Salient features of Indian Standard on Bullet resistant jackets (IS 17051:2018)

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Synopsis of IS 17051-2018

- This standard prescribes the minimum performance requirements of bullet resistant jackets for protection against small arms and ammunition and provides procedures for their evaluation.

- The scope of the standard is limited to physical and ballistic evaluation of bullet resistant jackets against in-service small arms ammunition used by the Indian armed forces, paramilitary, state police forces and other law enforcement agencies.

- This standard does not cover the threats from knives, sharply pointed instruments and shards, splinters and fragments from the hand grenades.

Synopsis of IS 17051-2018

- BRJ helps in absorbing impact and stop penetration of bullet from small arm/Rifle round

- Consist mainly of following component-

- i) Soft armour panel (SAP) (Front, back, groin, neck, collar etc)

- ii) Hard armour panel (HAP), (Front, Back and side for 360º protection)

- iii) Carrier to hold SAP & HAP
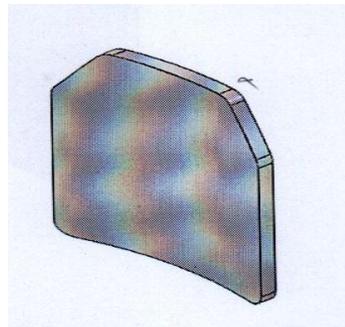
Synopsis of IS 17051-2018

- Specifies five size designations based on chest/bust girth- XS (72-80 cm), S (above 80-88), M (above 88-96), L (above 96-104), XL (above 104-112).

- Shall be designed ergonomically to minimize restrictions of movement – Ensured by conducting field tests by personnel.

- Includes optional requirements of Quick release system, Dynamic weight distribution system and high buoyancy jackets.

- Covers physical requirements like protection area of SAP and HAP, maximum aerial densities of BR panels and Total weight of jacket.

- Specifies 6 threat levels faced by Indian Army and Para military (Level 1 to 6).

Requirements of outer carrier fabric

Test Parameter	Requirement	Test Method
Mass, g/m^2, *Max*	160	IS 7016 (Part 1)
Tensile strength, N, *Min*: a) Warp wise b) Weft wise	 1150 900	IS 7016 (Part 2)
Tear strength, N, *Min*: a) Warp wise b) Weft wise	 160 140	IS 7016 (Part 3), Method A2, Trouser shaped test piece, Single tear method
Flame resistance test: a) Duration of flame (After flame time), s, *Max* b) Duration of afterglow, s, *Max*	 5 5	IS 11871, Method A
Resistance to water penetration (30 cm water column for 30 min)	No water penetration	IS 7016 Part 7
Colour fastness , *Min*	4	IS 2454

Minimum Coverage Areas of Components of Soft Armour Panel (m²)

Size	Total Protection Area of SAP (Including Torso, Neck, Shoulders and Groins)	Total Protection Area for shoulder only	Total Protection Area for Groin only	Total Protection Area for Neck and Collar only
XS	0.45	0.035	0.05	0.05
S	0.50	0.035	0.05	0.05
M	0.55	0.035	0.05	0.05
L	0.60	0.04	0.06	0.06
XL	0.65	0.04	0.06	0.06

Minimum Coverage Areas of Components of Hard Armour Panel (m²)

Panel/Size	XS	S	M	L	XL
Front/Back	0.066 7	0.070 0	0.073 5	0.077 2	0.081 0
Side (optional)	0.032 6	0.034 2	0.035 9	0.037 7	0.039 6
Groin (Optional)	0.037 0	0.037 0	0.037 0	0.037 0	0.037 0
Throat (Optional)	0.024 5	0.025 7	0.027 0	0.028 4	0.029 8
Total (considering front and back, two sides, throat and groin)	0.260	0.271	0.283	0.295	0.308
Total (considering only front and back)	0.133	0.140	0.147	0.154	0.162

Areal Density, Max

Threat level	Areal Density (25mm BFS)			Areal Density (44mm BFS)		
	SAP	HAP	Standalone	SAP	HAP	Standalone
1	5	–	–	3.8	–	–
2	5	15	21	3.8	15	20
3	5	16	22	3.8	15	20
4	5	23	29	3.8	22	27
5	5	27	33	3.8	25	30
6	5	40	46	3.8	38	44

