e-Government Procurement (e-GP)
NOTICE INVITING TENDER

The State Police Chief, Kerala Police Department, Government of Kerala invites online bids from reputed manufacturers/authorized dealers or reputed vendors for the SUPPLY OF FIBRE SHIELD. The bidders should comply with the following general conditions in addition to the additional conditions of the instant tender.

**General**

1. The Bidder should be a reputed Original Equipment Manufacturers (OEM) or authorized dealer of OEM, who is having an Authorization Certificate from the OEM to participate in the tender floated by Kerala Police. Certificate from the OEM for sales and service, to be produced.

2. One bidder cannot represent two suppliers/OEMs or quotes on their behalf in a particular tender.

3. The OEM/Bidder should have a well equipped service centre functioning in India (preferable in Kerala) to cater to immediately after sales requirement; copy of Service Centre details must be enclosed along with Tender document. (Preferably bidder should have a Service Centre in Kerala/South India).

4. A reputed vendor can participate in the tender provided the vending outfit is functioning in the market for at least 10 years.

5. The Bidder should have valid GST registration. Copy of GST registration certificate should be enclosed along with the tender.
6. The bidder should have valid PAN/Taxation Index Number. Copy of PAN/Taxation Index Number allocation letter should be enclosed along with the tender.

7. The Bidder must fulfil the following minimum qualification criteria to prove the techno-commercial competence and submit the documents in support thereof:
   a). Valid Authorization letter from the OEM to attend this particular Tender.
   c). Last 3 year’s financial status of the Bidder's/P&L and Balance Sheet/audit report of last 3 years.
   d). The bidder (authorized dealer/distributor) should have the dealership/distributionship for at least 3 (three) continuous consecutive years with the OEM.
   e). The Bidder has to submit a Warrantee Certificate along with invoices.
   f). In case of a propriety item, a certificate by the OEM to be attached.

<table>
<thead>
<tr>
<th></th>
<th>Tender No. &amp; Date</th>
<th>KPET/69/2018/PHQ Dated 26/10/2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Item</td>
<td>SUPPLY OF FIBRE SHIELD</td>
</tr>
<tr>
<td>2</td>
<td>Quantity</td>
<td>5000 Nos.</td>
</tr>
<tr>
<td>3</td>
<td>Estimated Amount</td>
<td>Rs. 82.50 Lakhs (MoPF Scheme)</td>
</tr>
<tr>
<td>4</td>
<td>Tender Fees</td>
<td>Rs. 14300 + Tax = Rs. 16050/- (Rupees Sixteen thousand and fifty only)</td>
</tr>
<tr>
<td>5</td>
<td>Earnest Money Deposit</td>
<td>Rs. 82,500/- (Rupees. Eighty two thousand and five hundred only)</td>
</tr>
<tr>
<td>6</td>
<td>Specifications</td>
<td>Attached in tender document</td>
</tr>
</tbody>
</table>

2
<table>
<thead>
<tr>
<th></th>
<th>Date and time of publication of e-Tender</th>
<th>27/10/2018, 02:00 PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Date of submission of e-Tender</td>
<td>27/10/2018, 02:00 PM To 17/11/2018,12:00 PM</td>
</tr>
<tr>
<td>10</td>
<td>Last date and time for online submission of e-tender</td>
<td><strong>17/11/2018, 12:00 PM</strong></td>
</tr>
<tr>
<td>11</td>
<td>Date and time of opening of e-Tender</td>
<td>19/11/2018, 3:00 PM</td>
</tr>
<tr>
<td>12</td>
<td>Place of opening</td>
<td>Police Headquarters, Thiruvananthapuram</td>
</tr>
<tr>
<td>13</td>
<td>Date, Time and Place of Technical Evaluation</td>
<td><strong>23/11/2018, 10.30 AM, at Special Armed Police Camp, Peroorkada, Thiruvananthapuram</strong></td>
</tr>
<tr>
<td>14</td>
<td>Bid Validity (Total Number of Days up to which the rates are to be firm)</td>
<td>180 days</td>
</tr>
<tr>
<td>15</td>
<td>Warranty &amp; AMC</td>
<td>Three years warranty. Charges for AMC/ATS for a period of three years after warranty period should be quoted in the financial Bid.</td>
</tr>
</tbody>
</table>
| 16| Address of Tender Inviting Authority  | State Police Chief, Kerala, Vazhuthacaud, Thiruvananthapuram - 695010  
Ph: 0471-2722566  
Fax: 0471-2722566  
e-mail: aig2phq.pol@kerala@gov.in  
Website: [www.keralapolice.gov.in](http://www.keralapolice.gov.in) |

