Body Armor Manufacturer's Workshop

February 15, 2024

Criminal Justice Testing and Evaluation Consortium

A Program of the National Institute of Justice

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COMPLIANCE TESTING PROGRAM

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Agenda

Criminal Justice Testing and Evaluation Consortium

Body Armor Manufacturer's Workshop
February 15, 2024 -- Agenda

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10:00 – 10:30:	Welcome / Introduction
10:30 – 11:45:	Overview of NIJ Standard 0101.07
11:45 – 1:00:	Lunch (on your own / RTI Cafeteria)
1:00 -- 1:45:	CTP Transition
1:45 – 2:15:	Administrative Changes to .07 CTP (Scheme / TIMS)
2:15 – 3:00:	FAQ's for 0101.07
3:00 – 4:00	Q&A for 0101.07 (Audience)
4:00	Adjourn

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Body Armor Manufacturer's Workshop

February 15, 2024

Overview of NIJ Standard 0101.07

Daniel Longhurst

Senior Manager. Standards Coordinator, CJTTEC

Criminal Justice Testing and Evaluation Consortium

U.S. Department of Justice
Office of Justice Programs
National Institute of Justice

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OCTOBER 2023

NATIONAL INSTITUTE OF JUSTICE

STANDARD
BODY ARMOR

Ballistic Resistance of Body Armor

NIJ Standard 0101.07

NIJ 0101.07 Presentation loading, estimated time remaining: 36mins, please wait….

NCJ 307346

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STRENGTHEN SCIENCE. ADVANCE JUSTICE.

Overview of presentation

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Topics covered in the morning session will include:

- Rationale for update/changes.
- Process of determining changes.
- Summary of significant changes.
  - Change in nomenclature of performance levels to provide a clear demarcation of armors tested to 0101.07 v's previous iterations of the standard.
  - Retirement of the little used NIJ Level IIA classification
  - Introduction of new threat rounds to the hard armor test protocol
- *Short break.*
  - Addition of specific test methods to assess the performance of shaped/structured armor (Female armor)
  - Removal of the reduced velocity conditioned armor tests.

Overview of presentation

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Topics covered in the morning session will include:

- Harmonized Test Methods and Laboratory Practices (ASTM)
- Soft Armor – “Shot 7” Additional P-BFD shot/measurement at top edge of front panel, clarifying the pass/fail criteria.
- Hard Armor – Revised P-BFD requirement, shot placement, testing curved plates (Crown shot)

Rationale for update/changes

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It was time!

NIJ 0101.06 was published in 2008

Changing threat environment of US law enforcement, emerging products that further demonstrated the need for an update (no formal testing to address Level III+, Level III++ plates that were being marketed)

Prevalence of .223/5.56mm and 7.62x39 MSC threats identified by STC LE participants.

Need to quantify and qualify additional protection so wearers have confidence in performance.

Revisit wider operational requirements.

Ensure that the standard remains fit for purpose.

Process of determining changes

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Our process of establishing new requirements

- The NIJ convened a Special Technical Committee. The committee was made up of 23 participants, the majority of which were serving US Law Enforcement officers and representatives from the following 15 agencies:

Arizona Department of Public Safety.	Houston Police Department.
California Department of Corrections and Rehabilitation.	Minneapolis Police Department.
Cobb County Police Department (GA).	Orange County Sheriff's Office (FL).
Columbia College Police Department (SC).	Ramsey County Sheriff's Office (MN).
Denver Police Department.	U.S. Marshals Service.
Department of Homeland Security.	U.S. Park Police.
Federal Bureau of Investigation (FBI)	U.S. Secret Service
	Unified Police Department of Greater Salt Lake.

- In addition to the LE representation there was participation from subject matter experts, compliance testing program staff, federal partners (inc., NIST & DoD), and NIJ approved laboratories.
- The committee determined the current operational requirements that both soft and hard armor need to address. This included a national survey to provide information on current threats.

Process of determining changes

- Prioritizing new requirements
  - Priority 1: **Officer Safety**
  - Addressing changes in threats faced
  - Retaining confidence levels in armor
  - Ensuring all tests “matter”

Process of determining changes

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Creating NIJ 0123.00 threat document.

What are the most commonly encountered brands of pistols?

