.2	71.4	75.6	79.3	81.1	80.5
		40°	118.9	120.4	102.1	89.6	81.7	75.1	71.1	71.8	74.3	77.6	80.0	81.2	80.2
		46°	131.1	132.8	108.2	96.1	87.8	79.3	76.4	77.1	78.7	81.2	82.8	83.7	83.3
		50°	126.7	127.6	112.3	100.3	93.6	84.7	81.6	82.4	83.6	85.6	86.7	87.7	87.9

Table 9 (*Concluded*)

Sl No.	515		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		52°	123.3	124.1	112.4	102.1	97.1	87.9	84.8	85.8	86.8	88.6	89.6	90.7	91.2
		55°	118.7	119.5	110.8	102.4	97.0	92.3	90.6	91.9	92.8	94.5	95.3	96.7	97.6
		60°	112.2	112.7	108.7	101.5	103.0	103.2	103.8	105.5	106.7	108.4	109.4	111.3	112.4
		65°	116.7	118.1	115.8	117.3	121.4	121.7	123.0	125.0	126.5	128.6	129.8	131.8	132.9

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 10 Spherical Coordinates for Full Headform of Size 525

(*Clause* A-1)

Sl No.	525		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2	94.2
		80°	93.0	92.9	92.8	93.0	93.2	93.6	93.6	94.0	94.7	95.0	95.6	95.7	95.7

Table 10 (*Continued*)

Sl No.	525		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		70°	92.5	92.5	92.5	92.5	92.3	92.2	92.4	93.2	94.6	95.9	97.0	97.3	97.2
		60°	93.3	93.3	93.3	92.5	91.1	90.2	90.4	91.7	93.6	96.1	97.9	98.1	98.0
		50°	94.6	94.6	94.6	92.1	89.1	87.4	87.5	89.3	91.9	95.3	98.0	98.1	98.0
		40°	95.2	95.1	94.9	90.6	86.3	83.9	83.8	86.0	89.4	93.5	97.1	97.3	97.3
		30°	94.6	94.4	93.6	88.0	82.7	79.9	79.7	82.2	86.2	91.0	95.4	96.1	96.3
		20°	93.2	92.7	91.2	84.6	78.8	75.8	75.6	78.3	82.6	87.9	93.1	94.7	95.1
		10°	92.2	91.1	88.8	81.4	75.5	72.4	72.3	75.2	79.2	84.7	90.5	93.3	93.9
ii)	Reference plane	0°	92.7	91.0	87.6	80.1	74.3	71.3	71.0	73.7	77.9	83.2	88.6	92.0	92.7
iii)	Angle V below	10°	94.1	93.1	88.4	79.3	72.6	70.2	70.3	72.5	75.9	81.1	85.3	88.3	88.8
		20°	98.6	99.8	90.7	81.1	73.7	70.2	67.4	69.9	73.0	77.5	81.6	84.2	84.8
		30°	107.0	108.4	94.6	83.7	77.2	74.2	67.6	69.4	72.6	76.9	80.7	82.5	81.9
		40°	121.0	122.5	103.8	91.2	83.1	76.4	72.3	73.1	75.6	79.0	81.4	82.6	81.5
		46°	133.4	135.1	110.1	97.7	89.3	80.7	77.7	78.4	80.1	82.6	84.2	85.1	84.8
		50°	128.8	129.5	114.2	102.0	95.2	86.2	83.0	83.9	85.0	87.1	88.2	89.2	89.4
		52°	125.3	126.0	114.3	103.9	98.7	89.4	86.2	87.3	88.3	90.2	91.1	92.2	92.8
		55°	120.6	121.2	112.6	104.1	98.6	93.9	92.2	93.5	94.5	96.1	97.0	98.4	99.2
		60°	114.0	114.3	110.6	103.2	104.7	105.0	105.6	107.4	108.6	110.3	111.3	113.2	114.3
		65°	118.4	119.6	117.8	119.3	123.5	123.8	125.2	127.2	128.7	130.8	132.0	134.1	135.2

Table 10 (*Concluded*)

Sl No.	525		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
V = Vertical angle above or below the reference plane. H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane. Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°. Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm. The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis. NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.														

Table 11 Spherical Coordinates for Full Headform of Size 535

(*Clause* A-1)

Sl No.	535		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8
		80°	94.6	94.5	94.5	94.6	94.8	95.2	95.2	95.6	96.3	96.6	97.3	97.3	97.4
		70°	94.1	94.1	94.1	94.2	94.0	93.9	94.1	94.8	96.2	97.6	98.7	98.9	98.9
		60°	94.9	94.9	94.9	94.1	92.7	91.8	92.0	93.3	95.2	97.7	99.5	99.7	99.7
		50°	96.2	96.2	96.2	93.7	90.7	89.1	89.1	90.9	93.5	96.9	99.6	99.7	99.6
		40°	96.8	96.7	96.5	92.3	87.9	85.5	85.4	87.6	91.0	95.1	98.8	98.9	98.9
		30°	96.2	96.0	95.2	89.6	84.3	81.5	81.3	83.8	87.8	92.6	97.0	97.7	97.9

Table 11 (*Concluded*)

Sl No.	535		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		20°	94.8	94.3	92.8	86.2	80.4	77.4	77.2	80.0	84.2	89.5	94.7	96.3	96.7
		10°	93.8	92.7	90.4	83.1	77.2	74.1	73.9	76.8	80.8	86.4	92.2	94.9	95.5
ii)	Reference plane	0°	94.3	92.6	89.3	81.7	75.9	72.9	72.6	75.3	79.6	84.9	90.3	93.6	94.3
iii)	Angle V below	10°	95.8	94.8	89.9	80.7	73.9	71.4	71.5	73.7	77.2	82.5	86.8	89.8	90.3
		20°	100.3	101.5	92.2	82.5	74.9	71.4	68.6	71.1	74.2	78.9	83.0	85.6	86.2
		30°	108.9	110.2	96.2	85.1	78.5	75.5	68.8	70.6	73.9	78.3	82.1	84.0	83.3
		40°	123.1	124.6	105.6	92.7	84.6	77.7	73.5	74.4	76.9	80.3	82.8	84.0	82.9
		46°	135.7	137.4	112.0	99.4	90.9	82.1	79.0	79.8	81.5	84.0	85.6	86.6	86.2
		50°	130.9	131.4	116.2	103.8	96.8	87.6	84.4	85.4	86.5	88.6	89.6	90.7	91.0
		52°	127.3	127.8	116.2	105.7	100.4	90.9	87.7	88.8	89.8	91.7	92.6	93.8	94.3
		55°	122.5	123.0	114.5	105.8	100.3	95.5	93.8	95.2	96.1	97.8	98.6	100.0	100.9
		60°	115.8	116.0	112.4	104.8	106.4	106.8	107.4	109.2	110.4	112.2	113.2	115.1	116.3
		65°	120.2	121.0	119.8	121.3	125.5	125.9	127.3	129.5	130.9	133.1	134.2	136.3	137.5

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 12 Spherical Coordinates for Full Headform of Size 545

(*Clause* A-1)

