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नेपाल गुणस्तर
NEPAL STANDARD

PROTECTIVE HELMETS FOR MOTORCYCLE RIDERS –SPECIFICATION

नेपाल सरकार

उद्योग बाणिज्य तथा आपूर्ति मन्त्रालय

नेपाल गुणस्तर तथा नापतौल विभाग

बालाजु, काठमाडौं

नेपाल गुणस्तर परिषद्
Nepal Council for Standardization (NCS)

अध्यक्ष

माननिय मात्रिका यादब, उधोग बाणिज्य तथा आपूर्ति मन्त्री

उपाध्यक्ष

श्री याम कुमारी खतिवडा, सचिव, उद्योग, बाणिज्य तथा आपूर्ति मन्त्रालय

सदस्यहरु

सि.नं.	नाम	पद	संस्था
१	श्री शत्रुधन प्रसाद पुडासैनी	सह सचिव	उद्योग, बाणिज्य तथा आपूर्ति मन्त्रालय
२	श्री	सह सचिव	उद्योग, बाणिज्य तथा आपूर्ति मन्त्रालय
३	श्री सुरेन्द्र पसाद सुवेदी	सह सचिव	शिक्षा, विज्ञान तथा प्रविधि मन्त्रालय
४	श्री संजीव कुमार कर्ण	सह सचिव	कृषि विकास मन्त्रालय (खाध प्रविधि तथा गुण नियन्त्रण वि.)
५	श्री निर्मला अधिकारी भट्टराई	सह सचिव	कानुन तथा संसदीय मामिला मन्त्रालय
६	श्री रिकेश महर्जन	इन्जिनियर (प्रतिनिधि सदस्य)	भौतिक पुर्वाधार तथा यातायात व्यवस्था म
७	श्री सुमनलाल श्रेष्ठ	प्राध्यापक	त्रिभुवन विश्वविधालय
८	श्री प्रा.डा. दिपक सुबेदी		काठमांडौ विश्वविधालय
९	श्री दिनेश श्रेष्ठ		नेपाल उधोग वाणिज्य महासंघ
१०	श्री दिपक श्रेष्ठ		नेपाल चेम्वर अफ कमर्स
११	श्री अनिता जोशी		उपभोक्ता सरोकारवाला संघ संस्था
१२	र्जना बुर्लाकोटीश्री सि		उपभोक्ता सरोकारवाला संघ संस्था
१३	श्री अरुणदेव भट्टराई		विज्ञ

सदस्य सचिव

श्री विश्ववाबु पुडासैनी, महानिर्देशक,ने.गु.तथा ना.बि.

हेल्मेट सम्बन्धि प्राविधिक समितिको सदस्यहरु

१.श्री विश्वबाबु पुडासैनि, महानिर्देशक ने.गु.तथा ना.वि

२.श्री रोमि मानन्धर ,उप महानिर्देशक ने.गु.तथा ना.वि

३.श्री दिनानाथ मिश्र , उप महानिर्देशक ने.गु.तथा ना.वि

४.श्री प्रमोदा प्रधान ,उप महानिर्देशक ने.गु.तथा ना.वि

५.श्री कृष्णदत्त भट्ट ,महानागरिक ट्राफिक प्रहरी

६.श्री माधब तिमिल्सिना, उपभोक्ता **अधिकार अनुसन्धान मंच**

७.श्री गोविन्द प्र. भट्टराई, नेपाल अटोमोबाइल्स एसोसिएसन

८.श्री रुद्र मणि घिमिरे, पूल्चोक इन्जिनरिगं क्यामपस

९.श्री सिताराम न्यौपाने , नेपाल मोटर साइकल फेडेरेसन

१०.श्री सुशिल तान्डुकार , **इन्स्टिच्युट** अफ अटोमोटिभ इन्जिनियरिगं

११.श्री सुवोध कु.घिमिरे, थापाथलि इन्जिनरिगं क्यामपस

१२.श्री आलोक कुमार मिश्र, ने.गु.तथा ना.वि .

१३. श्री मणिराम भुसाल , ने.गु.तथा ना.वि .

१४. श्री अनिल शाक्य ,ने.गु.तथा ना.वि .

१५. श्री सुमन बस्याल ,कोहिनर मेटल उद्योग

१६.श्री रवि कुमार झा ने.गु.तथा ना. .वि .

१७.श्री अञ्जन श्रेष्ठ, उद्योग वाणिज्य महासंघ

१८.श्री मनिषा महर्जन,उद्योग वाणिज्य तथा आपुर्ति मन्त्रालय

१९.श्री सुर्य सुब्बा ,घरेल ुतथा साना उद्योग विभाग

२०.श्री कृष्ण बहादुर सोडारी,ने.गु तथा ना.बि

प्रस्तावना

१.नेपाल गुणस्तर (प्रमाण चिन्ह) ऐन २०३७ ले प्रदत्त अधिकार प्रयोग गरी नेपाल गुणस्तर निर्धारण गर्ने यस विभागलाइ भएको निर्देशन र नीति सार राष्टिय गुणस्तर स्तरमा प्रलेखहरु तयार पार्ने सिलसिलामा आवश्यक तरिका र ढाँचामा यो गुणस्तर प्रलेख तर्ज्मा गरी प्रस्त्त गरिएको छ। यसले नेपाल ग्णस्तर सँग सम्बन्धित सबै पक्षका निमित्त आवश्क निर्देशीकाको कार्य गर्ने छ ।

२.यो प्रलेख तयार पार्दा गुणस्तर निर्धारणको प्रलेख सम्बन्धमा अरु देशहरुले र अन्तराष्टिय संगठनले अपनाएका प्रचलन ,तरिका र ढाचाँलाई यथोचित ध्यानमा राखिएको छ। यसको तर्ज्माको लागि विशेष गरी देहायको विदेशि तथा अन्तराष्टिय संघ संस्थाको प्रलेख तथा साधानको सहयोग लिएको छ।

क) आइ ंएस.ओ. इर्न्टनेशनल अर्गनाइजेसन फर स्टाण्डर्डइजेसन

ख)वी.एस. आई ब्रिटिश स्टाण्र्डड इन्स्टिच्युसन

ग)वी. आइ.एस. व्य्रो अफ इडिया स्टाण्डर्ड

३. प्रलेख तयार पार्दा खास ध्यानमा राखिएका **बुदाहरु**

३.१ गुणस्तर प्रलेखको तर्जुमा गर्दा अन्य प्रलेखको कुनै पनि परिच्छेदको उलंघ हुन नजाओस भनि यथाशक्य होशियारी राखिएको छ। असावधानीबाट केहि उलंघन हुन गएको ज्ञात हुन आएमा यसमा चाहिने संशोधनको लागि यथाशिघ्र कदम उठाउने छ।

