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ISO RECOMMENDATION

R 1511

PROTECTIVE HELMETS FOR ROAD USERS

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BRIEF HISTORY

The ISO Recommendation R 1511, *Protective helmets for road users*, was drawn up by Technical Committee ISO/TC 94, *Personal safety – Protective clothing and equipment*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1511, which was circulated to all the ISO Member Bodies for enquiry in March 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Italy	Switzerland
Belgium	Netherlands	Thailand
Denmark	New Zealand	Turkey
France	Norway	U.A.R.
Germany	Portugal	United Kingdom
Hungary	Romania	U.S.S.R.
India	South Africa, Rep. of	Yugoslavia
Ireland	Spain	
Israel	Sweden	

The following Member Body opposed the approval of the Draft :

U.S.A.

This Draft ISO Recommendation was then submitted by correspondance to the ISO Council, which decided, in June 1970, to accept it as an ISO RECOMMENDATION.

ISO Recommendation | R 1511 | June 1970

PROTECTIVE HELMETS FOR ROAD USERS

1. SCOPE

1.1 This ISO Recommendation applies to protective helmets for wear by riders of motor bycycles and the occupants of open motor cars, but does not apply to helmets for competition riding. Protective helmets are designed to mitigate the effects of a blow on the head received by a rider in the event of an accident.

1.2 Tests are given to ascertain compliance with the following requirements :

(*a*) shock absorption properties of the helmet assembly under various conditions of temperature and humidity;

(*b*) penetration resistance;

(*c*) rigidity of the shell;

(*d*) strength of the harness and its attachments;

(*e*) area to be protected.

NOTE. – Tests are also under consideration and development for determining resistance to slipping and abrasion, auditory transmission and the effects of ultra-violet light. Such tests will be added to this ISO Recommendation as and when they are completed.

2. DEFINITIONS

(See Fig. 1, page 13)

2.1 *Protective helmet*. A helmet primarily intended to protect the upper part of the wearer's head against a blow. Some helmets may give additional protection.

2.2 *Shell*. The hard, smooth material that provides the general form of the helmet.

2.3 *Peak*. A permanent or detachable extension of the shell above the eyes.

2.4 *Harness*. The complete assembly by means of which the protective helmet is maintained in position on the head. It consists, for example, of the following items :

2.4.1 *Headband*. The part of the harness surrounding the head at the base of the skull.

2.4.2 *Cradle*. The fixed or adjustable assembly of the parts of the harness in contact with the head.

2.4.3 *Drawlace*. The cord sometimes used in the cradle to regulate the fitting of the helmet.

2.4.4 *Chinstrap*. The strap of material which passes under or round the wearer's chin to retain the helmet in position.

2.4.5 *Cushioning*. Material to improve wearing comfort.

2.4.6 *Neck curtain*. The part of the helmet designed to cover the wearer's neck and made of soft material.

2.4.7 *Ear flaps*. The part of the helmet designed to cover the wearer's ears; it may be combined with the neck curtain.

2.5 *Anti-concussion tapes*. Supporting straps which, when fitted, absorb shock.

2.6 *Protective padding*. Material provided to absorb kinetic energy during an impact.

2.7 *Ventilation holes*. Holes made in the shell to permit circulation of air inside the helmet.

3. MATERIALS

The materials used in the manufacture of helmets should be of durable quality, i.e. their characteristics should not undergo appreciable alteration under the influence of ageing or of the circumstances of use to which the helmet is normally subjected (exposure to sun, rain, cold, dust, vibrations, contact with the skin, effects of sweat or of products applied to the skin or hair).

For those parts of the harness coming into contact with the skin, the manufacturer must not use materials which are known to cause infection. For a material not in general use for harnesses, advice as to its suitability should be sought.

4. CONSTRUCTION

4.1 General

The construction of the helmet should be essentially in the form of a hard shell having a smooth outer surface and necessary additional means of absorbing impact energy so that not more than the prescribed force is transmitted when tested in accordance with this ISO Recommendation. Any devices fitted to a helmet should be so designed that they are unlikely to cause any injury to the wearer in the event of an accident. In particular there should be no metallic or other rigid projections on the inside of the helmet such as might cause injury.

The helmet should be fitted with a chin strap not less than 20 mm ($\frac{3}{4}$ in) wide and the chin strap and the cradle should be securely fixed to the shell.

The assembled helmet should have a smooth external surface without reinforcing ridges. There should be no external projections greater than 3 mm ($\frac{1}{8}$ in) above the outer surface of the shell of the helmet except a goggle clip, if required. If an external projection (such as that used to secure a sun vizor) is easily detachable, this limit may be increased to 5 mm ($\frac{3}{16}$ in). Any external projections should be smooth and adequately faired to other surfaces.

The goggle fitting should project not more than 5 mm ($\frac{3}{16}$ in) above the outer surface of the helmet and be at the back of the helmet. If easily detachable, however, this requirement does not apply.

Where stitching is used to secure the harness to the shell, it should be protected against abrasion.

Rivet heads should project not more than 1.6 mm ($\frac{1}{16}$ in) above the outer surface of the helmet and show no sharp edges.

4.2 Shell

The shell should have as uniform a strength as possible and should not be specially reinforced at any point. This does not exclude a uniform increase in shell thickness but does exclude highly localised reinforcement. The profile at the front edge of the shell should not prevent the wearing of spectacles or goggles.

4.3 Earflaps and neck curtain

The helmet may be provided with ear flaps and also a neck curtain.

4.4 Weight

If a complete helmet (including ear flaps and neck curtain, if provided) weighs more than 1 kg (35 oz) it should be marked with its weight to the nearest 30 g (1 oz).

5. PROTECTIVE CHARACTERISTICS

5.1 Extent of protection

Subject to the requirement that there should be a peripheral vision range of approximately 120° each side of the centre line, it is desirable that as much of the head as possible should be protected above a horizontal plane at the level of the external auditory meatus and the inferior margin of the orbit.

For the purpose of this ISO Recommendation and to establish the extent of protection it is necessary to define an artificial headform, both to serve as a basis for instrumentation during tests and to provide fixed parameters for measurement. As the headform is artificial and does not have eyes or ears it has been found convenient to define the extent of the protection provided by reference to measurements from the point of the crown.

Details are given of suitable test headforms in section 7 of this ISO Recommendation, and although the variation of human head shapes is such that an artificial headform may not necessarily conform exactly to the shape of any random sample human head, a considerable amount of anthropological data has been reviewed in order to decide the limiting dimensions, and the headforms described are considered suitable to provide accurately fitting protective helmets for approximately 95 % of the population of all races.

Any point of the helmet above line AA of the headform (see Fig. 2) should attenuate shock transmission to at least the minimum requirements (see clause 5.2).

5.2 Shock absorption

When tested by the method given in clause 7.4, at low and high temperatures or in a moist condition, the shell of the helmet should not show any penetrating cracks (separation of material), and the harness should show no damage detrimental to its function. The force transmitted should not exceed 2000 daN (2000 kgf; 4400 lbf) when tested in accordance with clause 7.4.3 (*a*), or when tested in accordance with clause 7.4.3 (*b*), the maximum acceleration of the headform should not be greater than the equivalent of 400 *g* imparted to a mass of 5 kg, i.e. not greater than $400 \times \frac{5}{m}$ *g*, where *m* is the mass of the headform plus helmet expressed in kilogrammes.

5.3 Resistance to penetration

When the helmet is tested by the method given in clause 7.5, at low and high temperatures or in a moist condition, the distance between the point of the spike and the headform should at no time be less than 5 mm ($\frac{3}{16}$ in).

