No. L.VII.54/2010-12-Prov-R
भारत सरकार/Government of India
गृह मंत्रालय/Ministry of Home Affairs
पु.आ.प्रभाग /P M Division
संभरण-I डेस्क /Prov.I

26, Man Singh Road, Jaisalmer House
New Delhi, Dated : 13th November, 2013

To,

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

Subject : QRs and Trial Directives of Full Body Protector, Polycarbonate Shield, Helmet and Polycarbonate Lathi (Anti Riot Drill Equipment).

The QRs and Trial Directives of Full Body Protector, Polycarbonate Shield, Helmet and Polycarbonate Lathi as per Appendix 'A' and Appendix 'B" respectively 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.

Yours faithfully,

(Smt. S B Nanda)
Under Secretary (Prov.II)
Tel : 23381278

Encl : As above.

Copy forwarded to : SO (IT), MHA, with the requested to host the QRs and Trial Directives (soft copy being sent through email) on the MHA website (under the page Organisational Set up-Police Modernisation Division - Qualitative Requirements).

(R K Soni)
Section Officer (Prov.I)

Copy to : DDG(Procurement), P M Division, MHA.

Copy for information to : PPS to JS (PM)

Qualitative Requirements for Polycarbonate Anti Riot Equipments

1. Equipment Name:- HELMET

Colour-As required by the user..

- Glass Reinforced plastic material/ **or any other Accredited Test Laboratory proven superior material**.
- Design based on Personal Armour System Ground Troops (PASGT)/**totally protective and comfortable to wear.**
- Selectable, adjustable and comfortable.
- Snap fit and quick release chin strap.
- Scratch proof, Shatterproof, transparent polycarbonate **Visor** fitted with retched (openable) system.
- Provides excellent protection against projectiles, blunt hit encountered during riot situation.
- **Inner fabric should be detachable & washable.**
- Designed developed and ballistically tested by any **National Accredited Laboratory For caliberation and testing**.
- Wt.:- Less than 2.5 kg including all detachable Items.

a. PC Visor-

a. 2.6mm to 4.5 mm thickness, **scratch proof /scratch resistant.**
b. Movable, Adjustable, Detachable and Comfortable.
c. Anti-fog visor: 20°-50° incline
d. Light Transmission rate of visor not **less than** 85%
e. Attached Metal Net (Detachable): Wt. less than 600 gm
f. Its life should be upto 50% visiblity and not less than 02 years.

b- Shell

Material : ABS**(anti buta-di-ene poly-styrene)**/Fibre reinforced plastic (FRP) **or any other NABL proven superior material.**
Round shape shell with comfortable interior Cushion padding about 2 cm± 10% **with breathe- holes for air circulation**.
Adjustable and Comfortable harness **should be detachable & washable.**
Top Thickness: 5mm ± 10%
Side Thickness: 04mm± 10%
Weight : 1.60Kg ± 10%

c- **Ear Guard**

PC / ABS/ Fibre reinforced plastic **or any other NABL proven superior material with air circulation.**
Side thickness: 3.5 mm± 10%

d- **Chin Strap**

- Snug/Snap/Strip fit and quick release chin strap.
- Soft and comfortable on skin.

(M-8)

e- **Miscellaneous**

a. Anti-bacterial Cloth (Treated) **or any other NABL proven superior material** should be used for inner lining. A certificate to this effect will be provided from a govt. accredited laboratory.

b. PE(Poly Ethylene) inner layer against cutting and stabbing

c. Quick release buckle.

d. Design based on personal Armour System Ground Troops. (PASGT)/ **totally protective and comfortable to wear.**

e. Side holes to make hearing easier and back holes for better ventilation.

f. Provides excellent protection against projectiles encountered during RIOT situation with comfortable **sweat absorbing, Mesh Fabric** head padding **or any other NABL proven superior material.**

g. **Additional & Essential features**: Protection of neck- A semi- circular fire and water resistant pad to provide cover protection to sides of the neck and back protection of cervical from stones and projectile attacks.

h. **Neck curtain** should be fire resistant fabric/artificial leather or EPF (**Expanded Polythene Padding Foam)**/Polyfoam that can avoid smell and fungal infection **or any other NABL proven superior material.**

i. Capable of protecting personnel against brick batting, stone pelting, molotov cocktails, acid bottles, and cane attack etc.

j. Ventilation should be proper.

k. Designed to connect with ear/ head phone and gas mask.

l. Tested by leading NABL certified Laboratory for its parameters, and material used in construction/**fabrication**.

m. Shatterproof, transparent PC Visor,**Scratch resistant** fitted with ratchet **(openable)** system.

n. **Rust proof** metal pivot for opening and closing of visor.

