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STANDARD PROTECTION LEVELS

Specification for NIJ
Ballistic Protection
Levels and Associated
Test Threats

NIJ Standard 0123.00

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Introduction

This National Institute of Justice (NIJ) publication, *Specification for NIJ Ballistic Protection Levels and Associated Test Threats*, NIJ Standard 0123.00, specifies the NIJ ballistic protection levels and associated test threats identified by U.S. law enforcement as representative of current prevalent threats in the United States. This standard should be used in conjunction with other standards to test and evaluate specific ballistic-resistant equipment, such as ballistic-resistant body armor, against contemporary ballistic threats that pose a life-threatening safety hazard to U.S. law enforcement officers. This standard itself does not include any performance requirements or specify any test methods to evaluate ballistic-resistant equipment.

This document is the first of its kind published by NIJ. Prior versions of NIJ standards for ballistic-resistant body armor, helmets, and materials all included ballistic protection levels within the respective documents. These standards were published at different times—and the threats associated with the different ballistic protection levels often differed as the threats evolved over time. This document seeks to unify ballistic protection levels across a range of ballistic-resistant products used by U.S. law enforcement. It is divided into four sections and three appendices.

Separating the ballistic protection levels and test threats specified here in NIJ Standard 0123.00 from particular ballistic equipment performance requirements and test methodology (e.g., as described in NIJ Standard 0101.07, *Ballistic Resistance of Body Armor*) allows for greater interoperability among standards that are applicable to ballistic-resistant equipment. This modularity gives NIJ the ability to be responsive to new developments regarding threats while simultaneously reducing the administrative burden to update several performance standards that would use identical protection levels and test threat information. Likewise, NIJ can update an individual equipment performance standard or a laboratory test method or practice in response to new research without changing the ballistic protection levels and test threats.

NIJ Standard 0101.07, *Ballistic Resistance of Body Armor*, is the first NIJ standard to reference NIJ Standard 0123.00. NIJ anticipates that future revisions of its performance standards for ballistic-resistant helmets and shields will also reference this document. The NIJ Compliance Testing Program (CTP) will use this standard for testing, evaluation, and certification of ballistic-resistant body armor using NIJ Standard 0101.07 and other types of ballistic-resistant equipment that may be added to the scope of the NIJ CTP's conformity assessment activities. It will be used by ballistics laboratories that test body armor and by body armor manufacturers participating in the NIJ CTP.

The ballistic protection levels and test threats listed in NIJ Standard 0101.06, *Ballistic Resistance of Body Armor*, were the points of departure for NIJ Standard 0123.00. NIJ ballistic protection level-nomenclature has been revised from NIJ Standard 0101.06 to be more descriptive of ballistic threats and to reduce confusion among law enforcement who wear body armor and use ballistic-resistant equipment.

- NIJ Level II and NIJ Level IIIA have been replaced with “NIJ HG1” and “NIJ HG2,” respectively, to represent handgun (HG) threats.

- NIJ Level III and Level IV have been revised to three levels representing rifle (RF) threats: “NIJ RF1,” “NIJ RF2,” and “NIJ RF3.”
 - NIJ RF1 replaces Level III.
 - NIJ RF2 is a new intermediate rifle protection level introduced in this specification that includes all the threats at the NIJ RF1 protection level plus an additional threat.
 - NIJ RF3 replaces Level IV.

Table 1 specifies the test threats, the specific ammunition to be used, and the reference velocities to be used for HG1 and HG2. Table 2 specifies the test threats, the specific ammunition to be used, and the reference velocities to be used for RF1, RF2, and RF3.

The test projectiles and reference velocities in this standard have been updated from section 2 of NIJ Standard 0101.06 to reflect the evolving threats faced by U.S. law enforcement, including a wider range of rifle threats in addition to the 7.62x51mm M80. These include 5.56mm M193, 5.56mm M855, and 7.62x39mm mild steel core (MSC). Variability in the MSC round has driven the development of surrogate test round designs to ensure consistency in testing; however, NIJ Standard 0123.00 specifies a factory round until surrogate test round development activities are completed and validated, and a surrogate is commercially available.

NIJ Standard 0123.00 specifies a range of acceptable bullet dimensions, bullet mass, core dimensions, core mass, and core hardness for the factory 7.62x39mm MSC projectiles as well as audit procedures found in Appendix A to assess ammunition lots to determine suitability for use in testing. Physical characteristics of the ammunition as well as other factors, such as availability of supply, were considered in the assessment of the various factory rounds available to determine which one would be the best choice for the test threat.