5.4 Rigidity

When the two helmets are tested by the method given in clause 7.6, the deformation measured at the greater load of 63 daN should not exceed by more than 40 mm ($1\frac{1}{2}$ in) those at the initial load of 3 daN. After returning to the load of 3 daN the permanent deformation load in relation to the initial dimensions at this load should not exceed 15 mm ($\frac{9}{16}$ in).

5.5 Harness and chinstrap strength

5.5.1 *Resistance to deformation.* When tested in accordance with clause 7.7, the total vertical downward movement of the loading weight, caused by the extension under load of the harness and its attachment, should not exceed 25 mm ($\frac{15}{16}$ in).

5.5.2 *Resistance of harness to detachment from shell.* When tested in accordance with clause 7.7, the harness and its attachment should not break or tear away when a load of 100 daN (100 kgf; 220 lbf) is applied.

6. OPTIONAL CHARACTERISTICS

6.1 Flexibility of peak

If a peak is provided it should be reasonably flexible. When tested by the method given in clause 7.8, the deflection of the peak should not be less than 6 mm ($\frac{1}{4}$ in) or more than 32 mm (1 $\frac{1}{4}$ in).

6.2 Flame resistance of peak

If especially required to be resistant to flame, the material of the peak should not burn with emission of flame after a period of 5 seconds after removal of the burner when tested in accordance with clause 7.9.

7. TESTS

7.1 Sampling

7.1.1 *Condition*. For prototype and routine testing, helmets should be taken in the condition in which they are offered for sale.

7.1.2 *Number*. Samples are required as follows for prototype testing :

(*a*) three for shock absorption test;

(*b*) one for penetration test;

(*c*) one for transverse rigidity test;

(*d*) one for longitudinal rigidity test;

(*e*) one as a prototype specimen for retention.

Samples (*c*) and (*d*) may also be used for testing for resistance of harness to deformation and to detachment.

The number and proportion of output to be submitted for routine testing will be decided by the testing authority.

NOTE. – A satisfactory proportion has been found to be three helmets from each batch of two hundred taken over the batch, decreasing to three from each batch of four hundred after a satisfactory succession of fifty tests so long as the satisfactory succession is unbroken.

7.2 Conditioning for testing

7.2.1 *Pre-conditioning*. All helmets are pre-conditioned for at least 6 hours at a temperature of 20 ± 2 °C and a relative humidity of 65 ± 5 % before applying the following individual conditioning treatments and testing.

7.2.2 *Low temperature*. The helmet is exposed to a temperature of −10 ± 2 °C for not less than 4 nor more than 4 $\frac{1}{2}$ hours.

7.2.3 *High temperature*. The helmet is exposed to a temperature of 50 ± 2 °C for a period of not less than 4 nor more than 4 $\frac{1}{2}$ hours.

7.2.4 *Oven and refrigerator*. These should be sufficiently large to ensure that the helmets do not touch one another or the sides. In any event the total volume should be not less than 0.13 m^3 (4.5 ft^3). They should be reasonably air-tight and the oven should be fitted with a fan to provide effective air circulation. The relative humidity of the air in the oven should be controlled at approximately 65 ± 5 % by means of, for example, a saturated solution of sodium dichromate.

7.2.5 *Moisture*. After removal of any protective covering from the outside of the shell, the helmet is sprayed externally with water at 20 ± 2 °C at the rate of 1 litre per minute for not less than 4 nor more than 4 $\frac{1}{2}$ hours.

7.3 Headforms for testing for shock absorption and resistance to penetration

7.3.1 For testing road helmets, it is important to specify precisely a complete range of headforms to ensure a close fit, thereby avoiding inaccuracies in the measurement of transmitted force. Dimensions are given in Tables 1 and 2 (see also Fig. 2, 3, 4 (*a*) and 4 (*b*)).

Only the upper part of each headform is designed to represent the human head; the lower part is arbitrarily designed to enable the headform to be mounted either in the inclined position or upright, and also to provide a "chin" so that the helmet may be held securely on the headform by its chinstrap. A suggested method of headform construction is as follows :

The upper part of each headform is built up from layers of hardwood* planed to a thickness of 12.7 mm ($\frac{1}{2}$ in), or 6.35 mm ($\frac{1}{4}$ in) where required, and these are cut to outlines plotted from the tabulated dimensions. The grain is displaced by 90° from layer to layer. The layers are glued and screwed together, using a synthetic resin glue. Accurate assembly is facilitated by marking transverse and longitudinal axes on each piece and by drilling a small-diameter hole through the centre of each. The lower part is then built up from a further nine layers 12.7 mm ($\frac{1}{2}$ in) thick, cut to the same outline but with the rear ends truncated. The assembled headform is held in a press until the glue has hardened, when the final shaping may be undertaken. The "steps" on the upper part are cut away to give the required smooth curved surface; the sides of the lower part are flattened off and the chin rounded. The rear of the lower part is cut off at an angle of 60° to the horizontal so that the headform may be mounted with its inclined axis vertical for the shock absorption test. A flat block of wood is glued and screwed to the sloping face to make the total thickness of wood along the inclined axis equal to that along the vertical axis. The headform should be given several coats of shellac polish to seal it, and finally two Duralumin mounting plates are attached to it.

7.3.2 The headforms used for testing are described in clause 7.3.1 and may carry code letters for their circumferences. These circumferences should be equal to the "Circumference of the inside of the head fitting" figures. The setting out dimensions are given in Table 2 in relation to the reference line shown in Figure 3.

7.3.3 The internal circumference of the headband or other head fitting of each helmet should be measured with an adjustable ring gauge made of non-expanding material and the helmet tested on the largest headform whose circumference is not greater than the internal circumference of the helmet.

7.3.4 Headforms should be cut away along the line "ef" as shown in Figure 3 to allow correct fitting of the helmet. Each should be marked with the line AA shown in Figure 2, indicating the lower testing limit.

7.3.5 If the headforms are made of metal it should be noted that magnesium alloy of low resonant frequency has been used successfully.

* Hardwood having a density of 640 to 720 kg/m^3 (40 to 45 lb/ft^3) at a moisture content of 12 %.

7.4 Shock absorption tests

7.4.1 *Principle.* Shock absorption may be measured by either

(*a*) direct measurement of peak force transmitted to a fixed headform, or

(*b*) measurement of the peak acceleration of a freely movable headform.

7.4.2 *Apparatus.* The measuring apparatus used for method (*a*) should be able to measure without distortion forces of up to 4000 daN (4000 kgf; 8800 lbf) at frequencies between 0 and 2500 Hz. Precautions should be taken to ensure that the impact force is totally transmitted and that there is no loss due to deformation. The measuring instrument should be so positioned that its axis is co-axial with the path of the striker which should pass through the centre of gravity of the headform. If piezo-electric gauges are used, the limit to the time constant to release should be at least 20 seconds.

The base should be sufficiently large to offer full resistance to the effect of the blow and if of concrete it should weigh at least 1000 kg (1 ton) and be 1 m (3 ft) in height; if of steel it should weigh at least 500 kg ($\frac{1}{2}$ ton). The base should be bedded in rubber of 60 international hardness (Shore hardness), dry sand or similar material on a solid floor. The return compression wave should be obviated by appropriate means. The force transmitted is measured by a non-inertial device.

The striker for both test methods weighs 5 kg (11 lb), has a flat circular or square striking face having an area of 380 cm^2 (59 in^2) and its travel is either free or guided, but the speed of impact of a guided striker should equal that of a free fall.