Answer	0% 100%	Number of Response(s)	Response Ratio
Auto-Ordnance		6	2.2 %
Beretta		33	12.6 %
Bersa		15	5.7 %
Browning		6	2.2 %
Charter Arms		30	11.4 %
Colt		17	6.5 %
CZ		4	1.5 %
European American Armory (EAA)		2	<1 %
FNH		2	<1 %
Glock		126	48.2 %
H&K		5	1.9 %
Kel-Tec		52	19.9 %
Ruger		62	23.7 %
Sig Sauer		15	5.7 %
Smith and Wesson		101	38.6 %
Springfield Armory		21	8.0 %
Taurus		84	32.1 %
Walther		4	1.5 %
Other		53	20.3 %
	Totals	261	100%

Process of determining changes

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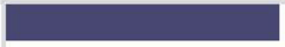
What are the most common calibers of pistols carried by criminals that your agency has contact with or that are located at crime scenes?

Answer	0% 100%	Number of Response(s)	Response Ratio
9 mm		219	80.5 %
10 mm		2	<1 %
.22 long rifle		45	16.5 %
.22 Magnum		19	6.9 %
.25 auto		27	9.9 %
.32 auto		26	9.5 %
.380 auto		94	34.5 %
.38		53	19.4 %
.40		105	38.6 %
.41 Magnum		0	0.0 %
.44 Magnum		6	2.2 %
.45 Long Colt		3	1.1 %
.45 GLOCK		19	6.9 %
.45 Auto		76	27.9 %
5.7x28 mm		5	1.8 %
Other		18	6.6 %
	Totals	272	100%

Process of determining changes

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What are the most common brands of rifles carried by criminals or encountered at crime scenes?

Answer	0% 100%	Number of Response(s)	Response Ratio
Browning		25	10.2 %
Bushmaster/Windham Weaponry		37	15.2 %
Colt		24	9.8 %
DPMS		13	5.3 %
FNH		5	2.0 %
H&K		6	2.4 %
Hi Point		31	12.7 %
Marlin		21	8.6 %
Mossberg		34	13.9 %
Remington		68	27.9 %
Ruger		32	13.1 %
Savage		33	13.5 %
Smith and Wesson		18	7.4 %
Springfield Armory		8	3.2 %
Winchester		36	14.8 %
Unknown maker of AK-47 or similar model variant		108	44.4 %
Other		30	12.3 %
	Totals	243	100%

Process of determining changes

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Reference the previous question, what are the most common calibers of these rifles?

Answer	0% 100%	Number of Response(s)	Response Ratio
.17 HMR		3	1.2 %
.22 long rifle		68	27.8 %
.22 Magnum		18	7.3 %
5.45 x 39 mm		6	2.4 %
5.56mm or .223		96	39.3 %
.243		17	6.9 %
5.57x 28mm		3	1.2 %
.30-30		26	10.6 %
.30-06		43	17.6 %
.357 Magnum		7	2.8 %
.308 or 7.62x 51mm		41	16.8 %
7.62x 39 mm		74	30.3 %
Other		33	13.5 %
	Totals	244	100%

Process of determining changes

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- In summary:
  - Changes were made based on end user requirements to:
    - address identified threats to LE
    - address limitations identified in the NIJ 0101.06 standard.
    - Provide appropriate confidence levels in armor performance that wasn't achievable using the 06 methodology.
  - Additional testing was included to demonstrate armor performance against the identified emerging threats or against identified challenges (angled shots, crown shots) where it was considered existing NIJ 0101.06 testing was not adequate.

Questions related to process for determining changes?

Summary of significant changes

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- Change in nomenclature of performance levels to provide a clear demarcation of armors tested to 0101.07 v's previous iterations of the standard.
- Retirement of the little used NIJ Level IIA classification
- Introduction of new threat rounds to the hard armor test protocol
- Addition of specific test methods to assess the performance of shaped/structured armor (Female armor)
- Removal of the reduced velocity conditioned armor tests.
- Introduction of ASTM Test methodologies and procedures.

Summary of significant changes

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Summary of significant changes

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Comparing 0101.06 and 0101.07 Threat Levels

NIJ Standard 0101.06			NIJ Standard 0101.07		
Soft Armor	Test Threat Ammunition	Reference Velocity	**Soft Armor**	Test Threat Ammunition	Reference Velocity
Level IIA	9mm Luger full metal jacketed (FMJ) round nose (RN) 124 grain	1225 ft/s	Protection level retired.		
	.40 S&W Full Metal Jacket (FMJ) 180 grain	1155 ft/s)			
Level II	9mm Luger full metal jacketed (FMJ)	1305 ft/s	**NIJ HG1**	9mm Luger full metal jacketed (FMJ)	1305 ft/s
	.357 Mag jacketed soft point (JSP)	1430 ft/s		.357 Mag jacketed soft point (JSP)	1430 ft/s
Level IIIA	.357 SIG TMJ 125 grain	1470 ft/s	**NIJ HG2**	9mm Luger FMJ RN	1470 ft/s
	.44 MAG jacketed hollow point (JHP)	1430 ft/s		.44 MAG jacketed hollow point (JHP)	1430 ft/s