Column 3 in Table 1 points to a webpage on the NIJ website that lists the specific commercial ammunition that contain the projectiles to be used as test threats. Ammunition manufacturers may change their part numbers at their discretion, and updating a webpage allows NIJ to be more responsive to changes in the industry without the need to update any other part of this document.

A previous draft of this standard was published for public comment in the *Federal Register*.¹

This document uses the following in accordance with international standards:

- “shall” indicates a requirement.
- “should” indicates a recommendation.
- “may” indicates a permission.
- “can” indicates a possibility or a capability.

¹ “Request for Public Comment on Proposed Specification Threat Levels and Associated Ammunition To Test Equipment Intended To Protect U.S. Law Enforcement Against Handguns and Rifles,” *Federal Register*, 83 FR 7776, February 22, 2018, <https://www.federalregister.gov/d/2018-03672>.

Please send written comments and suggestions to the Director, National Institute of Justice, Office of Justice Programs, U.S. Department of Justice, 810 7th Street NW, Washington, DC 20531.

Nothing in this document is intended to create any legal or procedural rights enforceable against the United States. Moreover, nothing in this document creates any obligation for any individual or organization to follow or adopt this voluntary standard nor does it create any obligation for manufacturers, suppliers, law enforcement agencies, or others to follow or adopt voluntary NIJ equipment standards.

1. Scope

- 1.1. This specification defines the National Institute of Justice (NIJ) ballistic protection levels and associated test threats.
- 1.2. This specification defines test threats that are representative of the prevalent ballistic threats identified by U.S. law enforcement.
- 1.3. This specification identifies five NIJ ballistic protection levels, two for handgun (HG) protection and three for rifle (RF) protection (See Tables 1 and 2):
 - (1) NIJ HG1
 - (2) NIJ HG2
 - (3) NIJ RF1
 - (4) NIJ RF2
 - (5) NIJ RF3
- 1.4. This specification is intended to be referenced by other standards that specify minimum performance requirements for ballistic equipment providing protection against handgun and rifle ammunition and other standards used to test and evaluate such equipment.
- 1.5. Values stated in either the International System of Units (metric) or U.S. Customary Units (inch-pound) are to be regarded separately as standard. The values stated in each system may not be exact equivalents. Both units are referenced to facilitate acquisition of materials internationally and minimize fabrication costs. Tests conducted using either system maintain repeatability and reproducibility of the test method, and results are comparable.

2. References

The following references form a basis, and provide support, for the requirements and procedures described in this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies, including any amendments.

“Glossary of Industry Terms,” Sporting Arms and Ammunition Manufacturers’ Institute website, accessed July 1, 2020, <https://saami.org/saami-glossary/>.

ASTM E18-15. *Standard Test Methods for Rockwell Hardness of Metallic Materials*. West Conshohocken, PA: ASTM International.

ASTM E29-13. *Standard Practice for Using Significant Digits in Test Data To Determine Conformance With Specifications*. West Conshohocken, PA: ASTM International.

ASTM E3005-20. *Standard Terminology for Body Armor and Related Items*. ASTM International, West Conshohocken, PA.

3. Terms and Definitions

3.1. *ammunition*, n. – one or more loaded cartridges consisting of case, primer, propellant, and one or more projectiles. (ASTM E3005)

3.2. *bullet*, n. – a projectile fired from a firearm or testing apparatus.

NOTE: The SAAMI definition considers bullets to be projectiles fired from rifled barrels, which differentiates bullets from shot, slugs, fragment simulators, and other projectiles. (ASTM E3005)

3.3. *can*, n. – a container designed for safe transport and storage of ammunition. It is typically made of metal and labelled with caliber, quantity, and manufacturing date or lot number.

3.4. *cartridge*, n. – single assembled unit consisting of a bullet, propellant, primer, and casing. Synonymous with *round*. (ASTM E3005)

3.5. *lot*, n. – a quantity of homogeneous ammunition, identified by a unique lot number, which is manufactured, assembled, or renovated by one producer under uniform conditions, and which is expected to function in a uniform manner.

3.6. *reference velocity*, n. – the required velocity for the specified test threat.

NOTE: In this document, reference velocities are given in Table 1 and Table 2.