**9. Mode of submission of bids: - Online.** All Bid documents shall be submitted only in online procedure through the e-GP website [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) in their designated online covers. Details of covers are given separately. No other mode of submission shall be accepted and such tenders will be rejected outright.

**10. Cover details: - No. of covers - 2. i) Technical Bid ii) Financial Bid.** The AMC/ATS after warranty period also to be quoted in the Financial Bid. In the case of Foreign Equipments, the rate must be quoted in Indian Rupees. The documents to be uploaded under each online covers are specified in the website.
11. **Downloading of e-Tender documents:** The tender document can be downloaded from the e-GP website [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) from the date and time of publication of e-tender onwards to last date and time for online submission of e-tender. Downloading of tender documents will not be possible after the date specified above.

12. **Submission of e-Tender documents:** The digitally signed tender document and other specified documents shall be submitted online through the e-GP website [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) well in advance before the last date and time mentioned above. No submission shall be allowed after the last date mentioned above.

13. **Payment of Tender Fees:** A non-refundable tender fee shall be paid in online mode through the e-GP website [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) at the time of bid submission. No other mode of payment shall be accepted. The tenders of bidders who do not remit fees through online will be rejected outright.

14. **Payment of Earnest Money Deposit (EMD):** The EMD shall be paid in online mode through the e-GP website [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) at the time of bid submission. No other mode of remittance shall be accepted.

15. **Exemption from payment of EMD:** Bidders who are registered with Store Purchase Department, Kerala or National Small Scale Industries Corporation Ltd., New Delhi (for the items tendered) are exempted from submission of EMD. Those bidders claiming exemption shall submit valid registration certificate from the SPD, Kerala or NSSIC, New Delhi. Tenders of bidders who do not remit EMD online or do not upload documental proof (digitally signed) for exemption of EMD will be rejected outright.

16. **Withdrawal and re-submission of e-Tender:** The Bidders are at liberty to withdraw the submitted tender/documents and to submit fresh tender/documents till the last date and time of submission of the e-Tender after which withdrawal/re-submission will not be allowed.

17. **Opening of e-Tenders:** The bids shall be opened online through the e-GP website [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) at the Police Headquarters, Vazhuthacaud, Thiruvananthapuram on the date and time mentioned above in the presence of the Bidders/authorized representatives who wish to attend at the above address. If the tender opening date happens to be a holiday or non-working day due to any valid reason, the tender opening process will be done on the next working day at the same time and place specified. Any change in the opening date/time/venue due to other reasons shall be informed by way of Corrigendum published in the e-GP website. The Technical Bids will be evaluated by a Technical Evaluation Committee and those that do not conform to the specifications or to the satisfaction of the Committee will be rejected. The financial bids of the Technically qualified Tenderers only will be considered for opening. The date of opening of financial Bids will be intimated to the concerned technically qualified tenderers, over phone/Fax/e-mail. This will be with in 7 to 10 days of evaluation of technical bid.