7.4.3 *Shock absorption test methods.* Each helmet is sampled and conditioned as described in clauses 7.1 and 7.2. Within 1 minute of its removal from the conditioning atmosphere it is placed firmly and fastened securely on the appropriate headform, with drawlace and any other cradle adjustment completely slackened. One of the following two methods should be used for this test :

(*a*) The striker is allowed to fall on to the helmet shell at any point above the line AA (see Fig. 2), for example the mid-frontal and mid-occipital zones with an impact energy of 12.5 kgf·m (90 ft·lbf), attained by a weight of 5 kg falling 2.5 m ± 5 mm. The height of the fall is measured from the point of impact on the helmet to the underside of the striker.

A recording allowing the determination of the transmitted force is made.

(*b*) The striker is allowed to fall on to the helmet shell at any point above the line AA (see Fig. 2), such as the mid-frontal and mid-occipital zones.

The impact energy at the moment of striking should be

$$\frac{k+1}{k} \times 12.5 \text{ kgf·m} \quad \text{or} \quad \frac{k+1}{k} \times 90 \text{ ft·lbf}$$

where $k = \dfrac{\text{mass (headform + helmet)}}{\text{mass of striker}}$

The maximum acceleration of the headform is recorded.

The headform (mass 4.5 ± 0.2 kg; 10 ± $\frac{1}{2}$ lb) should be able to move freely within an arc of at least 90° in relation to the vertical axis of the striker, and the restricting devices limiting the movement of the headform should not come within this arc.

7.5 Penetration test

7.5.1 *Apparatus.* A conical spike is placed on the shell at the point to be tested; a weight falls on to the rear end of the spike, and the depth of penetration of the spike is measured by a suitable non-inertial device such as a photo-electric cell.

NOTE. –

Mass of spike	0.3 kg (10.5 oz)
Mass of striker	3.0 kg (6.5 lb)
Angle at point of spike	60°
Radius of point	0.5 mm
Minimum height of cone of spike	40 mm
Hardness of tip of spike	between 50 and 45 Rockwell hardness is suggested

7.5.2 *Method of test.* The helmet is conditioned in the manner that gave the worst result in the shock absorption tests, and, within 1 minute of the time of removal from the conditioning atmosphere, is placed firmly on the appropriate headform as it would be on a human wearer.

The spike is placed on the shell at the test point which should be above the line AA (see Fig. 2). The striker is allowed to fall on to the rear of the spike through a distance of 1 m measured from the rear end of the spike to the underside of the striker.

The minimum distance remaining between the point of the spike and the headform is measured.

7.6 Rigidity test

Two helmets pre-conditioned as in clause 7.2.1 are subjected, one along the longitudinal axis and the other along the transverse axis, to loads as follows :

Each helmet is placed between two parallel plates and an initial load of 3 daN (3 kgf; 6 $\frac{1}{2}$ lbf) is applied to the shell. After 2 minutes the distance between the plates is measured and the load is increased to 63 daN by increments of 10 daN applied every 2 minutes. After 2 minutes of application of the load of 63 daN the distance between the plates is measured again. The applied load is then reduced to 3 daN and maintained for 5 minutes and the distance between the plates is re-measured.

7.7 Test for harness strength

One of the helmets used for the rigidity test is supported on an appropriate headform and the chinstrap is fastened so that it passes under two metal rollers 12.5 mm ($\frac{1}{2}$ in) in diameter and centres at 75 mm (3 in) apart, representing the alae of the mandible.

An initial load of 4.5 daN (4.5 kgf; 10 lbf) is applied to the chinstrap, and is gradually increased at a uniform rate to a load of 50 daN (50 kgf; 110 lbf) in 30 seconds. This load is maintained for 2 minutes after which the vertical movement of the loading weight is measured.

The other helmet used for the rigidity test is supported by its shell, retaining an appropriate headform inside it and a load of 100 daN (100 kgf; 220 lbf) is similarly applied to the chinstrap at its point of attachment to the shell.

The harness and its attachment is observed for detachment or other damage.

7.8 Test to determine flexibility of peak

The helmet, fitted with its peak, is mounted on an appropriate headform and is loaded with a mass of 12 kg (25 lb) to hold it firmly in place. A mass of 1 kg is then freely suspended for 2 minutes from a point within 12.5 mm ($\frac{1}{2}$ in) of the centre of the front edge of the peak. The deflection of the peak is measured.

7.9 Test for flame resistance of peak

The peak is mounted on a stand and a bunsen burner flame, between 15 and 20 mm in length and with air supply cut off, is brought into tip contact for 10 seconds with the peak, the burner being held at an angle of approximately 45°.

The peak is examined for flaming 5 seconds after the burner is removed.

8. INFORMATION TO USERS

Every helmet offered for sale should bear a label stating the following :

(*a*) For adequate protection, this helmet must fit closely and provide a range of peripheral vision of approximately 120° on each side of the centre line.

(*b*) This helmet is made to absorb the energy of a blow by partial destruction or damage to the shell and the harness. Even though such damage may not be readily apparent, any helmet subjected to severe impact should be replaced.

(*c*) The attention of users is also drawn to the danger of modifying or removing any of the original component parts of the helmet.

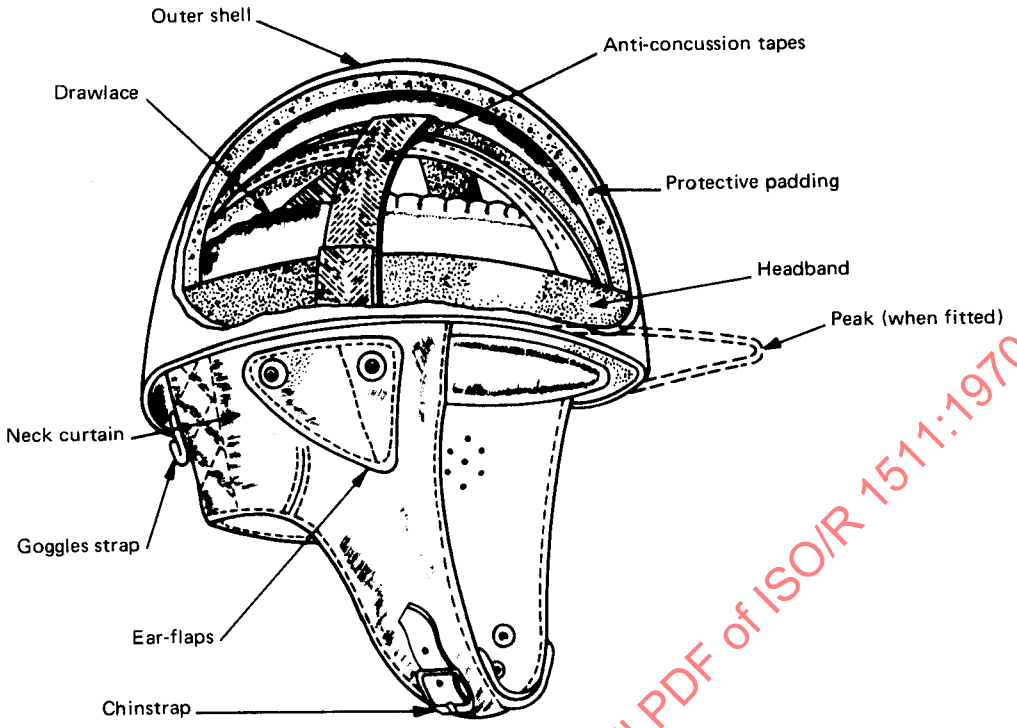
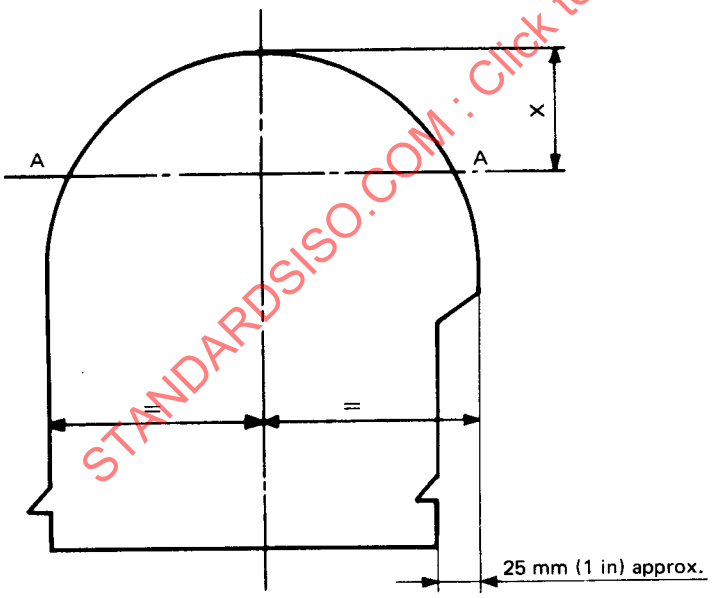