Sl No.	545		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	97.4	97.4	97.4	97.4	97.4	97.4	97.4	97.4	97.4	97.4	97.4	97.4	97.4
		80°	96.2	96.1	96.1	96.2	96.5	96.8	96.9	97.2	97.9	98.2	98.9	98.9	99.0
		70°	95.7	95.7	95.7	95.8	95.6	95.5	95.7	96.4	97.8	99.2	100.3	100.5	100.5
		60°	96.5	96.5	96.5	95.7	94.3	93.4	93.7	94.9	96.8	99.4	101.2	101.4	101.3
		50°	97.8	97.8	97.8	95.3	92.3	90.7	90.7	92.5	95.1	98.5	101.2	101.3	101.3
		40°	98.4	98.3	98.1	93.9	89.5	87.2	87.1	89.2	92.6	96.8	100.4	100.5	100.6
		30°	97.8	97.6	96.8	91.2	85.9	83.2	83.0	85.5	89.5	94.2	98.6	99.3	99.6
		20°	96.4	95.9	94.4	87.9	82.1	79.1	78.9	81.6	85.8	91.2	96.4	97.9	98.3
		10°	95.4	94.3	92.1	84.7	78.8	75.8	75.6	78.5	82.5	88.0	93.8	96.5	97.1
ii)	Reference plane	0°	95.9	94.3	90.9	83.3	77.5	74.5	74.2	76.9	81.2	86.5	91.9	95.2	95.9
iii)	Angle V below	10°	97.4	96.4	91.4	82.0	75.1	72.6	72.7	74.9	78.5	83.9	88.3	91.3	91.9
		20°	102.1	103.2	93.8	83.9	76.2	72.6	69.8	72.3	75.5	80.2	84.3	87.1	87.7
		30°	110.8	112.1	97.8	86.5	79.8	76.7	70.0	71.8	75.1	79.6	83.5	85.4	84.7
		40°	125.2	126.7	107.4	94.3	86.0	79.0	74.7	75.6	78.2	81.7	84.2	85.4	84.3
		46°	138.1	139.7	113.9	101.1	92.4	83.5	80.4	81.2	82.8	85.4	87.1	88.0	87.6

Table 12 (*Concluded*)

Sl No.	545		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		50°	132.9	133.4	118.1	105.5	98.5	89.1	85.8	86.8	87.9	90.0	91.1	92.2	92.5
		52°	129.3	129.7	118.2	107.5	102.1	92.4	89.2	90.4	91.3	93.2	94.2	95.4	95.9
		55°	124.5	124.7	116.4	107.5	102.0	97.0	95.3	96.8	97.7	99.4	100.2	101.7	102.6
		60°	117.6	117.6	114.2	106.5	108.1	108.5	109.2	111.1	112.3	114.0	115.0	117.0	118.2
		65°	121.9	122.5	121.7	123.3	127.6	128.0	129.4	131.7	133.1	135.3	136.5	138.6	139.7

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 13 Spherical Coordinates for Full Headform of Size 555

(*Clause* A-1)

Sl No.	555		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0

Table 13 (*Continued*)

Sl No.	555		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		80°	97.8	97.7	97.7	97.8	98.1	98.4	98.5	98.8	99.5	99.9	100.5	100.6	100.7
		70°	97.3	97.3	97.3	97.4	97.2	97.1	97.3	98.0	99.4	100.8	101.9	102.1	102.1
		60°	98.1	98.1	98.1	97.3	95.9	95.1	95.3	96.5	98.4	101.0	102.8	103.0	102.9
		50°	99.4	99.4	99.4	96.9	94.0	92.3	92.4	94.1	96.8	100.1	102.9	103.0	102.9
		40°	100.0	99.9	99.7	95.5	91.1	88.8	88.7	90.9	94.3	98.4	102.0	102.2	102.2
		30°	99.4	99.2	98.4	92.8	87.6	84.8	84.7	87.1	91.1	95.9	100.3	100.9	101.2
		20°	98.0	97.5	96.1	89.5	83.7	80.7	80.5	83.3	87.5	92.8	98.0	99.5	100.0
		10°	97.0	95.9	93.7	86.4	80.5	77.5	77.2	80.1	84.1	89.7	95.5	98.1	98.7
ii)	Reference plane	0°	97.5	95.9	92.6	84.9	79.1	76.2	75.9	78.5	82.8	88.1	93.5	96.8	97.5
iii)	Angle V below	10°	99.1	98.0	92.9	83.4	76.3	73.8	73.9	76.2	79.8	85.3	89.7	92.9	93.4
		20°	103.8	104.9	95.3	85.3	77.4	73.8	70.9	73.5	76.7	81.5	85.7	88.5	89.2
		30°	112.6	113.9	99.4	88.0	81.1	77.9	71.1	73.0	76.4	80.9	84.8	86.8	86.1
		40°	127.3	128.7	109.2	95.8	87.4	80.4	76.0	76.9	79.4	83.0	85.6	86.8	85.7
		46°	140.4	142.0	115.8	102.7	93.9	84.9	81.7	82.5	84.2	86.8	88.5	89.5	89.0
		50°	135.0	135.3	120.1	107.2	100.1	90.5	87.2	88.3	89.4	91.5	92.6	93.7	94.0
		52°	131.4	131.5	120.1	109.2	103.8	93.8	90.7	91.9	92.8	94.8	95.7	96.9	97.5
		55°	126.4	126.4	118.3	109.2	103.6	98.6	96.9	98.4	99.3	101.0	101.8	103.3	104.3
		60°	119.4	119.2	116.1	108.2	109.8	110.3	111.0	113.0	114.1	115.9	116.9	118.9	120.1

Table 13 (*Concluded*)

Sl No.	555		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		65°	123.7	124.0	123.7	125.2	129.6	130.1	131.5	133.9	135.3	137.5	138.7	140.9	142.0

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 14 Spherical Coordinates for Full Headform of Size 565

(*Clause* A-1)

Sl No.	565		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	100.6	100.6	100.6	100.6	100.6	100.6	100.6	100.6	100.6	100.6	100.6	100.6	100.6
		80°	99.4	99.4	99.3	99.4	99.7	100.0	100.1	100.4	101.1	101.5	102.1	102.2	102.3
		70°	98.9	98.9	98.9	99.0	98.8	98.7	98.9	99.7	101.0	102.4	103.6	103.8	103.8
		60°	99.7	99.7	99.7	99.0	97.6	96.7	96.9	98.1	100.1	102.6	104.4	104.6	104.5
		50°	100.9	101.0	101.0	98.5	95.6	93.9	94.0	95.7	98.4	101.7	104.5	104.6	104.5

Table 14 (*Continued*)

Sl No.	565		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		40°	101.6	101.5	101.3	97.1	92.8	90.4	90.4	92.5	95.9	100.0	103.6	103.8	103.8
		30°	101.0	100.9	100.1	94.4	89.2	86.4	86.3	88.7	92.8	97.5	101.9	102.6	102.8
		20°	99.7	99.1	97.7	91.1	85.4	82.4	82.2	84.9	89.1	94.5	99.6	101.1	101.6
		10°	98.6	97.6	95.4	88.0	82.2	79.1	78.8	81.7	85.8	91.3	97.1	99.7	100.3
ii)	Reference plane	0°	99.2	97.5	94.2	86.5	80.8	77.8	77.5	80.1	84.4	89.7	95.2	98.4	99.2
iii)	Angle V below	10°	100.7	99.6	94.4	84.7	77.5	75.0	75.1	77.4	81.0	86.6	91.2	94.4	94.9
		20°	105.5	106.6	96.9	86.7	78.7	75.0	72.1	74.7	78.0	82.8	87.1	90.0	90.6
		30°	114.5	115.8	101.0	89.4	82.4	79.2	72.3	74.2	77.6	82.2	86.2	88.2	87.5
		40°	129.4	130.8	110.9	97.4	88.8	81.7	77.2	78.2	80.7	84.4	87.0	88.2	87.0
		46°	142.7	144.3	117.6	104.4	95.5	86.3	83.0	83.9	85.5	88.2	89.9	90.9	90.5
		50°	137.1	137.2	122.1	109.0	101.7	91.9	88.7	89.7	90.8	93.0	94.1	95.3	95.5
		52°	133.4	133.4	122.0	111.0	105.4	95.3	92.1	93.4	94.3	96.3	97.3	98.5	99.1
		55°	128.3	128.2	120.2	110.9	105.3	100.2	98.5	100.0	100.9	102.7	103.5	105.0	106.0
		60°	121.2	120.8	117.9	109.9	111.5	112.1	112.8	114.9	116.0	117.8	118.8	120.8	122.1
		65°	125.4	125.5	125.7	127.2	131.6	132.2	133.7	136.1	137.5	139.7	140.9	143.1	144.3

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

Table 14 (*Concluded*)

Sl No.	565		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis. NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.															