Weight comparison of GSQR 1438 and BIS standard

Small size BRJ weight , Kgs		Medium size BRJ weight, Kgs		Large Size BRJ weight, Kgs	
GSQR 1438	BIS	GSQR 1438	BIS	GSQR 1438	BIS
10.1	9.23	10.4	9.68	11.3	10.40

Threat levels

Threat Level	Ammunition	Impact Velocity, m/s	Bullet weight, g	Remarks
1	9 × 19 mm, SM, MP-5, Carbine)	430 ± 15	7.4 - 8.2	For all flexible panels
2	7.62 × 39 mm, AK 47, MSC	710 ± 15	7.45 - 8.05	—
3	7.62 × 51 mm, NATO ball, SLR/BAR	840 ± 15	9.4 - 9.6	In addition, shall be compliance with threat level 2
4	5.56 × 45 mm, INSAS	890 ± 15	3.5 - 4.0	In addition, shall be compliance with threat level 3
5	7.62 × 39 mm, AK 47, HSC	700 ± 15	7.45 - 8.05	
6	7.62 × 54R, API	830 ± 15	10.3 -10.5	

Performance requirements

- Maximum permissible BFS limits shall be 25 mm or 44 mm.

- ***Critical Defect***

- a) Complete Perforation (HAP and SAP) *OR*

- b) BFS of any shot exceeding 10 percent of maximum permissible limit. *OR*

- c) Ballistic limit — $V_{50,BL} < V_{50, Manufacturer}$ [permissible up to (-)10 m/s]

- ***Major Defect***

- a) Perforation of HAP but stopped by SAP. *OR*

- b) Any BFS > 25 mm or 44 mm (with UPL ≤ 25 mm or 44 mm)

Shelf life & its Assessment

- Shelf life of SAP and HAP ballistic panels shall be minimum 5 years

- **SERVICE LIFE ASSESSMENT –**

- **For SAP-**

- Environmental chamber (Temp. $65 \pm 5°C$, humidity- 80 ± 5 %, Time -10 days) with tumbling apparatus (Rotation - 5 ± 1 rpm, Total Rotation-72000 ± 1500)

- **For HAP-**

- a) Uniform thermal exposure (Temp. $65 \pm 5°C$, humidity- 80 ± 5 %, Time -10 days)

- b) Cyclic thermal exposure test (Varying temp. and humidity)

- c) Mechanical drop test

Performance requirements after operating conditions

- **Extreme temperatures (For SAP & HAP)** – High (70 ± 5°C for 4 h) and low (minus 40 ± 5°C for 4 h)

- **Fluid exposure (For SAP & HAP)** - Water resistant (water head of 150 ± 10 mm for 30 minutes) and Sea water resistance (water head of 145 ± 10 mm for 30 minutes)