18. **Technical Evaluation:** All tenderers who quote for the supply of above equipment are required to be ready for live demonstration to be held at Special Armed Police Camp, Perurkada, Thiruvananthapuram on 23.11.2018 at 10.30 AM (or any other venue which will be
intimated in due course). In the event of firms not able to show live demonstration, they need to convince the Technical Evaluation Committee about such inability and resort to documentary/power point presentation with original product brochures/CDs/scale models/ videos/ slide shows etc. to the utmost satisfaction of the Technical Evaluation Committee. The Technical Evaluation Committee will be consisting of the following officials.

i. Additional Director General of Police, AP Bn. - Chairman
(Ph. No. 0471-2436054)

ii. Commandant, SAP - Member
(Ph. No. 0471-2433949)

iii. Commandant, AR TVPM City - Member
(Ph. No. 0471-2320746)

iv. Assistant Commandant, QM, SAP - Member
(Ph. No. 0471-2433949)

V. Assistant Commandant, QM AR TVPM City - Member
(Ph. No. 0471-2321146)

(The Chairman of the Committee can co-opt any other technical member of his choice to the Committee for proper evaluation of the tendered item. Any clarification/doubts regarding the specification or related matters pertaining to the items tendered may be freely got cleared through the officers included in the above committee by contacting them in the numbers shown against their names above. The contact in Police headquarters will be Junior Superintendent, H Section, Ph. No. 0471-2722768-1283).

19. All Bidders who participates in e-tender should produce hard copies of all relevant documents related to e tender at the time of technical evaluation, without fail.

20. Note to Bidders:

i) Bidders have to procure legally valid Digital Certificate (Class III) as per Information Technology Act, 2000 for digitally signing their electronic bids. Bidders can procure the same from any of the license certifying authority of India. For more details, please visit the e-GP website www.etenders.kerala.gov.in.
ii) Bidders are advised to note the Tender_Id and Tender No. & Date for future reference.

iii) All uploaded documents should contain the signature and the office seal of the bidder/ authorized persons and should be digitally signed while uploading. Documents uploaded without digitally signing shall entitle rejection of the tender.

iv) In the case of Foreign Equipments, the rate should be quoted in Indian Rupees. Preference will be given to those who are ready to supply the item without opening Letter of Credit. Ordinarily, no advance payment will be made for procuring the above item. In case advance payment has to be made, a clear case has to be made out by the Tenderee. However this will be only on extraordinary circumstances.

v). For obtaining Digital Signature Certificate and help on e-tendering process, contact Kerala State IT Mission, e-Government Procurement PMU & Helpdesk, Basement floor of Pension Treasury Building, Uppalam Road, Statue, Thiruvananthapuram; Ph: 0471-2577088, 2577188; Toll free no: 18002337315; e-mail: etendershelp@kerala.gov.in; Website: www.etenders.kerala.gov.in on all government working days from 9:30 am to 5:30 pm.

vi) The State Police Chief is empowered to reject any tender without assigning any reason.

vii) For any clarifications regarding the terms and conditions in this tender notice or the tender document, please contact Additional Asst. Inspector General of Police, OR Junior Superintendent H Branch, Police Headquarters, Vazhuthacaud, Thiruvananthapuram – 10 on all Government working days from 10:30 am to 5:00 pm. Ph:0471-2721547 Fax: 0471-2726945

NOTE: — Bidders are advised to go through the conditions in the notice inviting tender and the tender document carefully and comply them to avoid outright rejection of their tender.

For any litigation relating to this order, the jurisdiction will be Thiruvananthapuram City.

Sd/-

Additional Assistant Inspector General of Police
For Director General of Police & State Police Chief, Kerala
To

The DsG/Directors: AR (through LOAR), BSF, CISF, CRPF, ITBP, NSG, SSB, NIA and IB.

Subject: Revised QRs and TDs of Polycarbonate Shield.

The undersigned is directed to refer to DG, CRPF’s U.O. note No.L.VII-02/2015-16- Prov DA-5 (PC Shield) dated 03.10.2017 on the subject mentioned above and to say that the QRs and TDs in respect of Polycarbonate Shield as per Annexure-I and Annexure-II respectively, have been approved by the competent authority in MHA.