३.२ देशको ऐन नियम अन्तरगत परेको सबै बुदाँलाई यथोचित मान्यता दिइ यसको कुनै दफा तथा उरिच्छेदको उलंघन नहने गरी यो गुणस्तर प्रलेख तयार पार्ने कोशिस गरीएको छ। कथंदाचित गुणस्तर प्रलेखको कुनै भागमा उलेखित कुराहरु ह्मल प्रचलनमा भएका तथा भविष्यमा आउने ऐन नियम सँग बाझिन गएमा त्यस्ता (प्रलेख)का कुराहरु स्वत निष्कृय हुनेछ ।

३.३ **नापतौल** इकाई तथा तिनिहरुको रुपानतर गर्दा स्टयाण्डर्ड नापतौल ऐन अर्न्तगत जे जति नियमहरु छन् सबैलाई यथोचित मान्यता दिई यिनिहरको प्रयोग गरिएको छ।

३.४ यस प्रलेखको तर्जुमा ने.गु.तथा आइ.एस.आई र त्यस्तै अन्य अन्तर्राष्ट्रिय संघ स.स्थाहरुका सम्वन्धित विषयमा निर्देशिका पुस्तिका तथा गुणस्तर निर्धारण र गुण **नियन्त्रण** सम्बन्धी अरु कार्यहरुको प्रतिवेदन इत्यादिबाट सामाग्रीहरु इथासम्भव प्राप्त गरी तिनिहरुको सिफारिस अनुरुप सामन्जस्यता ल्याउन खोजिएको छ।

३.५ यस प्रलेखको तर्जुमा गर्दा नापतौल इत्यादि विभिन्न इकाइहरुको लागि अन्तर्राष्ट्रिय क्षेत्रमा चलिरहेको वहुमान्य इकाई तथ **आई.ए.सो.**ओ ले समेत सिफारिस गरेको एस .आइ .इकाई प्रणालीलाई यथासंभव प्रयोगमा ल्याइएको छ।

४. यस गुणस्तर प्रलेखमा उल्लेखित आवश्कताहरु अनुरुप छ वा छैन भन्ने कुरा निश्चित गर्ने गरिएको परीक्षण वा विश्लेषणको नतिजा प्रस्तुत गर्न संस्थाहरुलाई राउन्डिङ्ग अफ गर्दा नेगुण न.१७ अनुसार गरिनु पर्दछ।

५. यस गुणस्तर प्रलेखमा **हेल्मेट** सम्बन्धित प्राविधिक पक्षलाई मात्र समावेश गरिएको छ। **कारोबार** सम्बन्धी कुराहरु यस प्रलेखको क्षेत्र भित्र पर्दैन।

Nepal Standard

PROTECTIVE HELMETS FOR MOTORCYCLE RIDERS –SPECIFICATION

1 SCOPE

1.1 This standard lays down the requirements regarding materials, construction, workmanship, finish, mass and performance for protective helmets (with or without lower face cover) for everyday use by motorcycle riders.

1.2 The helmets covered by this standard are not intended for high speed competitive events.

2 REFERENCES

The Nepal standard listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply (see Fig. 1)

3.1 Motorcycle

A two wheeled motor vehicle, inclusive of any detachable side car having an extra wheel, attached to the motor vehicle.

3.2 Protective Helmet

A helmet primarily intended to protect the wearer's head against impact.

3.3 **Shell**

The hard part of the protective helmet which gives it its general shape.

3.4 Protective Padding

A material used to absorb impact energy.

3.5 Comfort Padding

A material provided for the wearer’s comfort.

3.6 Retention System

The complete assembly by means of which the helmet is maintained in position on the head, including any devices for adjustment of the system or to enhance the wearer’s comfort.

3.6.1 Headband

Part of retention system in contact with and surrounding the head.

3.6.2 Chin strap

A part of the retention system consisting of a strap that passes under the wearer’s jaws to keep the helmet in position.

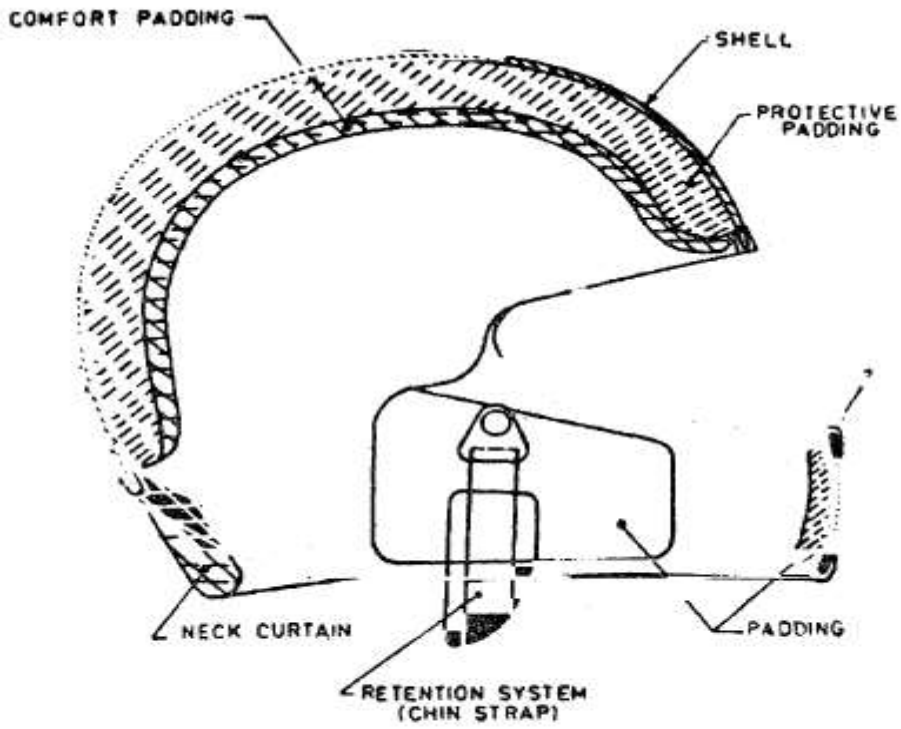


FIG. 1 A TYPICAL SKETCH SHOWING INTERNAL COMPONENTS OF HELMET

3.7 Peak

It is an extension of the shell above the eyes.

3.8 lower Face Cover

A detachable or integral part of the helmet covering the lower part of the face.

3.9 Visor

A transparent protective screen extending over the eyes and covering part of the face.

3.10 Goggles

Transparent protectors that enclose and cover the eyes.

3.11 Basic Plane of the Human Head

A plane at the level of the opening of the external auditory meatus (external ear opening) and the lower edge of the orbits (lower edge of the eye sockets).

