

**National Institute
of Justice**

***Technology Assessment
Program***

Ballistic Resistance of Police Body Armor

NIJ Standard 0101.02

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James K. Stewart, Director
National Institute of Justice

U.S. Department of Justice
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March 1985

**U.S. DEPARTMENT OF JUSTICE
National Institute of Justice**

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FOREWORD

This document, NIJ Standard-0101.02, Ballistic Resistance of Police Body Armor, is an equipment standard developed by the Law Enforcement Standards Laboratory of the National Bureau of Standards. It is produced as part of the Technology Assessment Program of the National Institute of Justice. A brief description of the program appears on the inside front cover.

This standard is a technical document that specifies performance and other requirements equipment should meet to satisfy the needs of criminal justice agencies for high quality service. Purchasers can use the test methods described in this standard to determine whether a particular piece of equipment meets the essential requirements, or they may have the tests conducted on their behalf by a qualified testing laboratory. Procurement officials may also refer to this standard in their purchasing documents and require that equipment offered for purchase meet the requirements. Compliance with the requirements of the standard may be attested to by an independent laboratory or guaranteed by the vendor.

Because this NIJ standard is designed as a procurement aid, it is necessarily highly technical. For those who seek general guidance concerning the selection and application of law enforcement equipment, user guides have also been published. The guides explain in nontechnical language how to select equipment capable of the performance required by an agency.

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NIJ STANDARD FOR THE BALLISTIC RESISTANCE OF POLICE BODY ARMOR

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NIJ STANDARD FOR THE BALLISTIC RESISTANCE OF POLICE BODY ARMOR

1. PURPOSE AND SCOPE

The purpose of this standard is to establish minimum performance requirements and methods of test for the ballistic resistance of police body armor. This standard is a revision of NILECJ-STD-0101.01, dated December 1978. This revision adds performance requirements for level III-A, a requirement to test fabric armor for shots impacting the armor at an incident angle of 30°, and a test method that simulates a multishot assault. In addition, the test round velocity for level IV armor has been changed from 838 ± 15 m (2750 ± 50 ft) per second to 868 ± 15 m (2850 ± 50 ft) per second and the allowable time to test the wet conditioned armor has been increased. The scope of the standard is limited to ballistic resistance only and does not address threats from knives or sharply pointed instruments, a different type of threat.

2. CLASSIFICATION

2.1 Discussion

This standard is applicable to armors intended to protect the torso against gunfire. Many different types of armor are now available; they range in ballistic resistance from those designed to protect against small caliber handguns to those designed to protect against high-powered rifles.

The ballistic threat posed by a bullet depends, among other things, on its composition, shape, caliber, mass, and impact velocity. Because of the wide variety of cartridges available in a given caliber, and because of the existence of hand loads, armors that will defeat a standard test round may not defeat other loadings in the same caliber. For example, an armor that prevents penetration by a 357 Magnum test round may or may not defeat a 357 Magnum round with higher velocity. In general, an armor that defeats a given lead bullet may not resist penetration by an identical round with a harder core. The test ammunitions specified in this standard represent common threats to law enforcement officers.

2.2 Classification

Police body armors covered by this standard are classified into six types, by level of performance.

2.2.1 Type I (22 LR; 38 Special)

This armor protects against the standard test rounds as defined in section 5.2.1. It also provides protection against lesser threats such as 12 gauge No. 4 lead shot and most handgun rounds in calibers 25 and 32.

2.2.2 Type II-A (Lower Velocity 357 Magnum; 9 mm)

This armor protects against the standard test rounds as defined in section 5.2.2. It also provides protection against lesser threats such as 12 gauge 00 buckshot, 45 Auto., 38 Special +P and some other factory loads in caliber 357 Magnum and 9 mm, as well as the threats mentioned in section 2.2.1.

2.2.3 Type II (Higher Velocity 357 Magnum; 9 mm)

This armor protects against the standard test rounds as defined in section 5.2.3. It also provides protection against most other factory loads in caliber 357 Magnum and 9 mm, as well as the threats mentioned in sections 2.2.1 and 2.2.2.

2.2.4 Type III-A (44 Magnum; Submachine Gun 9 mm)

This armor protects against the standard test rounds as defined in section 5.2.4. It also provides protection against most handgun threats, as well as the threats mentioned in sections 2.2.1 through 2.2.3.