FIG. 1 – **Helmet details**



Code letter	Dimension X	
	mm	in
A	27.0	1.06
B	28.5	1.12
C	30.0	1.18
D	31.8	1.25
E	33.3	1.31
F	34.8	1.37
G	36.4	1.43
H	38.1	1.50
J	39.7	1.56
K	41.2	1.62
L	42.7	1.68
M	44.5	1.75
N	46.0	1.81
O	47.5	1.87
P	49.1	1.93
Q	50.8	2.00

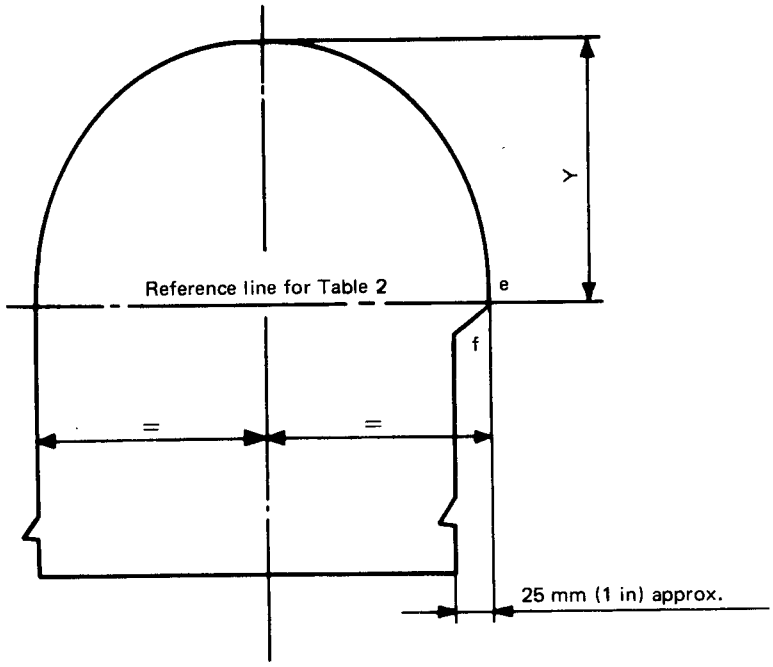
The line AA is scribed around the headform on a plane using a scribing block set X mm below the extreme top of the headblock

FIG. 2 – **Headform**

TABLE 1 – Headforms

Code letter of the headform	Circumference of the inside of the head fitting	
	mm	in
A	500	19 5/8
B	510	20
C	520	20 3/8
D	530	20 3/4
E	540	21 1/8
F	550	21 1/2
G	560	21 7/8
H	565	22 1/4
J	570	22 5/8
K	580	23
L	590	23 3/8
M	600	23 3/4
N	610	24 1/8
O	620	24 1/2
P	630	24 7/8
Q	640	25 1/4

Table 1 indicates, for the purposes of testing, which helmets can be mounted on a given headform.

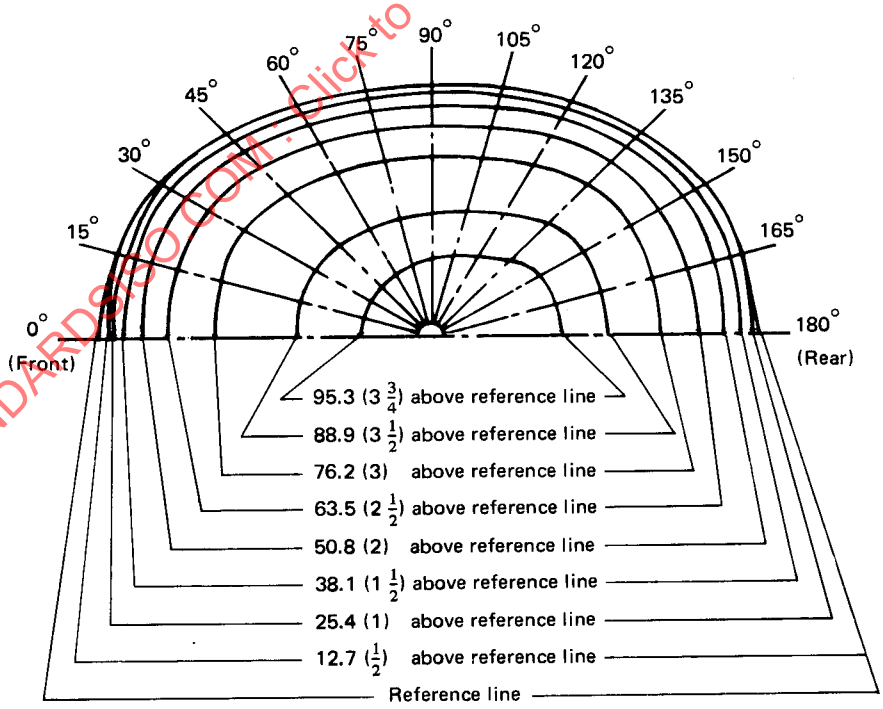


Code letter	Dimension Y	
	mm	in
A	89.7	3.53
B	91.2	3.59
C	92.7	3.65
D	94.5	3.72
E	96.0	3.78
F	97.5	3.84
G	99.1	3.90
H	100.8	3.97
J	102.4	4.03
K	103.9	4.09
L	105.4	4.15
M	107.2	4.22
N	108.7	4.28
O	110.2	4.34
P	111.8	4.40
Q	113.5	4.47

FIG. 3 – **Headform**

(Reference line for setting out Table 2)

Dimensions in millimetres
(inch values in parentheses)