- **In transit conditions (For HAP only)** – Mechanical drop (Height 1.2m and total weight on armour- 10 kg) and vibration test (25.4 mm peak-to-peak, circular synchronous motion at a frequency of 5 Hz for 1 h)
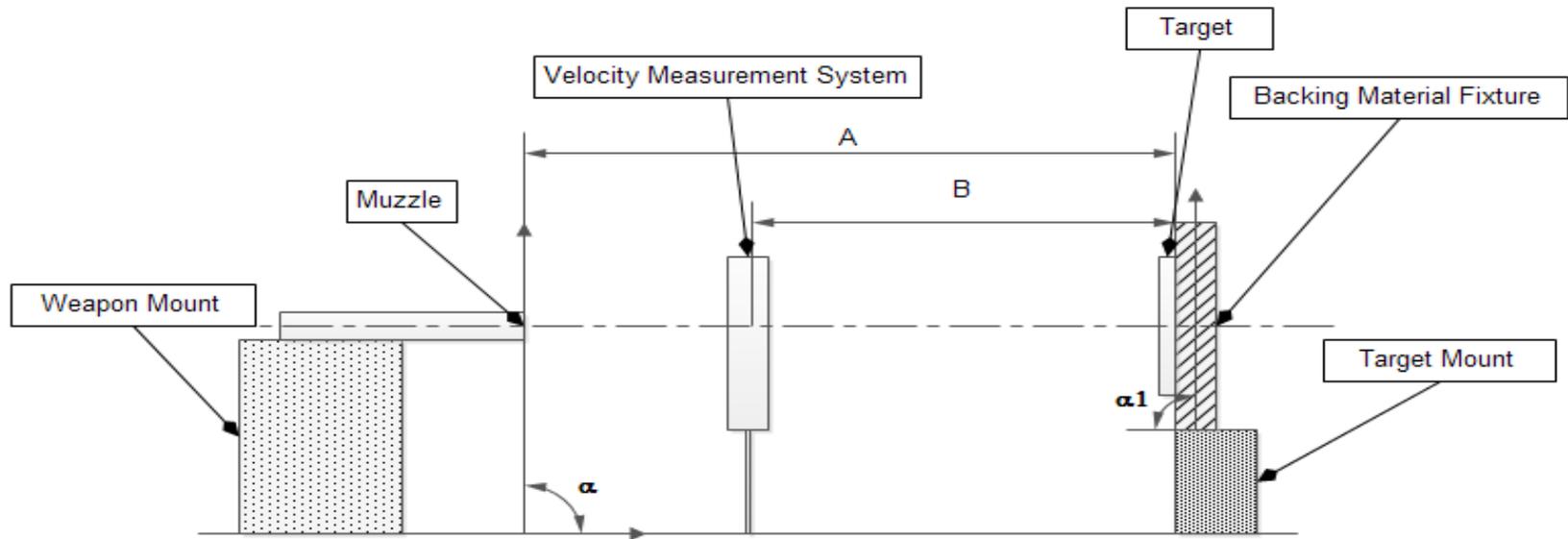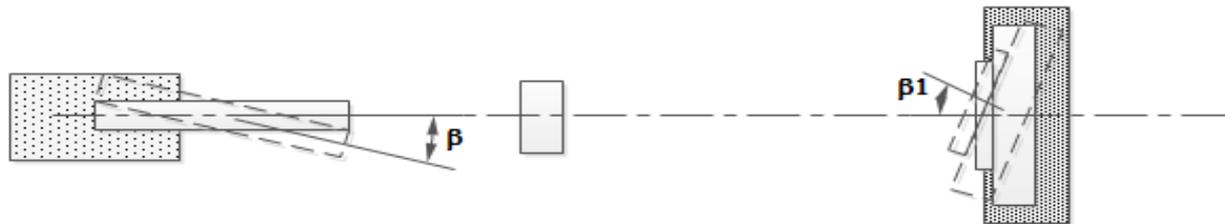
Number of shots

Threat Level	Panel Type	Total Shots	At 0° Angle	At 30° and 45° Angle
1	Front/Back	6	4	2
	Groin/Other	Max 3, Min 1	Max 3, Min 1	—
2	Front/Back	6	4	2
	Groin/Other	Max 3, Min 1	Max 3, Min 1	—
3	Front/Back	6	6	—
	Groin/Other	Max 3, Min 1	Max 3, Min 1	—
4	Front/Back	6	6	—
	Groin/Other	Max 3, Min 1	Max 3, Min 1	—
5	Front/Back	6	6	—
	Groin/Other	Max 3, Min 1	Max 3, Min 1	—
6	Front/Back	6	6	—

Brief testing procedure

Fair hit criteria

- **a) From the edge:**

- 1) At minimum distance of 51 mm in case of HAP (ICW or standalone configuration) or any flexible/rigid armour panel.

- 2) For SAP – between 51mm and 70mm from edge for shot numbers 1, 2, 3.

- 3) At less than 51 mm from edge but does not cause perforation or excessive BFS.

- **b) From a prior shot:**

- 1) At minimum distance of 51 mm in case of SAP/ HAP (ICW or standalone configuration) or any flexible/rigid armour panel.

- 2) At less than 51 mm distance from the prior shot but does not cause perforation or excessive BFS.

- **c) Velocity:**

- 1) At velocity within the specified range.

- 2) At a velocity less than the specified range but causes perforation or excessive BFS.

- 3) At a velocity more than the specified range and less than specified inter-shot distance and/or less than specified edge to shot and does not cause perforation or excessive BFS.

Ballistic Limit test parameters

Parameter Description	Value
Velocity of first shot	The reference velocity for the armour type and caliber
Velocity step until first reversal	a) – 30 m/s, if first shot was a perforation
	b) + 30 m/s, if first shot was a stop
Velocity step until second reversal	± 22 m/s, depending on result of previous shot
Velocity step after second reversal	± 14 m/s, depending on result of previous shot

BL Performance Requirements

- a) $V_{50,BL} \geq V_{50, \text{Manufacturer}}$ (permissible up to -10 m/s).