2. Henceforth, all the CAPFs/NIA & IB should procure and trial evaluates the above item, required by them, strictly as per the laid down QRs and TDs.

3. The concerned CAPFs will be accountable for correctness of the QRs and TDs of Polycarbonate Shield.

Encl: As above.

(Ritesh Kumar)
Under Secretary to the Govt. of India
Tel:23381278

Copy to:

1. SO (IT), MHA - with the request to host the revised QRs/Specifications of Polycarbonate Shield on official website of MHA (under the page of Organizational Set up, Police Modernization Division-Protective Gears Equipments) and Soft copy is being sent through email.

2. DG, BPR&D, near SSB Building, NH-8, Palam, Mahipalpur, New Delhi-110037.

3. DDG (Procurement), MHA

(C. Baby Usha)
Section Officer (Prov-I)
## REVIEW OF QRs/SPECIFICATION & QUALITATIVE REQUIREMENT OF POLYCARBONATE SHIELD

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Nomenclature</th>
<th>QRs/Specifications approved by MHA vide letter No.L.VII-54/2010-12-Prov-R dated 13/11/2013</th>
<th>Revised QRs/Specification proposed by Sub Group members of CAPFs and Scientists</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>
| 1       | 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 weight, 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 longevity.  
- High impact resistance.                                                   | 1. **SCOPE/INTRODUCTION**  
Polycarbonate shield is the most important protective equipment for a person deployed for handling riotous situation. It is required to protect him/her when facing crowds during demonstrations/processions and while dealing with riotous mobs. Polycarbonate shield has to protect the whole body from injuries due to impact, blow from blunt objects, brick batting, lathi blow, stone pelting, projectile/missiles, acid bulbs, Molotov cocktails and industrial chemical. A high standard Protective shield is therefore required for a policeman.  
Polycarbonate shield for riot police has to be light weight with shock absorption capabilities, good quality material and fire resistant for handling crowds with varying degree of hostility. |

(Mohan Mathpal)  
AD (Prov), SSB  
Member – 6  
(T.A. Singh) AC  
ITBP  
Member – 14

(Jagir Chand)  
PSO (P&T), BPR&D  
Member – 3

(A.K. Bhatnagar)  
HOD, PCD, BIS  
Member – 4

(Manna Singh)  
Comdt. (Prov & Acccts)  
Member – 3

(D.K. Choudhary)  
DIGP (Prov & Accats)  
Member – 2

(K. S. Bhandari)  
IGP, RAF  
Member – 1

(Rajeev Rai Bhatnagar) IPS  
DG, CRPF  
Chairman

(Ajay Singh)  
Team Cdr.  
NSG  
Member – 13

(Dr. L. Robert Varte)  
Scientist-C, DIPAS  
Member – 12

(Nisha Bura)  
Scientist-C, BIS  
Member – 11

(Hans Raj)  
DC  
BSP  
Member – 10

(A.K. Singh)  
DC  
RAF Hqr.  
Member – 9

(Neeta Kapil)  
SSO, NITRA  
Member – 8

(K.S. Airy)  
Assam Rifles  
Member – 7
## TECHNICAL DATA:

- **Shape**: Rectangular or any other proven better shape.
- **Length**: 910 mm to 1000 mm
- **Weight**: Less than 3.4 Kg.
- **Breadth (Flat)**: 580 mm ± 20 mm or any other proven better shape.
- **Breadth Concave**: 620 mm ± 10 mm or any other proven better shape.
- **Thickness**: 3.00 mm ± 0.5 mm
- **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.**

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**Considering above aspects, QRs of a Polycarbonate shield are proposed as under:**