Summary of significant changes

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Comparing 0101.06 and 0101.07 Threat Levels

NIJ Standard 0101.06			NIJ Standard 0101.07		
Hard Armor	Test Threat Ammunition	Reference Velocity	**Hard Armor**	Test Threat Ammunition	Reference Velocity
Level III	7.62 mm M80 Ball NATO FMJ	2780 ft/s	**NIJ RF1**	7.62x51mm M80 Ball NATO FMJ	2780 ft/s
				7.62x39mm MSC (Mild Steel Core)	2400 ft/s
				5.56mm M193 BT	3250 ft/s
N/A			**NIJ RF2**	7.62x51mm M80 Ball NATO FMJ	2780 ft/s
				7.62x39mm MSC (Mild Steel Core)	2400 ft/s
				5.56mm M193 BT (Boat Tail)	3250 ft/s
				5.56mm M855 BT (Boat Tail)	3115 ft/s
Level IV	30.06 M2 AP	2880 ft/s	**NIJ RF3**	30.06 M2 AP	2880 ft/s

Process of determining changes

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Questions related to nomenclature, protection levels or threat rounds?

Summary of significant changes

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- Change in nomenclature to aid interpretation of performance levels and provide a clear demarcation of armors tested to 0101.07 v's previous iterations of the standard.
- Retirement of the little used NIJ Level IIA classification
- Introduction of new threat rounds to the hard armor test protocol
- **Addition of specific test methods to assess the performance of shaped/structured armor (Female armor)**
- Removal of the reduced velocity conditioned armor tests.
- Introduction of ASTM Test methodologies and procedures.

Summary of significant changes

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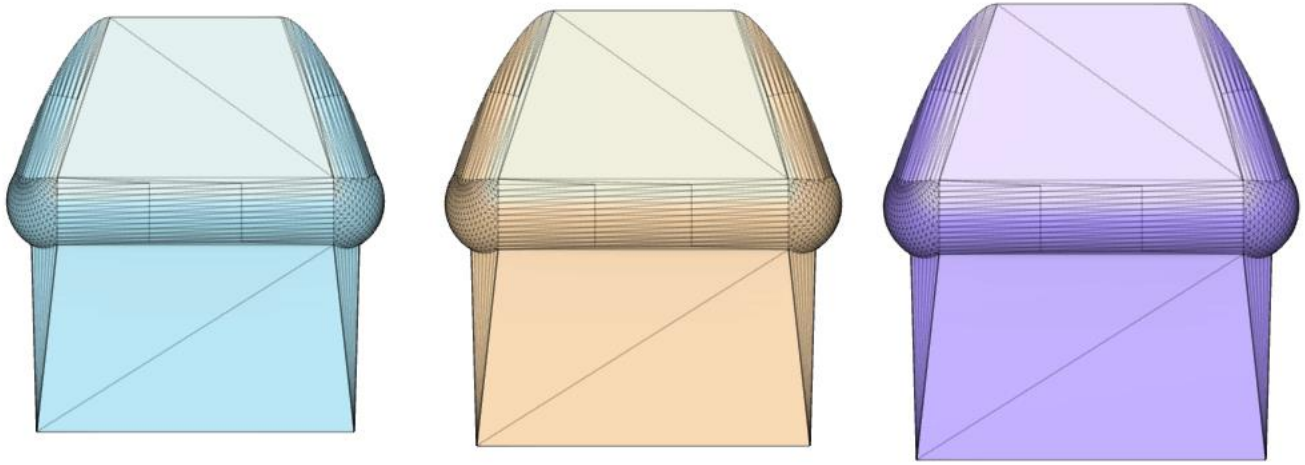
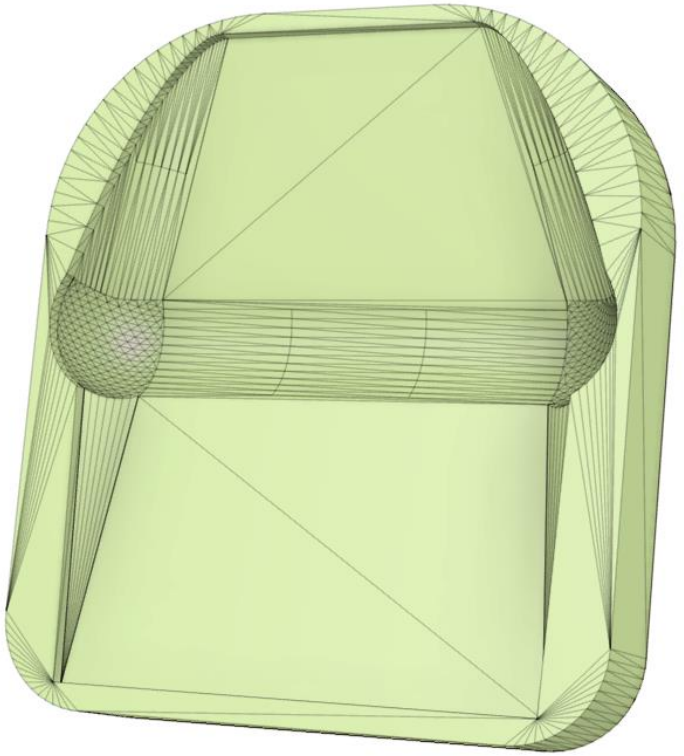
- Addition of specific test methods to assess the performance of shaped/structured armor (Female armor)