3.7. *round*, n. – one complete cartridge; used especially when counting or ordering cartridges as in a firing sequence.

3.8. *test threat*, n. – the projectile that is used in laboratory testing to impact the test item at a specific velocity or energy to assess performance of body armor. (Adapted from ASTM E3005)

NOTE: In this standard, test threat only refers to bullets fired from specified barrels.

4. NIJ Ballistic Protection Levels and Ballistic Test Threats

4.1. Table 1 lists the NIJ HG1 and NIJ HG2 protection levels and the associated test threats and reference velocities to be used for testing.

4.1.1. Appendix B provides a list of abbreviations used in Table 1.

Table 1. NIJ HG1 and NIJ HG2 Ballistic Protection Levels and Associated Test Threats and Reference Velocities

NIJ Ballistic Protection Level	Test Threat	Ammunition Identifier	Reference Velocity
NIJ HG1	9mm Luger FMJ RN 124 grain	NIJ.ojp.gov/ standard-0123-00	1305 ft/s (398 m/s)
	.357 Mag JSP 158 grain	NIJ.ojp.gov/ standard-0123-00	1430 ft/s (436 m/s)
NIJ HG2	9mm Luger FMJ RN 124 grain	NIJ.ojp.gov/ standard-0123-00	1470 ft/s (448 m/s)
	.44 MAG JHP 240 grain	NIJ.ojp.gov/ standard-0123-00	1430 ft/s (436 m/s)

4.2. Table 2 lists the NIJ RF1, NIJ RF2, and NIJ RF3 protection levels and the associated test threats and reference velocities to be used for testing.

4.2.1. Prior to performing testing with the 7.62x39mm MSC test threat listed in Table 2, ammunition shall be evaluated and shall meet the requirements specified in Annex A, NIJ Ammunition Audit Process.

4.2.2. Appendix B provides a list of abbreviations used in Table 2.

Table 2. NIJ RF1, NIJ RF2, and NIJ RF3 Ballistic Protection Levels and Associated Test Threats and Reference Velocities

NIJ Ballistic Protection Level	Test Threat	Ammunition Identifier	Reference Velocity
NIJ RF1	7.62x51mm M80 Ball NATO FMJ Steel Jacket 147 +0/-3 grain	U.S. military supply or rounds meeting NATO specifications	2780 ft/s (847 m/s)
	7.62x39mm MSC Ball Ammunition Type 56 from Factory 31	Factory 31 Ammunition evaluated and meeting the requirements of Appendix A	2400 ft/s (732 m/s)
	5.56mm M193 56 +0/-2 grain	U.S. military supply or rounds meeting NATO specifications	3250 ft/s (990 m/s)
NIJ RF2	7.62x51mm M80 Ball NATO FMJ Steel Jacket 147 +0/-3 grain	U.S. military supply or rounds meeting NATO specifications	2780 ft/s (847 m/s)
	7.62x39mm MSC Ball Ammunition Type 56 from Factory 31	Factory 31 Ammunition evaluated and meeting the requirements of Appendix A	2400 ft/s (732 m/s)
	5.56mm M193 56 +0/-2 grain	U.S. military supply or rounds meeting NATO specifications	3250 ft/s (990 m/s)
	5.56mm M855 61.8 ± 1.5 grain	U.S. military supply or rounds meeting NATO specifications	3115 ft/s (950 m/s)
NIJ RF3	30.06 M2 AP 165.7 +0/-7 grain	U.S. military supply or rounds meeting NATO specifications	2880 ft/s (878 m/s)

Appendix A. NIJ Ammunition Audit Process

A1. Ammunition Selection and Deconstruction

A1.1. The ammunition shall be 123-grain 7.62x39mm MSC ball Type 56 from Factory 31.

A1.2. The ammunition shall be from the same lot.

A1.2.1. Ammunition may be considered as from the same lot if it can be identified as such by can stamps, documentation in the can, or markings on the wrapping. The headstamp shall denote Factory 31, and the year of manufacture shall be documented by the laboratory.

A1.2.2. Select five of the above rounds as follows: two rounds from opposite corners of the first layer in the can, two rounds from opposite corners of the bottom layer in the can, and one from a different layer in the can (or different location if a partial can).

NOTE: The intent is to ensure selection of the first round in the lot, the last round in the lot, and three rounds in intermediate locations within the lot.

A1.2.3. Document which round is from each location.