### QRS/Specifications (Technical Data)

#### 2.1 Nomenclature: Polycarbonate Shield

#### 2.2 Colour: Colourless (More than 83% transparent)

#### 2.3 Weight: 3.4 Kg maximum. The weight of Polycarbonate body of the Shield shall be 2.6 Kg minimum.

#### 2.4 Dimensions:

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Breadth (Flat)</th>
<th>Breadth (Concave)</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>955 mm ± 45 mm and – 20 mm</td>
<td>580 mm ± 20 mm</td>
<td>620 mm ± 10 mm</td>
<td>03 mm Minimum</td>
</tr>
</tbody>
</table>

#### 2.5 Shape: Rectangular or any shape giving maximum coverage to the user.
3. **Material:**

3.1. The polycarbonate sheet shall be made of high impact resistant/natural polycarbonate material. It may contain additives, processing aids and stabilizers (for example, UV absorbers).

3.2. The polycarbonate material shall comply with the requirements given in Table 1 when tested as prescribed in Col-4 of Table 1.

### Table 1 Requirements for Polycarbonate Material

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>(1)</td>
<td>Melt Flow Index, g/10 min. (at 300°C under 1.2 Kg load when measured after pre-drying of the material at 120 ± 5°C upto 4 hrs.)</td>
<td>i) 1.5 to 8 (for extrusion/thermoforming) ii) 8 to 15 (for injection moulding)</td>
<td>IS 13360 (Part 4 / Sec 1)</td>
</tr>
<tr>
<td>(2)</td>
<td>Specific Gravity</td>
<td>1.19 to 1.22</td>
<td>IS 13360 (Part 3 Section 1)</td>
</tr>
</tbody>
</table>

(Mohan Mathpal) AD (Prov), SSB Member –6

(Jagat Chand) PSO (P&T), BPR&D Member –5

(A.K. Bhatnagar) HOD, PCD, BIS Member –4

(Mamta Singh) Comdt., (Prov & Accts) Member –3

(D.K. Choudhary) DIGP (Prov & Accts) Member –2

(K. S. Bhattacharyya) IGP, RAF Member –1

(Rajeev Rai Bhatnagar) IPS DG/CRPF Chairman

(T.A. Singh) AC ITBP Member –14

(Ajay Singh) Team Cdr. NSG Member –13

(Dr. L. Robert Varte) Scientist-C, DIPAS Member –12

(Nisha Bura) Scientist-C, BIS Member –11

(Hansraj) DC BSS Member –10

(A.K. Singh) DC RAF Hqrs. Member –9

(Neta Kapil) SSO, NITRA Member –8

(K. R. Airy) 2 I/C Assam Rifles Member –7
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Characteristics</th>
<th>Requirement</th>
<th>Method of test, Ref to IS/Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dart drop Impact, Min, J (at 27°C)</td>
<td>150</td>
<td>Annex B of IS 14443</td>
</tr>
<tr>
<td>2</td>
<td>Light Transmission, percent, Min</td>
<td>83</td>
<td>IS 13360 (Part-9 Section-5)</td>
</tr>
<tr>
<td></td>
<td>Flammability Test</td>
<td>94 HB class</td>
<td>IS 13360 Part-6 Section-5</td>
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</tbody>
</table>

3.3. The polycarbonate body of the shield shall also comply with the requirements given in Table 2 when tested as prescribed in Col. - 4 of the Table 2.

Table 2 Requirements for Polycarbonate body of the Shield:

<p>| Flexural Modulus, Min, MPa (with crosshead speed of 1.2 mm/min and a span to depth ratio of 16 to 1 (test specimen size, 04 mm x 10 mm) | 2200 | IS 13360 (Part-5 Section-7) |
| Izod Impact Strength, notched, Min, J/㎡ (test specimen thickness of 03 mm and notch radius of 0.25 mm) | 60   | IS 13360 (Part-5 Section-4) |
| Deflection Temperature under load at 1.82 MPa, Min °C | 120  | IS 13360 (Part-6 Section-17) |</p>
<table>
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<tr>
<td>4</td>
<td></td>
<td></td>
<td>3.4 Ribs shall be given all along the edges for higher structural strength.</td>
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<td>3.5 The Polycarbonate body of the Shield shall have abrasion resistance surface coating on both surfaces.</td>
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<td>4. <strong>Arm rest/Handle:</strong></td>
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<tr>
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<td>4.1 Cushioned arm rest to provide comfort in long use.</td>
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<td>4.2 Grips and supports must allow the user to comfortably hold and position the Polycarbonate Protective Shield.</td>
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<td>4.3 General requirement of handle:</td>
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<td></td>
<td>a) Manufacturing process for handle should be Gas-Assisted injection Moulding (GAIM);</td>
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<td>b) Material for handle should be polymeric, preferably polycarbonate;</td>
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<td>c) Elastomeric bushes and washer system should be used for nut and bolt system.</td>
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<td></td>
<td></td>
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<td>d) Metallic bolts, if used, shall be SS304 hex-headed M6 bolts; Nut and bolts system should preferably be self-locking.</td>
</tr>
</tbody>
</table>

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(A.K. Singh) DC RAF Hqr. Member –9
(Nitesh Kapil) SSO, NITRA Member –8
(S. Airy) Assam Rifles Member –7
Performance requirements of PC Shield

5.1. Resistance to vandalism:

5.1.1. The test is to provide complete protection against brick batting, stone pelting, iron rod/cane attack.

5.1.2. The Polycarbonate body of the shield shall have impact resistance of level ‘A3’ when tested for vandal resistance as per the test method prescribed in Annex C of IS 14443.

5.2. Resistance to Force Entry:
The Polycarbonate body of the shield shall have resistance of level ‘B3’ against penetration when tested for resistance to forced entry as per the test method prescribed in Annex D of IS 14443.

5.3. Resistance to Surface Abrasion:
The resistance of Polycarbonate shield to surface abrasion shall be tested in accordance with ASTM D 1044 for 100 cycles under 500 g load. Haze of test specimen shall not be more than 20 percent.

5.4. Resistance to Environmental Stress Cracking:
Environment Stress Cracking Resistance (ESCR) test shall be performed on polycarbonate body of the shield (with protective coating) by constant strain method as per IS 13360 (Part 8/Sec 9).
<table>
<thead>
<tr>
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<th>C</th>
<th>D</th>
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<tbody>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>6. <strong>Life:</strong> 06 Years.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>7. <strong>Miscellaneous:</strong></td>
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<td></td>
<td>7.1. The word RAF/ POLICE in 110 mm width and 400 mm length may be written of fluorescent paper (color to be specified by user) in the middle of the front side or as required by user department.</td>
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<tr>
<td></td>
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<td>7.2. The design of the shield should be such that during handling the vision area should not fall on the resting surface.</td>
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<td>8</td>
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<td>8. <strong>Certification:</strong></td>
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<td></td>
<td>Various tests shown above are done at following laboratories:</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>i) CIPET Labs.</td>
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<td></td>
<td>ii) DIPAS/ DRDO New Delhi</td>
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<td></td>
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<td>iii) NITRA, Ghaziabad</td>
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<td>iv) ATIRA, Ahmedabad</td>
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<td>v) GFSU, Gujarat</td>
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<td>vi) CFSL Labs</td>
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<td>vii) Any other NABL approved laboratory having scope of above parameters.</td>
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TRIAL DIRECTIVE OF POLYCARBONATE SHIELD