Summary of significant changes

- Addition of specific test methods to assess the performance of shaped/structured armor (Female armor)

Figure G.2. Shot 4 Placement Near Strike Face Overlap.

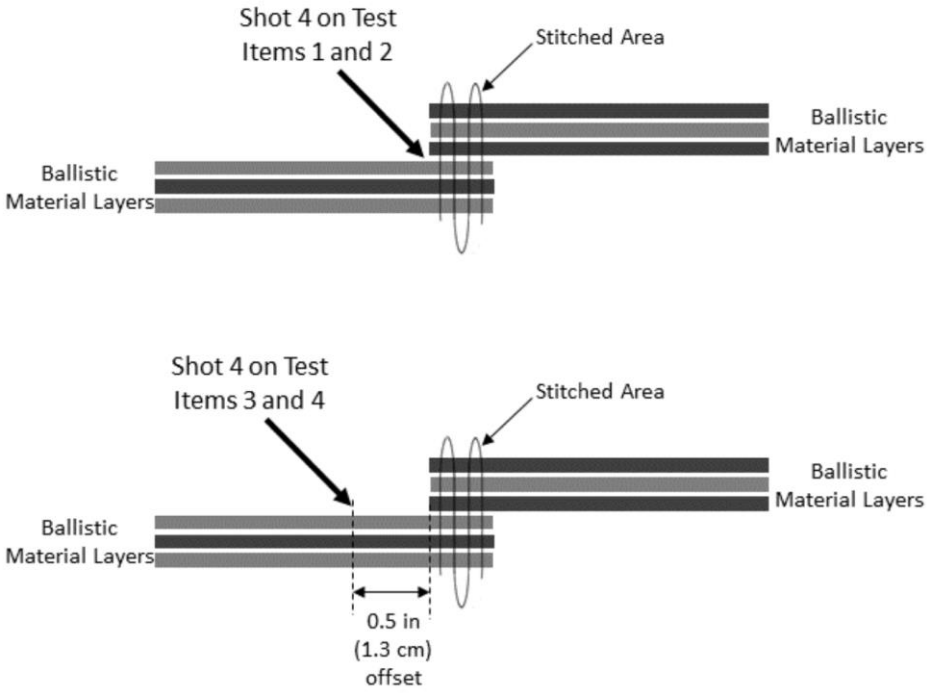
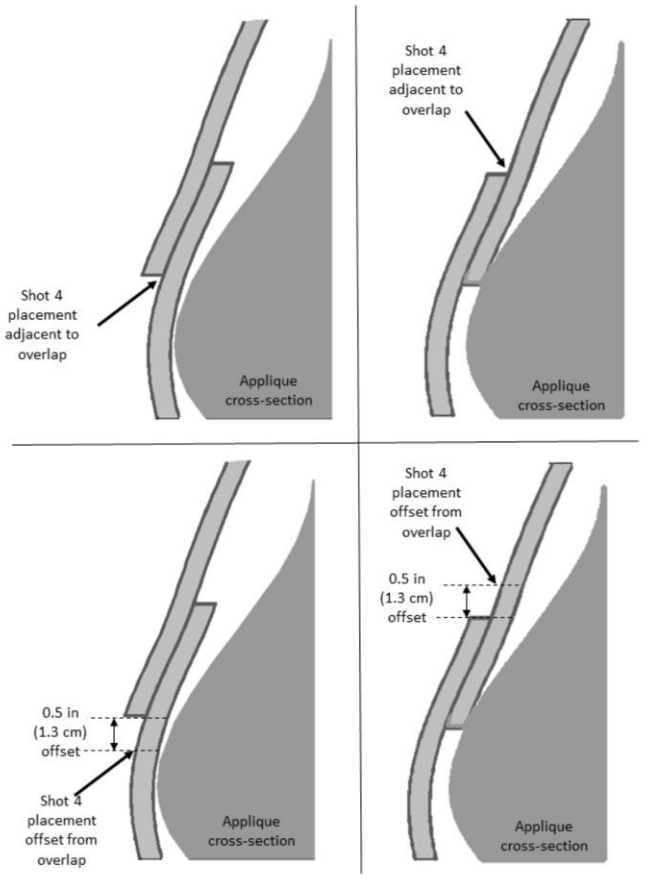