3.12 Basic Plane of the Headform

A plane which corresponds to the basic plane of the human head.

3.13 Central Vertical Axis

The line relative to human head or headform or helmet that lies in the plane of symmetry, and that is normal to the basic plane at a point equidistant from the front and back of the head Of the headform or (for helmet) of the headform that simulates the head that the helmet is intended to fit (Fig. 3B),

3.14 Reference plane

A construction plane parallel to the basic plane of the headform at a distance from it which is a function of the size of the headform.

3.15 Neek Curtain

A part of the helmet attached to the lower edge of the helmet designed to protect against adverse weather conditions, dirt and small stones,

4 MATERIAL

4.1 Shell

The shell of the helmet shall be of non-metallic materials conforming to the test requirements given in 4.5 and 9.1.

4.2 Protective Padding

It shall be of expanded polystyrene or any other material having similar properties.

4.3 Comfort Padding

It shall be of expanded polyurethane foam, polyethylene or any other suitable material having similar properties.

4.4 Retention System

The criteria for selection of material for chin strap and headband shall be sweat-resistant, non- Irritant and shall not be known to cause skin disease.

4.5 Metal Parts

The metal parts in helmet shall be either inherently corrosion resistant or shall have been treated for corrosion resistance. Such pans shall show no sign of corrosion when subjected to test as specified in NS1**…..

4.6 Visor

The criteria for selection of material for visor, if provided, shall be in accordance with NS2**...

5 SIZES

5.1 Helmets shall be of the sizes matching to the sizes of headform of 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630 and 640 mm in accordance with NS3**….

6 CONSTRUCTION REQUIREMENTS

6.1 General

6.1.1 The basic construction of the helmet shall be in the form of a hard outer shell containing additional means of absorbing impact energy and a retention system.

6.1.2 The protective helmet may be fitted with ear flaps and a neck curtain. It may also have a detachable peak, a visor and may also have a lower face cover.

6.1.3 No component or device shall be fitted to or incorporated in the protective helmet unless it ii designed in such a way that it shall not cause injury and that, when it is fitted to or incorporated in the protective helmet, the helmet still complies with the requirements of this standard.

6.1.4 The characteristics of the materials used in the manufacture of helmets shall be known not to undergo appreciable alteration under the influence of ageing, or of the circumstances of use to which the helmet is normally subjected, such as exposure to sun, extremes of temperature and rain. For those parts of the helmet coming into contact with the skin, the materials used should be known not to undergo appreciable alteration through the effect of perspiration or of toilet preparations. The materials known to cause skin troubles should not be used.

6.2 Shell

The extent of the protection provided shall be as given in 6.2.1 to 6.2.7.

6.2.1 The shell shall cover all areas above plane AA and shall extend downwards at least as far as the lines CDEF on both sides on the head- form (see Fig. 2A),

6.2.2 At the rear, the rigid parts and» in particular, the shell shall not be within a cylinder of diameter 100 mm, with axis situated at the intersection of the medium plane of symmetry of the headform and of a plane parallel to and 1 10 mm below the reference plane (see Fig. 2B),

6.2.3 The helmet shall not dangerously affect the wearer's ability to hear and shall conform to the requirements laid down m 9.5. Ventilation may be provided for increasing the comfort of the rider. The outer surface shall be perfectly smooth. Above the reference plane, the shape shall be in the form of a continuous, convex curve, except where shaping is provided for functional purposes. Below the reference plane, irregularities in the curve shall be smoothly faired. The shell shall not incorporate an integral peak, but may incorporate in integral lower face cover. Where means for attaching a visor are not provided, the profile at the front edge shall not prevent the wearing of goggles.

6.2.4 There shall be no external projections greater than 5 mm above the outer surface of the shell. Where a goggle fitting is provided at the rear of the helmet and is designed to be detach- able, this requirement shall not apply to such a fitting.

6.2.5 Any external projections other than press- fasteners shall be smooth and adequately faired. Rivet heads shall be radiused and shall not project more than 2 mm above the outer surface of the shell.

6.2.6 There shall be no inward-facing sharp edges on the inside of the helmet. Rigid projecting internal parts shall be covered with padding so that any stresses transmitted to the head are not highly concentrated. Rivet heads shall be radiused and shall not project more than 2 mm above the internal surface of the shell.

6.2.7 The components of the helmet which are intended to protect the head of the user shall be assembled such that they may not become easily detached or move under the conditions of the test as specified in 9.1.

6.3 Protective Padding

The protective padding shall cover all the areas defined in 6.2.1 taking into account the requirements given in 6.2.3.

6.4 Retention System

The helmet shall be held in place on the wearer's head by means of a retention system which is secured under the lower jaw and is firmly attached to the shell.

6.4.1 Chin Strap

The strap shall not be less than 20 mm wide under a load of (150 N ± 5) N applied under the conditions given in F-1.2.

6.4.2 The chin strap shall not include a chin cup.

6.4.3 The device to open the retention system shall not be capable of opening other than as a result of a deliberate act. In the case of a press- fastener opening device, the press- fastener shall be recessed, that is. the surface to which the pressure is applied shall be fitted with a fairing about its whole periphery so that opening docs not occur when the surface is pressed with a sphere of 100 mm diameter.

6.4.4 The retention of the helmet on the head by the retention system shall be verified when the test described in 9.6 is carried out. When a helmet subject to the test shall be that presenting the least favorable conditions (such as the thickest padding, etc.).

6.5 Peripheral Vision

6.5.1 The helmet shall be placed on the head, form (see NS3**…) corresponding to its size by the procedure as specified in Annex B.

6.5.2 In the conditions mentioned in 6.5.1, there shall be no occultation in the field of vision and shall satisfy the following requirements:

a) Horizontally - Two segments of dihedral angles symmetrical in relation to the median longitudinal vertical plane of the headform and situated between the reference and the basic planes. Each of these dihedral angles is defined by longitudinal vertical plane forming an angle of not less than 105◦ with the median longitudinal vertical plane and whose edge is the straight line L K (see fig. 2A, 2B, 3A and 3C).