- b) No perforations shall occur at or below the corresponding maximum fair hit velocity of a threat level.

- c) The estimated probability of complete perforation at the corresponding P-BFS reference velocity shall be less than 5 percent. In other words, $V_{05} \geq V_{\text{ref}}$
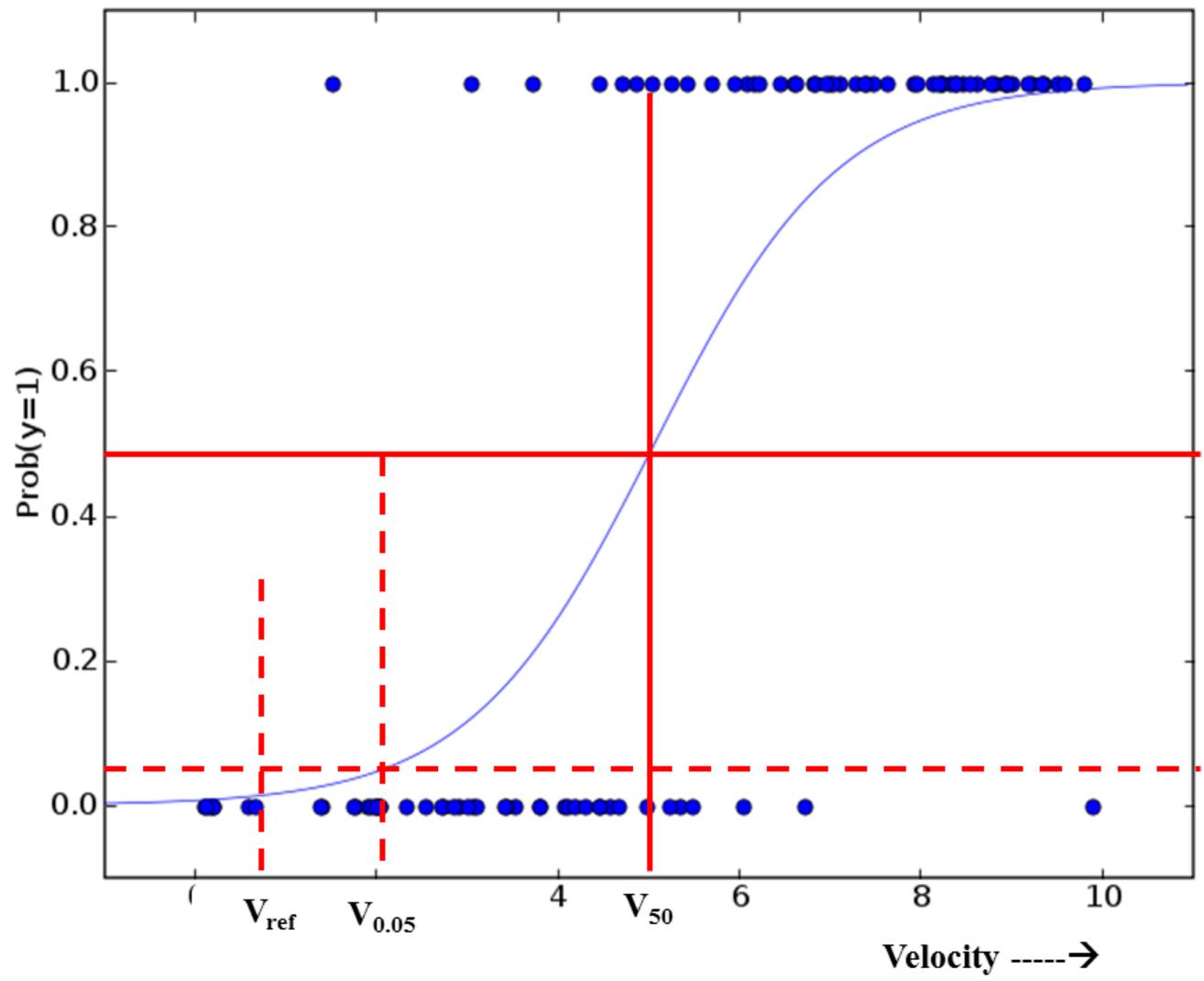
THANK YOU

FOR FINER DETAILS PLEASE CONTACT

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