2. Equipment Name:- Polycarbonate Lathi

Features :

- *Material : PC (polycarbonate)*
- *Ultra Strong*
- ***Scratch proof, Non-Corrosive, fire proof.***
- *Light wt.*
- *Transparent*
- *High Impact Resistance*
- *Long Shelf life*
- ***Straight/firm /collapsible features may be preferred in light of new technology with ideal flexiblity.***

Technical Features :-

- *Length : 1 mt* ± 10 mm
- *Diameter : 2.5cm ± 2mm*
- *Wall Thickness : 4mm ± 0.5mm*
- *Weight. :– 350gm ± 25 gm*

Additional and essential features

Handgrip-.

- About 5"
- Round shaped
- Unbreakable (As required).
- Soft, shock absorbent, but firm grip for proper handling with soft cushioning.

Wrist Band- In the form of flexi 6" cotton/nylon/ suitable fabric loop on the top of handgrip to enable proper security of the lathi/cane.

Protective shoe/stud:- Bottom 2" of Lathi plugged with ring shaped, firm, fire and water resistant fibre/rubber cap firmly/ permanently fixed.
Manufacturer's/ Supplier's written Submission regarding non-corrosion, scratch proofing, fire and water resistance be provided.

3. Equipment Name:- Polycarbonate Shield

- *Raw material: Engineering grade Polycarbonate or any other technically proven superior material.*
- *Provides excellent protection against brick batting, stone pelting,molotov cocktails,chains, acids, iron, rod/cane attack.*
- *Light wt., **scratch proof, durable** and transparent.*
- *Improved consistency in thickness and enhanced strength.*
- *Thick ribs all along the edges for higher structural strength.*
- *Vision area of shield so shaped as to avoid scratches during handling.*
- *Cushioned/ comfortable arm rest for comfort and longivity.*
- *High impact resistance.*

TECHNICAL DATA

- *Shape:* *Rectangular **or any other proven better shape.***
  Length: *910mm* to 1000mm
  Weight. : Less than 3.4 kg
  Breadth (Flat): 580mm ± 20mm ***or any other proven better shape.***
  Breadth Concave: 620mm ± 10mm ***or any other proven better shape.***
  Thickness: 3.0mm ± 0.5mm
- Material : Transparent/**scratch proof.**
- PC(polycarbonate) virgin grade, and not recycled.
- Edges well secured and covered by durable band / elbows.
- Raw material : Engineering grade Polycarbonate
- Provide complete protection against brick batting, stone pelting, iron rod/cane Attack, **molotov cocktails, acids.**
- Thick ribs all along the edges for higher structural strength
- Cushioned arm rest to provide comfort in long use i.e. to have solid strap, handle and pad for better grip.
- High impact resistance.

4. Equipment Name:- Full Body Protector

Material - Cloth Jackets of fire retardant drill cloth in required colour and required camouflage pattern.
Colour -**As required-plain/ disruptive/ camouflage pattern.**
Weight- 5.950kg ±10%
Size:- Small/ Large/ Extra Large (The description is given here for large size)
Properties

- Physical protection against brick batting cane/knife/**acid** attacks,**molotov cocktails** and projectiles encountered in Riot situation and other policing functions.
- Special fire retardant, high impact resistance rubber inserts.
- Protective sheets for front and back pouches with trauma pads.
- **Sweat absorbing mesh fabric (detachable & washable) in-lined** elbow and shin guards ergonomically formed to protect limbs during riot/mob situation
- Impact attenuation (reduction) above 80%.
- Ergonomic design for maximum wearing comfort.
- Thoroughly tested by leading **NABL** laboratories engaged in research in physiology and bio-engineering with certificate to that effect.
- Design ensures restraint free movement long shelf life, light wt. with Excellent Protection capability.

1. **Chest Protector**- (40 cm±10%)

a. Upto 4.5 mm±10% thick poly foam.
b. Inner lining made of mesh fabric(**Detachable & washable)** with sweat absorbing lining 2mm±10% thick foam with specified (16-22) shore A hardness and engineered plastic **certified from a NABL lab**.
c. Weight: - Less than 3.00 kg
d. Material – **High quality unbreakable** engineered plastic for front and back pouches with trauma pads.
e. High impact resistant rubber insert **to absorb trauma.**
f. **All sandwiches paddings of soft plastic with EVA (Ethylene and vinyl Acetylene based Polymer) foam or any other technically better test proven material, should have number of small holes for free movement of air.**
g. **Inter stichable so as to remain in place and not slip.**

