23 JAN 2014

(102)

F. No. IV-24011/01/2002-Prov.I 183
Bharat Sarkar/Government of India
Griha Mantralaya/Ministry of Home Affairs
PM Division/Prov. I Desk
*****

26, Man Singh Road, Jaisalmer House
New Delhi, Dated 22nd January, 2014

To,

DsG : AR (through LOAR), BSF, CISF, CRPF, ITBP, SSB, NSG & BPR&D.

Subject : QRs and Trial Directives for Bullet Resistant Helmets.

The QRs and Trial Directives in respect of Bullet Resistant Helmets, NIJ level IIIA as per Annexure have been accepted by the Competent Authority in MHA.

2. Henceforth, all the CAPFs should procure the above items required by them strictly as per the laid down Technical Specifications/QRs.

3. BR Helmet, BR Jackets, BR vehicles, Mine Protected vehicles etc are protective gears and therefore, putting detail QRs of such items on web site may not be in the interest of nation keeping in view its security. However, while floating tenders/RFP, utmost care needs to be taken to have effective transparency in the procedure, keeping in view the guidelines issued by the CVC on the subject.

4. This has the approval of JS (PM).

Encl: As above

Yours faithfully,

(Smt. S. B. Nanda)
Under Secretary to the Govt. of India
Tel : 23381278

Copy to : Director (Procurement), MHA.
Copy for information to : PS to JS (PM)
US (Prov.II)/ DC (Prov.I)/ SO (Prov.I)

उ. म. नि. (संभरण) DIG (Prov.)	
गुप कमा. (संभरण) G.C. (Prov.)	23/1/14
सेक्ट. कमा. Sqn. Cdr	
टीम कमा. Team Cdr	
मु. लि. Head Clk	

For perusal pls
DIG (Arm)

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QRs FOR BULLET RESISTANCE HELMET (BALLISTIC) FOR GROUND TROOPS

1. Ergonomy :-

It should be possible to wear, adjust and remove the helmet with ease even with gloved hands. It should be provided with a three point chin strap with comfortable cushioned chin cup made of appropriate non-abrasive, non-allergic material/double strap of reasonable width. The helmet should adequately cover the neck and ears but it should not impair the hearing. Helmet should be compatible with active ear protection.

2. Shape:-

The helmet should adequately cover the head, neck and ears of the wearer and its design should be on the lines of Modular Integrated Communications Helmet (MICH)/Advanced Combat Helmets (ACH). The shape of the helmet should facilitate the use of handsets within service communication equipment. Helmet should have provision to mount a display system, hands free communication equipment and fix-electro-optical devices and detachable visor as and when required. Vendor should provide a drawing of the helmet along with dimension and surface area for the entire three size helmet. The dimensions of attachment/accessories to be mounted on Helmet (including additional attachments) will be defined by the user separately in the tendering documents.

3. Material:-

Vendor should declare the type of material (Arial Density), construction, dimension and weight of fabricated B R Helmet during tendering process. They should maintain the same in bulk supplies.

4. Surface Finish & Colour:-

The proposed helmet should be of crinkle matt finish and able to be provided in any of the following colours: -

a) Disruptive IA pattern (Surface Finish & Colour disruptive IA pattern (without Indian Army Logo). However, during tendering process user organization may suggest to put their logo, if desired)
b) Khakhi/Sand/Desert Tan
c) Olive Green
d) White
e) Black
f) Or any other pattern specified by the user.

5. **Protection:-**

Protection of helmet against 9x19mm cartridge fired through Sub Machine Gun (Such as Sten Machine, MP-5, Carbine any other variant) from a distance of 5 meters to achieve a muzzle velocity 430 ± 15m/s and weight of the bullet between 7.4 gram to 8.2 gram. The deformation in the helmet should not exceed 13 mm. The material of the helmet should be fire/flame retardant and water resistant.

6. **Climatic Condition:-**

The entire helmet must withstand repeated and sustained exposure to climatic conditions. The firm must provide Certificate from the accredited laboratory with regard to temperature and humidity as given below: -

(a) Temperature - -50^0C to + 60^0C for six hours
(b) Relative Humidity – up to + 90%

7. **Use of Optical Instruments:-**

The design of the helmet should be such that it should not obstruct the use of monocular/binoculars (day and night), optical sights fitted on the weapons, range finders and Artillery optical instruments as per the requirement of user. The dimension of attachment/accessories to be mounted on Helmet will be defined by the user separately organisation in the tendering documents.