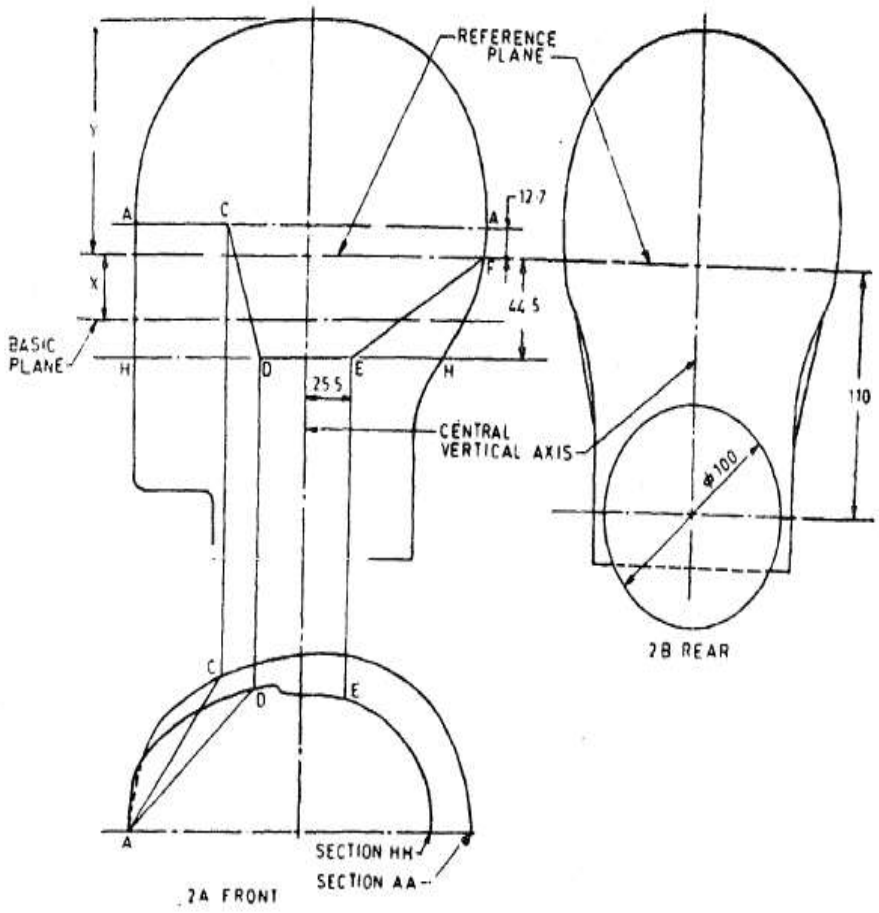
b) Upwards – A dihedral angle defined by the reference plane of the headform and a plane forming an angle of not less than 7◦ with the reference plane and whose edge is the straight line L_1, L_2: The points L_1 and L_2 representing the eyes (see fig, 3A and 3B).

c) Downwards – A dihedral angle defined by the basic plane of the headform and a plane forming an angel of not less than 45^0 with the basic plane and whose edge is the straight line k_1, k_2(see fig. 3A and 3B).

ALL DIMENSIONS IN MILLIMETERS.

Headforms	sizes	x	y	AC	HD
A	500	24	89.5	80	88
C	520	25	93	82	90
E	540	26	96	84	92
G	560	27	99	86	94
J	570	27.5	102.5	87	95
K	580	28	104	88	96
M	600	29	107	90	98
O	620	30	110	92	100

Fig. 2 HEAD FORM


REFERENCE PLANE
Y
X
A
C
A
12.7
F
44.5
BASIC PLANE
H
D
E
H
25.5
CENTRAL VERTICAL AXIS
110
ϕ100
2B REAR
C
D
E
A
SECTION HH
SECTION AA
2A FRONT

