(1)

IV-21011/10/2009-Prov.I
Government of India/ Bharat Sarkar
Ministry of Home Affairs / Grih Mantralaya
P.M. Division

Jaisalmer House, 26, Man Singh Road,
New Delhi, 1st July 2009.

To

The DsG: Assam Rifles/ BSF/ CISF/ CRPF/
ITBP/ NSG/SSB/ BPR&D

Subject: QRs/ Technical Specifications of Light Weight Bullet Proof Jackets.

The QRs/ Technical Specification of Light Weight Bullet Proof Jackets, as per Annexure, has been accepted by the competent authority in MHA.

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

1/7/9

(R.S. Sharma)
Director (Prov)

Copy to:-

1. DDG (Procurement), MHA
2. ~~PS~~ to JS (PM), MHA

1/7 D (Prov)

SPECIFICATION FOR BULLET PROOF JACKETS

DESIGN PARAMETERS FOR BP JACKETS

A. Shall conform to NIJ Standard of Ballistic Resistance of Personal Body Armour (NIJ Standard – 0101.04 updated revision 'A' & 'B') Protection against all of the following weapons:

(i) 9x19 mm cartridge fired through Sub Machine Gun (Such as Sten Machine, MP5, Carbine, any other variant) from a distance of 5 meters to achieve a muzzle velocity 430 ± 15 m/s and the weight of the bullet between 7.4 gm to 8.2 gm.

(ii) 7.62x51 mm cartridge NATO ball ammunitions fired through 7.62mm SLR/Bolt action rifle from a distance of 10 meters to achieve a muzzle velocity 838m/s ± 15 m/s and the weight of the bullet 9.4g to 9.6g.

(iii) 7.62x39 mm (mild steel core bullet) cartridge fired through AK series rifles from a distance of 10 meters to achieve a muzzle velocity 715 m/s ± 15 m/s and the weight of the bullet 7.45g to 8.05g.

B. Vest should have the components mentioned in para D below. Each component should be made of multi layers of same material. Each layer will be in single piece and of equal shape and size to maintain uniform thickness all over area up to edge level.

C. **SIZES OF SOFT ARMOUR PANEL (SAP):** STANDARD AND LARGE.

D. AREAS OF COMPONENTS OF SOFT ARMOUR PANEL

Coverage area of the soft armour panel as per the sizes will be as under:

S. No.	PANEL	STANDARD SIZE (Sq. Mtr.)	LARGE SIZE (Sq. Mtr.)
1	FRONT	0.15	0.18
2	BACK	0.24	0.26
3	COLLAR (TOTAL)	0.06	0.06
4	SHOULDER (TOTAL)	0.04	0.04
5	GROIN	0.06	0.06
	TOTAL	0.55	0.60

However, drawings of the various components of BP jacket are enclosed as appendix-'A' for guidance purpose in respect of its dimensions.

(i) **Negative tolerance in terms of area measurement is not permissible.**

(ii) **Measurements will be made with the help of scaled drawing on graph paper and using planimeter.**

E. **WEIGHT OF THE JACKET**

Total weight of BP Jacket including HAPs, SAPs, trauma pads and outer carrier should not exceed as mentioned below:-

(i) Standard size - 6.31 kg
(ii) Large size - 6.62 kg

F. **Size of Hard Armour Panel** –305mm X 254mm

Negative tolerance in dimensions of HAP is not permissible.

G. Shall consist of an outer carrier, removable Soft Armour Panels (SAP) of aramid fiber/suitable material and Hard armour panel (HAP) made of High Performance Polyethylene.

H. **BP JACKET - CONSTRUCTION:**

(i) It should be in the form of jacket to provide protection against 9mm bullet (Threat level IIIA of NIJ). It should not restrict overall vertical movement of the neck of the wearer.

(ii) It should have provision to accommodate two HAP plates in front and back as per dimensions specified in tender documents. Shall be lightweight and comfortable providing optimum mobility and speed.

(iii) Adjustable at the shoulders, waist and groin with appropriate fasteners (Velcro's). An adjustable nylon belt of minimum 10 cm width should be provided with double locking of jacket with velcro.

(iv) The vendor has to declare the type of materials, number of layers and their aerial density in technical bid of tender and they have to maintain the same in bulk supply.

(v) SAP should be encased in polyurethane coated materials so as to make it water proof.

(vi) **VELCRO FASTENERS**

All the clothing flaps of the jackets should have high quality velcro fasteners, so that it can be worn and taken off easily/quickly. The quality and report of Velcro including shears strength and peel strength should be as per Bureau of Indian Standards specification **IS: 8156-1994**. The IS: 8156-1994 may be available in the office of Bureau of Indian Standards. Vendors will submit test reports on Velcro from any NABL accredited lab or DMSRD (MoD), Kanpur.

(vii) **POCKET WITH FLAPS**

The jacket should be provided with two external pockets in outer carrier to house two magazines of 5.56mm LMG in each pocket. Two pockets should also be provided to accommodate one grenade (HE 36) in each pocket. The size of each magazine is 19 cm X 7.6cm X 3.5cm and size of HE 36 grenade is 110 mm X 65 mm.

(viii) **BELT/KAMARBANDH**

An additional belt of nylon/polyester weaving with minimum width of 10 cm should be provided around the waist to properly secure the B.P. jackets with the

body of the wearer around waist, so that weight of jacket is distributed on waist/shoulders. Kamarbandh should be of same material as outer carrier with velcro.