Table 15 Spherical Coordinates for Full Headform of Size 575

(*Clause* A-1)

IS No.	575		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3
		80°	101.0	101.0	100.9	101.0	101.3	101.6	101.7	102.0	102.7	103.1	103.8	103.8	104.0
		70°	100.5	100.5	100.5	100.6	100.5	100.3	100.5	101.3	102.6	104.1	105.2	105.4	105.4
		60°	101.3	101.3	101.3	100.6	99.2	98.3	98.5	99.7	101.7	104.2	106.1	106.3	106.2
		50°	102.5	102.6	102.5	100.2	97.2	95.6	95.6	97.3	100.0	103.3	106.1	106.2	106.1
		40°	103.2	103.1	102.9	98.7	94.4	92.1	92.0	94.1	97.6	101.6	105.2	105.4	105.4
		30°	102.6	102.5	101.7	96.1	90.8	88.1	88.0	90.4	94.4	99.1	103.5	104.2	104.4
		20°	101.3	100.7	99.3	92.8	87.0	84.1	83.9	86.6	90.8	96.1	101.3	102.7	103.2
		10°	100.3	99.2	97.0	89.7	83.8	80.8	80.5	83.3	87.5	93.0	98.8	101.3	101.9
ii)	Reference plane	0°	100.8	99.2	95.8	88.1	82.4	79.4	79.1	81.7	86.0	91.3	96.8	100.0	100.8

Table 15 (*Concluded*)

IS No.	575		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
iii)	Angle V below	10°	102.3	101.3	95.9	86.1	78.8	76.2	76.3	78.6	82.3	88.0	92.6	95.9	96.4
		20°	107.2	108.2	98.4	88.1	79.9	76.2	73.3	75.9	79.3	84.2	88.5	91.4	92.1
		30°	116.3	117.6	102.6	90.8	83.7	80.4	73.5	75.4	78.8	83.6	87.6	89.6	88.9
		40°	131.5	132.9	112.7	98.9	90.3	83.0	78.4	79.4	82.0	85.7	88.4	89.6	88.4
		46°	145.0	146.6	119.5	106.0	97.0	87.6	84.3	85.2	86.9	89.6	91.3	92.4	91.9
		50°	139.2	139.2	124.0	110.7	103.3	93.4	90.1	91.2	92.3	94.5	95.6	96.8	97.0
		52°	135.4	135.2	124.0	112.8	107.1	96.8	93.6	94.9	95.9	97.8	98.8	100.0	100.6
		55°	130.2	129.9	122.1	112.6	106.9	101.8	100.1	101.7	102.6	104.3	105.1	106.7	107.6
		60°	123.0	122.4	119.8	111.6	113.2	113.8	114.6	116.7	117.9	119.6	120.7	122.7	124.0
		65°	127.2	126.9	127.6	129.2	133.7	134.3	135.8	138.3	139.7	141.9	143.1	145.4	146.6

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 16 Spherical Coordinates for Full Headform of Size 585

(*Clause* A-1)

Sl No.	585		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9
		80°	102.6	102.6	102.5	102.6	103.0	103.3	103.3	103.6	104.4	104.8	105.4	105.4	105.6
		70°	102.1	102.0	102.1	102.3	102.1	102.0	102.1	102.9	104.2	105.7	106.8	107.0	107.1
		60°	102.9	102.9	102.9	102.2	100.8	99.9	100.1	101.4	103.3	105.8	107.7	107.9	107.8
		50°	104.1	104.2	104.1	101.8	98.8	97.2	97.2	99.0	101.6	104.9	107.7	107.9	107.7
		40°	104.8	104.8	104.5	100.3	96.0	93.7	93.7	95.8	99.2	103.2	106.8	107.0	107.1
		30°	104.2	104.1	103.3	97.7	92.5	89.7	89.6	92.0	96.0	100.8	105.1	105.8	106.1
		20°	102.9	102.3	101.0	94.4	88.7	85.7	85.5	88.2	92.4	97.7	102.9	104.3	104.8
		10°	101.9	100.8	98.7	91.4	85.5	82.5	82.1	85.0	89.1	94.6	100.4	102.9	103.5
ii)	Reference plane	0°	102.4	100.8	97.5	89.8	84.0	81.0	80.7	83.3	87.6	92.9	98.4	101.6	102.4
iii)	Angle V below	10°	104.0	102.9	97.4	87.4	80.0	77.3	77.5	79.9	83.6	89.4	94.1	97.4	98.0
		20°	108.9	109.9	99.9	89.4	81.1	77.4	74.4	77.1	80.5	85.5	89.9	92.8	93.5
		30°	118.2	119.5	104.2	92.2	85.0	81.7	74.6	76.6	80.1	84.9	89.0	91.0	90.2
		40°	133.6	135.0	114.5	100.5	91.7	84.3	79.6	80.7	83.3	87.1	89.8	91.0	89.8
		46°	147.3	148.9	121.4	107.7	98.5	89.0	85.6	86.6	88.2	91.1	92.8	93.8	93.3
		50°	141.3	141.1	126.0	112.5	104.9	94.8	91.5	92.7	93.7	96.0	97.1	98.3	98.5

Table 16 (*Concluded*)

Sl No.	585		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		52°	137.4	137.1	125.9	114.6	108.8	98.3	95.1	96.4	97.4	99.4	100.3	101.6	102.2
		55°	132.1	131.6	124.0	114.3	108.6	103.3	101.6	103.3	104.2	105.9	106.7	108.3	109.3
		60°	124.8	124.0	121.6	113.3	115.0	115.6	116.4	118.6	119.7	121.5	122.5	124.6	126.0
		65°	128.9	128.4	129.6	131.2	135.7	136.4	137.9	140.5	141.9	144.2	145.3	147.6	148.9

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 17 Spherical Coordinates for Full Headform of Size 595

(*Clause* A-1)

Sl No.	595		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5
		80°	104.2	104.2	104.2	104.2	104.6	104.9	104.9	105.3	106.0	106.4	107.0	107.0	107.3
		70°	103.7	103.6	103.7	103.9	103.7	103.6	103.8	104.5	105.8	107.3	108.5	108.6	108.7

Table 17 (*Continued*)

Sl No.	595		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		60°	104.4	104.5	104.5	103.8	102.4	101.5	101.8	103.0	104.9	107.4	109.3	109.5	109.4
		50°	105.7	105.8	105.7	103.4	100.4	98.8	98.9	100.6	103.3	106.6	109.4	109.5	109.4
		40°	106.4	106.4	106.1	101.9	97.6	95.3	95.3	97.4	100.8	104.9	108.5	108.7	108.7
		30°	105.8	105.7	104.9	99.3	94.1	91.4	91.3	93.7	97.7	102.4	106.7	107.4	107.7
		20°	104.5	103.9	102.6	96.0	90.3	87.4	87.2	89.8	94.1	99.4	104.5	105.9	106.4
		10°	103.5	102.5	100.3	93.0	87.1	84.1	83.8	86.6	90.8	96.2	102.1	104.5	105.2
ii)	Reference plane	0°	104.0	102.4	99.1	91.4	85.6	82.6	82.3	84.9	89.2	94.5	100.1	103.2	104.0
iii)	Angle V below	10°	105.6	104.5	98.9	88.8	81.2	78.5	78.7	81.1	84.9	90.8	95.6	98.9	99.5
		20°	110.6	111.6	101.5	90.8	82.4	78.6	75.6	78.3	81.8	86.8	91.3	94.3	95.0
		30°	120.1	121.3	105.9	93.6	86.3	82.9	75.8	77.8	81.3	86.2	90.4	92.4	91.6
		40°	135.7	137.1	116.3	102.0	93.1	85.6	80.9	82.0	84.5	88.4	91.2	92.4	91.1
		46°	149.7	151.1	123.3	109.4	100.1	90.4	87.0	88.0	89.6	92.5	94.2	95.3	94.8
		50°	143.4	143.0	127.9	114.2	106.6	96.3	92.9	94.1	95.2	97.5	98.6	99.8	100.0
		52°	139.4	138.9	127.8	116.4	110.5	99.8	96.6	98.0	98.9	100.9	101.9	103.2	103.8
		55°	134.0	133.4	125.9	116.0	110.2	104.9	103.2	104.9	105.8	107.6	108.4	110.0	111.0
		60°	126.6	125.7	123.5	115.0	116.7	117.4	118.2	120.5	121.6	123.4	124.4	126.5	127.9
		65°	130.7	129.9	131.6	133.1	137.8	138.5	140.0	142.8	144.1	146.4	147.6	149.9	151.2