A1.3. Perform the following steps for each round:

A1.3.1. Deconstruct the cartridge using a kinetic bullet puller (i.e., pull the bullet).

A1.3.2. Make the following measurements for the bullet:

(1) Mass, measured in grains

(2) Length, measured in mm

(3) Diameter, measured in mm

A1.4. Measurements for each bullet shall be recorded using the significant digits in Table A1.

A1.4.1. Measurements shall be taken using the Rounding Method in accordance with ASTM E29-13, *Standard Practice for Using Significant Digits in Test Data To Determine Conformance With Specifications*.

A1.4.2. A calibrated scale and calibrated digital calipers that can measure the Physical Characteristics to one decimal place beyond the values listed in Table A1 shall be used.

Table A1. Physical Characteristics for 7.62x39mm MSC Bullet for NIJ RF1 and NIJ RF2 Testing

Physical Characteristic	Minimum	Maximum
Bullet Mass	121.0 grain	124.4 grain
Bullet Length	26.2 mm	26.7 mm
Bullet Diameter	7.8 mm	8.0 mm

A1.5. The requirements listed in Table A1 shall be met in order to proceed to Section A2, Core Dimension and Mass Measurement.

A2. Core Dimension and Mass Measurement

A2.1. Perform the following steps on the bullets from the five rounds selected in Section A1 to extract the steel core.

A2.1.1. Remove the steel jacket and lead layer to isolate the core of the bullet.

NOTE: It is highly recommended that a lathe be used to cut and strip the bullet jacket. All efforts should be made not to damage the steel core of the bullet during this process.

A2.1.2. Make the following measurements for the core:

- (1) Mass, measured in grains
- (2) Length, measured in mm
- (3) Diameter, measured in mm

A2.1.3. Digitally photograph each core to show its geometry.

A2.2. Measurements for each bullet shall be recorded using the significant digits in Table A1.

A2.2.1. Measurements shall be taken using the rounding method in accordance with ASTM E29-13.

A2.2.2. A calibrated scale and calibrated digital calipers that can measure the physical characteristics to one decimal place beyond the values listed in Table A2 shall be used.

Table A2. Core Requirements

Physical Characteristic	Minimum	Maximum
Core Mass	54.0 grain	56.3 grain
Core Length	19.3 mm	20.3 mm
Core Diameter	5.7 mm	5.8 mm

A2.3. The requirements listed in Table A2 shall be met in order to proceed to Section A3, Core Hardness Testing.

A3. Core Hardness Testing

A3.1. The five cores from Section A2 shall be used. If removal of the jacket damaged the core, the damaged areas shall be avoided when taking hardness measurements.

A3.2. Rockwell hardness testing shall be done in accordance with ASTM E18-15, *Standard Test Methods for Rockwell Hardness of Metallic Materials*.

- A3.2.1. The Rockwell testing machine shall be calibrated by a calibration laboratory accredited to ISO/IEC 17025, using a test block specified in ASTM E18-15.
- A3.2.2. All measurements shall be performed on the Hardness Rockwell “B” (HRB) scale, and the correction factors specified in ASTM E18-15, Table A6.2 for a ¼-inch (6.4 mm) convex cylindrical surface shall be applied to all uncorrected HRB readings.
- A3.3. Data collection and reporting shall be conducted in accordance with the following.
 - A3.3.1. Both uncorrected and corrected hardness measurements shall be recorded.
 - A3.3.2. Per Section 5.2.4 of ASTM E18-15, Rockwell hardness measurements and the average value of Rockwell hardness measurements shall be rounded to one decimal place.
 - A3.3.3. Three valid corrected HRB hardness measurements shall be averaged in order to determine an average corrected hardness value for each core, which shall be the hardness value reported for each core.
- A3.4. Prior to making hardness measurements on the cores, the “daily verification procedure” shall be performed in accordance with ASTM E18-15, Section A1.5, and the results documented.
- A3.5. The following testing procedure shall be performed to take hardness measurements on the cores.
 - A3.5.1. Hardness testing shall be conducted immediately following verification in Section A3.4.
 - A3.5.2. The indenter shall not be jogged up or down prior to the first sample measurement or in between each sample measurement. If the machine is jogged in either direction, repeat the verification procedure in Section A3.4 prior to measuring the next core.
 - A3.5.3. Corrections shall be applied to account for the diameter of the steel core.
 - A3.5.4. Based on the length measurements of the cores, determine the midpoint of each as measured from tip to base.
 - A3.5.5. At the midpoint of each core, measure the diameter.
 - A3.5.6. Indent each core three times as specified below.
 - A3.5.6.1. Securely place the core in a pin style V-block anvil to ensure stability for HRB measurement.
 - A3.5.6.2. At the approximate midpoint of the core, on its convex surface, perform an HRB measurement.
 - A3.5.6.3. Staying at the midpoint of the core, rotate the core approximately 120-degrees and perform an HRB measurement.
 - A3.5.6.4. Staying at the midpoint of the core, rotate the core approximately 120-degrees (in the same direction as above) and perform an HRB measurement.
 - A3.5.7. The hardness measurements for each core shall be recorded and reported in accordance with Section A3.3.