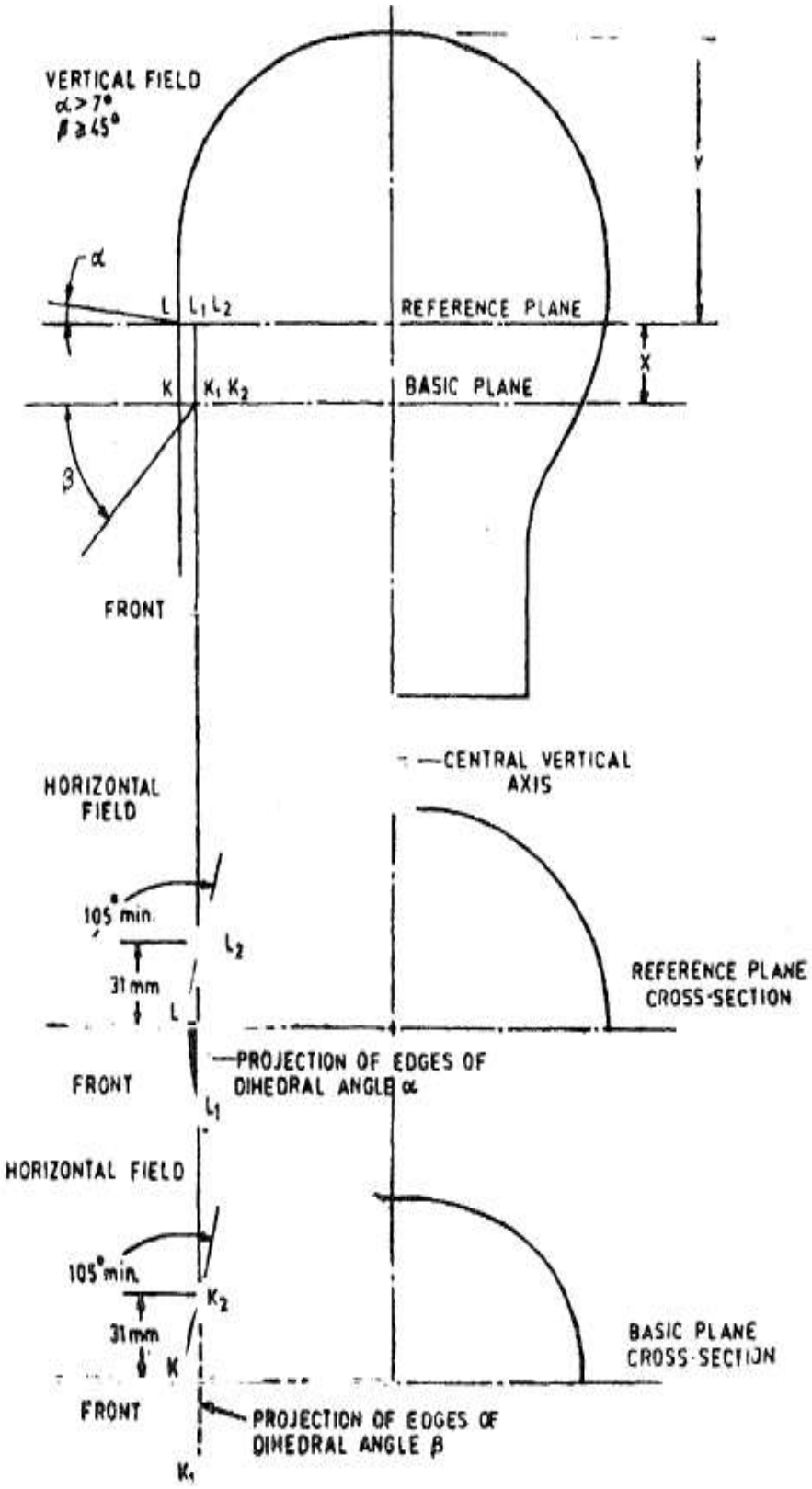


FIG. 3A PERIPHERAL VISION

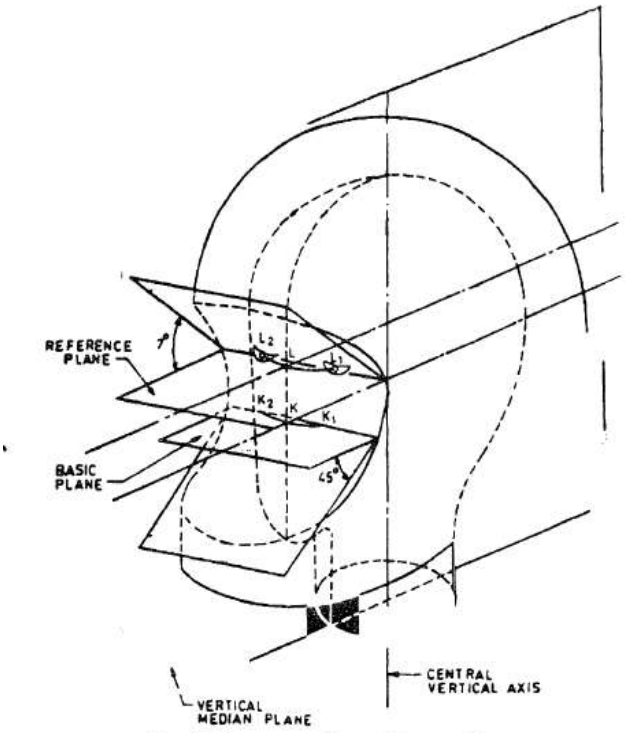


FIG. 3B PERIPHERAL VISION-VERTICAL FIELD

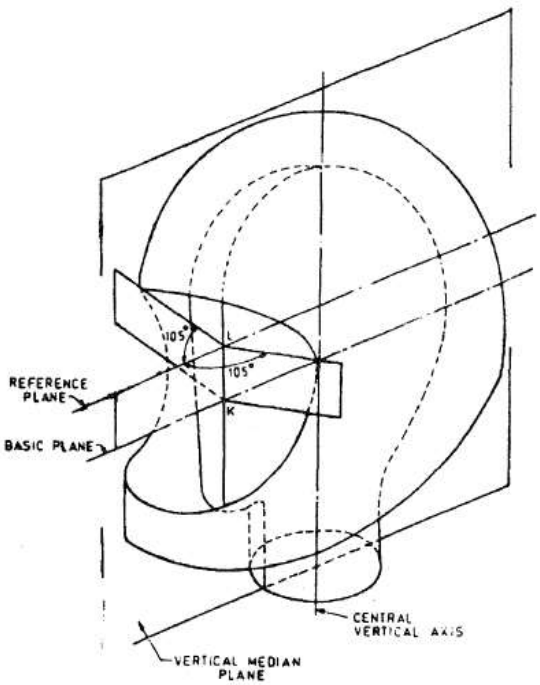


FIG. 3C PERIPHERAL VISION-HORIZONTAL FIELD

6.6 Visor

The requirements in regard to visor, if provided shall be as specified in NS2**…

7 WORKMANSHIP AND FINISH

7.1 All edges shall be smooth and rounded. Any external or internal projection permitted under 6.2.4, 6.2.5 and 6.2.6 shall be soft, smooth and adequately faired to other surface.

8 MASS

8.1 The helmets with less mass are preferred and may be available with the increasing availability or more advanced composites helmet (without peak, visor and detachable lower face cover, if provided) shall not exceed 1500 g.

9 PERFORMANCE REQUIRMENTS

9.1 Impact Absorption Test

9.1.1 Types of conditioning

Prior to any type of further conditioning for mechanical tests, each helmet shall be subjected to solvent conditioning:

a) Solvent conditioning — Take a cotton doth approximately 150 mm square and a quantity approximately 25 ml of a solvent consisting of test liquid with (70 percent octane and 30 percent toluene). Using the cloth soaked in the solvent, apply the solvent to all those regions of the outside surface of the helmet shell within 50 mm of the chin strap fixings and keep these regions wet within the solvent for 7.5 ± 2.5 seconds. Repeat the procedure on the remainder of the external surface including any chin guard* keeping these regions wet for 12.5 ± 2.5 seconds. No further conditioning or testing be done during the following 30 minutes*

b) Ambient (temperature and humidity) conditioning — The helmet shall be exposed to a temperature of 25 ± 5^0C and a relative humidity of 65 ±5 percent for at least 4 hours in an oven.

c) Heat conditioning — The helmet shall be exposed to a temperature of 50 ± TC for not less than 4 hours and not more than 6 hours in dry heat.

d) Low-temperature conditioning — The helmet shall be exposed to a temperature of-20 ± 2^0C for not less than 4 hours sad not more than 6 hours in a cold chamber.

c) Ultraviolet-radiation conditioning and moisture conditioning — The outer surface of the protective helmet shall be exposed to ultraviolet radiation by a 125 watt zenonfilled quartz lamp for 48 hours at a range of 25 cm subsequently spaying for 4 to 6 hours with water at ambient temperature at the rate of 1 litre per minute.

The conditioned helmet shall be tested for impact absorption test by the method described in Annex C. The first Impact shall be carried out within 45 seconds. All the subsequent impacts shall be completed within not more than 5 minutes after subjecting to the conditions specified in 9.1.1(a) to (e) above, and samples to be conditioned shall be as per Table 1.

The conditioned helmet tested shall meet the requirements, when the resultant acceleration (RMS value of acceleration measured along the three directions) measured at the center of gravity of the headform shall be < 150 g_n (where g_n = 9.81 m/sec^2) for any 5 milii seconds continuously and at no time exceeds 300 g_n.

Table 1 conditioning of samples

Caluse (9.1)

Number of helmet to be conditioned					Total
Test	**Ambient temperature and hygrometry conditioning**	**Heat conditioning**	**Low temperature conditioning**	**Ultraviolet radiation conditioning and moisture conditioning**	
Impact Absorption	1	1	1	1	4
Resistance to penetration	1				1*
rigidity	2				2
Retention system	1				1

*To be tested under the condition which has given the worst results in impact absorption test.

9.2 Resistance-to-penetration Test

Helmet shall be subjected to test in accordance with the method specified in Annex D at two points within the area of protection at least 5 mm distant from each other and from any earlier point of impact, after subjecting to process of conditioning which has given the least, satisfactory results in impact-absorption test. During the test* the head of the punch shall no) come closer than 5 mm measured vertically to the headform.