2. **Elbow Pad**. (Length- 37 cm±10%)

a. Made of soft engineered plastic
b. Velcro closure.
c. EVA (Ethylene and vinyl Acetylene based Polymer) Poly foam of minimum specified hardness.
Engineered plastic with matt surface of 2.5mm±10% thickness.
d. Mesh fabric poly foam of upto 4mm±10% specified hardness.
e. Should be able to withstand impact from one metre on hard surface.
f. **Inter stichable so as to remain in place and not slip.**
g. **All sandwiches paddings of soft plastic with EVA (Ethylene and vinyl Acetylene based Polymer) foam or any other technically better test proven material, should have number of small holes for free movement of air.**
h.**The fabric should be detachable & washable.**

3.**Shin guard-** (Length- 55 cm±10%)

a. Made of soft engineered plastic **or any other NABL proven superior material.**
b. Elastic stripes for easy wearing.
c. Velcro closure
d. **Sweat absorbing mesh fabric** Poly foam 10mm±10% hardness
e. **Inter stichable so as to remain in place and not slip.**
f. **All sandwiches paddings of soft plastic with EVA (Ethylene and vinyl Acetylene based Polymer) foam or any other technically better test proven material, should have number of small holes for free movement of air.**
g. **The fabric should be detachable & washable.**

4. **Upper Arm**

a. High protection engineered soft plastic **or any other NABL proven superior material** with **Sweat absorbing mesh fabric (Detachable & washable)** inner protection with a unique flexible design for optimum movement, fit and comfort **suitable to human body parts shape.**
b. Velcro fixed.
c. **Inter stichable so as to remain in place and not slip.**
g. **All sandwiches paddings of soft plastic with EVA (Ethylene and vinyl Acetylene based Polymer) foam or any other technically better test proven material, should have number of small holes for free movement of air**

5. **Shoulder Pad (15 cm±10%)**

a. Velcro fixed.
b. High protection engineered soft plastic **or any other NABL proven superior material** with a unique flexible design for optimum movement, fit and comfort.
c. Poly foam (preferably 3mm thickness) with specified (35-40) Shore A hardness and black mesh fabric that covers the chest and back.
d. High protection engineered soft plastic with shock absorbing EVA Polyfoam cushioning the shoulder.
e. Inner lining made of mesh sweat absorbing fabric **(detachable & washable).**
f. **Inter stichable so as to remain in place and not slip.**
g. **All sandwiches paddings of soft plastic with EVA (Ethylene and vinyl Acetylene based Polymer) foam or any other technically better test proven material, should have number of small holes for free movement of air.**

6. **Groin :-**

a. Section has an outer shock absorbing **Sweat absorbing mesh fabric (detachable & washable)** padding (plastic/ EVA/ poly foam) along with hard shell cap **or any other NABL proven superior material.**
b. The protection attachment should cover the groin area from all ricocheted projectiles and allow a comfortable sitting.
c. **Inter stichable so as to remain in place and not slip.**
d. **All sandwiches paddings of soft plastic with EVA (Ethylene and vinyl Acetylene based Polymer) foam or any other technically better test proven material, should have number of small holes for free movement of air**

7. **Forearm & Elbow Guard** (37 cm±10%)

a. High protection engineered soft plastic outer shell **or any other NABL proven superior material** should provide flexibility required for forearm and elbow.
b. Shock absorbing poly foam with minimum specified (Maximum 5mm) thickness and black mesh**(detachable & washable fabric)** lining which offers comfort and breathability
c. Adjustable straps fastening with durable elastic and Velcro
d. High protection engineered soft plastic of minimum specified standard thickness (Preferably 2.5-3.5mm) so that it does not lose its flexibility with higher padding **or any other NABL proven superior material.**
e. **Inter stichable so as to remain in place and not slip.**
f. **All sandwiches paddings of soft plastic with EVA (Ethylene and vinyl Acetylene based Polymer) foam or any other technically better test proven material, should have number of small holes for free movement of air.**

8. **Thigh Guard** (44cm±10%)

a. Thigh guard must be supported by kamarbandh to avoid slippage while running and during movement
b. High protection engineered unbreakable plastic of 2.5 to 04 mm thickness on thigh section.
c. EVA **(Ethylene and vinyl Acetylene based Polymer)** foam **or any other technically better test proven material** with minimum 4.5 mm thickness and mesh lining **(detachable & washable fabric)**for comfort and breathability.
d. Adjustable straps fastening with durable elastic and Velcro.
e. Length:- 146.5±10%
f. **Inter stichable so as to remain in place and not slip.** A fire retardant drill cloth **(detachable & washable fabric)** jacket with fire retardant and polycarbonate inserts in front and back pouches. Two shin guards having high resistant unbreakable plastic inserts.

g. **All sandwiches paddings of soft plastic with EVA (Ethylene and vinyl Acetylene based Polymer) foam or any other technically better test proven material, should have number of small holes for free movement of air.**

Remarks of the Chairman -

Sh. Dilip Trivedi

Chairman - DG, CRPF

12/8/13.