(ix) Two pouches (one each on front and rear of outer carrier) should be provided to accommodate two 305 mm x 254 mm Hard Armour Plates so that jacket protects vital organs of body.

(x) Ballistic panels (SAPs & HAPs) shall be removable from outer carrier.

(xi) Outer carrier shall be machine washable

(xii) TRAUMA PAD FOR TRAUMA ATTENUATION

(a) Trauma pad must be provided behind the SAPs, so that it remains to body surface to provide proper cushioning.

(b) It must cover uniformly up to edge level of the SAPs.

(c) Back face Signature (BFS) should not exceed 25 mm in plasticine block at 30± 2.9 degree centigrade temperature of plasticine.

(d) Drop test will be carried out as per NIJ standards.

I. MATERIALS

- The outer carrier shall be made of high tenacity, heavy duty, aBPasion Proof and 100% vest integrity fabric PU coated Nylon.
- The Fabric weight should not be less than 95 gm/m2.
- The fabric shall be treated for protection against water, fire (fire retardant) and ultra violet rays' exposure.
- The fabric must be suitable to wear in the Indian conditions of heat, rain and humidity.
- The inner side (body side) shall also be of a similar faBPic and shall be treated for moisture and water repellency.
- The cloth of the carrier must be pre-shrunk before stitching.
- BP Jackets should be UV Proof.

Note:

The methods of testing criteria for measuring the properties of outer carrier shall be as per IS: 11871-1986, IS: 3417-1979 (reaffirmed 1997), IS: 392-1989 and IS 391 – 1975.

- Duration of flame after removal of burner-maximum 5 seconds (Test Method IS11871)
- Duration of flame afterglow- maximum 5seconds (Test method IS11871)
- Hydrostatic Head-Minimum 100 cms of water (Test Method IS391-1975)
- Water penetration should be zero (Test Method IS392-1989)
- Mean Ultra Violet Penetration Factor- Minimum 100 (Test Method IS 3417)
- **Important** - Vendor should supply 3 meters of each faBPics used both at the time of tender and from actual production for testing.

The tests specified will be conducted at a government institute, having required technical expertise. The institute will be selected by Technical Evaluation Committee in consultation with experts. All tests will be in accordance with the SOP. Any changes in the SOP will be decided by Technical Evaluation Committee.

J. VEST FIT:

- The overall length of the BP jacket shall be such that there is no "ride up" while sitting.
- The overlapping degree of front and rear panels shall be such as to provide for maximum freedom of movement.

K. **COLOUR:** CAMO. The bidders will submit samples of BP Jackets of any camo colour. However, before placement of bulk supply order, exact camo colour alongwith modifications required, if any, in outer carrier will be intimated.

L. **LABELLING:** The outer carrier and the two soft Armour panels must be labeled as per NIJ standards giving the following details.

Name of the Manufacturer:
Name of the Product:
Date of Manufacturing:
Date of Issue:
Threat level:
Size:
Serial No:
NIJ Standard:
Strike face of jacket should be clearly marked

M. **SOFT ARMOUR PANEL (SAP)**

- SAP shall be able to withstand NIJ threat level III A In respect of the caliber & the weapon selected for trial and other parameters such as weight & velocity of the bullet in ammunition selected for trials.
- Shall protect both front and back torsos.
- Shall be made of Aramid /suitable material.
- The weight of the Aramid/suitable Filament, denier and type of weave shall be so balanced as to make the SAP lightweight, soft and pliable.
- The aerial density of the panels shall be such as to provide the rated ballistic and trauma protection.
- No tears, rips, worn spots, discolorations, loose or torn stitching and set wrinkles on the SAP shall be allowed.
- The panel shall be treated with approved and durable water repellant.
- The SAP shall be removable from outer carrier to allow for periodic cleaning.
- The SAP shall be placed in tightly sealed; water repellant and PU coated heavy-duty fabric so as to make it completely waterproof.
  (a) Hydrostatic Head-Minimum 100 cms of water (Test Method IS391-1975)
  (b) Water penetration should be zero (Test Method IS392-1989)
- The aramid fiber layers shall be stitched in a suitable pattern in case SAP is made of aramid. The design given with this specification is for illustrative purpose only.

Note: **Tenderers must declare number of layers and type of material (aerial density of material) used for fabricating Soft Armour Panel and Hard Armor Panel as per original manufacturer of the material. Raw Material Assurance Certificate (RAMC) must be given from original manufacturer in respect of material for SAP and HAP, valid for a period of six months from the closing date of tender. The vender has to declare the numbers of layers used for fabricating SAP and HAP of tender samples and they have to maintain the same in bulk supplies.**

N. **HARD ARMOUR PLATE (HAP)**

- Shall be made of high performance polyethylene fiber.

- Shall provide NIJ threat level III protection against cartridge 7.62x51 mm ammunition and 7.62x39 mm ammunition (mild steel core bullet) from a distance of 10 meters in conjunction with Soft Armour Panel.
- Each plate should not weigh more than 1.5 kg.
- Shall be of minimum size 305mm x 254mm to cover the vital parts of the body.
- Curvature of the HAP shall be suitable to fit the body contour.
- HAP shall be shielded water repellant and PU coated heavy-duty faBPic so as to make it completely water proof.