9.3 Rigidity Test

The helmet shall be tested by the method prescribed in Annex B and shall meet the following requirements:

a) Along each axis, the deformation measured under 630 N load shall not exceed by 40 mm than that measured under the initial 30 N load.

b) After restoration of 30 N load, the deformation measured shall not exceed by 15 mm than that measured under the initial 30 N load.

9.4 Dynamic Test of retention System

Helmet shall be tested for their retention system by the method given in Annex F and it shall meet the following requirements:

a) The dynamic displacement of the point of application of the force shall not exceed 35 mm,

b) After two minutes, the residual displacement of the point of application of the force, as measured under a mass of 15 ± 0.5 kg shall not exceed 25 mm,

c) Damage to the retention system shall be accepted provided that it is still possible to take the helmet easily off the headform and that the requirements given in (a) and (b) above are met.

9.5 Audibility Test

The helmet shall be tested for their sound attenuation properties by the method given in Annex G. The sound transmission loss shall be not more than 10 dB oven the frequency range 250 to 2 000 Hz.

9.6 Retention Test of Hemet

The helmet previously conditioned at ambient temperature and humidity, shall be placed on and secured to the appropriate headform, selected from those listed in Fig. 2 A and 2B, in accordance with the requirements given in Annex C-1.3.

A device to guide and release a falling mass (the total mass being 3 ± 0.1 kg) is hooked on to the rear part of the shell in the median vertical plane of the helmet, as shown in Fig. 7.

The falling mass of (10 kg ± O-OI kg) is then released and drops in a guided free fall from a height of 0.50 m ± 0.01 m.

After the test, the angle between the reference line situated on the crown of the helmet and the reference plane of the headform shall not exceed 30°.

9.7 Opening Angle (visor) Test

The helmet, fitted with the visor being tested, shall be placed on a test headform of appropriate size, selected from those listed m Fig. 2A, in accordance with the provisions given in

Annex C-1.3,

When the visor is in the raised position, the angle between the secant MN defined in Fig. 8 and the horizontal shall be at least 5^0, With the point M situated below the horizontal plane passing through point N.

9.8 Flexibility of Peak

Where provided it shall be tested by the method described in Annex H. The peak shall neither break nor become detached from the helmet. Its deflection shall be between 6 mm and 32 mm.

10 SAMPLING AND CRITERIA FOR CONFORMITY

The method of sampling and criteria for conformity shall be as per NS5**...

11 INSTRUCTIONS

Each helmet shall be supplied with a printed card fixed with a tag having the following information:

a) For adequate protection, the helmet shall fit closely and the chin strap shall be under tension at all times of vehicular use;

b) The helmet is made to absorb some of the energy of a blow by partial destruction of its component parts and even though damage may not be readily apparent, any helmet subjected to severe impact should be discarded; and

c) To maintain the full efficiency of this helmet, there shall be no alteration to the structure of the helmet or its component parts.

12 MARKING

12.1 Each helmet shall be clearly and indelibly marked with the following information on the inside of the helmet:

a) Manufacturer's name or trade-mark,

b) Size,

c) Year of manufacture, and

d) Mass of helmet to the nearest 20 g.

12.1.1 Certificate Marking

The helmet may also be marked with the Standard Mark. Detail are available with the Bureau of Nepal Standards.

ANNEX A

(Clause 2)

LIST OF REFERRED STANDARDS

NS1** Method of testing corrosion resistance of electroplated and anodized aluminium coating by neutral salt spray test

NS2** Specification for visor for scooter helmets

NS3** specification for wooden headforms for testing of helmets

NS4** specification for electric horns for automobiles

NS5** Methods for sampling of helmets

NS6** specification for sound level meters

ANNEX B

(Clause 6.5.1)

POSITIONING OF THE HELMET OF THE HEADFORM

B-1 The helmet is placed on a headform of appropriate size. A load of 50 N is applied on the crown of the helmet in order to adjust the helmet on the headform. It shall be ascertained that the vertical median plane of the helmet coincides with the median vertical plane of the headform.

B-2 The front edge of the helmet is placed against a guage to check the minimum angle for the upward field of vision. The following points are then checked.

B-2.1 The line AC and the ACDEF zone are covered by the shell (see Fig. 2) and the requirements for the minimum downward angle and the horizontal field of vision are satisfied.

B-2.2 Requirements mentioned in 6.2.2 relating to the rear projection shall be met with.

B-3 If the conditions mentioned in B-2 are not met, the helmet is moved slightly from front to rear to seek a position where all the requirements are met. Once such a position is determined, a horizontal line is drawn on the shell at the level of the **AA** plane. This horizontal line shall deter- mine the reference plane for the positioning of the helmet during the tests.

ANNEX C
(Clause 9.1)

IMPACT ABSORPTION TEST

C-1 DESCRIPTION OF TEST

C-1.1 Principle

Impact absorption capacity is determined by recording against time the acceleration imparted to a headform fitted with the helmet, when dropped in guided free fall at e specified impact velocity upon a fixed steel anvil.

C-1.2 Marking of points of impact

Before conditioning, the points of impact shall be marked as indicated in Fig. 4.

C-1.3 positioning of the Helmet after conditioning

The helmet shall be positioned in accordance with the requirements of Annex B on a headform of appropriate size selected from among those listed in C-2.1.5. The helmet shall then be tipped towards the rear so that the front edge of the helmet in the median plane is displaced by 25 mm; the retention system shall then be adjusted under the chin of the headform; if the system includes an adjustable chin-strap, the strap is tightened as much as possible.

C-1.4 The test headform shall be so positioned that the designated point on the helmet is vertically above the centre of the anvil. The plane tangential to the point of impact shall be horizontal.

C-2 APPARATUS (see Fig. 5)

C-2.1 The test apparatus shall comprise of the following

a) A base
b) An anvil rigidily fixed to a base,

c) A free fall guidance system,
d) A mobile system supporting the helmeted headform,
e) A metal headform fitted with a tridirectional accelerometer and a measuring assembly, and
f) A system by which the point of impact may be brought into correspondence with the centre of the anvil.

C-2.1.1 Base

The base shall be made of steel or concrete or a combination of these materials and have masa of at least 500 kg. It shall be so constructed that there is no significant deformation of surface under the test load.

No part of the base or anvil shall have a resonance frequency liable to affect the measurents.

C-2.1.2 Anvils

C-2.1.2.1 The flat steel anvil shall have a circular impact face of 130 ± 3 mm in diameter

C-2.1.2.2 The hemispherical steel anvil shall have an impact face of 50± 2 mm in radius.

C-2.1.3 Mobile System and Guides

The mobile system supporting the headform shall be such that it's characteristics do not affect the measurement of acceleration at the centre of gravity of the headform. It shall also be such that any point in the area ACDEF can be positioned vertically above the centre of the anvil.