Member - 1 - Sh. Ajit Kulshreshtha, IGP RAF

Member - 2 - Sh. Marianus Minj, DIGP (Prov & Acct)

Member - 3 - Dr. Prem Chand, Comdt. 103 BN RAF

Member -4 - Sh. Kamalvir Yadav, Dy. Comdt., NSG

Member -5 - Sh. S.K.Thakur, Dy. Comdt, Assam Rifles

Member - 6 - Sh. N.S. Sodha, Dy. Comdt, BSF

Member – 7 - Sh. V.K. Verma, Dy. Comdt, SSB

Member – 8 - Sh. Pintu Yadav, Dy. Comdt., CWS- 1, RPR

Member -9 - Sh. B.K. Singh, Asstt. Comdt.. SSB

Member-10 - Sh. Patras Lakra, S.O. (Prov), CISF

TRIAL DIRECTIVES FOR ANTI RIOT EQUIPMENTS

A. P.C. SHIELD:-

TRIAL WILL BE CONDUCTED ON THE FOLLOWING TEST

01- PHYSICAL TEST :- The dimension will be measured physically as per tender enquiry and mentioned in the following table.

LENGTH	
BREADTH	
THICKNESS	
WEIGHT	

02- RESISTANCE TO IMPACT TEST :-

Trial Philosophy

The purpose of the polycarbonate shield is to protect the policeman from the various types of missiles that are thrown at him by the rioters most commonly. Such missiles range from stones or similar pieces of bricks/concrete; pieces of glass and glass bottles; acid bulbs/bottles containing sulphuric acid used in storage batteries and hydrochloric acid used for toilet cleaning purposes; and burning rags/bicycle tyres and Molotov Cocktails/firebombs made basically by petrol/diesel/kerosene. The rioters may also attack the policeman with various types of wooden/bamboo sticks, and bicycle chains that would not be thrown but would be wielded by hands on coming close to the policemen. The shield is the only defensive implement available to the policemen and hence it must be able to provide him adequate protection from all such threats. The second issue is that the USP (unique selling proposition) of the polycarbonate shield over the old wicker shield was that it is transparent which allows the user to constantly see what is in front of him as he tries to protect himself whereas the old wicker shield seriously hampered visibility. When our men are facing a barrage of stones, the shield necessarily needs to be transparent so that he may see the stone coming through it and manoeuvre himself properly or wield the shield suitably so as to block the stone. So is the case with a stick. A wicker (cane) shield severely restricts visibility and thus becomes a handicap in facing a barrage of stones or sticks. Hence the polycarbonate shield must retain its transparency even after a certain amount of bombardment by the missiles discussed above. It should not develop such scratches or cracks that would reduce its visibility to an unacceptable level.

The PC shield is not supposed to protect the policeman from a rioter who has got iron rods, GI pipes, heavy metal chains (such as those of bikes), heavy sticks (such as oars or iron-bound lathis), nunchakus and sharp-edged metallic weapons like swords and hence it will not be tested against them. It should be kept in mind that flexible weapons like chains and nunchakus, even if they are stopped by the shield, can still flex their way around and hurt the policeman.

Trial Methodology

The only way of testing the P.C. shield is to test it against the types of missiles that have been described above. The scientific way of testing is to prescribe the exact nature of the missiles that would be used in testing. This is necessary because they come in a huge variety and a shield that would protect against all of them would become unacceptably heavy. The choice is dictated by prevalence of use—that is, the board has chosen those missiles which are most widely used and hence most likely to be encountered by the policemen.

Stones-Pieces of bricks/concrete:

In real life, people throw stones that vary from 100gm to 500gm. For the purpose of this directive, the board has actually weighed pieces of stones and compared them with the pieces that we have collected from those that the unlawful assemblies/rioting have thrown at us at various places in the country. There are photographs available in which they have been found throwing stones that could be as heavy as 8-10 kg. But such stones are usually thrown against vehicles and we may ignore them for personnel. The board finds that pieces weighing about 150 g are eminently suited by their size to be thrown with maximum speed. A piece of stone weighing 150gm is typically less than 6 cm x 4.5 cm x 3.5 cm in size. It fits in the hand so well that it lends itself excellently to be thrown with maximum speed. The rioters, of course, throw bigger as well as smaller pieces also. We will ignore them in the test. But we will use pieces of bricks and concrete of 150 grams.