O. OTHER STIPULATIONS

JACKET STYLE	:	POLICE
SERVICEABILITY	:	10 YEARS (HAP, SAP & trauma pad)
GUARANTEE	:	The Outer Carrier along with trauma padding shall be guaranteed for a period of 2 years against all manufacturing defects
TEMPERATURE	:	-50^0 C to $+50^0$C (Operating temperature)
HUMIDITY	:	95% at 40^0C
STORAGE	:	Normal Room Temp.

P. IMMUNITY LEVEL:

(a) Hard Armour Plates: The HAPs are to be tested in conjunction with SAPs.

- Six bullets NATO ball (9.4g to 9.6gms) fired from 7.62 MM SLR/bolt action rifle from a distance of 10 meters at zero angle of incidence.
- Six bullets (mild steel core), from 7.62 mm of AK rifle from a distance of 10 Mts. at zero angle of incidence on separate plates.

(b) Soft Armour Panels:

- Six shots fired through 9mm Sub Machine Gun (Such as Sten Machine, MP-5, Carbine, any other variant) from a distance 5 meters. with a muzzle velocity 430 ± 15 m/s and the weight of the bullet between 7.4 gm to 8.2 gm as specified in standard.

The velocities of bullets fired through weapons are given as follows:

Armour Type	Test Bullet	Bullet weight	Reference Velocity m/s	Hits per Armor part at 0° angle of incidence	BFS* Depth Maximum	Shots per Panel
III A	9mm FMJ RN	7.4gm to 8.2 gm	430 ± 15	4+2 at 30^0 angle	25 mm	6
III	7.62mm NATO FMJ	9.4 to 9.6g	838 ± 15	6	25 mm	6
	7.62mm mild steel core	7.45g to 8.05g	715 ± 15	6	25 mm	6

- BFS – **Back Face Signature on Plasticine.**

- **Selected weapon and lot of ammunition, for which reference velocity has been once achieved, will remain the same throughout ballistic testing of all tender samples of various firms.**

All tests will be in accordance with the SOP. Any changes in the SOP will be decided by Technical Evaluation Committee.

Q. **Testing Criteria**

(i) Scientific inspections/ballistic trial of these BP jackets will be conducted as NIJ standard 0101-04 incorporating revision 'A'&'B' for BP jackets.

(ii) Groin Pad will be tested ballistically with 9mm SMC. Three evenly spaced fair hits at zero degree angle incidences shall be taken and BFS should not exceed 25mm.

R. **Miscellaneous**

(i) The supplier /manufacturer shall provide one number of BP jackets of the order size along with HAP at their cost from the lot of every 500 numbers but minimum four numbers per lot of jackets for the purpose of the ballistic test/evaluation of the tendered specifications at the time of materializing the supply. These will be selected prior to dispatch at random in the factory premises.

(ii) While submitting the samples for tender, the supplier shall mention the exact area of SAP and HAP and give the template of the jackets as per the area, so that import of raw materials of the BP jackets will be allowed accordingly.

(iii) Five tender samples are required for technical evaluation from a firm.

(iv) Each model/BP and of BP jackets should be submitted against a separate tender form.

S. **Testing facilities**

Ballistic trials as per the QRs will be held at TBPL, Chandigarh or any other facility as decided by Technical Evaluation Committee.

STANDARD OPERATING PROCEDURES (SOP) FOR TESTING OF LIGHT WEIGHT BULLET PROOF JACKET.

A. General Information:

1. Before commencement of ballistic trial vendors shall be briefed about test procedures. They will be asked to sign certain certificates (Annexure A). Tests will be conducted as per laid down procedure. No deviation shall be allowed.

2. The decision of Technical Evaluation Committee 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) Annexure-B1 & B2. No re-testing of tested samples on the firm's request will be undertaken.

3. Test sequence will be decided through draw of lots.

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

5. Ballistic trial will be conducted firstly on wet samples for each weapon (AK-47 Rifle, 7.62mm SLR/bolt action rifle and 9 mm Sub Machine Gun (Such as Sten Machine, MP-5, Carbine, any other variants), followed by dry test.

6. Physical examination of the tender sample would be carried out by a Group of Officers nominated by the Chairman of Technical Evaluation Committee.

7. A vendor or his authorized representative would be present during the physical examination which would include physical parameter and weight, comfort and checking of the documents.

8. A vendor or his representative must submit, in writing, any objections or representation with regards to these trials, to the officer In charge of the team, within half an hour of the completion of evaluation of his sample.

9. Ballistic trials as per the QRs will be held at TBPL, Chandigarh or any other facility as decided by Technical Evaluation Committee. The entire proceedings of the preparation of various equipments such as plasticine box or chronometer, mounting etc., standardization, reading of these instruments and their mounting and conduction of the ballistic trials, will be carried out by the expert of the laboratory.

10. The final results would be made available to the vendor or his representative at a designated place and time, decided by the Chairman of the Technical Evaluation Committee.

11. Any representation with regards to these trials will have to be submitted in writing to the Officer In charge by the vendor or his authorized representative within half an hour of the receipt of these reports. No subsequent representation will be entertained.

12. The decision of the Chairman, Technical Evaluation Committee shall be final on the representation of vendor or their authorized representative.

B. Acceptance criteria:

From each group of 5 standard samples, submitted by the vendor, only one-piece chosen at random, will be put through test for all the physical parameter including workmanship and labelling requirements. If that sample meets the physical requirements, the entire group would be deemed to have passed for physical parameters. If the sample chosen at random doesn't meet the physical requirements, the entire group will be rejected.