Figure G.3. Examples of Shot Placement in Regions of Horizontal Overlap.



Questions related to the testing of shaped/female armor?

Summary of significant changes

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- Change in nomenclature to aid interpretation of performance levels and provide a clear demarcation of armors tested to 0101.07 v's previous iterations of the standard.
- Retirement of the little used NIJ Level IIA classification
- Introduction of new threat rounds to the hard armor test protocol
- Addition of specific test methods to assess the performance of shaped/structured armor (Female armor)
- **Removal of the reduced velocity conditioned armor tests.**
- Introduction of ASTM Test methodologies and procedures.

Removal of reduced velocity for conditioned armor

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- NIJ 0101.07 no longer has the reduced velocity testing that was present in .06
- STC participants expressed concerns about changes in performance requirements. Operational requirements and risk assessments do not vary according to the age of the armor being worn!
  - In .06 the reduced velocity was introduced to accommodate concerns from industry about the unknown impact of tumbling.
  - No longer a valid rationale as tumbling has been part of the compliance test for over a decade and impact on performance should be well understood.
- STC felt that there is no longer a valid justification for retaining the reduction in velocity as the tumbling requirement test is no long “new”, given we have over 15 years of data relating to the performance of conditioned armor.

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Questions related to the removal of reduced velocity for conditioned armor?

Harmonized Test Methods and Laboratory Practices (ASTM)

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- ASTM D5264-98(2019), *Practice for Abrasion Resistance of Printed Materials by the Sutherland Rub Test*.
- ASTM E3004-22. *Standard Specification for Preparation and Verification of Clay Blocks Used in Ballistic-Resistance Testing of Torso Body Armor.*
- ASTM E3005-20. *Standard Terminology for Body Armor.*
- ASTM E3062/E3062M-20. *Standard Specification for Ballistic Test Ranges for Small Arms and Fragmentation Testing of Ballistic-Resistant Items.*
- ASTM E3068-20. *Standard Test Method for Contact Measurement of Backface Deformation in Clay Backing During Body Armor Testing*.
- ASTM E3078/E3078M-23. *Standard Practice for Conditioning of Hard Armor Test Items.*
- ASTM E3107-23. *Standard Test Method for Resistance to Penetration and Backface Deformation for Ballistic-Resistant Torso Body Armor and Shoot Packs.*
- ASTM E3110/E3110M-22. *Standard Test Method for Collection of Vx Ballistic Limit Data for Ballistic-Resistant Torso Body Armor and Shoot Packs.*
- ASTM E31 12/E3112M-20, *Standard Test Method for Ballistic-Resistant Products and Shoot Packs..*
- ASTM E3192-20, *Standard Practice for Soft Body Armor Conditioning By Tumbling*.

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Process of determining changes

Questions related to incorporating ASTM Documents?

Overview of presentation

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Topics covered in the morning session will include:

- Harmonized Test Methods and Laboratory Practices (ASTM)
- **Soft Armor – "Shot 7" Additional P-BFD shot/measurement at top edge of front panel, clarifying the pass/fail criteria.**
- Hard Armor – Revised P-BFD requirement, shot placement, testing curved plates (Crown shot)