C-2.1.4 Accelerometer and Measuring Assembly

The accelerometer shall be capable of withstanding a maximum acceleration of 2 000 g without damage. Its mass shall be 50 g. The measuring system including the drop assembly shall have a frequency response in accordance with the following requirements:

a) Frequency response shall be Hat between 0.1 HZ to 1 000 HZ within ±5 dB (that is for a constant input acceleration with the frequency band, the output shall be constant within ±5 dB);

b) Sampling frequency shall be minimum 10 kHZ;

c) Minimum resolution of the equipment shall be 1 part in 236 parts or greater; and

d) Overall error within frequency range shall not exceed 2 percent.

C-2.1.5 Headfroms

The shape of the test headform to be used for the impact-absorption shall comply with the requirements of NS3**… for dimensions below and above the reference plane. The general characteristics of the test headforms to be used shall be as given in the Table 2.

Table 2 General characteristics of Test Headform
(Clause c-2.1.5)

Symbol	size (mm)	mass (kg)
A	500	3.1±0.10
E	540	4.1±0.12
J	570	4.7±0.14
M	600	5.6±0.16
O	620	6.1±0.18

Note – headform of sizes not listed in Table 2 shall be tested with the next smallest headform size given in Fig.2.

C-2.1.6 The centre of gravity of the headform shall be near the point G on the central vertical axis at "1"mm below the reference plan, as defined in NS3**……., RMS values of acceleration shall be measured along the three directions.

The headform shall contain, near its centre of gravity, a housing for a tri-directional accelerometer, such that the inertial centre of the accelerometer shall be at the centre of gravity of the headform.

C-3 IMPACT VELOCITY

The drop height shall be such that the unit the constituted by the headform and helmet falls on test anvil at a velocity which immediately before impact shall be equal to $7_{-0.35}^{+0.0}$ m/s for anvils as given in C-2.1.2.1 and $6_{-0.15}^{+0.0}$m/s for anvils specified in C-2.1.2.2.

C-3.1 The velocity of the moving mass shall be measured between I cm and 6 cm before impact, to an accuracy of 1 percent. The acceleration against time* at the centre of gravity of the headform shall be measured as specified in C-2.1.4

C-4 METHOD

C-4.1 Selection of points of impact

Each test shall be carried out first with the flat anvil and then with the hemispherical anvil on the same helmet at two neighboring but separate points. The distance between the two points shall be 15±5 mm except for the two points X and X_t for which the distance shall be 60 ±5 mm

C-4.2 Six points of impact shall be defined for each type of helmet:

a) In the frontal area, B and B_1 situated in the vertical plane of symmetry of the helmet and above point B;

b) In the lateral area, X and Xu at an angle of 45* rearwards and upwards; and

c) P and Pi, above the plane parallel to the base plane passing through point A,

C-4.3 The test sequence shall conform to the Table 3.

Table 3 Sequence of testing impact-absorption test
Clause C-4.3

Conditioning	anvils	points of impact
Ambient	Flat then hemispherical	B and B_1 X and X_1
Under any condition as mentioned in 9.1.1 (a) to (e)	Flat then hemispherical	P and P_1
Heat	Flat then hemispherical	B and B_1 X and X_1
Low temperature	Flat then hemispherical	B and B_1 X and X_1
Ultra-violet radiation And moisture	Flat then hemispherical	B and B_1 X and X_1

ANNEX D

(Clause 9.2)

RESISTANCE TO PENETRATION TEST

D-1 PROCEDURE

D-1.1 The protective helmet shall be placed, with an initial load of 10 N, on a headform oriented to such a way that the plane tangential to the shell at the point selected for the test is substantially horizontal. A metal punch with a conical head rounded at the top shall be placed vertically to touch the shell at the point selected and held in position by a ring. A metal drop hammer shall fall on the top of the punch, and the depth to which the point penetrates into the shell shall be measured by means of an inertia-free device, such as a photoelectric device, indicating the minimum vertical distance reached, in this test between the head of the punch and the headform.

D-1.2 The testing device mentioned in D-1.1 shall have the following characteristics:

Mass of punch	0.3±0.01 kg
Angle of cone forming punch head	60±1°
Radius of rounded top	0.5 mm

of punch head	
Mass of drop hammer	3±0.025 kg
Height of fall measured Between top face of Punch and lower face Of drop hammer	1±0.005 m
Hardness of tip	between 45 and 50◦ Rockwell, scale C
Minimum cone height	40 mm

ANNEXE E

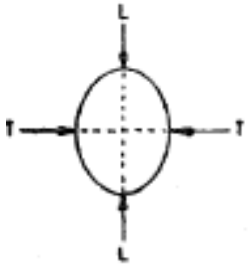
(Clause 9.3)

RIGIDITY TEST

E-1 PEOCEDURE

E-1.1 The helmet, after undergoing ambient- temperature and humidity conditioning, shall be placed between two parallel plates by means of which a known load can be applied along the longitudinal axis (line LL in the figure below). An initial load of 30N shall be applied, and after two minutes the distance between the plates shall be measured. The load shall then be increased by 100 N every two minutes to a maximum of 630 N. After two minutes of application of the 630N load, the distance between the plates shall be measured.

E-1.2 The load applied to the plates shall then be reduced to 30 N again and kept at that value



for five minutes; the distance between the plates shall then be measured.

E-1.3 The helmet used for the test along the longitudinal axis shall be a new helmet and another new helmet shall be used for the test along the transverse axis.

ANNEX F
(Clause 9.4)

DYNAMIC TEST OF THE RETENTION SYSTEM

F-1 PROCEDURE

F-1.1 The helmet shall be positioned as prescribed in C-1.3.

F-1.2 In this position the helmet shall be held by the shell (see Fig. 6) at penetration point of the vertical axis passing through the centre of gravity of the headform. The headform is equipped with a load-bearing device aligned with the vertical axis passing through the centre of gravity of the headform and with a device to measure the vertical displacement of the point of application of the force.

F-1.3 A guide and arrest device for a falling mass shall then be attached below the headform.

The mass of the headform so equipped in this way shall be 15 ± 0.5 kg; this produces the preloading on the retention system for determining the position from which the vertical displacement of the point of application of the force shall be measured.

F-1.4 The falling mass of 10 ± 0.1 kg shall then be released 9Xid shall drop in a guided free fall from a height of 750 ± 5 mm.