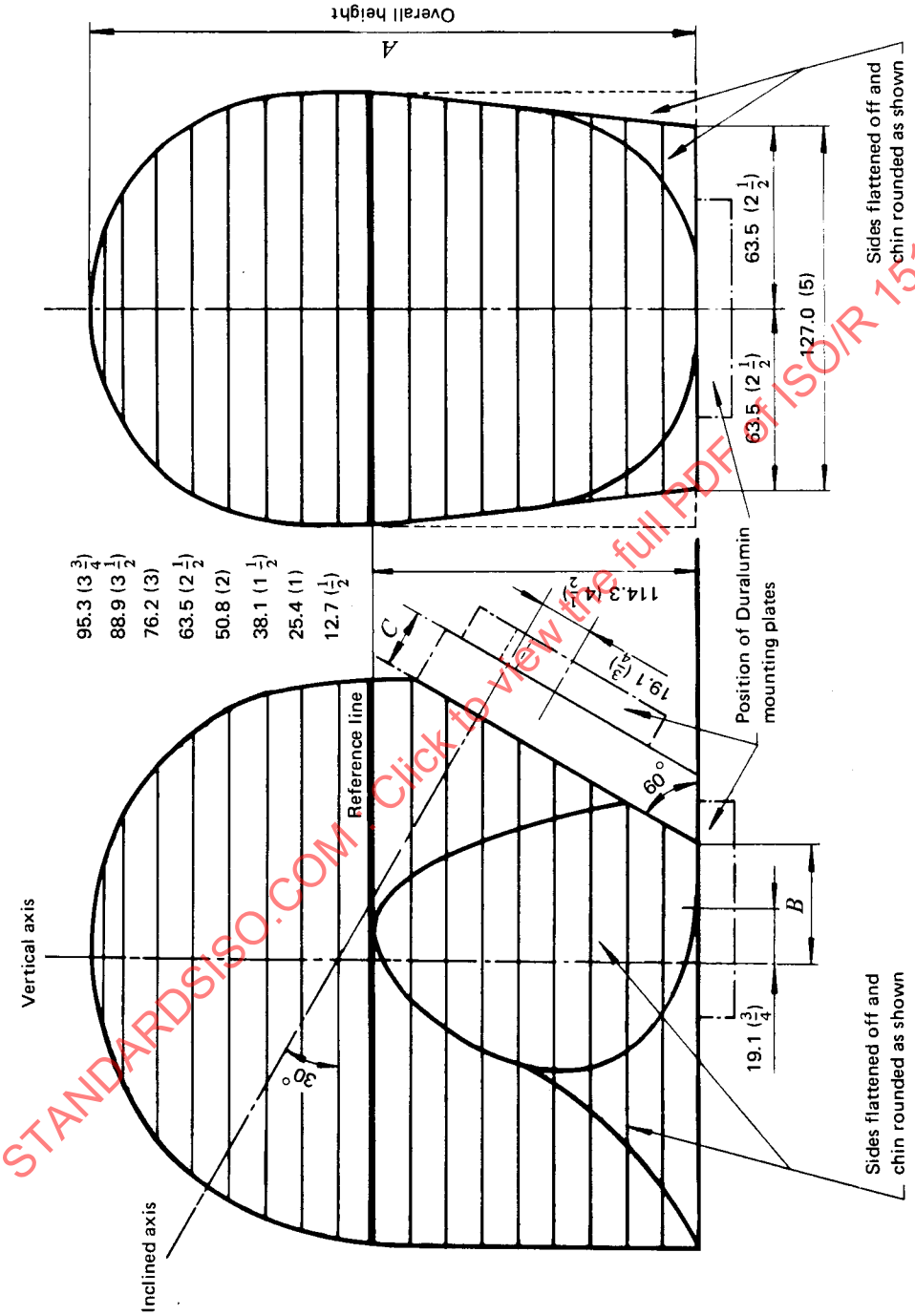


Except for heights above reference line all dimensions for which numerical values are given are constant for all sizes of headform.

For polar co-ordinates of horizontal sections, see Table 2.

FIG. 4 (*a*) – **Wooden headform**

Dimensions in millimetres
(inch values in parentheses)



For dimensions A, B and C see Table 2

FIG. 4 (*b*) – **Wooden headform**

TABLE 2 – **Polar co-ordinates of horizontal cross-sections and other dimensions of wooden headforms lettered A to Q**
(To be read in conjunction with Figures 2, 3, 4 (*a*) and 4 (*b*))

Headform A													
Height above reference line		Front 0°		15°		30°		45°		60°		75°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0	88.1	3.47	86.4	3.40	83.1	3.27	75.4	2.97	69.9	2.75	66.8	2.63
12.7	$\frac{1}{2}$	86.9	3.42	85.3	3.36	83.1	3.27	75.4	2.97	69.9	2.75	66.8	2.63
25.4	1	84.6	3.33	83.6	3.29	82.3	3.24	75.4	2.97	69.9	2.75	66.8	2.63
38.1	$1\frac{1}{2}$	80.8	3.18	80.3	3.16	79.5	3.13	72.9	2.87	67.6	2.66	65.3	2.57
50.8	2	74.7	2.94	74.4	2.93	74.0	2.91	68.1	2.68	63.2	2.49	61.0	2.40
63.5	$2\frac{1}{2}$	64.8	2.55	64.8	2.55	64.8	2.55	59.9	2.36	55.6	2.19	53.3	2.10
76.2	3	45.7	1.80	45.7	1.80	45.5	1.79	43.4	1.71	41.4	1.63	40.4	1.59
82.6	$3\frac{1}{4}$	31.0	1.22	31.2	1.23	31.2	1.23	31.0	1.22	30.0	1.18	29.7	1.17

90°		105°		120°		135°		150°		165°		Rear 180°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
66.5	2.62	69.3	2.73	73.4	2.89	78.8	3.10	84.1	3.31	87.6	3.45	88.1	3.47
66.5	2.62	69.3	2.73	73.4	2.89	78.8	3.10	84.1	3.31	87.6	3.45	88.1	3.47
66.5	2.62	69.3	2.73	73.4	2.89	78.8	3.10	84.1	3.31	86.1	3.39	86.1	3.39
65.0	2.56	67.6	2.66	71.6	2.82	76.5	3.01	81.3	3.20	82.8	3.26	82.8	3.26
60.7	2.39	63.2	2.49	66.8	2.63	71.6	2.82	73.7	2.90	76.7	3.02	76.7	3.02
53.1	2.09	55.4	2.18	59.2	2.33	63.5	2.50	67.6	2.66	67.6	2.66	67.6	2.66
40.4	1.59	42.4	1.67	46.2	1.82	50.5	1.99	54.6	2.15	54.6	2.15	54.6	2.15
30.2	1.19	32.5	1.28	36.1	1.42	40.4	1.59	43.9	1.73	44.5	1.75	44.5	1.75

Dimensions (see Fig. 4 (*b*)) :

	mm	in
A	204.0	8.03
B	29.5	1.16
C	31.5	1.24

TABLE 2 – **Polar co-ordinates of horizontal cross-sections and other dimensions of wooden headforms lettered A to Q**
(To be read in conjunction with Figures 2, 3, 4 (*a*) and 4 (*b*)) (*continued*)

Headform B													
Height above reference line		Front 0°		15°		30°		45°		60°		75°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0	89.7	3.53	88.1	3.47	84.6	3.33	76.7	3.02	71.4	2.81	68.3	2.69
12.7	$\frac{1}{2}$	88.4	3.48	87.4	3.44	84.3	3.32	76.7	3.02	71.4	2.81	68.3	2.69
25.4	1	85.9	3.38	85.3	3.36	83.6	3.29	76.7	3.02	71.4	2.81	68.3	2.69
38.1	$1\frac{1}{2}$	82.3	3.24	82.0	3.23	80.8	3.18	74.4	2.93	69.3	2.73	66.5	2.62
50.8	2	76.5	3.01	76.7	3.02	75.9	3.00	69.9	2.75	65.0	2.56	62.5	2.46
63.5	$2\frac{1}{2}$	66.5	2.62	66.8	2.63	66.8	2.63	61.2	2.41	56.6	2.23	54.4	2.14
76.2	3	49.3	1.94	49.5	1.95	49.5	1.95	46.2	1.82	43.4	1.71	42.2	1.66
82.6	$3\frac{1}{4}$	36.1	1.42	36.6	1.44	36.6	1.44	35.1	1.38	33.5	1.32	32.8	1.29
88.9	$3\frac{1}{2}$	13.2	0.52	13.2	0.52	13.5	0.53	14.2	0.56	15.2	0.60	16.5	0.65