The next question that arises is the speed with which the stones are thrown. Ideally a speed radar must measure speeds but that may be impractical in our circumstances as it would not be easily available to us. However, there are simple ways of estimating speeds with sufficient accuracy. More important for us is to simulate real life conditions. The simplest method for this purpose is range. The board has observed in numerous riotous situations that the rioters are able to throw such stones at up to 75 yards range. But 45 yards range is more common. Stones of 150 grams would therefore be thrown by our men (since all of them uniformly possess a prescribed minimum bodily strength and fitness as

determined from various standard tests) at 45 yards with two hopping steps run-up because the rioters are also seen using this technique most frequently.

Pieces of glass/glass bottles:
The weight of the pieces of glass/glass bottles would also be limited to 150 grams. They will be made by breaking ordinary plate glass and glass bottles. Since throwing them with bare hands may be risky, the throwers can use leather gloves.

Testing Parameters

The shield would be fitted in a heavy bracket that would simulate its being held in a human hand and then missiles would be thrown on it. In other words, the shield shall be held from its grip and not fitted in a frame from its sides. The structure supporting the device that holds the shield shall be sufficiently heavy (70 kg to simulate a man's body weight) so that the impact of the missiles is absorbed largely by the shield and not transferred to the frame. A real man cannot be allowed to hold the shield because in case the device fails or if the thrower misses his mark, the man could be injured. Our men would stand 45 yards from it and throw missiles on it. In real life, it has been seen that sometimes the rioters come as close as 25 yards. It is necessary to ensure that the shield does not break from this range also. Each shield shall be subjected to 25 direct (and not bounced) hits each by missiles of the type described above at the two ranges- 45 and 25 yards. The shield must not shatter or develop cracks under the individual or cumulative impact of such missiles. It should also not get scratched in such a manner as to reduce its visibility. The entire experiment shall be video recorded and still photographs shall also be taken of the shield before and after the use of the missiles.

When corrosive substances like acids and burning rags are used against the shield, the shield should not get damaged by them.

Acid bulbs/bottles:

Since it is potentially dangerous for throwers to use acid bulbs (the rioters are desperados in comparison), the acid resistance of the PC shield shall be determined by pouring the acids of the type described above on the shield and observing the outcome. Time of contact will be 30 minutes because in real life, a policeman who gets attacked by these may not get time up to 30 minutes to withdraw from the scene and clean the shield.

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Burning rags/Bicycle tires/Molotov Cocktails/Firebombs:

Burning rags are thrown by rioters attached on a stick. Burning bicycle tyres or pieces thereof are thrown solo. A Molotov Cocktail or firebomb is a glass bottle with a combustible fluid such as petrol/diesel/kerosene filled inside to some capacity and the rest filled with rags which are lighted and thrown. In India we have so far not encountered the use of gelled fuel and hence we shall not be testing for that. In any case, the purpose is to check fire resistance. The resistance to a bottle or its piece has already been covered above. Hence the shields need only to be exposed to the fire of burning rags soaked in petrol/diesel/kerosene, and burning bicycle tyres. Since in real life the policeman is supposed to fend it off as soon as possible, the time of contact will be limited to 10 seconds.

Sticks:

Sticks come in a wide variety of sizes. Obviously the shield cannot be expected to protect from all of them. The board, after a study of the sticks used in various riots and also in martial arts has found that a bamboo stick 32 inches long and of one inch diameter typically weighs less than 375gm. This is a stick that can be easily wielded with one hand. In practice therefore, it can be inferred from this that we should seek protection from bamboo sticks that weigh 500gm and can be wielded with both hands.

Testing Parameters:

The man will stand in front of the shield in the bracket and hit it with full force with the stick wielded by both hands. The shield will be hit 25 times. It should not develop any crack at all anywhere on its body.

3. Certification Test- Any NABL (National Accreditation Board for Testing and Calibration Laboratories) approved laboratories tests or certificates regarding quality of the standard of materials used and technical parameters may be verified during product delivery as per practice in vogue.

B. HELMET

Trial Philosophy

We have already discussed the type of missiles which the rioters throw at the police. The same missiles which are supposed to be blocked by the shield can still hit the policeman if thrown simultaneously by more than one rioter from two different directions. His helmet is intended to protect him from serious head injury from such missiles. It may also be noted that rioters may actually come close to a policeman and so close that it would not be possible to wield the

shield with enough dexterity to ward off all the blows and the missiles. Hence the protection standards of a helmet have to be necessarily higher and much more stringent than those for the shield.