V = Vertical angle above or below the reference plane.

Table 17 (*Concluded*)

Sl No.	595		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane. Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°. Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm. The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis. NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.														

Table 18 Spherical Coordinates for Full Headform of Size 605

(*Clause* A-1)

Sl No.	605		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	107.1	107.1	107.1	107.1	107.1	107.1	107.1	107.1	107.1	107.1	107.1	107.1	107.1
		80°	105.8	105.9	105.8	105.9	106.2	106.5	106.5	106.9	107.6	108.0	108.6	108.6	108.9
		70°	105.3	105.2	105.3	105.5	105.4	105.2	105.4	106.1	107.4	108.9	110.1	110.3	110.3
		60°	106.0	106.0	106.1	105.5	104.1	103.2	103.4	104.6	106.5	109.1	111.0	111.2	111.0
		50°	107.3	107.4	107.3	105.0	102.1	100.4	100.5	102.2	104.9	108.2	111.0	111.1	111.0
		40°	108.0	108.0	107.7	103.6	99.3	97.0	97.0	99.0	102.5	106.5	110.1	110.3	110.3
		30°	107.4	107.3	106.5	100.9	95.7	93.0	93.0	95.3	99.3	104.0	108.4	109.0	109.3

Table 18 (*Concluded*)

Sl No.	605		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		20°	106.1	105.6	104.3	97.7	92.0	89.1	88.9	91.5	95.7	101.0	106.2	107.5	108.0
		10°	105.1	104.1	102.0	94.7	88.8	85.8	85.4	88.2	92.4	97.9	103.7	106.1	106.8
ii)	Reference plane	0°	105.6	104.1	100.7	93.0	87.2	84.3	83.9	86.5	90.8	96.1	101.7	104.8	105.6
iii)	Angle V below	10°	107.2	106.2	100.4	90.1	82.5	79.7	79.9	82.4	86.2	92.2	97.0	100.4	101.0
		20°	112.4	113.3	103.0	92.2	83.6	79.9	76.8	79.5	83.0	88.2	92.7	95.7	96.5
		30°	121.9	123.2	107.5	95.1	87.7	84.2	76.9	79.0	82.6	87.5	91.8	93.9	93.0
		40°	137.8	139.1	118.0	103.5	94.5	87.0	82.1	83.2	85.8	89.8	92.6	93.8	92.5
		46°	152.0	153.4	125.2	111.0	101.6	91.8	88.3	89.3	91.0	93.9	95.6	96.7	96.2
		50°	145.5	145.0	129.9	115.9	108.2	97.7	94.3	95.6	96.6	99.0	100.1	101.3	101.5
		52°	141.4	140.7	129.8	118.1	112.1	101.2	98.0	99.5	100.4	102.4	103.4	104.7	105.3
		55°	136.0	135.1	127.8	117.7	111.9	106.5	104.8	106.6	107.4	109.2	110.0	111.7	112.7
		60°	128.4	127.3	125.3	116.6	118.4	119.1	120.0	122.4	123.5	125.3	126.3	128.4	129.8
		65°	132.5	131.4	133.5	135.1	139.8	140.6	142.2	145.0	146.3	148.6	149.8	152.2	153.5

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 19 Spherical Coordinates for Full Headform of Size 615

(*Clause* A-1)

Sl No.	615		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8
		80°	107.7	107.6	107.6	107.4	107.6	107.8	108.1	108.5	109.3	109.3	108.5	109.2	109.2
		70°	106.9	106.8	106.9	107.1	107.0	106.9	107.0	107.7	110.5	110.5	111.3	111.6	111.6
		60°	107.6	107.6	107.7	107.1	105.8	104.8	104.9	106.1	110.7	110.7	112.8	112.9	112.8
		50°	108.9	109.0	108.9	106.6	103.6	102.0	102.1	103.7	109.8	109.8	112.6	112.7	112.7
		40°	109.6	109.6	109.3	105.1	100.8	98.5	98.6	100.6	108.1	108.1	111.5	111.8	111.8
		30°	109.0	108.9	108.2	102.6	97.3	94.7	94.7	97.1	105.7	105.7	110.0	110.6	110.9
		20°	107.7	107.2	105.9	99.3	93.7	90.8	90.6	93.2	102.7	102.7	108.0	109.3	109.7
		10°	106.7	105.7	103.6	96.3	90.4	87.4	86.9	89.7	99.5	99.5	105.2	107.7	108.4
ii)	Reference plane	0°	107.3	105.7	102.4	94.6	88.8	85.9	85.5	88.2	92.4	97.8	103.5	106.4	107.3
iii)	Angle V below	10°	108.9	107.8	101.9	91.5	83.7	80.9	81.1	83.6	87.5	93.6	98.5	101.9	102.5
		20°	114.1	115.0	104.6	93.6	84.9	81.1	77.9	80.7	84.3	89.5	94.1	97.2	97.9
		30°	123.8	125.0	109.1	96.5	89.0	85.4	78.1	80.2	83.8	88.9	93.2	95.3	94.4
		40°	139.9	141.2	119.8	105.1	95.9	88.3	83.3	84.5	87.1	91.1	93.9	95.3	93.9
		46°	154.3	155.7	127.0	112.7	103.1	93.2	89.6	90.7	92.3	95.3	97.1	98.2	97.6
		50°	147.6	146.9	131.8	117.7	109.8	99.1	95.7	97.1	98.1	100.4	101.6	102.8	103.1

Table 19 (*Concluded*)

Sl No.	615		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		52°	143.4	142.6	131.7	119.9	113.8	102.7	99.5	101.0	101.9	104.0	104.9	106.3	106.9
		55°	137.9	136.9	129.7	119.4	113.5	108.0	106.4	108.2	109.0	110.8	111.6	113.3	114.4
		60°	130.2	128.9	127.2	118.3	120.1	120.9	121.8	124.2	125.3	127.1	128.1	130.3	131.8
		65°	134.2	132.8	135.5	137.1	141.8	142.7	144.3	147.2	148.5	150.8	152.0	154.4	155.8

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 20 Spherical Coordinates for Full Headform of Size 625

(*Clause* A-1)

Sl No.	625		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	110.4	110.4	110.4	110.4	110.4	110.4	110.4	110.4	110.4	110.4	110.4	110.4	110.4
		80°	109.0	109.1	109.0	109.1	109.5	109.7	109.8	110.1	110.8	111.3	111.9	111.9	112.2

Table 20 (*Continued*)