90°		105°		120°		135°		150°		165°		Rear 180°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
68.1	2.68	70.9	2.79	75.2	2.96	80.5	3.17	85.9	3.38	88.9	3.50	89.7	3.53
68.1	2.68	70.9	2.79	75.2	2.96	80.5	3.17	85.9	3.38	88.9	3.50	89.7	3.53
68.1	2.68	70.9	2.79	75.2	2.96	80.5	3.17	85.9	3.38	87.4	3.44	88.1	3.47
66.3	2.61	68.8	2.71	72.6	2.86	77.7	3,06	82.8	3.26	84.1	3.31	84.3	3.32
62.5	2.46	64.8	2.55	68.3	2.69	73.2	2.88	77.5	3,05	78.0	3.07	78.0	3.07
54.6	2.15	56.6	2.23	60.2	2.37	65.3	2.57	69.3	2.73	69.3	2.73	69.3	2.73
42.4	1.67	44.5	1.75	47.7	1.88	52.8	2.08	57.2	2.25	57.4	2.26	57.4	2.26
33.0	1.30	34.8	1.37	38.4	1.51	42.9	1.69	47.5	1.87	47.2	1.86	47.0	1.85
16.5	0.65	19.6	0.77	22.6	0.89	26.9	1.06	30.7	1.21	30.7	1.21	30.7	1.21

Dimensions :

	mm	in
A	205.5	8.09
B	31.5	1.24
C	29.7	1.17

TABLE 2 – **Polar co-ordinates of horizontal cross-sections and other dimensions of wooden headforms lettered A to Q (To be read in conjunction with Figures 2, 3, 4 (*a*) and 4 (*b*)) (*continued*)**

Headform C													
Height above reference line		Front 0°		15°		30°		45°		60°		75°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0	91.2	3.59	89.7	3.53	86.1	3.39	78.7	3.10	72.6	2.86	69.9	2.75
12.7	$\frac{1}{2}$	89.9	3.54	88.6	3.49	86.1	3.39	78.7	3.10	72.6	2.86	69.9	2.75
25.4	1	87.6	3.45	87.1	3.43	85.3	3.36	78.7	3.10	72.6	2.86	69.9	2.75
38.1	$1\frac{1}{2}$	84.6	3.33	83.8	3.30	82.3	3.24	76.5	3.01	70.6	2.78	68.1	2.68
50.8	2	78.5	3.09	78.2	3.08	77.5	3.05	72.4	2.85	66.5	2.62	64.3	2.53
63.5	$2\frac{1}{2}$	69.3	2.73	69.1	2.72	69.1	2.72	64.5	2.54	59.4	2.34	57.2	2.25
76.2	3	52.3	2.06	52.3	2.06	52.3	2.06	49.3	1.94	46.2	1.82	45.2	1.78
82.6	$3\frac{1}{4}$	39.9	1.57	39.9	1.57	39.9	1.57	38.1	1.50	37.1	1.46	36.6	1.44
88.9	$3\frac{1}{2}$	20.6	0.81	20.6	0.81	20.6	0.81	21.3	0.84	22.1	0.87	22.9	0.90

90°		105°		120°		135°		150°		165°		Rear 180°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
69.6	2.74	72.4	2.85	76.7	3.02	82.0	3.23	87.4	3.44	90.4	3.56	91.2	3.59
69.6	2.74	72.4	2.85	76.7	3.02	82.0	3.23	87.4	3.44	90.4	3.56	91.2	3.59
69.6	2.74	72.4	2.85	76.7	3.02	82.0	3.23	87.4	3.44	89.2	3.51	89.9	3.54
68.1	2.68	70.6	2.78	74.7	2.94	79.8	3.14	84.3	3.32	85.6	3.37	86.4	3.40
64.3	2.53	66.5	2.62	70.4	2.77	75.4	2.97	79.5	3.13	80.3	3.16	80.8	3.18
57.4	2.26	59.7	2.35	63.5	2.50	68.3	2.69	71.9	2.83	71.9	2.83	71.9	2.83
45.7	1.80	48.0	1.89	51.6	2.03	56.1	2.21	59.4	2.34	59.7	2.35	59.9	2.36
36.8	1.45	38.6	1.52	41.9	1.65	46.2	1.82	50.5	1.99	51.1	2.01	51.3	2.02
23.9	0.94	25.4	1.00	28.2	1.11	31.8	1.25	34.3	1.35	34.5	1.36	34.5	1.36

Dimensions :

	mm	in
A	207.0	8.15
B	33.5	1.32
C	27.9	1.10

TABLE 2 – **Polar co-ordinates of horizontal cross-sections and other dimensions of wooden headforms lettered A to Q**
(To be read in conjunction with Figures 2, 3, 4 (*a*) and 4 (*b*)) (*continued*)

Headform D

Height above reference line		Front 0°		15°		30°		45°		60°		75°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0	93.0	3.66	90.9	3.58	87.9	3.46	80.8	3.18	74.4	2.93	71.4	2.81
12.7	$\frac{1}{2}$	91.7	3.61	89.7	3.53	87.9	3.46	80.8	3.18	74.4	2.93	71.4	2.81
25.4	1	89.9	3.54	89.2	3.51	86.9	3.42	80.8	3.18	74.4	2.93	71.4	2.81
38.1	$1\frac{1}{2}$	85.9	3.38	85.6	3.37	84.1	3.31	78.0	3.07	72.1	2.84	69.1	2.72
50.8	2	80.5	3.17	80.3	3.16	79.5	3.13	73.4	2.89	68.3	2.69	65.3	2.57
63.5	$2\frac{1}{2}$	71.9	2.83	71.9	2.83	71.6	2.82	65.8	2.59	61.0	2.40	58.7	2.31
76.2	3	55.6	2.19	55.6	2.19	55.6	2.19	53.1	2.09	49.5	1.95	47.8	1.88
82.6	$3\frac{1}{4}$	43.7	1.72	43.7	1.72	43.4	1.71	42.2	1.66	40.6	1.60	39.4	1.55
88.9	$3\frac{1}{2}$	27.7	1.09	27.7	1.09	27.7	1.09	27.4	1.08	27.2	1.07	27.2	1.07

90°		105°		120°		135°		150°		165°		Rear 180°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
71.1	2.80	74.2	2.92	78.0	3.07	83.6	3.29	89.2	3.51	92.2	3.63	93.0	3.66
71.1	2.80	74.2	2.92	78.0	3.07	83.6	3.29	89.2	3.51	92.2	3.63	93.0	3.66
71.1	2.80	74.2	2.92	78.0	3.07	83.6	3.29	89.2	3.51	91.2	3.59	91.9	3.62
69.1	2.72	71.6	2.82	75.9	2.99	81.0	3.19	86.4	3.40	87.9	3.46	88.1	3.47
65.3	2.57	68.1	2.68	71.9	2.83	77.0	3.03	82.0	3.23	82.6	3.25	82.8	3.26
58.7	2.31	61.0	2.40	65.0	2.56	69.9	2.75	73.9	2.91	74.2	2.92	74.4	2.93
47.8	1.88	49.5	1.95	53.1	2.09	58.2	2.29	62.0	2.44	62.2	2.45	62.2	2.45
39.4	1.55	41.7	1.64	45.2	1.78	50.0	1.97	53.6	2.11	53.8	2.12	53.8	2.12
27.4	1.08	29.5	1.16	32.3	1.27	36.6	1.44	39.6	1.56	39.9	1.57	39.9	1.57

Dimensions :

	mm	in
A	208.7	8.22
B	35.6	1.40
C	26.2	1.03

TABLE 2 – Polar co-ordinates of horizontal cross-sections and other dimensions of wooden headforms lettered A to Q
(To be read in conjunction with Figures 2, 3, 4 (*a*) and 4 (*b*)) (*continued*)