PHYSICAL TEST

The dimensions will be measured physically as per tender enquiry and mentioned in the following table.

P.C. VISOR WEIGHT	
P.C. VISOR THICKNESS	
SHELL THICKNESS	
SHELL WEIGHT	
EAR GUARD THICKNESS	

Trial Methodology

The helmet shall be tested primarily in accordance with IS 9652:1980 (reaffirmed 2002) read with IND/GS/1684(b) for non-metal helmet for police force and use the same terminology as used there.

Testing Parameters

Shock Absorption Test- Helmets shall be tested for shock absorption by the method described below within one minute after subjecting them to conditions specified in (a) or (b) or (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 shell for 4 hours at room temperature.

Wooden Headform: Conforming to IS: 7692-1975.

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 (50000 kgf/mm). The headform shall be mounted on the gauge so that its vertical axis coincides with the vertical axis of the gauge. .

Accuracy: The overall error of the whole set up including the load measuring and recording system shall be not more than 10 percent.

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Concrete or similar monolithic block having a minimum height of 1 m, lengt m and width 0·6 m, and mass 1 ton, shall be used to support the gauge a headform, the block shall be bedded on dry sand on a solid floor.
A striker shall be in the form of a rectangular block of wood weighing 4.5 ± 0. kg and having a horizontal striking face 180 mm square. The striker shall slid freely and without oscillation down, with two vertical guide wires so positioned that the centre of gravity of the striker lies on the vertical axis of the gauge and both lie in the plane of the guide wires.

Method: The helmet shall be placed on the headform. The striker shall be raised to a clear height of 1·8 m ± 5 mm above the point of contact with the helmet and allowed to fall freely. A photographic or other high speed record of the force transmitted during impact shall be made.

No single helmet shall, however, be subjected to more than one of these conditions and neither of the maximum values of transmitted force obtained shall exceed 20 kN (2000 kgf) and shell shall remain intact, with no cracks extending as far as the edge and through the thickness of the shell.

Penetration Resistance: The helmet shall be subjected to the following tests for resistance against penetration within one minute after subjecting to the conditions specified above which has given worst result in shock absorption.

a) Plate Test - When tested in accordance with the method described below, no integral part of the helmet shall fail or stretch permitting the helmet to be forced down over the headform. The shell shall not be-dented or pierced through to touch the wooden headform or the cradle.

b) Plumb-Bob Test - When tested by the method described below, no integral part of the helmet shall fail or stretch permitting the helmet to be forced down over the headform. The static measurement of the depth of penetration or dent shall not exceed 10 mm.

Method For Plate Test

Mount the helmet on wooden headform (see IS : 7692-1915) and then drop a steel plate 300 mm square and 6 mm in thickness with its plane vertical from a clear height of 3.0 m so that one side of the square strikes the top of the crown of the helmet. Examine the helmet for denting or piercing, failure of any integral parts, etc.

Method For Plumb-Bob Test

Mount the helmet on the headform and drop freely a cylindrical steel striker weighing 2 kg, 32 mm in diameter and having at its lower end a conical point with an included angle of 36° and a maximum tip radius of 0·5 mm, from a clear height of 1 meter to strike the top of the crown of helmet. Examine the helmet for piercing, denting of failure of any integral parts.

Strength of Retention Systems: Helmet shall be tested for their retention system by the method given below and it shall not fail under the maximum loading of 0.5 kN (50 kgf) and the total extension as measured between the pre-load of 0.25 kN (25 kgf) and the maximum load of 0.5 kN (50 kgf), shall not exceed 10 mm.

Method For Test

The helmet is placed on the appropriate headform with the chin strap fastened over a device approximating to the shape of the bony structure of the lower jaw. This shall consist of two metal rollers each 12.5 ± 0.5 mm in diameter and at 76 ± 0·5 mm centers apart. The helmet shall be supported on the head form so that the points of attachment of the chin strap to the shell will be subjected to the same test as the strap itself.

After applying a preload of 0.25 kN (25 kgf) for not less than 30 seconds an additional load of 0.25 kN (25 kgf) shall be applied to the device retained by the chin strap at a uniform rate of 1 kN (100 kgf) per minute. After 2 minutes at the maximum load the elongation of the retention system is determined by measuring the vertical distance between reference point on the device and on top of the helmet shell, and comparing this distance with that obtained under preload at 30 seconds interval.

Rigidity Test: Helmet when tested by the method prescribed below the maximum deformation shall not exceed the initial deformation by more than 40 mm and the residual permanent deformation shall not exceed 15 mm.