Soft Armor – Additional P-BFD shot / measurement at top edge of front panel

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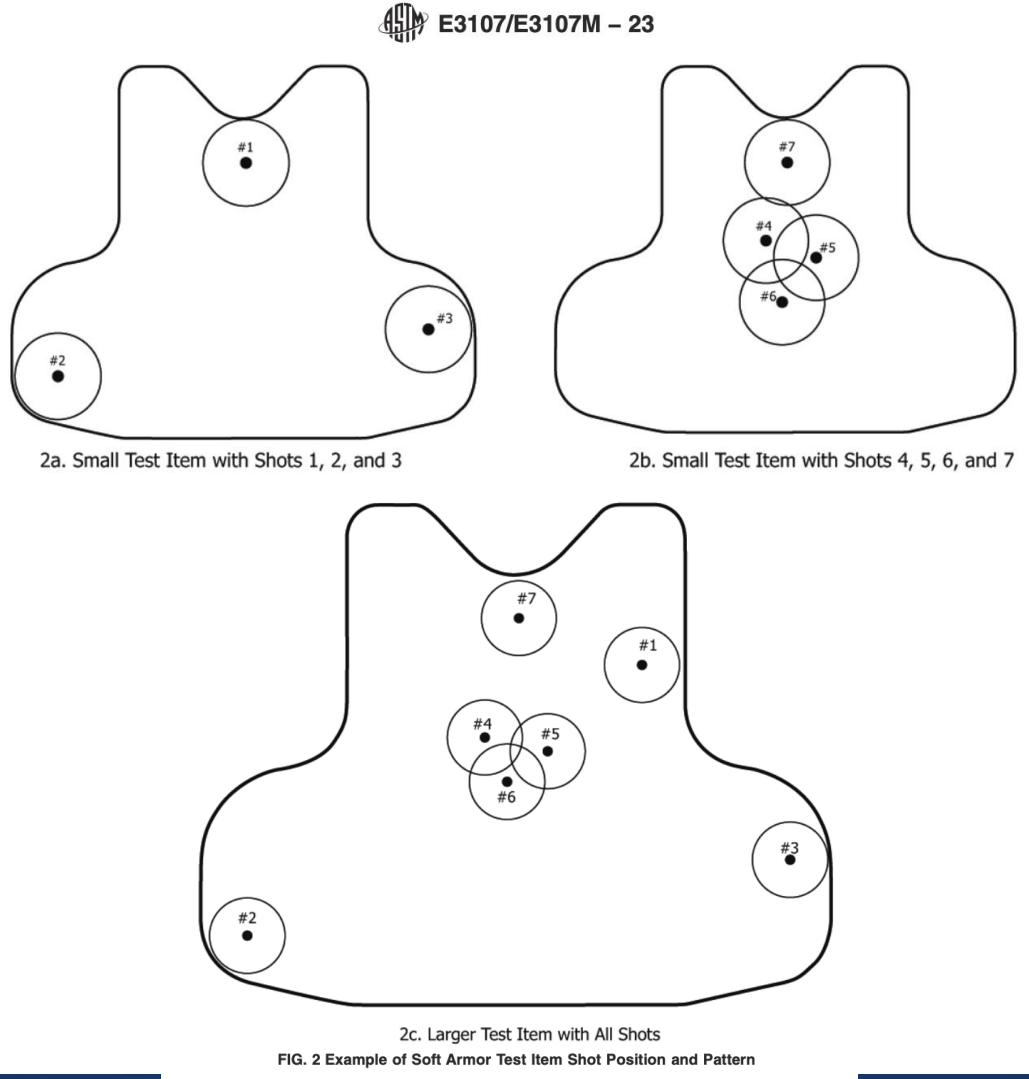
- From NIJ 0101.07 Section 9.2.6

- For shot 7 on a front panel, **if any portion of a test threat or a fragment of a test threat is embedded in or passes into any area of the backing material, that shall be considered a CP.**
- NOTE: This is an exception to the definition of a CP on soft armor from Section 3.2.3 of this NIJ standard that applies only to shot 7 at the neck of a front panel.



Soft Armor – Additional P-BFD shot/measurement at top edge of front panel

Questions related to “Shot 7”?

Changes in testing of hard armor plates

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Correction:

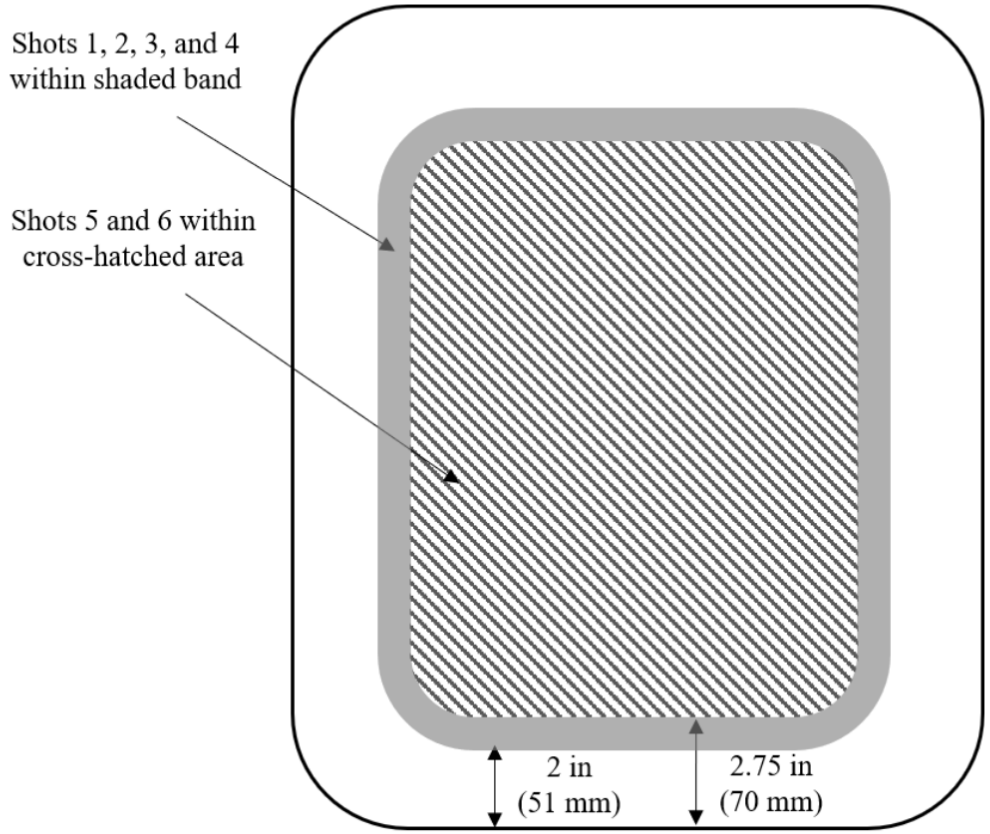
Only 2 BFD (not 4) measurements will be made on 6-shot hard armor plates.

Shots 1 & 2 will be used for both six-shot and 3 shot plate BFD calculations.

Existing threat rounds are retained, and the following new threat rounds have been introduced:

- 7.62x51mm M80 **RF1 & RF2**
- 7.62x39mm Mild Steel Core **RF1 & RF2**
- 5.56mm M193 **RF1 & RF2**
- 5.56mm M855 **RF2 Only**.
- 30.06 M2 AP **RF3 Only**

Figure 9. NIJ RF1, NIJ RF2, and NIJ RF3: Shot Placement for 6 Shots Per Test Item



Changes in testing of hard armor plates

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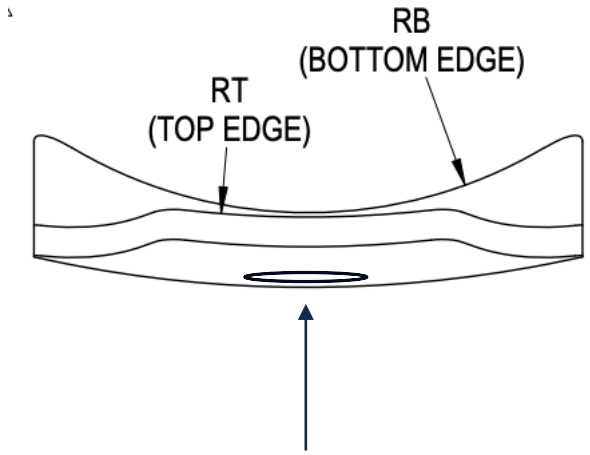
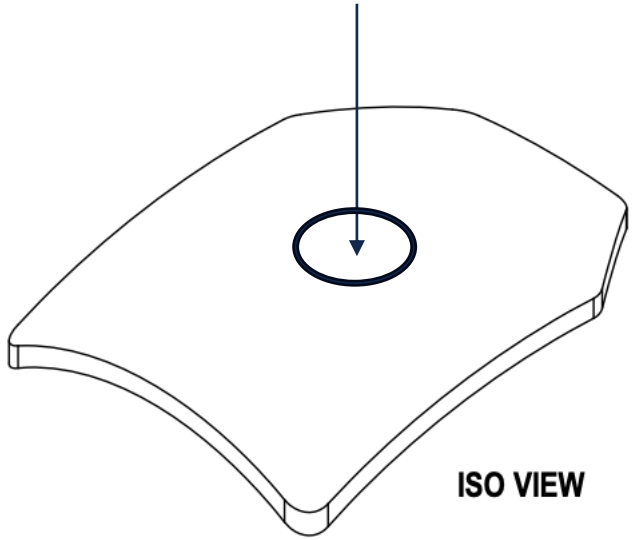
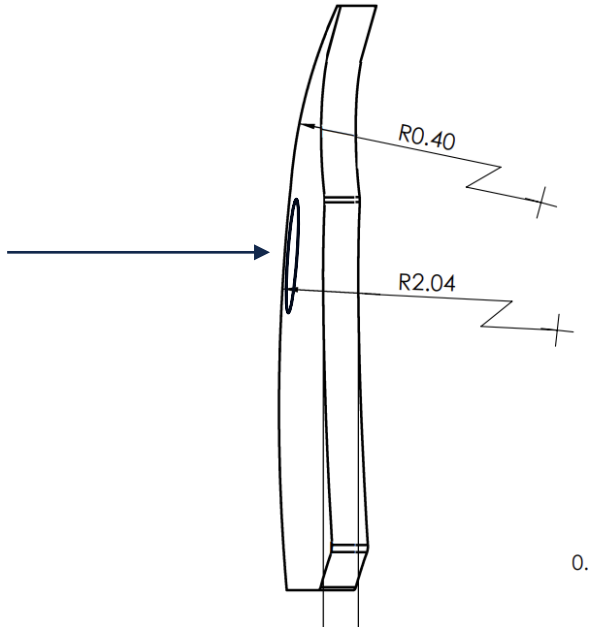
Introduction of test at crown of curvature.