8. **Compatibility:-**

The design of the helmet should be compatible to wear along with respirators and chemical hoods. The metal/plastic parts if used must be coated and laminated with grade-I insulation. The firm must provide Certificate from the accredited laboratory.

9. **Comfort:-**

The helmet should not cause any undue discomfort even after prolonged wearing by an individual for more than eight hours. The helmet should not hinder aiming during firing and enable unhindered use of in service optical devices and personal spectacles.

10. **Weight:-**

The weight of the helmet less the visor should be as under:-

(a) Small Size Helmet – Not more than 1.25 Kg
(b) Medium size helmet – Not more than 1.35 Kg
(c) Large size helmet – Not more than 1.45 Kg

11. Inner Lining/Harness:-

The helmet should be provided with a suspension system which should be adjustable to head size. A removable pad system for suspension, comfort and protection from the deformation as mentioned in the para-5 above should be provided, which should ensure air circulation.

12. Chin Strap:-

Adjustable chin strap with three or four points support must be provided. The material of the chin strap should be suitable to Indian weather conditions and should be rugged enough to withstand rough handling in the field. The buckle of the chin strap should be easy to engage/disengage and its position on the cheek should not hinder aiming during firing. The material of the buckle should be harmless to skin in all types of climate conditions.

13. Size:-

The helmet should be provided in three sizes, viz. Small, Medium and Large size. The inner circumference of the helmet with the suspension pads should be adjustable as under: -

13.1 Head circumference (maximum circumference measurement of the head above the eyebrows)

(a) Small Size – 48 up to 52 cms
(b) Medium Size – more than 52 up to 57 cms
(c) Large Size – more than 57 up to 64 cms

13.2 Sagittal arc (It measures the distance over the top of the head between the glabella to the nuchale, which is the base of the occiput).

(a) Small Size – 30 up to 35 cms
(b) Medium Size – more than 35 up to 39 cms
(c) Large Size – more than 39 up to 44 cms

14. Shelf Life:-

Shelf life of helmet indicated is 10 years in storage conditions. The operational life of 7 years is mentioned in field conditions, because of different

climatic conditions and normal wear and tear. In this regard manufacturer has to submit a certificate along with the supply.

15. Provision for Visor:-

Suitable provisions should exist in the BR helmet for attaching a protective visor. An additional weight of upto 1.5 kgs with click system (Tolerance of 10 gms permitted) for the visor alongwith provision for its attachment in the overall weight of the helmet is acceptable. The visor and provision for its attachment in the helmet would be required on selective basis as per user requirement. It should provide protection against ballistic fragments and other flying debris. It should have a clear air passage on the top and bottom to prevent fogging of the visor. It should confirm to ballistic protection as per the user requirement.

16. User Evaluation:-

16.1 Testing of BR Helmet for **Ballistic Evaluation** will be carried out at CFSL or TBRL, Chandigarh laboratories as per QRs and Trial directive.

16.2 Testing of BR Helmet **Physical Evaluation** should confirm the Indian Standard: 9562-1980 (Reaffirmed 2007) Edition 1.5 (2000-12).

17. Packing:-

The helmet should be packed individually in a water proof carry bag.

18. Literature/Document:-

Literature giving details of the equipment, functioning and handling should be provided at the time of trials. It must also give out details of maintenance requirements.

19. Warranty: -

Store supplied against this specification shall be deemed to bear the warranty of the supplier against defective design material, workmanship and performance for period of twelve months from the date of receipt of store at consignee end. And if during the specified period, the store supplied is found to

be defective, the same shall be replaced immediately with serviceable store by the supplier at site free of any charges as may be decided by the purchasing officer, on recommendation of consignee/Quality Assurance Authority.

20. Note:-

20.1 The QRs and |Trial Directives are dynamic/live and may be amended only on the approval of competent authority.

20.2 The QRs/Trial directive has been drawn jointly with the association of CAPFs, DRDO (TBRL, DIPAS), CFSL Chandigarh, AIIMS Delhi and DGQA.