2.2.5 Type III (High-Powered Rifle)

This armor protects against the standard test round as defined in section 5.2.5. It also provides protection against lesser threats such as 223 Remington (5.56 mm FMJ), 30 Carbine FMJ, and 12 gauge rifled slug, as well as the threats mentioned in sections 2.2.1 through 2.2.4.

2.2.6 Type IV (Armor-Piercing Rifle)

This armor protects against the standard test round as defined in section 5.2.6. It also provides at least single hit protection against the threats mentioned in sections 2.2.1 through 2.2.5.

2.2.7 Special Type

A purchaser having a special requirement for a level of protection other than one of the above standard threat levels should specify the exact test rounds to be used, and indicate that this standard shall govern in all other respects.

2.3 Configuration

Police body armor is offered in a variety of configurations. All makes and models offer protection for the torso front. Many models also cover the back, and some offer additional protection. Police body armor may be specified to protect:

- (a) torso front, or front and sides
- (b) torso back, or back and sides
- (c) groin,
- (d) coccyx (end of the spine)

or any practical combination of these, as required.

3. DEFINITIONS

3.1 Angle of Incidence

The angle between the line of flight of the bullet and the perpendicular to the plane tangent to the point of impact, also known as the angle of obliquity (see fig. 1).

3.2 Backing Material

A block of nonhardening, oil-base modeling clay placed in contact with the back of the armor test specimen during ballistic testing.

3.3 Deformation

The maximum momentary displacement of the back surface of the armor test specimen caused by a fair hit that does not penetrate the armor.

3.4 Fair Hit

A bullet that impacts the armor at an angle of incidence no greater than $\pm 5^\circ$ from the intended angle of incidence, no closer to the edge of the armor part than 7.6 cm (3 in) and no closer to a prior hit than 5 cm (2 in),

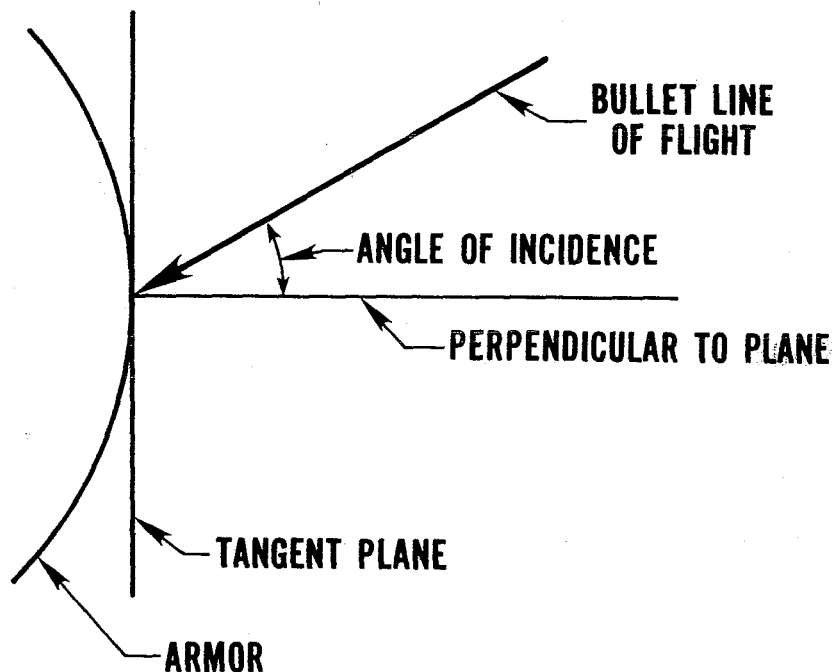


FIGURE 1. *Angle of incidence.*

and at an acceptable velocity as defined in this standard. A bullet that impacts too close to the edge or to a prior hit and/or at too high a velocity, but does not penetrate, shall be considered a fair hit for the determination of nonpenetration, but not for the determination of deformation.

3.5 Full Metal Jacketed Bullet (FMJ)

A bullet made of lead completely covered, except for the base, with copper alloy (approximately 90 copper-10 zinc).

3.6 Jacketed Soft Point (JSP)

A bullet made of lead completely covered, except for the point, with copper alloy (approximately 90 copper-10 zinc).

3.7 Lead Bullet

A bullet made of lead alloyed with hardening agents.

3.8 Penetration

Complete perforation of an armor test sample by a test bullet or by a fragment of the bullet or armor, as evidenced by the presence of that bullet or a fragment in the backing material, or by a hole which passes through the backing material.