Sl No.	625		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		70°	108.5	108.4	108.5	108.8	108.6	108.4	108.6	109.3	110.5	112.2	113.4	113.5	113.6
		60°	109.2	109.2	109.3	108.7	107.3	106.4	106.6	107.8	109.7	112.3	114.2	114.4	114.3
		50°	110.5	110.6	110.5	108.3	105.3	103.7	103.8	105.4	108.2	111.4	114.2	114.4	114.2
		40°	111.1	111.2	110.9	106.8	102.5	100.2	100.2	102.3	105.8	109.7	113.3	113.5	113.5
		30°	110.7	110.5	109.8	104.1	99.0	96.3	96.3	98.6	102.6	107.3	111.6	112.2	112.5
		20°	109.3	108.8	107.5	100.9	95.3	92.4	92.2	94.8	99.0	104.3	109.4	110.7	111.3
		10°	108.3	107.4	105.3	98.0	92.1	89.1	88.7	91.5	95.7	101.2	107.0	109.3	110.0
ii)	Reference plane	0°	108.9	107.3	104.0	96.2	90.4	87.5	87.1	89.7	94.0	99.4	104.9	108.0	108.9
iii)	Angle V below	10°	110.5	109.4	103.5	92.8	84.9	82.1	82.3	84.8	88.8	94.9	99.9	103.4	104.1
		20°	115.8	116.7	106.1	95.0	86.1	82.3	79.1	81.9	85.6	90.8	95.5	98.6	99.4
		30°	125.6	126.9	110.7	97.9	90.3	86.7	79.3	81.4	85.1	90.2	94.5	96.7	95.8
		40°	142.0	143.3	121.6	106.6	97.4	89.6	84.5	85.8	88.4	92.5	95.3	96.7	95.3
		46°	156.6	158.0	128.9	114.3	104.6	94.6	90.9	92.1	93.7	96.7	98.5	99.6	99.0
		50°	149.7	148.8	133.8	119.4	111.4	100.6	97.2	98.5	99.5	101.9	103.1	104.3	104.6
		52°	145.5	144.4	133.7	121.7	115.5	104.2	101.0	102.5	103.4	105.5	106.5	107.9	108.5
		55°	139.8	138.6	131.6	121.1	115.2	109.6	108.0	109.8	110.7	112.5	113.3	115.0	116.0
		60°	132.0	130.5	129.0	120.0	121.8	122.7	123.6	126.1	127.2	129.0	130.0	132.2	133.7
		65°	136.0	134.3	137.5	139.1	143.9	144.8	146.4	149.4	150.7	153.0	154.2	156.7	158.1

Table 20 (*Concluded*)

Sl No.	625		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
V = Vertical angle above or below the reference plane. H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane. Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°. Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm. The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis. NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.														

Table 21 Spherical Coordinates for Full Headform of Size 635

(*Clause* A-1)

Sl No.	635		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0
		80°	110.6	110.7	110.6	110.7	111.1	111.3	111.4	111.7	112.4	112.9	113.5	113.5	113.8
		70°	110.1	110.0	110.1	110.4	110.2	110.0	110.2	110.9	112.1	113.8	115.0	115.1	115.2
		60°	110.8	110.8	110.8	110.3	108.9	108.0	108.2	109.4	111.3	113.9	115.9	116.1	115.9
		50°	112.1	112.2	112.1	109.9	106.9	105.3	105.4	107.0	109.8	113.0	115.9	116.0	115.8
		40°	112.7	112.8	112.5	108.4	104.1	101.9	101.9	103.9	107.4	111.3	114.9	115.1	115.2
		30°	112.3	112.1	111.4	105.7	100.6	98.0	97.9	100.2	104.2	108.9	113.2	113.8	114.2

Table 21 (*Concluded*)

Sl No.	635		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		20°	110.9	110.4	109.2	102.6	96.9	94.1	93.9	96.4	100.6	106.0	111.1	112.3	112.9
		10°	109.9	109.0	106.9	99.6	93.7	90.8	90.3	93.1	97.4	102.8	108.7	110.9	111.6
ii)	Reference plane	0°	110.5	109.0	105.6	97.8	92.1	89.1	88.7	91.3	95.6	101.0	106.6	109.6	110.5
iii)	Angle V below	10°	112.2	111.0	105.0	94.1	86.1	83.3	83.5	86.1	90.1	96.3	101.4	104.9	105.6
		20°	117.5	118.4	107.7	96.4	87.4	83.5	80.3	83.1	86.8	92.1	96.9	100.1	100.8
		30°	127.5	128.7	112.3	99.3	91.6	87.9	80.4	82.6	86.3	91.5	95.9	98.1	97.2
		40°	144.1	145.4	123.4	108.2	98.8	90.9	85.8	87.0	89.6	93.9	96.7	98.1	96.6
		46°	158.9	160.3	130.8	116.0	106.2	95.9	92.3	93.4	95.0	98.1	99.9	101.1	100.5
		50°	151.8	150.8	135.7	121.1	113.1	102.0	98.6	100.0	101.0	103.4	104.5	105.8	106.1
		52°	147.5	146.3	135.6	123.5	117.2	105.7	102.5	104.0	104.9	107.1	108.0	109.4	110.0
		55°	141.7	140.3	133.5	122.8	116.8	111.2	109.5	111.5	112.3	114.1	114.9	116.6	117.7
		60°	133.8	132.1	130.9	121.7	123.5	124.4	125.4	128.0	129.0	130.9	131.9	134.1	135.6
		65°	137.7	135.8	139.4	141.1	145.9	146.9	148.5	151.6	152.9	155.3	156.4	158.9	160.4

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

Table 22 Spherical Coordinates for Full Headform of Size 645

(*Clause* A-1)

Sl No.	645		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Angle V above	90°	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6
		80°	112.2	112.4	112.2	112.3	112.7	112.9	113.0	113.3	114.0	114.5	115.1	115.1	115.5
		70°	111.7	111.6	111.7	112.0	111.9	111.7	111.8	112.5	113.7	115.4	116.6	116.8	116.9
		60°	112.4	112.4	112.4	112.0	110.5	109.7	109.9	111.0	112.9	115.5	117.5	117.7	117.5
		50°	113.7	113.8	113.7	111.5	108.5	106.9	107.0	108.6	111.4	114.6	117.5	117.6	117.5
		40°	114.3	114.4	114.1	110.0	105.7	103.5	103.5	105.5	109.0	113.0	116.6	116.8	116.8
		30°	113.9	113.7	113.0	107.4	102.3	99.6	99.6	101.9	105.9	110.6	114.8	115.5	115.8
		20°	112.6	112.0	110.8	104.2	98.6	95.7	95.5	98.1	102.3	107.6	112.7	113.9	114.5
		10°	111.5	110.6	108.6	101.3	95.4	92.5	92.0	94.7	99.0	104.5	110.3	112.5	113.2
ii)	Reference plane	0°	112.1	110.6	107.3	99.5	93.7	90.7	90.3	92.9	97.3	102.6	108.2	111.2	112.1
iii)	Angle V below	10°	113.8	112.7	106.5	95.5	87.4	84.5	84.8	87.3	91.3	97.7	102.8	106.4	107.1
		20°	119.2	120.1	109.2	97.8	88.6	84.7	81.4	84.3	88.1	93.5	98.3	101.5	102.3
		30°	129.4	130.6	113.9	100.8	92.9	89.2	81.6	83.8	87.6	92.8	97.3	99.5	98.6
		40°	146.3	147.5	125.1	109.7	100.2	92.2	87.0	88.3	90.9	95.2	98.1	99.5	98.0
		46°	161.3	162.6	132.7	117.7	107.7	97.3	93.6	94.8	96.4	99.5	101.4	102.5	101.9
		50°	153.9	152.7	137.7	122.9	114.7	103.5	100.0	101.4	102.4	104.9	106.0	107.4	107.6

Table 22 (*Concluded*)

Sl No.	645		Radii (in mm) for the Angle H												
			0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		52°	149.5	148.1	137.5	125.3	118.8	107.2	103.9	105.6	106.4	108.6	109.5	111.0	111.6
		55°	143.6	142.1	135.4	124.5	118.5	112.8	111.1	113.1	113.9	115.7	116.5	118.3	119.4
		60°	135.6	133.8	132.7	123.4	125.2	126.2	127.2	129.9	130.9	132.7	133.7	136.0	137.6
		65°	139.5	137.3	141.4	143.0	148.0	149.0	150.7	153.9	155.1	157.5	158.7	161.2	162.7

V = Vertical angle above or below the reference plane.