C. Test Sequence:

The compliance test report (CTR) form shall be used to record and document the results of the tests. Sequence of testing for BP Jacket will be as under:

i. Submission of all certificates prescribed in tender inquiry.
ii. Measurement of weight and other physical dimensions
iii. Visual inspection for checking physical deformity and other parameter
iv. 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.)

D. Visual Inspection

D_1. Workmanship

Each sample of ballistic resistance armour (herein after called armour) shall be free from wrinkles, blisters, cracks, crevices fabric tears, crazing, chipping or sharp corners and edges as well as evidence(s) of inferior workmanship. Furthermore, all samples shall be identical in appearance, size and construction.

D_2. Labeling

Each set of sample of ballistic Proof armour shall be durably and clearly marked /labelled in a readable type and font. The marking/label shall be depicting following information of indelible nature permanently attached to either exterior surface of the panel.

(a)	Name of the manufacturer.	XYZ
(b)	Name of the product.	aabb
(c)	Date of manufacturing	dd:mm:yyyy
(d)	Date of Issue	(to be filled by user)
(e)	Protection level	III/ IIIA
(f)	Size	standard/ Large

(g) Identification Number ABCD.....

(h) NIJ Standard 0101.04 (Revision A & B)

Note: Strike face of jacket should be clearly marked.

E. TEST METHODS

E1. Workmanship Examination

a) Armour Carriers

All armour samples carriers and ballistic panel coverings received for compliance testing will be visually and individually inspected for damage, material flaws, or poor workmanship as defined in specifications. All flaw(s) will be noted on the CTR form.

b) Ballistic Panels

Pre-test:- Before testing, all armour samples ballistic panels and inserts received as tender sample will be individually inspected for damage, material flaws, or poor workmanship as defined in specifications. All identified flaws will be noted on the CTR form(s) for use in deficiency notification reporting.

F. Conduct of Test –

i. Preparation of Plasticine and drop test

Backing Material Calibration

Calibration of the Plasticine clay backing material will be accomplished before and after each sequence of firing of six shot. 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 51 mm from fixture edge to indent edge and a minimum of 152 mm between indent centres.

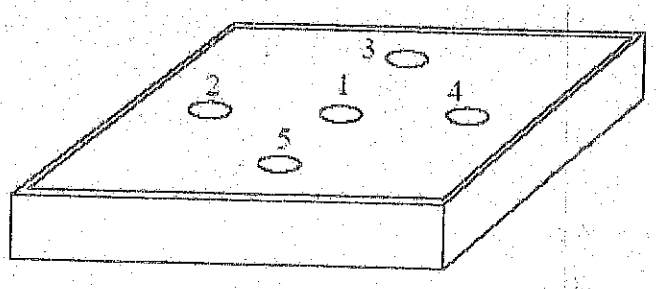


Figure-1 drop tests (Example only)

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.

ii. Armourer strapping

a) Shot Location Marking

Shot locations will be clearly marked directly on the sample(s) as per criteria.

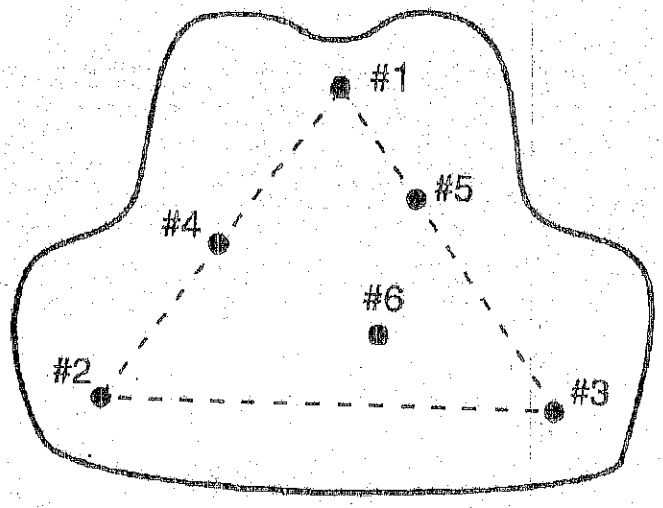
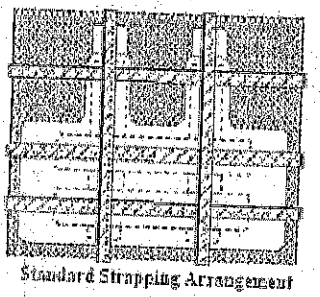


Figure-2 Shot locations **(example only)**

b) Armour Strapping

Armour sample(s) or panel(s) will be secured to the backing material fixture using 51 mm wide elastic straps, held together using Velcro attachments. Figure illustrates the details, type and location of the strapping devices. The placement of the straps will be such that they do not interfere with the impact points on the panels.



Standard Strapping Arrangement

Using a pencil or other appropriate tool, lightly trace

the outline of the sample on to the backing material to document the original position of the sample.

iii. Samples preparations/mounting/firing

Firing sequence

Wet panel will be fired upon followed by dry testing.

G. Firing Sequence for Level III A Armour

G_1. Requirements

(a) One complete BPJ sample, consisting of front and back set of armour panels. Front and back panels are to be used for dry and wet tests respectively.

(b) Six fair hit impacts per armour panel for compliance test.

G_2. Acceptance Criteria for Penetration and BFS Compliance

(a) No perforation through the panel, either by the bullet or by any fragment of the bullet.

(b) No measured BFS depression depth greater than 25 mm.

G_3. Test Range Configuration

(a) Position the front face of the backing material 5 m ± 25 mm from the muzzle of the test barrel.