20.3 The level of protection is limited to the 9 mm (Level III A) protection.

Dr S K Verma Sc. C
TBRL, Chandigarh

Dr Debarati Bhattacharjee, Sc. D
TBRL, Chandigarh

Abhiram Pankaj,
Dy Comdt
CRPF

B S Bedwal, AC
CISF

Lt Col Rajiv Anand,
DGQA, Delhi

Maj Angad Behl,
51 SAG, NSG

Dr Asha Dhir,
Dy Director
CFSL, Chandigarh

***Col A P Singh,**
SSB HQr, Delhi

Lt Col Virendra Pant
NSG HQ,

T Chatterjee, Sc. C
DIPAS, DRDO

*Dr Sanjeev Lalwani
AIIMS Delhi

**Vineet Kumar,
Comdt. BSF

13/12/13
(Anand Prakash)
IG/Director(Mod)

(Rajan Gupta)
DG, BPR & D
(CHAIRMAN)

13/12/13

***Col. A. P Singh
SSB HQr, Delhi

**Vineet Kumar, Comdt BSF
13.12.13

*Dr. Sanjeev Lalwani
AIIMS Delhi
13/12

Annexure 'A'

STANDARD OPERATING PROCEDURES FOR TESTING OF BALLISTIC RESISTANCE HELMET (NIJ-IIIA)

A. General Information:

1. Before commencement of ballistic trial, the Board of Officers/Trial testing team shall brief the participant vendors:-

(a) Testing equipments and set up.

(b) Testing procedure.

1.1 The vendor has to give satisfactory certificates regarding procedure and test set up of conduct of ballistic test.

1.2 Test will be conducted as QRs and Trial directive as per laid down procedure.

1.3 No deviation shall be allowed.

2. In case the Vendor or his authorized representative has any observation, with regards to procedure/test set up of conduct of trial, the same will be submitted in writing on the spot within half an hour before commencement of trial. Any departure from this will disqualify him from any future representation.

3. Roma Plasticine blocks, instruments, Arms & Ammunitions to be used for ballistic testing will be made available to representative of firms for inspection before commencement of ballistic trial.

4. Only one authorized signatory of firm will be allowed to associate/witness the ballistics trial of the samples submitted by respective firm.

5. The decision of Constituted Evaluation Committee/Board of Officers as appointed by the MHA will be final and binding. The test results will be recorded on the same day and firms' signatory shall be

required to sign Compliance Test Report (CTR). No re-testing of tested samples on the firm's and users request will be undertaken.

6. Test sequence of vendors will be decided through draw of lots.

7. Fair and unfair shots will be given due weightage.

8. Drop test will be conducted in presence of authorized concerned vendor.

9. Ballistic trial will be conducted firstly on **Wet** samples followed by **Dry** test.

10. All the events should have Video recording and still Photographs.

11. Acceptance criteria of Tender Samples:- From each size (Small, Medium and Large) of 5 B.R. Helmet samples (one for reference, second for physical evaluation, third for wet test, fourth for Dry test and fifth for deformation test) submitted by the vendor, only one-piece chosen at random, will be put through test for all the physical parameter including workmanship and labeling requirements. If that sample meets the physical requirements, the entire lot of particular size would be deemed to have passed for physical parameters. If the sample chosen at random doesn't meet the physical requirements, the entire lot of particular size will be rejected.

11.1 The Compliance Test Report (CTR) form shall be used to record and document the results of the tests. Sequence of testing for BP H will be as under:

(a) Submission of all certificates prescribed in tender inquiry.
(b) Measurement of weight and other physical dimensions
(c) Visual inspection for checking physical deformity and other parameter

11.2 Ballistic Trial: (Note: In case of non-conformity with any of the parameters of the tests mentioned above, the next sequence of test will not be conducted.)

11.3 Labeling: Each set of sample of Ballistic Resistant Helmet shall be durably and legibly marked /labeled. The marking/label shall be depicting following information of indelible nature permanently attached to either exterior surface of the sample.

(a)	Name of the manufacturer.	XYZ
(b)	Name of the product.	abc
(c)	Date of manufacturing	dd.mm.yy
(d)	Date of Issue	(to be filled by user)
(e)	Protection level	IIIA
(f)	Size	Small/Medium/Large
(g)	Identification Number	ABCD……
(h)	Standard	MHA QRs & Trial Directive

12. Test Sequence:-

12.1 Physical testing: -Testing of BR Helmet should confirm the Indian Standard: 9562-1980 (Reaffirmed 2007) Edition 1.5 (2000-12). The following sequence of test should be carried out as per **Indian Standard**.

(a) Workmanship and finish:- Shape, Make, Design, Workmanship should be o required standard and marking (Manufacturer's name/trade mark, size, year of manufacture, with or without neck protector, with or without visor, Protection level, Helmet serial level) with identification number on each Helmets.