Method For Rigidity Test

Apparatus for Press with Two Parallel Metal Plates: They are arranged so that the distance between them could be determined within ± 1 mm.

One helmet shall be tested along its longitudinal axis and the other along its transverse axis. In both cases the helmets shall be positioned between the two parallel plates by means of which the initial load of 30 N (3 kgf) shall be

applied to the helmet shell. After 2 minutes, the distance between the plates shall be measured. The load shall then be increased to 630 N (63 kgf) by increment of 100 N (10 kgf) every 2 minutes and maintained at that level for 2 minutes, after which the distance between the plates shall be measured again. The load applied t o the plates shall then be reduced to 30 N (3 kgf) and maintained at this level for 5 minutes. The distance between the plates shall be measured again. The difference in distance between the plates when the load was increased from 30 to 630 N (3 to 63 kgf) and the difference in distance between the plates when the initial load of 30 N (3 kgf) was applied and the final load of 30 N (3 kgf) was applied shall be reported for both the longitudinal and transverse direction.

Water Absorption Test: Helmet shall be tested for water absorption in accordance with the method specified below. They shall not absorb water more than 5 percent of their mass.

The samples which have been used for shock absorption [(a) above therein] shall be used for carrying out this test. Cut three pieces, 25 X 50 cm from the shell. Coat the cut edges of each with wax or sealing compound, weigh the specimens and then immerse them for 24 hours in water at a temperature of 27 ± 2° C. Remove them from the water, dry the surfaces by wiping them, and weigh the pieces again. Report the average gain in mass as a percentage.

Flammability Resistance: When tested by the method described below, there shall be no flaming or visible evidence of flame penetration to the inside of the helmet.

Method For Flame Test

The helmet shall be supported, crown uppermost, on a headform (see IS: 7692 - 1975). A barthel burner conforming to the requirements given below, is to be brought into contact with the outer surface of the helmet with the flame at right angles at a point of 12 cm below the crown, measured externally, whilst it is rotated steadily through one complete revolution at a speed of 2 rev/min.

The test shall be carried out with barthel burner conforming to A-I of IS: 4355-1967. The following accessories shall be used with the burner:

a) Reservoir,
b) Connecting tube of polyethylene or soft rubber,
c) Absolute alcohol (ethanol),
d) Bare copper wire 0·71 mm diameter having a free length of not less than 100 mm, and
e) Stand to help the reservoir.

The absolute alcohol shall be filled in the reservoir and the tube, air bubbles entrapped in the tube shall be removed by pressing the tube several times. Cotton waste soaked *in* spirit shall be kept in the cup on the burner and lighted. After a few minutes when the burner is sufficiently heated the regulator of burner shall be turned to allow the spirit to flow in the form of vapour. Burner shall be operated with the valve so as to get a flame height of 150 rom. Level of the fuel shall be 760 ±75 mm above the base of the burner. Satisfactory operation of burner shall be checked by inserting in the flame the bare copper wire of 0.71 mm diameter having a free length of not less than 100 mm in position normally occupied by lower edge of the test piece, that is, 50 mm above the burner and reaching farther edge of the flame. The wire should not take more than 6 seconds to melt.

Firing Test: When tested by the method described below, none of the pellets shall penetrate the inner surface of the shell and there shall be no bulging of the inner surface of more than 5 mm.

Method For Firing Test

Each helmet shall be mounted on a head form (see IS : 7692 - 1975) except that it shall be without plates), tightly fastened to securely hold the helmet. Head form shall be firmly secured to the base support or planted securely in a firm ground.

The helmet shell shall be struck by one round of 12 bore, 4 buck cartridge of AF Kirkee fired from a distance of 10 meters front side being the target while aiming horizontally. The gun shall be a standard 12 bore and its barrel shall not have any choke. One sample shall be tested in front and back and another sample for sides.

3. Certification Test- Any NABL (National Accreditation Board for Testing and Calibration Laboratories) approved laboratories tests or certificates regarding quality of the standard of materials used and technical parameters may be verified during product delivery as per practice in vogue.

C- BODY PROTECTOR

TRIAL WILL BE CONDUCTED ON THE FOLLOWING TEST

01- PHYSICAL TEST: - The dimension will be measured physically as per tender enquiry and mentioned in the following table.