(b) 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.

(c) Ensure for proper placement of the test bullet.

G_4. Sample Preparation, Mounting and Firing

ii. Start with the wet conditioned back panel of armour sample. Place the exposed surface of the calibrated backing material in intimate contact with the back face of the armour panel under test and restrict the movement of the panel from its original position by securing it with two vertical and three horizontal elastic straps, 51 mm wide with Velcro closures. Using a pencil or other appropriate tool, lightly trace the outline of the sample onto the backing material to document the original position of the sample.

iii. The straps shall be positioned to restrict the movement of the panel from its original position, leaving the strike face impact area(s) exposed.

iv. Position the backing material fixture to assure proper impact placement and angle of incidence (0 degree) of the test round at location one, as shown in figure 2.

v. **Measurement of Back Face Signature :-**

(a) Measure the BFS of first shot.

(b) Measure the BFS of 2nd or 3rd shot (which is having higher velocity).

(c) The maximum value of Back Face Signature (BSF) will be necessarily recorded on Compliance Test Report (CTR) form between (a) and (b) which is having higher value.

vi. **Fire Shot No. 1**: Fire the first test round against the armour panel at location one (fig. 2). Examine the armour panel and the backing material to determine whether the bullet made a fair hit and whether complete penetration occurred. If no complete penetration (CP) occurred and the bullet made a fair hit, measure and record the BFS depression. Record the BFS on the CTR.

vii. If no complete penetration occurred and the bullet made an unfair hit, a second attempt will be made to attain a fair hit. This second attempt will be made to impact **the same general area** of the panel as the first shot but more than 51 mm from the previous shot and more than 51 mm from any edge of the panel. **If a fair hit is still not attained, the firing sequence will be terminated. No more than a total of eight impacts are permitted on any armour panel.**

viii. **Remount Armour Sample**: Adjust the armour panel back to its original condition (i.e. smooth and manipulate the ballistic material to return it to its original configuration) and replace it on the backing material in its original position using the traced outline in the backing material as a guide. Do not recondition the backing material; **do not remove the test bullet if it is trapped in the panel.** When conducting the remaining firing sequence, inspect the armour panel following each impact to verify that the impact was a fair hit with no complete penetration, and **smooth out the panel in preparation for the next shot.**

ix. **Fire Shot No. 2**: Reposition the backing material fixture with the armour panel in position so that the shot will impact the panel at location two. Fire the test round. Do not change the position of the armour panel on the backing material, but adjust the panel and mounting straps as necessary to restore its original condition. **Do not remove any trapped bullets from the panel.**

x. **Fire Shot No. 3**: Reposition the backing material fixture with the armour panel in position so that the shot will impact the panel at location three. Fire the test round. Do not change the position of the armour panel on the backing material, but adjust the panel and mounting straps as necessary to restore its original condition. **Do not remove any trapped bullets from the panel.**

xi. **Fire Shot No. 4**: Reposition the backing material fixture with the armour panel in position so that the shot will impact the panel at location four. Fire the test round. Do not change the position of the armour panel on the backing material, but adjust the panel and mounting straps as necessary to restore its original condition. **Do not remove any trapped bullets from the panel.**

xii. **Fire Shot No. 5**: Reposition the backing material fixture with the armour panel in position so that the shot will impact the panel at location five. Fire the test round. Do not change the position of the armour panel on the backing material, but adjust the panel and mounting straps as necessary to restore its original condition. **Do not remove any trapped bullets from the panel.**

xiii. **Fire Shot No. 6**: Reposition the backing material fixture with the armour panel in position so that the defined angle of incidence between the perpendicular to the armour and the line of flight of the test round is 0 degree and the bullet will impact the armour at location six. Fire the test round. **Remove and thoroughly examine the armour panel and backing material for complete penetrations by bullets or fragments.**

xiv. **Post Test Drop Calibration**: Perform five drop tests on the backing material in the general areas of figure 1. Post test drop locations shall be at least 51 mm away from any other drop impact. Record all measurements on the CTR and determine compliance with drop calibration criteria. If the backing material meets post test drop specifications, repair the backing material and repeat the pre-test drop calibration. If the repaired backing material fixture passes the pre-test calibration, it may be reused for the second panel firing sequence, subject to passing another post test drop upon conclusion of the firings.

xv. **Test Front Panel**: Mount the front panel of the armour sample to a pre-test drop calibrated backing material fixture, and repeat the test sequence above using the same ammunition. Record all results on the CTR.

xvi. **Record Results**: Record the results of all testing in the CTR (appendix-B_2).

H. P-BFS Test for Groin Pad

Groin pad shall be impacted with three fair hits evenly spaced not less than 51 mm apart, and not less than 51mm from an edge, at 0 degree obliquity. The BFS due to the first fair hit shall be measured to determine compliance. **Any fair hit bullet that penetrates the groin pad, the complete jacket shall be rejected.**

I. Firing Sequence for Level III Armour

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I_1. Requirements

(a) Two complete BPJ sample or two each- front and back SAP and four HAP.

(b) Front panel with plate and back with plate will be put to dry and wet tests respectively.

(c) Six fair hit impacts against each of front and back SAP and HAP combine.

I_2. Acceptance Criteria for Penetration and BFS Compliance

(a) No perforation either by the bullet or any fragment of the bullet through the armour (SAP and HAP combine).

(b) No measured BFS depression depth greater than 25 mm.