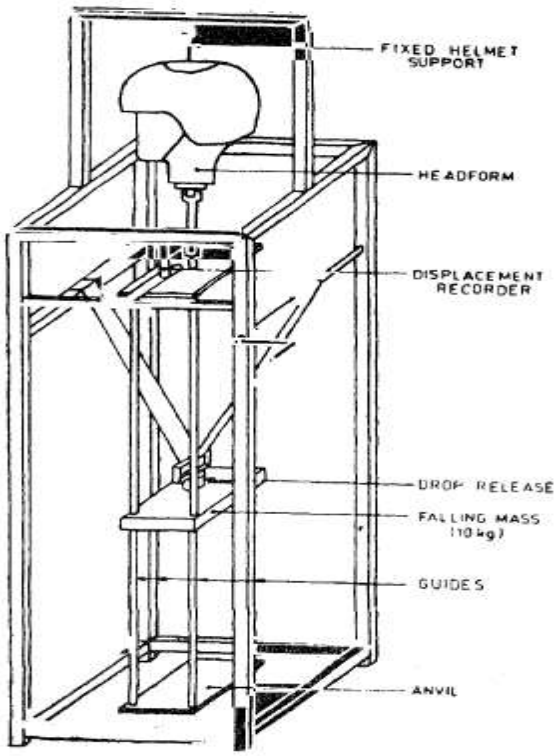


FIG. 6 DYNAMIC TEST OF RETENTION SYSTEM

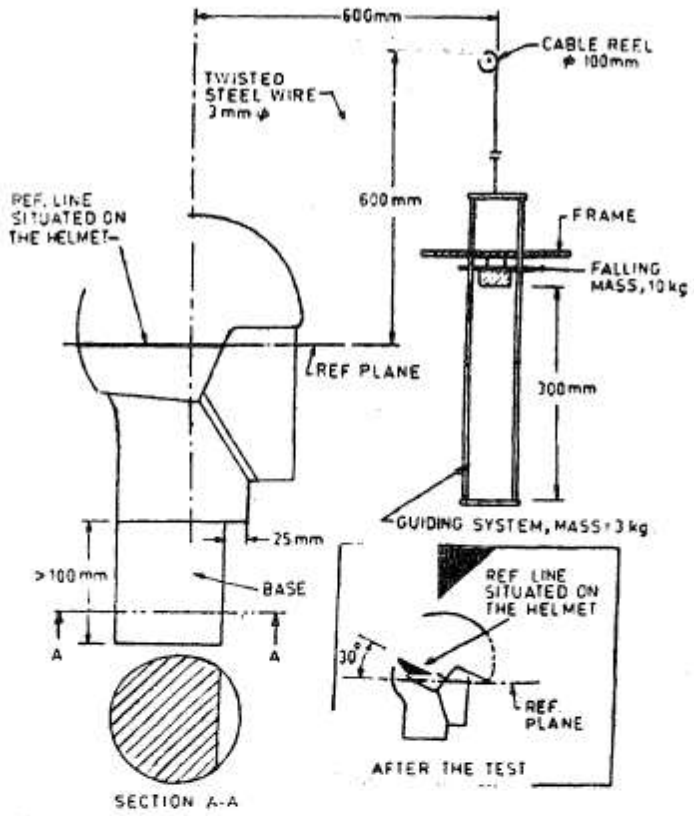
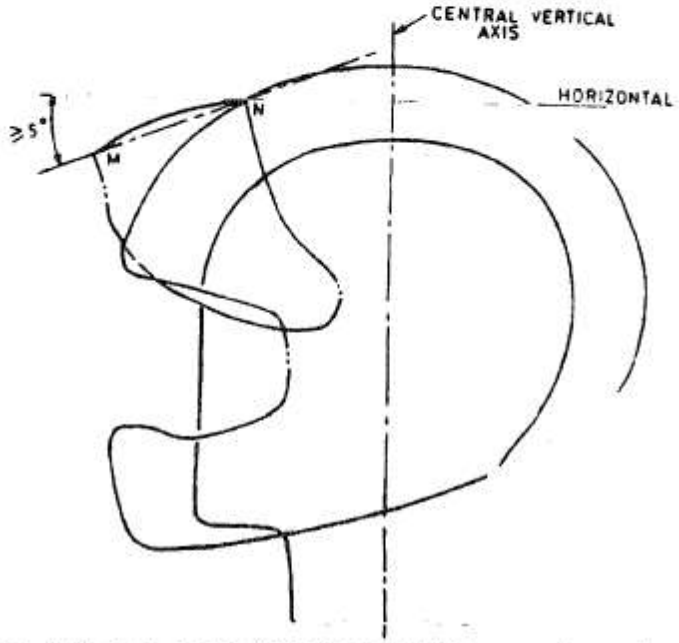


FIG. 7 RETENTION TEST APPARATUS



The secant line MN is the straight line joining the points of the upper and lower edges of the visor contained in the median vertical plane of the helmet.

FIG. 8 TESTING OF THE ANGLE OF OPENING OF THE VISOR

ANNEX G

(Clause 9.5)

AUDIBILITY TEST

G.1 APPARATUS

G-1.1 Measuring Apparatus

Measuring apparatus shall consist of a headform conforming to NS3**…. and sound level meter in accordance with NS6**…….. The microphone of sound level meter shall be fitted at a place corresponding to the right or left human ear's location.

NOTE— For this test weighting network Curve A shall be used.

G.1.2 Sound Source

The sound surface shall be a horn conforming to Type 2A of NS4**…. (which has sound pressure level range of 90 to 115 dB(A). The sound source shall be located so that sound is incident from back of the headform.

G-2 PROCEDURE

G-2.1 This test shall be carried out under the prevailing atmospheric conditions and the background noise level shall be such that the reading indicated on the sound level meter by the noise is at least 10 dB of below that of the horn sound level. This test shall be carried out in an open space in which there is no obstacle within a radius of 12 m and no acoustical focusing affects or nearby parallel walls. The horn shall be mounted 1.2 m above the ground and shall be fixed in a rigid manner on a base whose mass shall be at least 10 times that of the horn and not less than 15 kg and shall be adjustable sideways and up and down. The sound waves are emitted from the horn by using suitable 12 V dc power supply and are directed towards the rear of the headform at the distance of 2 m. The two readings are taken with and without helmet. The difference shall be recorded to the nearest dB.

ANNEX H

(Clause 9.6)

TEST FOR FLEXIBILITY OF PEAK

H-1 PROCEDURE

H-1.1 The helmet shall be left on the headform used for the test described in Annex D and loaded with a load of 120 N to hold it firmly in place. A mass carrier having a mass of U4 g shall be suspended from the front edge of the peak at its centre by means of small hook and a light strong thread passing over a pulley. The position of the pulley shall be adjusted so that the thread is perpendicular to the peak at its point of attachment. A mass of I kg shall be placed gently on the carrier and left for 2 minutes, after which time the resulting movement shall be measured by means of an index attached to the thread below the pulley and moving over a fixed vertical scale.