(b) Mass :- As per MHA QRs

(c) Sampling and criteria for conformity:-The method of sampling and criteria for conformity shall be as specified in IS-9695-1980.

(d) Performance requirement: - As per MHA QRs

12.2 Shock absorption test:- Helmets shall be tested for shock absorption by method described in **Appendix A** within one minute after subjecting them to conditions specified in (a) , (b) and (c) given below :-

(a) A temperature of 65 ± 2°C for 4 hours in an oven.

(b) A temperature of -10 ± 2°C for 4 hours in a refrigerator, and

(c) Water flowing over the whole outer surface of the BR Helmet for 4 hours.

Appendix A

v-1.1) Apparatus

v-1.2) Wooden Head form-confirming to IS 7692-1975*

v-1.3) A Gauge and Recording Apparatus for Measuring Force–The gauge and the associated recording apparatus shall have proper time constant to be able to measure the impact loading up to 40 KN (4000 kgf) independent of the time of application of the force and a slow application of the load required for its calibration. The gauge shall have a minimum stiffness of 500 kN/mm (50 000 kgf/mm).The head form shall be mounted on the gauge so that its vertical axis coincides with the vertical axis of the gauge.

Accuracy

v-1.4) The overall error of the whole set up including the load measuring and recording system shall be not more than 10 percent.

v-1.5) Concrete or similar monolithic block having a minimum height of 1 m, length 1 m and width 0.6m, and mass 1

ton, shall be used to support the gauge and headform the block shall be bedded on dry sand on a solid floor.

v-1.6) Striker shall be in the form of a rectangular block of wood weighing 45± 0.1 Kg and having a horizontal striking face 180mm square. The striker shall slide freely and without oscillation down two vertical guide wires so positioned that the center of gravity of the striker lies on the vertical axis of the gauge and both be in plane of the guide wires.

v-1.7) Method As per Indian Standard

vi) Penetration Resistance: - As per IS 9562-1980

vii) Strength of Retention system: - As per IS 9562-1980

viii) Rigidity test: - As per IS 9562-1980

ix) Water Absorption Test: - As per IS 9562-1980

x) Flammability Resistance: -As per IS 9562-1980

xi) Mold and Fungus resistance:- As per Mil Specification

13. Ballistic testing:-

13.1 Back Ground: - Helmets intended for the use by law enforcement officers should provide some level of protection from a broad range of threats, including those incurred during high- speed pursuit, falls from motorcycles, assault with blunt instruments and bullet impacts.

13.2 The Ballistic resistant Testing portion of existing procedures measure the resistance of the helmet to bullet penetration, but not measure the intrusion of the back face of the helmet into the protected area (blunt trauma). Results of Ballistic Resistance Testing of a broad range helmets indicate that this deformation may be extreme and, perhaps, even lethal in nature.

14. Scope : - The scope of this testing procedure is limited to evaluating the ballistic resistance of the BR Helmet regarding penetration by bulleted ammunition and the resistance of potentially lethal, back face intrusion of the helmet into the protected cavity as result of non-penetrating bullet impacts.

15. Applicability:-

15.1 This test procedure applies to BR Helmets intended to resist the direct threats of ballistic impact-bullet penetration and deformation of the helmet into the protected area.

15.2 The injuries to head and cervical spine caused by bullet/projectiles impact, require experimentation which is not possible on living human beings and on cadavers the typical ante-mortem features of the injuries shall not be seen in –situ except the depth of penetration.

15.3 This test procedure is NOT intended to evaluate the level of protection provided by BR Helmets impacted with other than ballistic projectiles, such as clubs or hand-thrown missiles, nor this procedure intended to evaluate the protection from injuries due to deceleration from vehicular collisions, falls from vertical heights, or falls from moving vehicles.

15.4 While Bullet Resistant Helmets may provide some level of protection from non-ballistic impacting and from the collateral, biomechanical injuries related to accelerations and decelerations of the head and BR Helmet, no such protection is implied nor warranted by this test procedure. Concern for this type of protection should be evaluated using test methodologies and evaluation criteria specifically intended for that purpose.