H = Angle of vertical slice, measured in horizontal plane, from front of mid-sagittal plane.

Angles in degrees, to be measured with an uncertainty of measurement not exceeding ± 0.2°.

Radii in mm, with a tolerance of ± 0.5 percent and measured with an uncertainty of measurement not exceeding 0.1 mm.

The jaw line shall be radiused along its length with a nominal 5 mm radius. The base of the neck shall be squared off perpendicular to the central vertical axis.

NOTE — The surface corresponding to the radii shown in underlined lies below the jaw line 2.

ANNEX B

(*Foreword*)

EQUATIONS DEFINING THE RADII OF THE SPHERICAL COORDINATE SYSTEM FOR SIZES 495 TO 645

B-1 The equations defining the radii of the spherical coordinate system for sizes 495 to 645 are given in Table 23 and Table 24.

Table 23 At and Above the Reference Plane

(*Clause* B-1)

Sl No.	Angle V	Angle H	Equation to Define Radius, R	Angle H	Equation to Define Radius, R	Angle H	Equation to Define Radius, R
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	90	0	0.161 8 × C + 9.247 6	15	0.162 1 × C + 9.080 4	30	0.161 9 × C + 9.165 7
ii)	80		0.160 1 × C + 8.973 7		0.162 5 × C + 7.543 2		0.161 8 × C + 7.888 6
iii)	70		0.159 6 × C + 8.724 6		0.159 9 × C + 8.507 5		0.160 4 × C + 8.273 5
iv)	60		0.159 × C + 9.842		0.159 4 × C + 9.607 3		0.159 2 × C + 9.752 5
v)	50		0.158 8 × C + 11.224		0.160 5 × C + 10.314		0.159 × C + 11.123
vi)	40		0.159 4 × C + 11.516		0.161 1 × C + 10.517		0.159 8 × C + 11.007
vii)	30		0.160 5 × C + 10.344		0.161 × C + 9.885 5		0.161 5 × C + 8.812 6
viii)	20		0.161 2 × C + 8.576 4		0.161 2 × C + 8.026 9		0.163 8 × C + 5.160 1
ix)	10		0.161 1 × C + 7.628		0.163 1 × C + 5.423 1		0.165 4 × C + 1.920 3
x)	0		0.161 7 × C + 7.798		0.163 5 × C + 5.157 3		0.163 4 × C + 1.863 1
xi)	90	45	0.162 3 × C + 8.945 8	60	0.161 8 × C + 9.247 6	75	0.162 2 × C + 9.005 3
xii)	80		0.161 3 × C + 8.270 7		0.160 1 × C + 8.973 7		0.162 6 × C + 7.845 8
xiii)	70		0.162 2 × C + 7.381 4		0.159 6 × C + 8.724 6		0.162 7 × C + 6.924 1
xiv)	60		0.162 6 × C + 7.086 7		0.159 × C + 9.842		0.162 2 × C + 5.927 3
xv)	50		0.162 1 × C + 6.953 7		0.158 8 × C + 11.224		0.161 8 × C + 4.167 3
xvi)	40		0.161 3 × C + 5.966 5		0.159 4 × C + 11.516		0.162 2 × C + 1.12
xvii)	30		0.161 4 × C + 3.251 1		0.160 5 × C + 10.344		0.163 5 × C - 3.177 6

Table 23 (*Continued*)

Sl No.	Angle V	Angle H	Equation to Define Radius, R	Angle H	Equation to Define Radius, R	Angle H	Equation to Define Radius, R
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
xviii)	20		0.163 3 × C − 1.134 8		0.161 2 × C + 8.576 4		0.165 × C - 7.873
xix)	10		0.165 3 × C - 5.346 5		0.161 1 × C + 7.628		0.165 2 × C - 11.186
xx)	0		0.161 7 × C - 4.831 6		0.161 7 × C + 7.798		0.161 4 × C - 10.437
xxi)	90	90	0.162 × C + 9.125 8	105	0.162 1 × C + 9.093 3	120	0.162 2 × C + 9.004 6
xxii)	80		0.161 4 × C + 8.89		0.161 1 × C + 9.399 1		0.161 4 × C + 9.931 8
xxiii)	70		0.161 6 × C + 7.599 3		0.160 7 × C + 8.861 3		0.159 6 × C + 10.799
xxiv)	60		0.162 × C + 5.360 8		0.160 7 × C + 7.341 2		0.160 6 × C + 9.314 2
xxv)	50		0.162 9 × C + 1.948 4		0.161 4 × C + 4.534 1		0.162 7 × C + 6.468 4
xxvi)	40		0.164 5 × C - 2.566		0.162 8 × C + 0.516 8		0.163 9 × C + 3.316 5
xxvii)	30		0.166 1 × C - 7.525 9		0.164 2 × C - 4.037 2		0.164 1 × C + 0.046 2
xxviii)	20		0.166 3 × C - 11.749		0.164 4 × C - 7.974		0.164 4 × C - 3.755 4
xxix)	10		0.164 2 × C - 13.931		0.162 5 × C - 10.108		0.165 1 × C - 7.481 2
xxx)	0		0.160 8 × C - 13.392		0.159 5 × C - 10.002		0.160 9 × C - 6.53
xxxi)	90	135	0.162 2 × C + 9.006 2	150	0.162 2 × C + 8.984 6	165	0.162 2 × C + 9.025 5
xxxii)	80		0.162 9 × C + 9.457 9		0.162 5 × C + 10.332		0.161 5 × C + 10.924
xxxiii)	70		0.162 3 × C + 10.728		0.163 4 × C + 11.251		0.162 5 × C + 11.945
xxxiv)	60		0.161 6 × C + 11.292		0.163 4 × C + 12.112		0.163 2 × C + 12.437
xxxv)	50		0.161 3 × C + 10.589		0.162 6 × C + 12.622		0.163 × C + 12.498
xxxvi)	40		0.161 9 × C + 8.529 1		0.161 8 × C + 12.194		0.162 2 × C + 12.145
xxxvii)	30		0.163 2 × C + 5.299 3		0.162 × C + 10.352		0.161 3 × C + 11.42
xxxviii)	20		0.164 6 × C + 1.456 1		0.163 6 × C + 7.188 2		0.160 5 × C + 10.417
xxxix)	10		0.164 6 × C - 1.688 5		0.165 1 × C + 3.848 5		0.160 1 × C + 9.242 8
xl)	0		0.161 2 × C - 1.391		0.163 × C + 3.067 3		0.160 1 × C + 7.912 5
xli)	90	180	0.162 × C + 9.082 1				

Table 23 (*Concluded*)

Sl No.	Angle V	Angle H	Equation to Define Radius, R	Angle H	Equation to Define Radius, R	Angle H	Equation to Define Radius, R
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
xlii)	80		0.164 3 × C + 9.491 6				
xliii)	70		0.163 4 × C + 11.462				
xliv)	60		0.162 4 × C + 12.789				
xlv)	50		0.162 1 × C + 12.914				
xlvi)	40		0.162 2 × C + 12.172				
xlvii)	30		0.162 2 × C + 11.166				
xlviii)	20		0.161 6 × C + 10.277				
xlix)	10		0.161 1 × C + 9.304 2				
l)	0		0.162 6 × C + 7.230 4				