- A3.5.8. The reported Rockwell hardness measurement shall be recorded in accordance with Section 5.2.4 of ASTM E18-15.
- A3.5.9. The requirement for core hardness of each core shall be a minimum of 78.0 and a maximum of 92.0.

A4. Documentation

- A4.1. The laboratory shall document and report all ammunition and bullet data, core dimension and mass data, and core hardness test data.
- A4.2. The laboratory shall document and report specifics concerning the 7.62x39mm MSC, Type 56 Ball ammunition, including:
 - A4.2.1. Ammunition lot number and source of lot number (See Section A1.2)
 - A4.2.2. Year of manufacture
 - A4.2.3. Manufacturing location
 - A4.2.4. Cartridge head stamp information

Appendix B. List of Abbreviations

AP	Armor-piercing
FMJ	Full metal jacket
JHP	Jacketed hollow point
JSP	Jacketed soft point
MSC	Mild steel core
NATO	North Atlantic Treaty Organization
RN	Round-nose

Appendix C. Bibliography

ANSI/SAAMI Z299.3 – 2015. *Voluntary Industry Performance Standards for Pressure and Velocity of Centerfire Pistol and Revolver Ammunition for the Use of Commercial Manufacturers*. Newtown, CT: Sporting Arms and Ammunition Manufacturers' Institute.

ANSI/SAAMI Z299.4 – 2015. *Voluntary Industry Performance Standards for Pressure and Velocity of Centerfire Rifle Ammunition for the Use of Commercial Manufacturers*. Newtown, CT: Sporting Arms and Ammunition Manufacturers' Institute.

Contra Threat Sciences, LLP. *7.62x39mm Mild Steel Core Ammunition*. April 29, 2019. Report prepared for the NIJ Justice Technology Information Center.

A.D. Mearns. *7.62 x 39 mm PS Ball Characterisation*. 2015. UK Defence Science and Technology Laboratory.

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NIJ standards and conformity assessment activities are conducted by NIJ's Office of Technology and Standards (OTS). OTS works to identify the needs of state and local criminal justice system practitioners for equipment standards and test protocols, develops voluntary performance standards for specific criminal justice tools and technologies, establishes conformity assessment requirements for demonstrating that commercially available equipment conforms to those standards, and publishes listings of product models that have been tested through one or more specified organizations and found to comply with the standards.

The standards development process begins with gathering the operational needs and requirements of practitioners in the field. Based on those needs and requirements, the standards are developed in coordination with a special technical committee composed of criminal justice practitioners, testing experts, other technical experts, federal partners, and members from practitioner-stakeholder organizations. Manufacturers, vendors, and other interested parties are provided with an opportunity to review and comment on draft standards prior to their publication.

All NIJ standards are voluntary standards. There is no requirement or obligation for manufacturers, law enforcement or corrections agencies, or others to follow or adopt these voluntary law enforcement technology equipment standards. The primary intent of these standards is to provide end users and equipment producers with performance criteria on equipment characteristics and allow comparison of product models based on standardized testing methods and performance requirements. These standards do not specify a particular solution but rather define what a potential solution must accomplish. Conformity assessment based on NIJ standards, such as testing and certification, provides a level of confidence in that particular model's fitness for use in specified circumstances. The ultimate goal is to help ensure, to the degree possible, that law enforcement and corrections equipment is safe, reliable, and effective.

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NIJ standards, including this standard, are available at no charge online at <https://nij.ojp.gov/active-nij-standards-and-comparative-test-methods>. Users of NIJ standards are advised to check that page regularly to determine whether a particular law enforcement technology equipment standard has been revised or superseded, or if the compliance status of a particular model has changed as applicable.

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