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16. Reference documents

16.1 NIJ Standard for Body Armour, NIJ-STD-0101

16.2 NIJ Standard for Ballistic Helmets, NIJ-STD-0106.00

16.3 H.P White Laboratories, HPW-TP-0401.01.B

16.4 Mil Specification 810/810G.

16.5 Indian Standard 9562-1980.

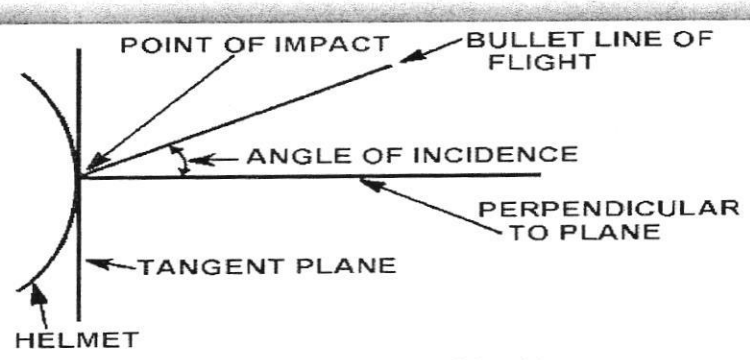


Figure 1. Angle of incidence.

17 Definitions

17.1 Angle of incidence: - The angle between the line of flight of a bullet and the perpendicular to the plane tangent to the point of impact.

17.2 Basic Plane: - The plane through the centres of the external opening and the lower edges of the eye sockets.

17.3 Back Face Deformation (BFD) : - The maximum indentation in the backing material caused by a non-perforating impact on the BR Helmet. The BFD is the perpendicular distance between two planes. One plane contains the reference point on the surface of backing material and the other contains the point that represents the deepest indentation in the backing material.

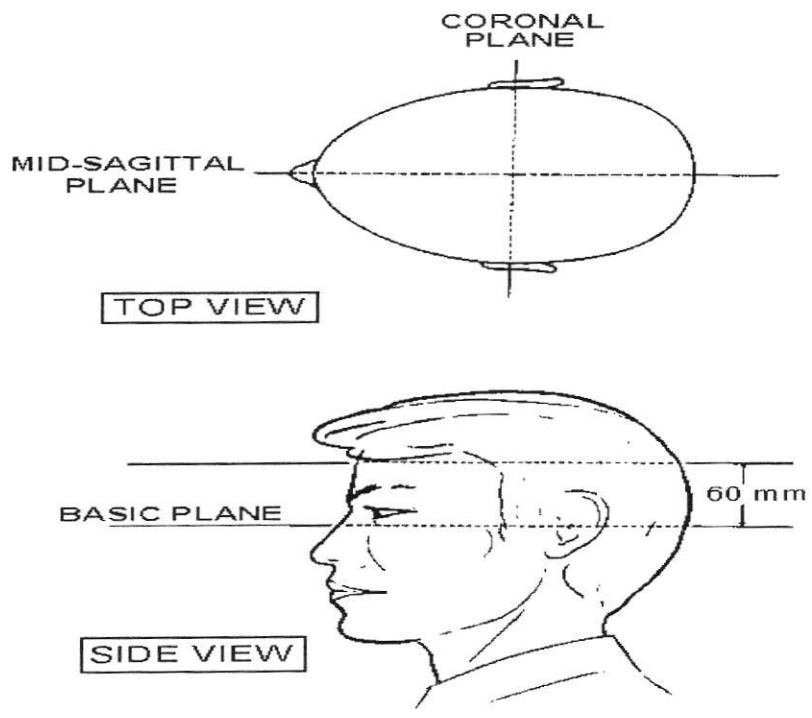


Figure 2. Head planes.

17.4 Backing Material: - Homogenous oil based modelling clay (Roma # Grey), properly conditioned according to NIJ standards is filled up in the head-form used during ballistic testing.

17.5 Coronal Plane: - The plane, perpendicular to the basic plane and mid-sagittal planes, which passes through the centres of the external ear openings.

17.6 Full Metal Jacketed (FMJ) :- A bullet made of lead completely covered, except for the base, copper alloy (approximately 90% copper-10% zinc).

17.7 Jacketed Soft Point (JSP) A bullet made of completely covered, except for the point, with copper alloy (approximately 90% copper-10% zinc).

17.8 Mid-sagittal Plane: - The plane, perpendicular to the basic and coronal planes, which symmetrically bisect the head.