I_3. Test Range Configuration

(a) Position the front face of the backing material 10m±25 mm from the muzzle of the test barrel.

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

(c) Ensure for proper placement of the test bullet.

I_4. Sample Preparation, Mounting, and Firing

i. For armour that utilizes a rigid plate or plates such that the armour panel does not make full contact with the backing material surface, the backing material will be built up in a manner that conforms to the armour panel's shape. This build up will require use of additional clay backing material conditioned in the same manner as the backing material fixture.

ii. Mark the front armour panel, plate for six impacts, evenly spaced on the panel according to the spacing criteria of a minimum of 51 mm from any edge to armour and 51 mm from any previous impact. Start with Wet conditioned back armour panel and plate.

iii. Place the exposed surface of the conditioned and drop test calibrated backing material in intimate contact with the back face of the armour panel, plate and secure it with two vertical and three horizontal elastic straps, 51 mm wide with Velcro closures.

iv. The straps shall be positioned to leave the strike face impact areas exposed while not permitting the armour to shift on the backing material when impacted.

v. Firing Sequence: Conduct all six of the firings in accordance with the sequence specified in figure 3 below. All shots for Type III armour samples will be at zero degree obliquity.

vi. Front Panel Testing: Repeat the above tests on dry front ballistic panel and plate combine.

vii. Record Test Results: Record the result of all testing in the CTR (appendix-B_2).

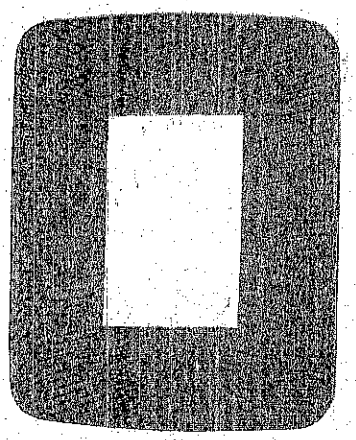


Figure-3 **(Example only)**

viii. **Measurement of Back Face Signature (BFS):-**

(a) Measure the BFS of all shots.

(b) The highest value of Back Face Signature (BSF) will be recorded on Compliance Test Report (CTR) form.

J_4. Sample Preparation, Mounting, and Firing

i. For armour that utilizes a rigid plate or plates such that the armour panel does not make full contact with the backing material surface, the backing material will be built up in a manner that conforms to the armour panel's shape. This build up will require use of additional clay backing material conditioned in the same manner as the backing material fixture.

ii. Mark centrally the plate for an impact according to the spacing criteria of a minimum of 51 mm from any edge of armour. Start with wet conditioned and followed by dry.

iii. Place the exposed surface of the conditioned and drop test calibrated backing material in intimate contact with the back face of the armour panel, plate and secure it with two vertical and three horizontal elastic straps, 51 mm wide with Velcro closures.

iv. The straps shall be positioned to leave the strike face impact areas exposed while not permitting the armour to shift on the backing material when impacted.

v. Firing Sequence: Conduct a test shot centrally on HAP with zero degree obliquity.

vi. Front Panel Testing: Repeat the above tests on dry front SAP and HAP combine.

vii. Record Test Results: Record the result of all testing in the CTR (appendix-B_2).

K. Fair Hit:

A bullet that impacts the armour sample or panel at an angle of incidence no greater than ±5° from the intended angle of incidence, no closer to the edge of the ballistic panel than 51 mm and no closer to a prior hit than 51 mm at an impact velocity within ±15 m/s of the required reference test velocity.

A bullet that impacts the sample of panel at an angle of incidence no greater than ±5° from the intended angle of incidence, no closer to the edge of the ballistic panel than 51 mm and no closer to a prior hit than 51 mm at an impact velocity less than 15 m/s below the required reference test velocity which produces a penetration or an excessive back face signature.

A bullet that impacts the armour sample or panel at an angle of incidence no greater than ±5° from the intended, no closer to the edge of the ballistic panel than 51 mm and no closer to a prior hit than 51 mm at an impact velocity more than 15 m/s above the required test velocity which does not produces a penetration or an excessive back face signature.

Note: Selected weapon and lot of ammunition for which reference velocity has been once established, will be deemed standardised throughout the ballistic testing for all the subsequent tests of all tenderers.

L. Post test: - each armour samples ballistic components (e.g., front and back panels) will be physically inspected immediately after testing and their respective configuration reported for layer, weave, stitching, material, etc.

(a) Label Examination:

The complete armour sample and each part (carrier and ballistic panels) will be examined for conformance to the labelling requirements of specifications. Note any deviations from requirements will be recorded in the CTR form.

(b) Inspection Deficiency Notifications

The MHA/Competent Authority will be informed within two (2) working days of discovery of any shipping damage, major product flaws, or poor quality workmanship, or label inconsistency. Such discoveries and notice will result in suspension of the compliance test until approval of MHA/ Competent Authority is received by the testing Committee to further proceed with the tests/ evaluation.