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>QRs/Specifications approved by MHA vide letter No.L.VII.54/10-12-Prov-R dated 13/11/2013</th>
<th>Revised TDs proposed by Sub Group members of CAPFs and Scientists</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A. P.C. SHIELD:-</td>
<td>I. TRIAL METHODOLOGY</td>
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<td>TRIAL WILL BE CONDUCTED ON THE FOLLOWING TEST</td>
<td>The purpose of the Polycarbonate shield is to protect the</td>
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<td>policeman from the various types of missiles that are thrown</td>
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<td>at him by the rioters. Such missiles range from stones or</td>
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<td>similar pieces of bricks/concrete, pieces of glass and glass</td>
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<td>bottles, acid bulbs/bottles containing sulphuric acid used in</td>
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<td>storage batteries and hydrochloric acid used for toilet cleaning</td>
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<td>purposes and burning rags/bicycle tires and Molotov cocktails/</td>
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<td>thrown but would be wielded by hands on coming close to the</td>
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<td>policemen. Therefore, the Polycarbonate shield must be able</td>
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<td>to provide adequate whole body protection from all above</td>
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<td>threats. In such circumstance, high standard of Polycarbonate</td>
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<td>shield is required for protection of policeman.</td>
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<tr>
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<th>Length</th>
<th>Breadth</th>
<th>Thickness</th>
<th>Weight</th>
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## 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 types 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 policeman. The shield is the only defensive implement available to the policeman 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 manœuvre 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.

## 02. Physical test:

a) The dimension will be measured physically as per QRs by board of officers:

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Length</td>
<td>955 mm + 45 mm and - 20 mm</td>
</tr>
<tr>
<td>Breadth (Flat)</td>
<td>580 mm + 20 mm</td>
</tr>
<tr>
<td>Breadth (Concave)</td>
<td>620 mm ± 10 mm</td>
</tr>
<tr>
<td>Thickness</td>
<td>03 mm Minimum</td>
</tr>
</tbody>
</table>

2.5 Shape: Rectangular or any shape giving maximum coverage to the user.
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), 03 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 policeman.

Stones-Pieces of bricks/concrete:
In real life, people throw stones that vary from 100 gm to 500 gm. 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 gm are eminently suited by

03. Material:-
Labs will conduct following test for testing the material of Polycarbonate sheet:-

3.1 Polycarbonate Sheet Material test:
a) Melt flow Index – As per IS 13360 (part 4/Sec 7).
b) Specific Gravity – As per IS 13360 (Part 3/Sec 1).
c) Flexural Modulus – As per IS 13360 (Part-5 Section-7).
d) Izod Impact strength - As per IS 13360 (Part-5 Section-4).
e) Deflection Temperature – As per IS 13360 (Part-6 section-17).

3.2 Polycarbonate Shield material test:
a) Dart drop Impact - As per IS 14443 Annex B.
b) Light Transmission – As per IS 13360 (Part-9, section-5).
c) Flammability – As per IS 13360 (Part 6/ Sec 5)

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their size to be thrown with maximum speed. A piece of stone weighing 150 gm 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 form various standard test 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 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

4. Arms rest/Handle:
Fitments of Arms rest and handle to be physically checked by Board of Officers as per QRs.

5. Performance test:

5.1. Resistance to vandalism:
The Polycarbonate body of the shield shall have impact resistance of level ‘A3’ when tested for vandal resistance as per the test method prescribed in Annex- C of IS 14443.

5.2. Resistance to Force entry:
The polycarbonate body of the shield shall have resistance of level ‘B3’ against penetration when tested for resistance to forced entry as per the test method prescribed in Annex D of IS 14443.

5.3 Resistance to Surface Abrasion:
The body of the shield when tested for resistance to surface abrasion in accordance with ASTM D1044 for 100 cycles under 500 g load, shall have haze percent not more than 20 percent.

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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 and 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 P C 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.

<table>
<thead>
<tr>
<th>Burning Rags/Bicycle Tires/Molotov Cocktails/Firebombs:</th>
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</thead>
<tbody>
<tr>
<td>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</td>
</tr>
</tbody>
</table>
6. Certification:

Various tests shown above are done at following laboratories.

i) CIPET Labs.
ii) DIPAS/DRDO, New Delhi
iii) NITRA, Ghaziabad
iv) ATIRA, Ahmedabad
v) GFSU, Gujarat
vi) CFSL Labs
vii) Any other NABL approved laboratory having scope of above parameters.

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.

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