- Research has shown that some materials are vulnerable when impacted at the crown of their multi-curve construction.
- The crown shot will be placed at the high point of the armor's strike face when laying horizontally on a flat surface.



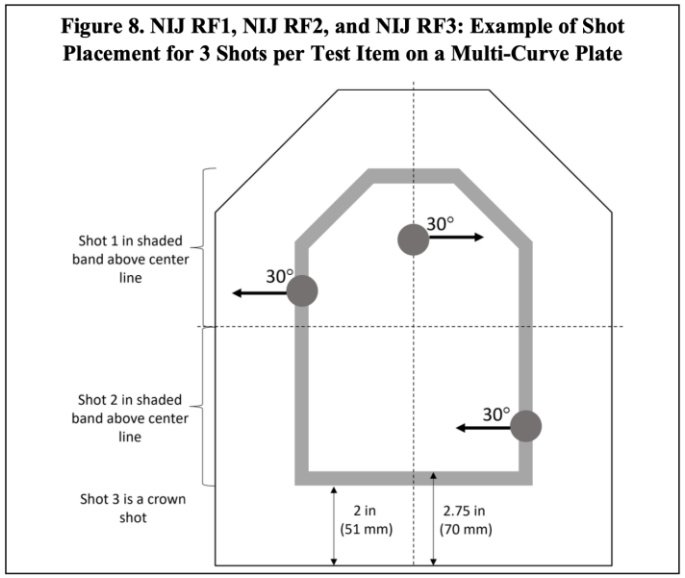


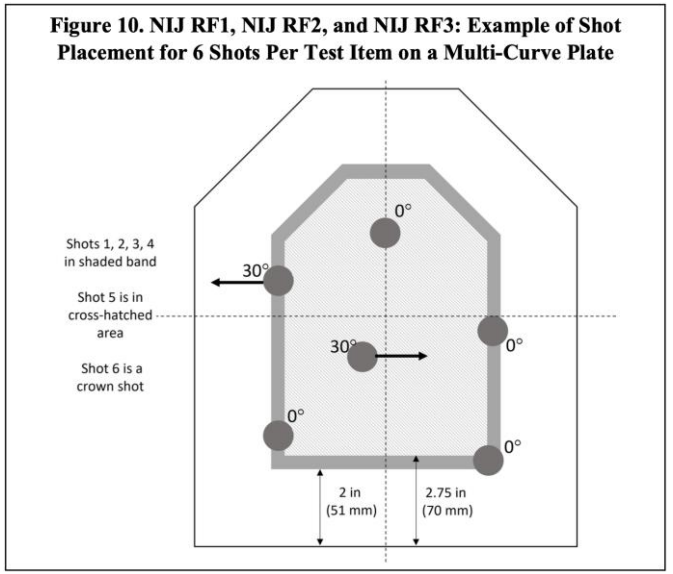


Changes in testing of hard armor plates

Introduction of angled shots on hard armor

- Research has also shown that some hard armor materials are vulnerable when impacted at an angle. Testing has been introduced to demonstrate continued performance against angled shots.
- Neither the round, nor fragments or shards of the plate may embed in or passes into any area of the backing material.





Questions related to the testing of hard armor?

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NIJ and the NIJ CTP team would like to thank today's attendees for your support and participation in the NIJ Compliance Testing Program.

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