3.9 Semi-Wadcutter

A bullet shape characterized by a flat nose and a tapered section leading to a cylindrical bullet body with a sharp break where the taper meets the body.

3.10 Strike Face

The surface of an armor designated by the manufacturer as the face that should be worn away from the body.

4. REQUIREMENTS

4.1 Acceptance Criteria

An armor model satisfies the requirements of this standard if all four sample items (see sec. 5.1) meet the workmanship (see sec. 4.3) and labeling (see sec. 4.4) requirements and when tested in accordance with section 5.4, each part of the armor (torso front, back, side, groin and coccyx) meets the penetration and deformation requirements (see sec. 4.5) both wet and dry.

4.2 Test Sequence

Tests shall be conducted in the order presented in this standard. All armors shall be examined for compliance with the requirements of sections 4.3 and 4.4, and shall then be tested for compliance with the requirements of section 4.5.

4.3 Workmanship

Each armor shall be free from wrinkles, blisters, cracks or fabric tears, crazing, chipped or sharp corners and other evidences of inferior workmanship.

4.4 Labeling

Each armor shall be clearly and durably marked to provide the following information:

- a) name, logo or other identification of the manufacturer
- b) type of body armor, according to section 2 of this standard, and reference to this edition of the standard (i.e., NIJ Standard-0101.02)
- c) size
- d) lot number
- e) month and year of manufacture
- f) strike face, if any
- g) cleaning instructions for the ballistic material and for the armor carrier, if any
- h) for type I through type III-A armor, a warning in type at least 1.5 times the size of the rest of the type on the label stating that the armor is not intended to protect the wearer from rifle fire and, if applicable, that the armor is not intended to protect the wearer from sharp edged or pointed instruments.
- i) certification of compliance with this edition of this NIJ standard.

Items d and e may be incorporated into a single number, e.g., a serial number.

4.5 Ballistic Penetration and Deformation

One complete armor (each part) shall be tested for resistance to ballistic penetration and ballistic deformation in accordance with section 5.4 after wet conditioning in accordance with section 5.2.10. A second complete armor shall be tested in accordance with section 5.4 in the dry condition. Penetration by any fair hit, deformation to a depth greater than 44 mm (1.73 in), or penetration by a bullet at a velocity lower than the required impact velocity in either test, shall constitute failure. The detailed requirements are summarized in table 1.

At the option of the tester, a type I, II-A, II or III-A armor part which has successfully withstood six fair hits with one test ammunition may thereupon be tested with the second test ammunition. However, if failure occurs with the second test ammunition a retest shall be conducted. A second specimen of that armor part shall be tested with the second test ammunition and the results of that test shall govern.

TABLE I. Test summary.

| Armor type | Test ammunition | Test variables | | | Performance requirements | | |
|--|-----------------------------------|---------------------|--------------------------------|----------------------------|--|------------------------------|---|
| | | Nominal bullet mass | Suggested barrel length | Required bullet velocity | Required fair hits per armor part at 0° angle of incidence | Maximum depth of deformation | Required fair hits per armor part at 30° angle of incidence |
| I | 22 LRHV Lead | 2.6 g 40 gr | 15 to 16.5 cm 6 to 6.5 in | 320±12 m/s 1050±40 ft/s | 4 | 44 mm 1.73 in | 2 |
| | 38 Special RN Lead | 10.2 g 158 gr | 15 to 16.5 cm 6 to 6.5 in | 259±15 m/s 850±50 ft/s | 4 | 44 mm 1.73 in | 2 |
| II-A | 357 Magnum JSP | 10.2 g 158 gr | 10 to 12 cm 4 to 4.75 in | 381±15 m/s 1250±50 ft/s | 4 | 44 mm 1.73 in | 2 |
| | 9 mm FMJ | 8.0 g 124 gr | 10 to 12 cm 4 to 4.75 in | 332±12 m/s 1090±40 ft/s | 4 | 44 mm 1.73 in | 2 |
| II | 357 Magnum JSP | 10.2 g 158 gr | 15 to 16.5 cm 6 to 6.5 in | 425±15 m/s 1395±50 ft/s | 4 | 44 mm 1.73 in | 2 |
| | 9 mm FMJ | 8.0 g 124 gr | 10 to 12 cm 4 to 4.75 in | 358±12 m/s 1175±40 ft/s | 4 | 44 mm 1.73 in | 2 |
| III-A | 44 Magnum Lead SWC Gas Checked | 15.55 g 240 gr | 14 to 16 cm 5.5 to 6.25 in | 426±15 m/s 1400±50 ft/s | 4 | 44 mm 1.73 in | 2 |
| | 9 mm FMJ | 8.0 g 124 gr | 24 to 26 cm 9.5 to 10.25 in | 426±15 m/s 1400±50 ft/s | 4 | 44 mm 1.73 in | 2 |
| III | 7.62 mm | 9.7 g | 56 cm | 838±15 m/s | 6 | 44 mm | 0 |
| | (308 Winchester) FMJ | 150 gr | 22 in | 2750±50 ft/s | | 1.73 in | |
| IV | 30-06 | 10.8 g | 56 cm | 868±15 m/s | 1 | 44 mm | 0 |
| | AP | 166 gr | 22 in | 2850±50 ft/s | | 1.73 in | |
| Special requirement (see sec. 2.2.7)* | * | * | * | * | * | 44 mm 1.73 in | * |