Headform E													
Height above reference line		Front 0°		15°		30°		45°		60°		75°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0	94.5	3.72	93.0	3.66	89.7	3.53	82.0	3.23	76.2	3.00	73.2	2.88
12.7	$\frac{1}{2}$	93.2	3.67	91.9	3.62	89.7	3.53	82.0	3.23	76.2	3.00	73.2	2.88
25.4	1	91.2	3.59	90.7	3.57	88.9	3.50	82.0	3.23	76.2	3.00	73.2	2.88
38.1	$1\frac{1}{2}$	87.6	3.45	87.9	3.46	85.9	3.38	80.0	3.15	74.7	2.94	71.6	2.82
50.8	2	82.0	3.23	82.3	3.24	81.0	3.19	75.4	2.97	70.4	2.77	67.8	2.67
63.5	$2\frac{1}{2}$	73.4	2.89	73.7	2.90	73.4	2.89	68.6	2.70	64.0	2.52	61.5	2.42
76.2	3	57.7	2.27	57.9	2.28	58.2	2.29	55.9	2.20	52.6	2.07	50.5	1.99
82.6	$3\frac{1}{4}$	46.5	1.83	46.5	1.83	46.5	1.83	45.2	1.78	43.2	1.70	42.4	1.67
88.9	$3\frac{1}{2}$	30.5	1.20	30.5	1.20	30.7	1.21	31.0	1.22	31.2	1.23	31.2	1.23

90°		105°		120°		135°		150°		165°		Rear 180°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
72.9	2.87	75.7	2.98	79.8	3.14	84.8	3.34	90.7	3.57	93.7	3.69	94.5	3.72
72.9	2.87	75.7	2.98	79.8	3.14	84.8	3.34	90.7	3.57	93.7	3.69	94.5	3.72
72.9	2.87	75.7	2.98	79.8	3.14	84.8	3.34	90.7	3.57	92.7	3.65	93.0	3.66
71.4	2.81	74.2	2.92	77.7	3.06	82.6	3.25	88.6	3.49	89.2	3.51	89.2	3.51
67.6	2.66	70.4	2.77	73.9	2.91	79.0	3.11	83.8	3.30	84.3	3.32	84.3	3.32
61.2	2.41	63.5	2.50	67.1	2.64	71.9	2.83	76.5	3.01	76.5	3.01	76.5	3.01
50.3	1.98	52.1	2.05	55.1	2.17	59.7	2.35	64.5	2.54	64.8	2.55	64.8	2.55
42.9	1.69	44.5	1.75	47.5	1.87	52.3	2.06	56.4	2.22	56.9	2.24	56.6	2.23
31.8	1.25	33.8	1.33	36.8	1.45	40.4	1.59	43.9	1.73	44.2	1.74	44.2	1.74

Dimensions :

	mm	in
A	210.3	8.28
B	37.8	1.49
C	24.4	0.95

TABLE 2 – **Polar co-ordinates of horizontal cross-sections and other dimensions of wooden headforms lettered A to Q**
(To be read in conjunction with Figures 2, 3, 4 (*a*) and 4 (*b*)) (*continued*)

Headform F													
Height above reference line		Front 0°		15°		30°		45°		60°		75°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0	96.0	3.78	94.5	3.72	90.9	3.58	83.6	3.29	78.0	3.07	74.7	2.94
12.7	$\frac{1}{2}$	94.7	3.73	93.7	3.69	90.9	3.58	83.6	3.29	78.0	3.07	74.7	2.94
25.4	1	92.2	3.63	91.7	3.61	90.4	3.56	83.6	3.29	78.0	3.07	74.7	2.94
38.1	$1\frac{1}{2}$	89.4	3.52	89.7	3.53	88.1	3.47	81.8	3.22	76.2	3.00	73.2	2.88
50.8	2	84.3	3.32	84.3	3.32	83.6	3.29	77.5	3.05	72.4	2.85	69.9	2.75
63.5	$2\frac{1}{2}$	75.7	2.98	75.7	2.98	75.4	2.97	70.1	2.76	65.8	2.59	63.5	2.50
76.2	3	61.2	2.41	61.0	2.40	61.0	2.40	58.7	2.31	54.9	2.16	52.8	2.08
88.9	$3\frac{1}{2}$	35.1	1.38	34.8	1.37	34.8	1.37	35.1	1.38	35.3	1.39	35.8	1.41
95.3	$3\frac{3}{4}$	16.3	0.64	16.0	0.63	16.0	0.63	17.0	0.67	18.0	0.71	19.8	0.78

90°		105°		120°		135°		150°		165°		Rear 180°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
74.4	2.93	77.2	3.04	81.0	3.19	86.4	3.40	92.2	3.63	95.3	3.75	96.0	3.78
74.4	2.93	77.2	3.04	81.0	3.19	86.4	3.40	92.2	3.63	95.3	3.75	96.0	3.78
74.4	2.93	77.2	3.04	81.0	3.19	86.4	3.40	92.2	3.63	93.7	3.69	94.2	3.71
73.2	2.88	75.4	2.97	79.2	3.12	84.1	3.31	89.7	3.53	90.4	3.56	91.2	3.59
69.6	2.74	71.6	2.82	75.2	2.96	79.8	3.14	84.6	3.33	85.3	3.36	85.6	3.37
63.2	2.49	65.3	2.57	68.6	2.70	72.6	2.86	77.2	3.04	78.0	3.07	78.2	3.08
52.6	2.07	54.4	2.14	58.2	2.29	62.2	2.45	66.8	2.63	66.8	2.63	67.1	2.64
36.1	1.42	37.8	1.49	40.9	1.61	45.2	1.78	49.0	1.93	49.0	1.93	49.0	1.93
21.3	0.84	23.4	0.92	25.9	1.02	29.0	1.14	32.3	1.27	32.5	1.28	32.5	1.28

Dimensions :

	mm	in
A	211.8	8.34
B	39.9	1.57
C	22.4	0.88

TABLE 2 – Polar co-ordinates of horizontal cross-sections and other dimensions of wooden headforms lettered A to Q
(To be read in conjunction with Figures 2, 3, 4 (*a*) and 4 (*b*)) (*continued*)

Headform G

Height above reference line		Front 0°		15°		30°		45°		60°		75°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0	97.5	3.84	95.8	3.77	93.0	3.66	85.1	3.35	79.5	3.13	76.2	3.00
12.7	$\frac{1}{2}$	96.3	3.79	95.3	3.75	92.7	3.65	85.1	3.35	79.5	3.13	76.2	3.00
25.4	1	93.7	3.69	92.7	3.65	91.4	3.60	85.1	3.35	79.5	3.13	76.2	3.00
38.1	$1\frac{1}{2}$	90.4	3.56	89.7	3.53	88.9	3.50	83.3	3.28	77.7	3.06	75.2	2.96
50.8	2	86.1	3.39	85.6	3.37	84.6	3.33	79.0	3.11	73.7	2.90	71.1	2.80
63.5	$2\frac{1}{2}$	77.5	3.05	77.2	3.04	76.5	3.01	72.1	2.84	67.3	2.65	64.5	2.54
76.2	3	63.8	2.51	63.8	2.51	64.0	2.52	61.2	2.41	57.4	2.26	54.9	2.10
88.9	$3\frac{1}{2}$	39.9	1.57	39.6	1.56	39.6	1.56	39.1	1.54	38.4	1.51	37.8	1.49
95.3	$3\frac{3}{4}$	20.6	0.81	20.6	0.81	20.6	0.81	21.3	0.84	22.4	0.88	23.4	0.92