(m-1) (m-2) (m-3) (m-5) (m-9) (m-8) (m-7) (m-4) (m-10) (m-6) (M-11) 8/4/13

CHEST PROTECTOR	LENGTH	
	THICKNESS	
	WEIGHT	
ELBOW PAD	LENGTH	
	THICKNESS	
	WEIGHT	
SHIN GUARD	LENGTH	
	THICKNESS	
	WEIGHT	
SHOULDER PAD	LENGTH	
	THICKNESS	
	WEIGHT	
FOREARM & ELBOW GUARD	LENGTH	
	THICKNESS	
	WEIGHT	
THIGH GUARD	LENGTH	
	THICKNESS	
	WEIGHT	

Trial Methodology

Troops in the field are likely to be hit on their trunk by the same missiles which hit their shields. Hence the body protector must also be able protect against the same stones. A man who is wearing the body protector must be assured that his floating ribs shall not break should a stone hit him there. Even in a game like cricket when one dons the pads, it is assured that the shinbone shall not fracture even if a 100 mph delivery were to hit it.

Trial Parameters

When objects are thrown to test the protection offered by the body protector, we cannot make a man wear it because he runs the risk of getting injured by glass pieces etc. Hence testing in respect of missiles shall be done by making a man-sized dummy wear it and missiles thrown at it from the ranges prescribed for the shields. Body Protectors will therefore be tested by throwing various objects from 45 yards, 25 yards and sticks wielded with two hands from a close distance.

The dummy shall be weighted to make its weight about 70 kg to bring it close to an average man's. After throwing the missiles, the dummy shall be observed closely to assess the effect of the impact. Resistance to corrosive substances and fire shall be ascertained in the manner prescribed for the PC shield.

However, there is one critical parameter for which we will have to make a man wear it. There may be situations in which the rioters come so close as to hit a man with a stick. We avoided testing the stick on the helmet because in the case of failure of the product, the wearer could have been perhaps fatally wounded in the head. But a hit from a stick on the body can be taken even if the product does not perform well. The stick prescribed for the shield shall be used here also. The policeman would wear the body protector and the other policeman would wield the stick on him with two hands on different parts of the body protector 25 times on each part of the protector.

The effectiveness of the concerned part of the body protector will be judged by the pain felt on that part. The pain should be tolerable by an average man.

3. Certification Test- Any NABL (National Accreditation Board for Testing and Calibration Laboratories) approved laboratories tests or certificates regarding quality of the standard of materials used and technical parameters may be verified during product delivery as per practice in vogue.

D- P.C. LATHI

PHYSICAL TEST :- The dimension will be measured physically as per tender enquiry and mentioned in the following table.

LENGTH	
DIA METER	
WALL THICKNESS	
WEIGHT	

Trial Philosophy

The philosophy of using a polycarbonate hollow pipe lathi as against a bamboo stick is that a hollow pipe of polycarbonate is flexible. On the other hand, the bamboo stick, in comparison is quite inflexible. When an inflexible stick strikes the human body, it deposits most of the energy at the point of impact. Whereas when a flexible stick strikes the human body, it bends upon impact and thus absorbs a part of the impact energy in itself, thereby reducing the amount of energy that is deposited in the tissues at the point of impact. Hence a flexible pipe would inflict less severe injury than a rigid pipe of the same length and weight.

Trial Methodology

While several tests for flexibility can be prescribed, the best way to test it is on a human body only because we are going to use it on human bodies only. Human subjects in ordinary summer clothing shall be given one-handed hits from the lathi on different parts of the body except vital and sensitive parts like head, neck, face and groin in the manner we use it in the field. The subjects will report on the injury which should be, in their perception, the optimum pain—neither too little nor too much.

While injury inflicted is one parameter, there is another parameter that should not be neglected. When used in the field, it is quite likely that the aim would miss and the lathi would hit a very hard object like the road or a wall. The lathi should not break in this situation. Hence to test this aspect, the lathi shall be hit with full force on hard tarred ground 25 times and the effect would be observed.

3. Certification Test- Any NABL (National Accreditation Board for Testing and Calibration Laboratories) approved laboratories tests or certificates regarding quality of the standard of materials used and technical parameters may be verified during product delivery as per practice in vogue.

Remarks of the Chairman -

(Sh. Dilip Trivedi)

Chairman - DG, CRPF

8/4/13.

Member - 1 - Sh. R.N. Misra, IGP RAF

Member - 2 - Sh. Kamal Kant Sharma, DIGP (Prov & Acct)

Member - 3 - Sh. K. K. Sinha, Comdt. 107 BN, RAF

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Member – 9 - Sh. V.K. Verma D/C SSB

Member -10 - Sh. B.K. Singh, D/C SSB

8/4/13

Co-opted Member- Sh. Pintu Yadav, Dy. Comdt., CWS- 1, RPR