Table 24 Below the Reference Plane

(*Clause* B-1)

Sl No.	Angle, V	Angle, H	Equation to Define Radius, R	Angle, H	Equation to Define Radius, R	Angle, H	Equation to Define Radius, R
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	10	0	0.163 7 × C + 8.204 4	15	0.162 4 × C + 5.779 1	30	0.150 6 × C + 9.327
ii)	20		0.171 5 × C + 8.597 3		0.162 8 × C + 7.657 4		0.154 6 × C + 9.502 1
iii)	30		0.186 1 × C + 9.328 1		0.169 4 × C + 10.843		0.161 × C + 10.056
iv)	40		0.210 4 × C + 10.544		0.184 6 × C + 11.485		0.177 4 × C + 10.713
v)	46		0.232 × C + 11.629		0.208 2 × C + 13.186		0.186 1 × C + 11.391
vi)	50		*0.209 4 × C + 18.822*		*0.193 4 × C + 27.957*		0.187 8 × C + 11.531
vii)	52		*0.201 6 × C + 19.465*		*0.184 8 × C + 28.943*		*0.193 5 × C + 12.717*
viii)	55		*0.191 8 × C + 19.923*		*0.173 7 × C + 30.031*		*0.189 4 × C + 13.21*
ix)	60		*0.179 9 × C + 19.532*		*0.161 7 × C + 29.455*		*0.184 6 × C + 13.635*
x)	65		*0.175 4 × C + 26.334*		*0.147 5 × C + 42.113*		*0.196 7 × C + 14.539*
xi)	10	45	0.134 5 × C + 8.733 7	60	0.122 6 × C + 8.277 2	75	0.119 6 × C + 7.381 5
xii)	20		0.138 8 × C + 8.251 1		0.124 9 × C + 8.082 9		0.120 9 × C + 6.710 9

Table 24 (*Continued*)

Sl No.	Angle, V	Angle, H	Equation to Define Radius, R	Angle, H	Equation to Define Radius, R	Angle, H	Equation to Define Radius, R
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
xiii)	30		0.142 2 × C + 9.036 8		0.130 9 × C + 8.458 2		0.124 6 × C + 8.789 5
xiv)	40		0.154 6 × C + 10.016		0.142 3 × C + 8.435 2		0.132 1 × C + 7.042 1
xv)	46		0.165 9 × C + 10.65		0.153 × C + 9.018 1		0.138 4 × C + 8.055 4
xvi)	50		0.173 8 × C + 10.78		0.162 1 × C + 10.12		0.144 1 × C + 10.522
xvii)	52		0.178 × C + 10.447		0.167 5 × C + 10.799		0.148 1 × C + 11.641
xviii)	55		*0.170 2 × C + 14.751*		*0.165 3 × C + 11.864*		0.157 1 × C + 11.423
xix)	60		*0.168 5 × C + 14.694*		*0.170 9 × C + 14.974*		*0.176 5 × C + 12.349*
xx)	65		*0.197 8 × C + 15.457*		*0.203 9 × C + 16.436*		*0.210 2 × C + 13.41*
xxi)	10	90	0.120 7 × C + 6.902 2	105	0.123 5 × C + 7.635 5	120	0.128 8 × C + 8.271 8
xxii)	20		0.116 9 × C + 6.043		0.119 7 × C + 7.085 7		0.126 1 × C + 6.754 3
xxiii)	30		0.116 4 × C + 6.526 7		0.120 3 × C + 6.225 7		0.124 5 × C + 7.259 1
xxiv)	40		0.122 6 × C + 7.913 5		0.126 6 × C + 6.626 6		0.127 5 × C + 8.666 9
xxv)	46		0.132 3 × C + 8.252 5		0.136 2 × C + 6.930 3		0.135 7 × C + 8.860 4
xxvi)	50		0.141 8 × C + 8.534 4		0.146 1 × C + 7.200 3		0.145 × C + 8.915 4
xxvii)	52		0.147 5 × C + 8.800 7		0.152 2 × C + 7.401 3		0.151 × C + 9.025 2
xxviii)	55		0.157 6 × C + 9.453 3		0.163 2 × C + 7.838 1		0.162 × C + 9.401 3
xxix)	60		0.179 6 × C + 11.317		0.187 3 × C + 9.042 5		0.186 2 × C + 10.804
xxx)	65		0.212 5 × C + 13.609		0.221 8 × C + 10.794		0.220 3 × C + 13.024
xxxi)	10	135	0.138 4 × C + 8.449 9	150	0.145 8 × C + 8.803 4	165	0.151 × C + 9.054 6
xxxii)	20		0.132 8 × C + 7.806		0.139 3 × C + 8.430 1		0.144 6 × C + 8.252
xxxiii)	30		0.132 5 × C + 7.377 6		0.138 4 × C + 8.037 1		0.141 5 × C + 8.247 5
xxxiv)	40		0.135 3 × C + 7.93 76		0.139 × C + 8.460 1		0.140 8 × C + 8.658 6
xxxv)	46		0.141 1 × C + 8.516 4		0.142 9 × C + 9.181 6		0.144 7 × C + 9.179 2
xxxvi)	50		0.148 5 × C + 9.111 8		0.149 × C + 9.932 8		0.151 2 × C + 9.83
xxxvii)	52		0.153 6 × C + 9.514 2		0.153 7 × C + 10.41		0.156 1 × C + 10.288
xxxviii)	55		0.163 5 × C + 10.286		0.163 2 × C + 11.271		0.166 1 × C + 11.164
xxxix)	60		0.187 1 × C + 12.058		0.187 × C + 13.127		0.190 6 × C + 13.106

Table 24 (*Concluded*)

Sl No.	Angle, V	Angle, H	Equation to Define Radius, R	Angle, H	Equation to Define Radius, R	Angle, H	Equation to Define Radius, R
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
xl)	65		0.222 1 × C + 14.23		0.222 × C + 15.467		0.226 2 × C + 15.31
xli)	10	180	0.152 3 × C + 8.866 7				
xlii)	20		0.146 × C + 8.137 6				
xliii)	30		0.139 1 × C + 8.870 4				
xliv)	40		0.137 2 × C + 9.511 5				
xlv)	46		0.142 9 × C + 9.733 1				
xlvi)	50		0.151 2 × C + 10.064				
xlvii)	52		0.157 × C + 10.35				
xlviii)	55		0.168 1 × C + 10.984				
xlix)	60		0.193 7 × C + 12.646				
l)	65		0.229 2 × C + 14.831				

NOTE — The equations shown in italics define the surface below the jaw line.

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Fire Fighting Sectional Committee, CED 22