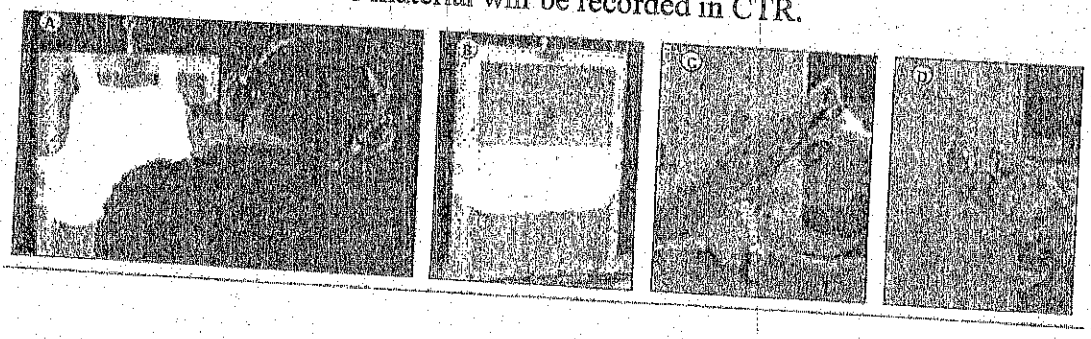
M. Sampling:

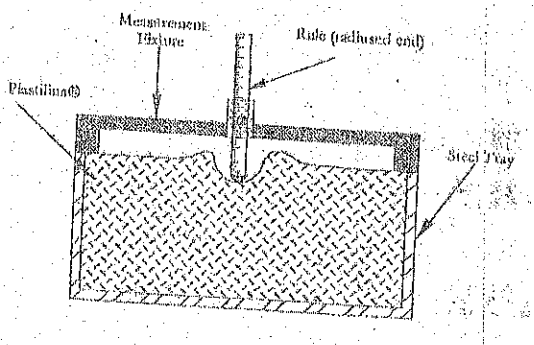
Out of five tender samples, one will be used for physical dimension measurement and from remaining four samples; for every ballistic test one will be selected randomly.

N. **Ballistic Penetration and Back face Signature Test (P-BFS):**

i. All armour samples submitted to compliance testing will undergo a series of ballistic impact tests using the ammunition specified in specifications. Depth of back face signature will be measured by using callipers after removing the deformation in the clay with the help of metal scrappers. A measurement of 25 mm or less is a passing test.

ii. Average of two reading by placing measuring instrument putting horizontally across the back face material will be recorded in CTR.





O. **Velocity Measurement Equipment (Example only)**

Test round velocities will be determined using a velocity measurement equipment.

P. **Wet Conditioning**

Body armour undergoing P-BFS performance testing will be tested in a wet condition. Dipping armour panel under test for thirty minutes in a large vessel where vertical column of water is minimum 15 centimetres will produce this condition.

Q. **Test Duration**

After wet conditioning the first shot must be fired within ten minute and entire shots fired within 30 minutes. Test start and stop times will be recorded in the CTR form.

R. Backing Material Fixture Preparation

a) Backing Material Fixtures

A minimum of three backing material fixtures filled with appropriate backing material is required. The inside dimensions of the backing material fixture shall be 610 mm x 610 mm x 140 mm ± 2 mm deep. The tolerance on all dimensions will be ± 2 mm.

b) Surface Preparation

The clay in each BMF will be manipulated to produce a block free of voids, and with a smooth, flat front surface for the accurate and consistent measurement of depression depths. The front surface of the backing material shall be even with the surface plane defined by the fixture edges. Additional clay, conditioned along with each BMF, shall be used to fill voids and restore the front surface as needed.

c) Backing Material Conditioning

The clay of backing material shall be initially conditioned at a temperature of 30±2.9 degree centigrade. The actual conditioning temperature and recovery time between uses will be determined by drop test results. The failure to meet drop test result will require reconditioning of back face material.

d) Backing Material Fixture Rotation:

In case back face material is not giving prescribed drop test result, then it should be replaced with newly conditioned material. All drop test calibration results will be recorded in the CTR. It is recommended that a minimum of two fixtures be rotated between the test and conditioning cycles to ensure fulfilment of these requirements.

Annexure A

CERTIFICATE

It is to certify that I _____, the authorized representative of, M/s _____ have understood the method of conduct of ballistic trial of light weight B.P. Jackets by the Technical Committee headed by _____ for ballistic trial of tender samples of light weight bullet proof Jackets submitted by our firm and, I am satisfied with the method adopted, as per TE specifications and procedure of the trial. I do not have any observation or representation on the subject trial, which has been personally attended by me. My representation / observations for the subject trial is enclosed herewith.

Date_____ and Time_____

Place _____

(Signature of authorized Rep)