17.9 Penetration: - Any portion of the projectile material which passes through the helmet.

18. Shot, Fair:- An projectile of the specified construction and specified velocity impacting at the specified angle of obliquity and intended shot impact location on the sample, also to include:-

18.1 The projectile which produces a penetration having less than reference velocity shall be declared a fair shot.

18.2 Projectile striking at a greater angle of obliquity than that specified which produces a penetration shall be declared a fair shot.

18.3 Projectile striking at velocities greater than the specified maximum which **DOES NOT** penetration shall be declared a fair shot.

19. Shot, Unfair: - Any of the following categories of shot shall be declared unfair and shall not be used in evaluating the test samples-

19.1 Any shot which penetrates at a velocity greater than the maximum specified.

19.2 Any non-penetrating shot at velocities less than the minimum specified.

19.3 Any otherwise fair shot which strikes that sample within 1.0-inch of the edge of the sample (Center of impact to edge).

19.4 Any otherwise fair shot which penetrating a test sample that has been previously impacted with five or more prior shots.

19.5 Inter shot distance less than one inch.

20. Ambient Condition

Unless otherwise specified the ambient conditions are kept as below:-

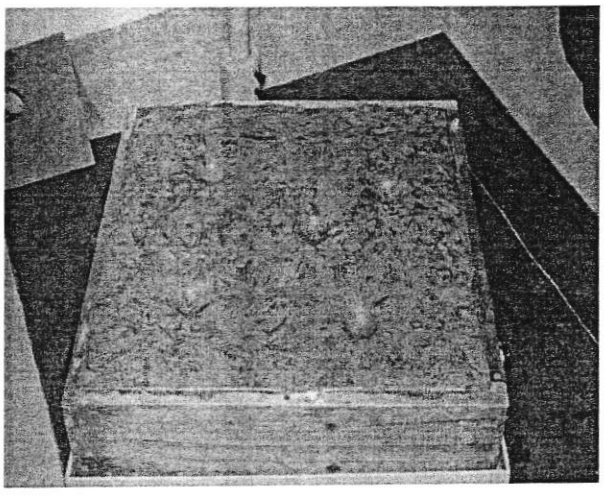
Temperature→	$23^0C \pm 3^0C$
Humidity→	$50\% \pm 20\%$

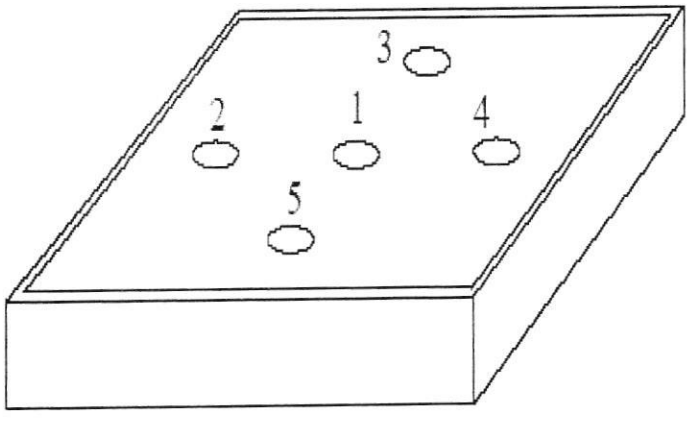
21. Conduct of Test – Preparation of Plasticine and drop test:-

21.1 Backing Material Calibration:- Calibration of the Plasticine clay backing material will be accomplished before and after each sequence of firing. Calibration will be accomplished using the equipment and techniques specified below:-

a) Drop weight: Steel Sphere
b) Drop weight size: 63.5mm ±0.05mm in diameter
c) Drop weight mass: 1043 g ±5 g
d) Drop height: 2.0 m

e) Drop spacing: Minimum of 76 mm from fixture edge to indent edge and a minimum of 152 mm between indent centres.





Each calibration drop will consist of a free fall of the steel sphere onto the conditioned backing material. A minimum of five drops will be completed with the five drop arithmetic mean depth of depression to be 20±3mm at 30±2.9 degree centigrade.