*These items must be specified by the user. All of the items must be specified.

Notes: Armor parts covering the torso front and torso back, with or without side coverage, shall each be impacted with the indicated number of fair hits. Armor parts covering the groin and coccyx shall each be impacted with three fair hits at 0° angle of incidence. The deformation due to the first fair hit with a velocity not less than 10 m/s (32.8 ft/s) below the maximum for the test round shall be measured to determine compliance. No fair hit or lower velocity bullet shall penetrate the armor.

Abbreviations: AP – Armor Piercing
FMJ – Full Metal Jacketed
JSP – Jacketed Soft Point
LRHV – Long Rifle High Velocity
RN – Round Nose
SWC – Semi-Wadcutter

5. TEST METHODS

5.1 Sampling

Two complete armors, selected at random and sized to fit a 117 cm (46 in) to 122 cm (48 in) chest circumference, shall constitute a test sample. (Note: The larger the size, the more likelihood that all of the ballistic testing will fit on just two complete armors.) A maximum of two additional type I, II-A, II, and III-A armors of the same size may be required for retesting.

5.2 Test Equipment

It should be noted that hand-loaded ammunition may be required to achieve some of the bullet velocities required in the following sections.

5.2.1 Type I Test Weapons and Ammunition

5.2.1.1 22 LR

The test weapon may be a 22 caliber handgun or test barrel. The use of a handgun with a 15 to 16.5 cm (6 to 6.5 in) barrel is suggested. Test bullets shall be 22 Long Rifle High Velocity lead, with nominal masses of 2.6 g (40 gr) and measured velocities of 320 ± 12 m (1050 ± 40 ft) per second.

5.2.1.2 38 Special

The test weapon may be a 38 Special handgun or test barrel. The use of a handgun with a 15 to 16.5 cm (6 to 6.5 in) barrel is suggested. Test bullets shall be 38 Special round-nose lead, with nominal masses of 10.2 g (158 gr) and measured velocities of 259 ± 15 m (850 ± 50 ft) per second.

5.2.2 Type II-A Test Weapons and Ammunition

5.2.2.1 Lower Velocity 357 Magnum

The test weapon may be a 357 Magnum handgun or test barrel. The use of a handgun with a 10 to 12 cm (4 to 4.75 in) barrel is suggested. Test bullets shall be 357 Magnum jacketed soft point, with nominal masses of 10.2 g (158 gr) and measured velocities of 381 ± 15 m (1250 ± 50 ft) per second.

5.2.2.2 Lower Velocity 9 mm

The test weapon may be a 9 mm handgun or test barrel. The use of a handgun with a 10 to 12 cm (4 to 4.75 in) barrel is suggested. Test bullets shall be 9 mm full metal jacketed, with nominal masses of 8.0 g (124 gr) and measured velocities of 332 ± 12 m (1090 ± 40 ft) per second.

5.2.3 Type II Test Weapons and Ammunition

5.2.3.1 Higher Velocity 357 Magnum

The test weapon may be a 357 Magnum handgun or test barrel. The use of a handgun with a 15 to 16.5 cm (6 to 6.5 in) barrel is suggested. Test bullets shall be 357 Magnum jacketed soft point, with nominal masses of 10.2 g (158 gr) and measured velocities of 425 ± 15 m (1395 ± 50 ft) per second.