90°		105°		120°		135°		150°		165°		Rear 180°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
75.9	2.99	78.5	3.09	83.1	3.27	88.4	3.48	94.0	3.70	97.0	3.82	97.5	3.84
75.9	2.99	78.5	3.09	83.1	3.27	88.4	3.48	94.0	3.70	97.0	3.82	97.5	3.84
75.9	2.99	78.5	3.09	83.1	3.27	88.4	3.48	94.0	3.70	95.8	3.77	96.3	3.79
74.9	2.95	77.0	3.03	81.3	3.20	86.6	3.41	91.7	3.61	92.7	3.65	93.0	3.66
70.9	2.79	73.2	2.88	78.0	3.07	82.8	3.26	87.1	3.43	87.9	3.46	88.1	3.47
64.3	2.53	66.5	2.62	70.9	2.79	75.9	2.99	79.0	3.11	79.8	3.14	80.0	3.15
54.9	2.16	56.9	2.24	61.5	2.42	66.5	2.62	68.8	2.71	69.1	2.72	69.1	2.72
38.4	1.51	40.4	1.59	44.2	1.74	49.8	1.96	52.8	2.08	53.1	2.09	53.1	2.09
23.9	0.94	25.4	1.00	28.7	1.13	33.5	1.32	37.8	1.49	39.1	1.54	39.1	1.54

Dimensions :

	mm	in
A	213.4	8.40
B	42.0	1.65
C	20.6	0.81

TABLE 2 – **Polar co-ordinates of horizontal cross sections and other dimensions of wooden headforms lettered A to Q (To be read in conjunction with Figures 2, 3, 4 (*a*) and 4 (*b*)) (*continued*)**

Headform H

Height above reference line		Front 0°		15°		30°		45°		60°		75°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0	99.3	3.91	97.3	3.83	94.0	3.70	86.4	3.40	80.5	3.17	77.7	3.06
12.7	$\frac{1}{2}$	97.3	3.83	96.3	3.79	93.7	3.69	86.4	3.40	80.5	3.17	77.7	3.06
25.4	1	95.8	3.77	94.7	3.73	93.0	3.66	86.4	3.40	80.5	3.17	77.7	3.06
38.1	$1\frac{1}{2}$	91.9	3.62	91.7	3.61	90.2	3.55	83.6	3.29	78.0	3.07	75.4	2.97
50.8	2	86.9	3.42	86.9	3.42	85.9	3.38	79.8	3.14	74.7	2.94	71.9	2.83
63.5	$2\frac{1}{2}$	79.5	3.13	79.5	3.13	79.2	3.12	73.7	2.90	68.3	2.69	65.8	2.59
76.2	3	67.1	2.64	67.1	2.64	67.3	2.65	63.8	2.51	59.2	2.33	56.6	2.23
88.9	$3\frac{1}{2}$	42.9	1.69	43.2	1.70	43.4	1.71	42.4	1.67	41.4	1.63	40.6	1.60
95.3	$3\frac{3}{4}$	26.7	1.05	26.9	1.06	27.4	1.08	27.4	1.08	26.9	1.06	27.2	1.07

90°		105°		120°		135°		150°		165°		Rear 180°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
77.5	3.05	80.3	3.16	84.1	3.31	89.7	3.53	95.5	3.76	98.6	3.88	99.3	3.91
77.5	3.05	80.3	3.16	84.1	3.31	89.7	3.53	95.5	3.76	98.6	3.88	99.3	3.91
77.5	3.05	80.3	3.16	84.1	3.31	89.7	3.53	95.5	3.76	97.8	3.85	98.3	3.87
75.7	2.98	78.0	3.07	81.7	3.22	86.9	3.42	92.5	3.64	93.7	3.69	94.5	3.72
72.4	2.85	74.9	2.95	78.2	3.08	83.6	3.29	88.4	3.48	89.2	3.51	89.9	3.54
66.3	2.61	68.8	2.71	72.1	2.84	77.2	3.04	81.5	3.21	81.5	3.21	81.8	3.22
56.6	2.23	58.9	2.32	62.2	2.45	67.3	2.65	71.1	2.80	71.1	2.80	71.1	2.80
41.1	1.62	42.9	1.69	46.5	1.83	51.3	2.02	55.1	2.17	55.9	2.20	55.9	2.20
28.2	1.11	30.0	1.18	33.3	1.31	38.1	1.50	42.9	1.69	43.9	1.73	44.2	1.74

Dimensions :

	mm	in
A	215.1	8.47
B	43.9	1.73
C	18.8	0.74

TABLE 2 – **Polar co-ordinates of horizontal cross sections and other dimensions of wooden headforms lettered A to Q (To be read in conjunction with Figures 2, 3, 4 (*a*) and 4 (*b*)) (*continued*)**

Headform J													
Height above reference line		Front 0°		15°		30°		45°		60°		75°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0	100.8	3.97	98.8	3.89	96.3	3.79	88.1	3.47	82.0	3.23	79.5	3.13
12.7	$\frac{1}{2}$	99.6	3.92	98.0	3.86	95.8	3.77	88.1	3.47	82.0	3.23	79.5	3.13
25.4	1	96.8	3.81	95.8	3.57	94.5	3.72	88.1	3.47	82.0	3.23	79.5	3.13
38.1	$1\frac{1}{2}$	93.7	3.69	92.7	3.65	91.9	3.62	86.1	3.39	80.0	3.15	77.2	3.04
50.8	2	89.2	3.51	88.6	3.49	87.9	3.46	82.0	3.23	76.2	3.00	73.9	2.91
63.5	$2\frac{1}{2}$	81.5	3.21	80.8	3.18	81.0	3.19	75.9	2.99	70.6	2.78	68.1	2.68
76.2	3	69.3	2.73	69.1	2.72	69.3	2.73	65.3	2.57	61.2	2.41	58.9	2.32
88.9	$3\frac{1}{2}$	47.2	1.86	47.5	1.87	48.0	1.89	46.2	1.82	44.5	1.75	43.7	1.72
95.3	$3\frac{3}{4}$	32.8	1.29	32.8	1.29	33.3	1.31	32.5	1.28	32.0	1.26	32.3	1.27

90°		105°		120°		135°		150°		165°		Rear 180°	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
79.2	3.12	82.0	3.23	85.9	3.38	91.7	3.61	96.8	3.81	100.1	3.94	100.8	3.97
79.2	3.12	82.0	3.23	85.9	3.38	91.7	3.61	96.8	3.81	100.1	3.94	100.8	3.97
79.2	3.12	82.0	3.23	85.9	3.38	91.7	3.61	96.5	3.80	98.3	3.87	98.8	3.89
77.7	3.06	80.0	3.15	83.8	3.30	89.4	3.52	94.5	3.72	95.8	3.77	96.0	3.78
74.4	2.93	77.0	3.03	80.5	3.17	85.9	3.38	90.4	3.56	90.9	3.58	90.9	3.58
68.3	2.69	71.1	2.80	74.4	2.93	79.5	3.13	83.8	3.30	84.1	3.31	84.1	3.31
59.2	2.33	61.7	2.43	65.0	2.56	69.3	2.73	73.2	2.88	73.4	2.89	73.4	2.89
44.2	1.74	46.2	1.82	50.0	1.97	54.1	2.13	58.2	2.29	58.4	2.30	58.4	2.30
33.0	1.30	35.1	1.38	38.1	1.50	42.2	1.66	46.5	1.83	47.2	1.86	47.2	1.86

Dimensions :

	mm	in
A	216.7	8.53
B	46.2	1.82
C	17.0	0.67