21.2 The Helmets testing is carried out for the threat level III-A with arms and ammunitions whose detail are given below in the table:-

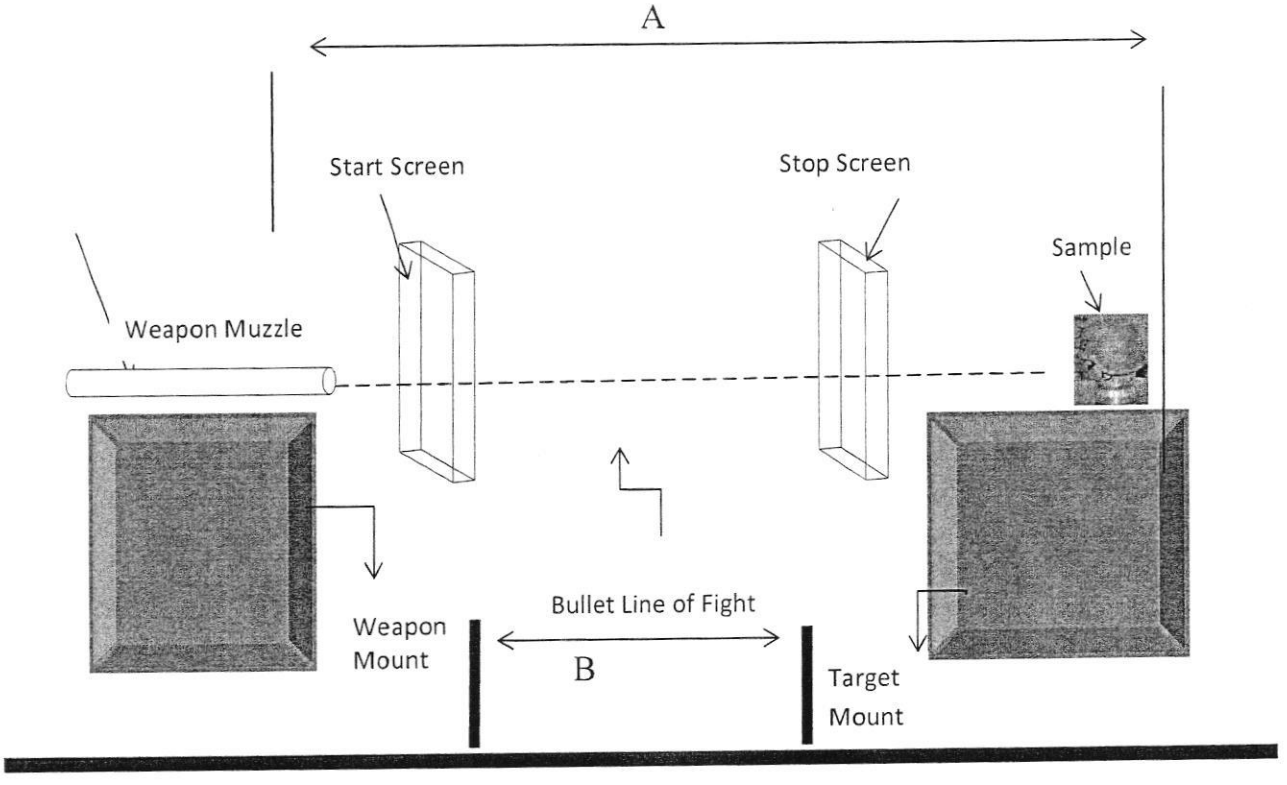
Threat Level	Weapon	Weight	Velocity	Hit spot
Ammunition				

	Calibre	Type				
III-A	9x19 mm	FMJ	9mm Sub machine gun (Sten machine, MP-5 , carbine any other variant) MP 5	Between 7.4 to 8.2 gram	430±15 meter/second	05

22. Range Configuration :-

Range Setup

The test range is setup as per Figure 4. Unless specified otherwise, for low velocity threats/ handgun rounds, the panel is mounted at a distance of 5.0 ± 0.1 m from the muzzle of the weapon. For high velocity/ rifle rounds, the panel is mounted at a distance of 10.0 ± 0.1 m from the weapon.



A→ 5 ± 0.1m for low velocity threats/rifle rounds.

B→ Adjustable distance to meet velocity requirements.

23. Test Procedure:- As per MHA QRs & Trial Directive

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23.1 In preparation for this test, five impact area are to be marked on BR Helmet.

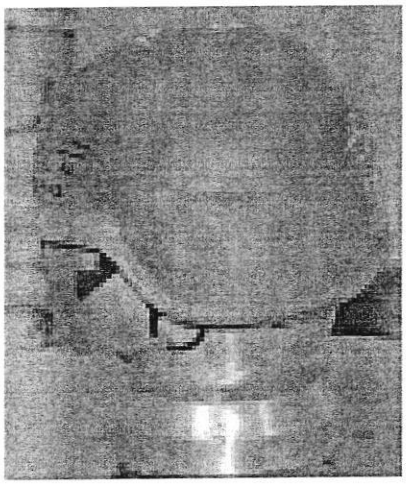
23.2 **Crown**- Six inch diameter circle centered about a point on the top of the BR Helmet which intersects the coronal and sagittal centerline

23.3 **Front**- 45 degrees on either side of the sagittal centerline extending from the crown marking to the lower edge.