Organization	*Representative(s)*
In Personal Capacity (*House No. 1933, Sector-4, Urban Estate, Gurugram*)	DR K. C. WADHWA **(*Chairperson*)**
Advance Firetec and Research Lab Private Limited, New Delhi	SHRI SUBIR K. NANDI
Agni Controls, Chennai	SHRI BALACHANDRAN SHRI ARUN KUMAR (*Alternate*)
Airports Authority of India, New Delhi	SHRI ARVIND KUMAR SHRI P. K. DESHMUKH (*Alternate*)
Bennett Coleman and Company Limited, New Delhi	SHRI PURUSHOTAM SINGH
Central Industrial Security Force, New Delhi	SHRI SUDHIR KUMAR
Central Public Works Department, New Delhi	SHRI CHAITANYA KUMAR VERMA SHRI PREM MOHAN (*Alternate*)
Centre for Fire and Explosive Environment Safety, Defence Institute of Fire Research, Delhi	SHRI PANKAJ CHAWLA
CSIR - Central Building Research Institute, Roorkee	DR HARPAL SINGH SHRI SHORAB JAIN (*Alternate*)
Directorate General of Quality Assurance, New Delhi	CONTROLLER JT CONTROLLER (*Alternate*)
Engineers India Limited, New Delhi	SHRI AMITABH KISHORE SHRI GYASUDDIN (*Alternate* I) SHRI AKASH DEEP PATEL (*Alternate* II)
Fire and Emergency Services, Kolkata	SHRI ABHIJIT PANDEY SHRI KAMAL NANDY (*Alternate*)
Fire and Security Association of India, Chennai	SHRI ANAS RIZVI
F. M. Engineering International India Branch, Bengaluru	SHRI SRIKANTH YAJJALA SHRI YASSAR NABEEL MOHAMED (*Alternate*)
Gunnebo India Private Limited, Thane	SHRI JOHNSON MATHEW SHRI SAMIR MISRI (*Alternate* I) SHRI YOGESH JADHAV (*Alternate* II)
H. D. Fire Protect Private Limited, Thane	SHRI HARISH N. DHARAMSHI SHRI K. T. CHAUDHARI (*Alternate* I) SHRI ANIK N. DHARAMSHI (*Alternate* II)
Indian Oil Corporation Limited, New Delhi	SHRI SAMIR V. SATHE
Institute of Fire Engineers India, New Delhi	PRESIDENT SHRI U. S. CHHILLAR (*Alternate* I) SHRI PRADEEP KUMAR (*Alternate* II)

Organization	*Representative(s)*
Johnson Controls, Bengaluru	SHRI SANTHOSH MUZUMDAR SHRI NITIN RASTOGI (*Alternate*)
K. V. Fire Chemicals India Private Limited, Navi Mumbai	SHRI RAJESH SABADRA SHRI UDAY K. SHROFF (*Alternate*)
Maharashtra Fire Services, Mumbai	SHRI SANTOSH S. WARICK SHRI KIRAN HATYAL (*Alternate*)
Ministry of Home Affairs, New Delhi	SHRI MORESHWAR KUDKILWAR
National Association of Fire Officers, Mumbai	SHRI M. V. DESHMUKH PRESIDENT (*Alternate*)
Nohmi Bosai India Private Limited, Gurugram	SHRI ISWAR IYER SHRI NEERAJ SEHGAL (*Alternate*)
Oil Industry Safety Directorate, Noida	SHRI MURARI MOHAN PRASAD SHRI N. K. PANDEY (*Alternate*)
Proion Consultants, New Delhi	SHRI SANDEEP GOEL
Reliance India Limited, Mumbai	SHRI UMESH KHANDALKAR SHRI MUKESH CHANDRA KUMAR (*Alternate*)
RESQ Technologies, Aabad	SHRI ROHIT V. SHAH
Safex Fire Services Limited, Mumbai	SHRI JITENDRA SHAH SHRI SANDIP SHAH (*Alternate*)
Shah Bhogilal Jethalal & Bros., Ahmedabad	SHRI MUKESH M. SHAH
State Bank of India, Mumbai	SHRI MAYANK YADAV
Swastik Synergy Engineering Private Limited, Mumbai	SHRI MUKESH D. SHAH SHRI KUNAL ZATAKIA (*Alternate* I) SHRI VARUN SHAH (*Alternate* II)
TTS Consultant, Kolkata	SHRI TARAK CHAKRABORTY
Uttar Pradesh Fire Service, Government of Uttar Pradesh, Lucknow	SHRI P. K. RAO SHRI AMAN SHARMA (*Alternate*)
In Personal Capacity (*K-33-A, Green Park, First Floor, New Delhi*)	SHRI S. K. DHERI
In Personal Capacity (*27A, Tapovan Senior Citizens Foundation, Coimbatore*)	SHRI T. R. A. KRISHNAN
In Personal Capacity (*Bldg. No.8/S/3, Kamat Classic, Phase 4, Caranzalem, Panaji*)	SHRI ASHOK MENON
In Personal Capacity (*Gheekanta Road, Near Madhuram Cinema, Ahmedabad*)	SHRI ABHAY D. PURANDARE
In Personal Capacity (*D-317, 2nd Floor, Nirman Vihar, New Delhi*)	SHRI R. C. SHARMA

Organization	*Representative(s)*
BIS Directorate General	SHRI DWAIPAYAN BHADRA, SCIENTIST 'E'/DIRECTOR AND HEAD (CIVIL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI RAJESH CHOUDHARY
SCIENTIST 'B'/ASSISTANT DIRECTOR
(CIVIL ENGINEERING) BIS

Helmet Subcommittee, CED 22 : 5

Organization	*Representative(s)*
In Personal Capacity (*Bldg. No.8/S/3, Kamat Classic, Phase 4, Caranzalem, Panaji*)	SHRI ASHOK MENON **(*Convener*)**
3M India Limited, Bengaluru	SHRI VINAY PATHAK SHRI BIDYUT CHETIA (*Alternate*)
All India Helmets Manufacturers Association, Faridabad	SHRI MADHU BHUSHAN KHURANA
All India Two Wheeler's Helmet Manufacturers Association, Delhi	SHRI GOVIND PARSAD DABRAL SHRI BHARAT BHUSHAN (*Alternate*)
Automotive Research Association of India, Pune	SHRI B. S. YAMGAR
Bureau of Police Research and Development, New Delhi	PRINCIPAL SCIENTIFIC OFFICER DR M. M. GOSAL (*Alternate*)
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Concert Trust, Consumers Association of India, Chennai	SHRI M. R. KRISHNAN SHRI M. SOMASUNDARAM (*Alternate*)
Concord Arai Private Limited, Chennai	SHRI R. RAM KRISHANAN SHRI A. R. D. RAMACHANDRA RAJA (*Alternate*)
CSIR - Central Institute for Mining and Fuel Research, Dhanbad	DR HARENDRA SINGH
Defence Bio-Engineering and Electromedical Laboratory, Ministry of Defence, Bengaluru	DR R. INDUSHEKAR SHRI TAPAN KHILARIWAL (*Alternate*)
Defence Materials and Stores Research and Development Establishment, Kanpur	DR R. K. TIWARI SHRI ARUN KUMAR SINGH (*Alternate*)
Directorate General of Mines Safety, Dhanbad	SHRI C. B. PRASAD SHRI N. P. DEORI (*Alternate*)
Hero Motocorp Limited, New Delhi	SHRI HARJEET SINGH SHRI PIYUSH CHOWDHRY (*Alternate*)

Organization	*Representative(s)*
Honeywell International India Private Limited, Gurugram	SHRI RAVI AVUPATI
Indian Institute of Technology Delhi, New Delhi	DR SANJEEV SANGI DR PUNEET MAHAJAN (*Alternate*)
Mines Safety Appliances Limited, Kolkata	SHRI K. SANYAL SHRI S. BHATTACHARYA (*Alternate*)
Ministry of Home Affairs, New Delhi	SHRI PRASHANT LONKAR SHRI MORESHWAR KUDKILWAR (*Alternate*)
Ministry of Road Transport and Highways, New Delhi	SHRI S. P. GUPTA SHRI K. C. SHARMA (*Alternate*)
Society of Indian Automobile Manufacturers (SIAM), Delhi	SHRI PRASHANT KUMAR BANERJEE ASSISTANT DIRECTOR (*Alternate*)
Steelbird Hi-Tech India Limited, Solan	SHRI RAJEEV KAPUR SHRI ARUN KUMAR (*Alternate*)
STUDDS Accessories Limited, Faridabad	SHRI SIDHARTHA KHURANA
Voluntary Organisation in Interest of Consumer Education (VOICE), New Delhi	SHRI M. A. U. KHAN SHRI RAJIV JHA (*Alternate*)
In Personal Capacity (*D-317, 2nd Floor, Nirman Vihar, New Delhi*)	SHRI R. C. SHARMA

(*Continued from second cover*)

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