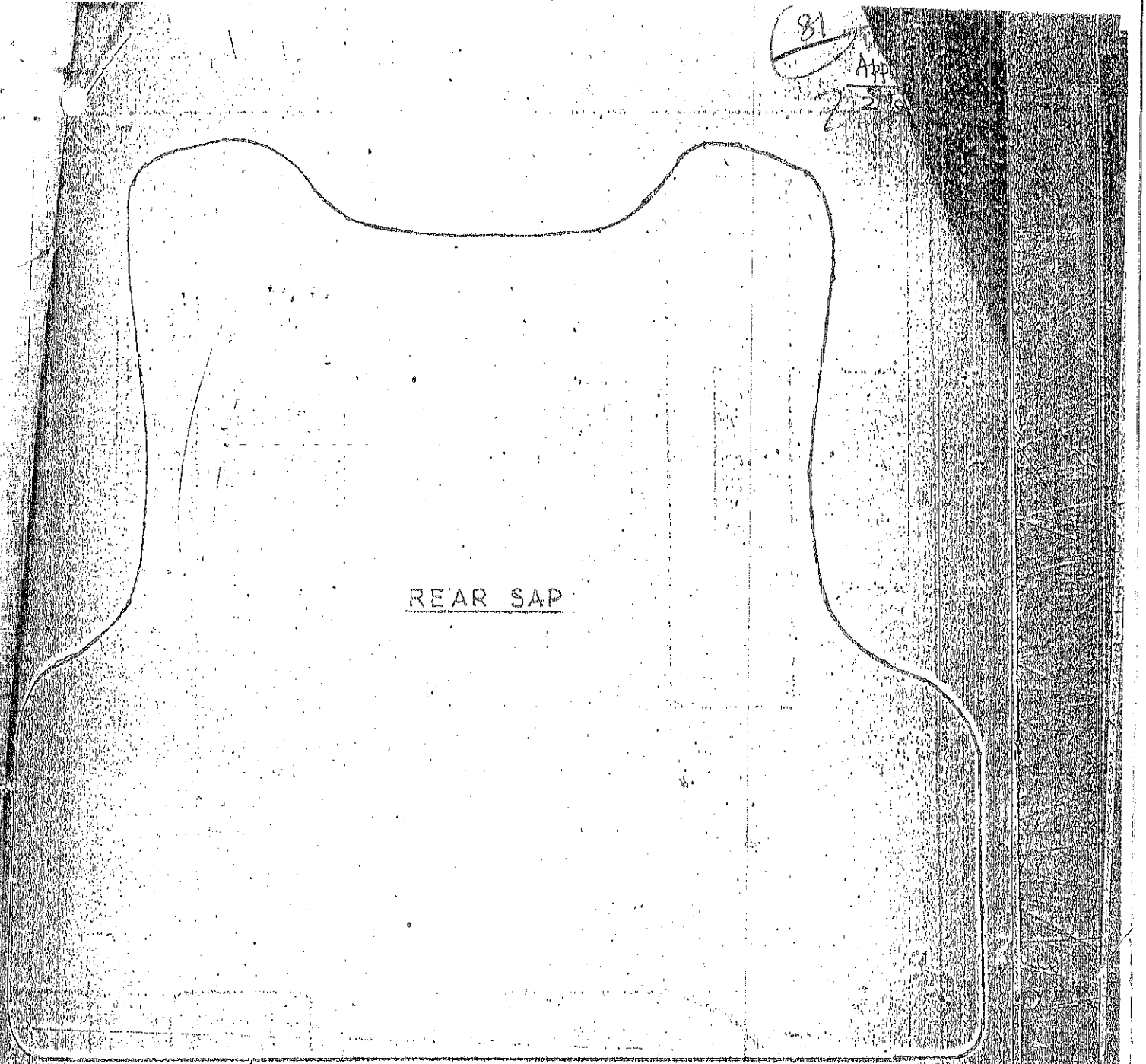
Appendix-A 2
1 of 3

FRONT SAP

Scale 1:2·77

Signature of the Tenderer

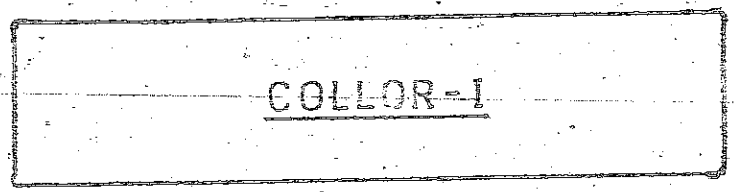
16

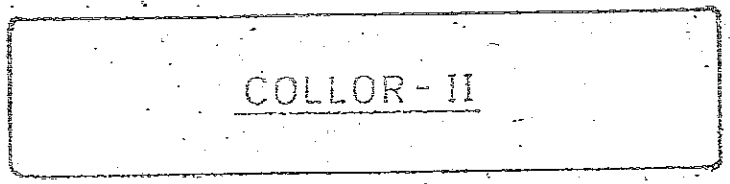


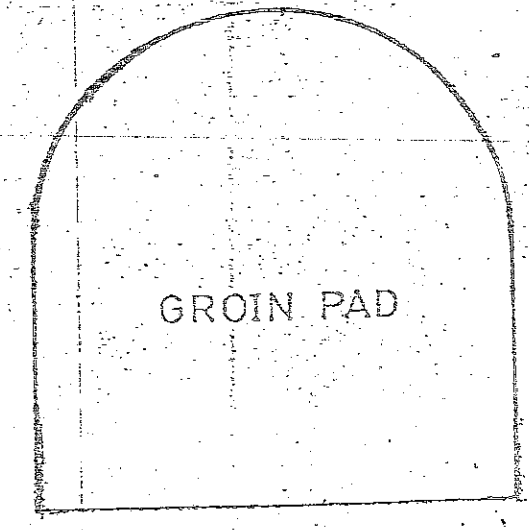
Scale 1:3·40

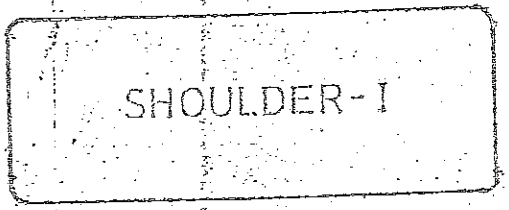
Signature of the Tenderer

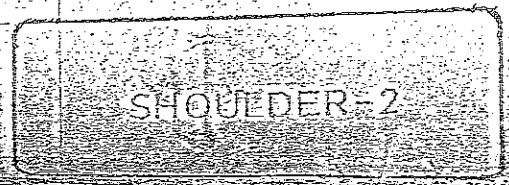
Appendix-IV











Scale = 1:4

Signature of the Tenderer