23.4 **Rear**- 45 degrees on either side of the sagittal centerline extending from the crown marking to the lower edge.

23.5 **Sides**- The right and left side areas between the front and rear areas extending from the crown to the lower edge.

The channels (slots) in both the coronal and sagittal planes of the head form intended for the use in the deformation testing shall be packed with Plasticina modelling clay, ensuring there are no voids, cavities or depression in the final contoured assembly.



23.6 Prior to initiation of testing, the drop verification sample shall be drop tested on filled with plasticine to confirm its consistency.

23.7 The BR Helmet test sample shall be positioned on a rigidly mounted clay-filled test head form at a distance of 5 meters from the muzzle of a test barrel or weapon to produce zero degree of obliquity impacts. The manufacturer installed strapping system shall be used to affix the BR Helmet to head form.

23.8 Fire a sufficient number of pre-test rounds (minimum of three) to ensure that the test round will strike the armour with a velocity within the specified velocity range.

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23.9 Wet Test: - The BR Helmet sample should immerse in water as per laid down procedure (2 hours immersion in water). First shot should fire within 10 minutes after taking out BR Helmet sample from water and all the shots should fire within 30 minutes.

23.10 After first shot, the BR Helmet shall be removed from the head form and the depth of the depression with respect to the original surface of the clay determined. Maximum deformation shall be recorded to the nearest millimetre. In making this determination, any clay surrounding the impression which has been raised above the original level of the surface shall be ignored. Measurement of the magnitude of the resultant depression (if any) shall be made from a point originating from a radius flush and consistent with the contour of the pre- shot clay surface. If required, the clay shall be replaced and/or smoothed prior to the next shot. If there is penetration and shot is fair, the testing shall be terminated.

23.11 The BR Helmet shall then be remounted for the next shot. After each shot as till the last shot is fired, deformation shall be measured every time. If there is penetration at any of shot being '**fair**', the testing shall be terminated

23.12 Additional shot within one or more of the defined locations may be necessitated as a result of the any of the shot being declared '**unfair**'. If there has been no prior fair shot penetration, a penetration by second shot at any location shall be lead to termination of the test of that BR Helmet sample.

23.13 Data for all shots- Fair and Unfair – shall be reported and penetration or excessive deformation in any of the fair shot shall be used to fail the design.

24. Measurement of Deformation:-

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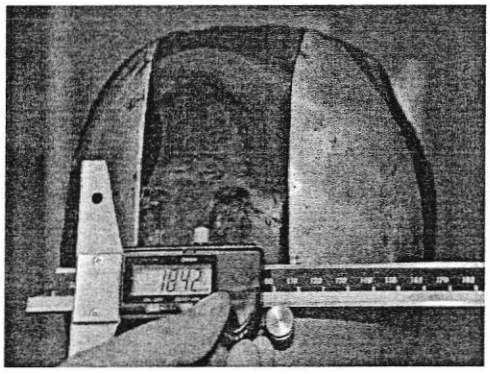
After each fire, BR Helmet is removed and without disturbing Back Face Deformation is measured.



25. The test methodologies adopted in this Document by and large follows the procedures laid down by NIJ Standards and HP White Lab and procedures of concerned testing laboratory.

Dr S K Verma Sc. C
TBRL, Chandigarh

Dr Debarati Bhattacharjee, Sc. D
TBRL, Chandigarh

Abhiram Pankaj,
Dy Comdt
CRPF

B S Bedwal, AC
CISF

Lt Col Rajiv Anand,
DGQA, Delhi

Maj Angad Behl,
51 SAG, NSG

Col A P Singh,
SSB HQr, Delhi

Lt Col Virendra Pant
NSG HQ,

Dr Asha Dhir,
Dy Director
CFSL, Chandigarh

T Chatterjee, Sc. C
DIPAS, DRDO

Dr Sanjeev Lalwani
AIIMS Delhi

Vineet Kumar,
Comdt. BSF

(Anand Prakash)
IG/Director(Mod)

(Rajan Gupta)
DG, BPR & D
(CHAIRMAN)