5.2.3.2 Higher Velocity 9 mm

The test weapon may be a 9 mm handgun or test barrel. The use of a handgun with a 10 to 12 cm (4 to 4.75 in) barrel is suggested. Test bullets shall be 9 mm full metal jacketed, with nominal masses of 8.0 g (124 gr) and measured velocities of 358 ± 12 m (1175 ± 40 ft) per second.

5.2.4 Type III-A Test Weapons and Ammunition

5.2.4.1 44 Magnum

The test weapon may be a 44 Magnum handgun or test barrel. The use of a handgun with a 14 to 16 cm (5.5 to 6.25 in) barrel is suggested. Test bullets shall be 44 Magnum, lead semi-wadcutter with gas checks, nominal masses of 15.55 g (240 gr), and measured velocities of 426 ± 15 m (1400 ± 50 ft) per second.

5.2.4.2 Submachine Gun 9 mm

The test weapon may be a 9 mm SMG or test barrel. The use of a test barrel with a 24 to 26 cm (9.5 to 10.25 in) barrel is suggested. Test bullets shall be 9 mm full metal jacketed, with nominal masses of 8.0 g (124 gr) and measured velocities of 426 ± 15 m (1400 ± 50 ft) per second.

5.2.5 Type III Test Weapon and Ammunition

The test weapon may be a rifle or a test barrel chambered for 7.62 mm (308 Winchester) ammunition. The use of a rifle with a barrel length of 56 cm (22 in) is suggested. Test bullets shall be 7.62 mm full metal jacketed (U.S. military designation M80), with nominal masses of 9.7 g (150 gr) and measured velocities of 838 ± 15 m (2750 ± 50 ft) per second.

5.2.6 Type IV Test Weapon and Ammunition

The test weapon may be a rifle or a test barrel chambered for 30-06 ammunition. The use of a rifle with a barrel length of 56 cm (22 in) is suggested. Test bullets shall be 30 caliber armor piercing (U.S. military designation APM2), with nominal masses of 10.8 g (166 gr) and measured velocities of 868 ± 15 m (2850 ± 50 ft) per second.

5.2.7 Special Type Test Weapon and Ammunition

The test weapon, cartridge type, bullet construction, bullet caliber, bullet mass, and bullet striking velocity must all be specified by the user.

5.2.8 Chronograph

The chronograph shall have a precision of 1 μ s and an accuracy of 2 μ s. Its triggering devices shall be of either the photoelectric or conductive screen type.

5.2.9 Armor Backing Material

The backing material shall be in the form of a single block at least 10.2 cm (4 in) thick and of sufficient length and width [approximately 61×61 cm (24×24 in)] to completely back the armor part to be tested.

The armor backing material shall be conditioned by being kept for at least 3 h at a temperature between 15 and 30 °C (59 and 86 °F), and shall be worked thoroughly to eliminate any voids. Its consistency shall be such that a depression of 25 ± 3 mm (1 ± 0.1 in) in depth is obtained when a 1 kg (2.2 lb) cylindrical steel mass, 45 mm (1.75 in) in diameter and having a hemispherical striking end, is dropped from a height of 2 m (6.5 ft) onto one of its square faces. Three drop tests shall be made, and the center of each impact site shall be at least 75 mm (3 in) from a previous impact site and from any edge. A guide tube or other means may be used as required to assure that the striking end of the cylindrical mass impacts the backing material squarely. The backing material may be maintained at any temperature in the above range that will give it the required consistency.

A backing material found to be suitable is Roma Plastilina No. 1 modeling clay, available from Sculpture House, Inc., 38 East 30th St., New York, NY 10016, and other artist supply centers.

5.2.10 Wet Armor Conditioning

The complete armor shall be conditioned by subjecting both sides of each armor part to a water spray under the following conditions:

The spray nozzles shall be of such size and so spaced that 10 ± 2 L (2.5 ± 0.5 gal) of water per hour falls uniformly distributed on each 0.1 m² (1 ft²) of spray booth floor area, and so located that the droplets are falling from gravitational force only, when they strike the armor surface.

Each surface of each armor part shall be sprayed for 3 min. If a strike face is specified, spray it last. Ballistic testing shall begin immediately after the armor is removed from the spray. The maximum time the armor may be out of the spray shall not exceed 30 min. After 30 min of testing, if the testing has not been completed, the test data shall be discarded and wet testing must begin again with a new armor.

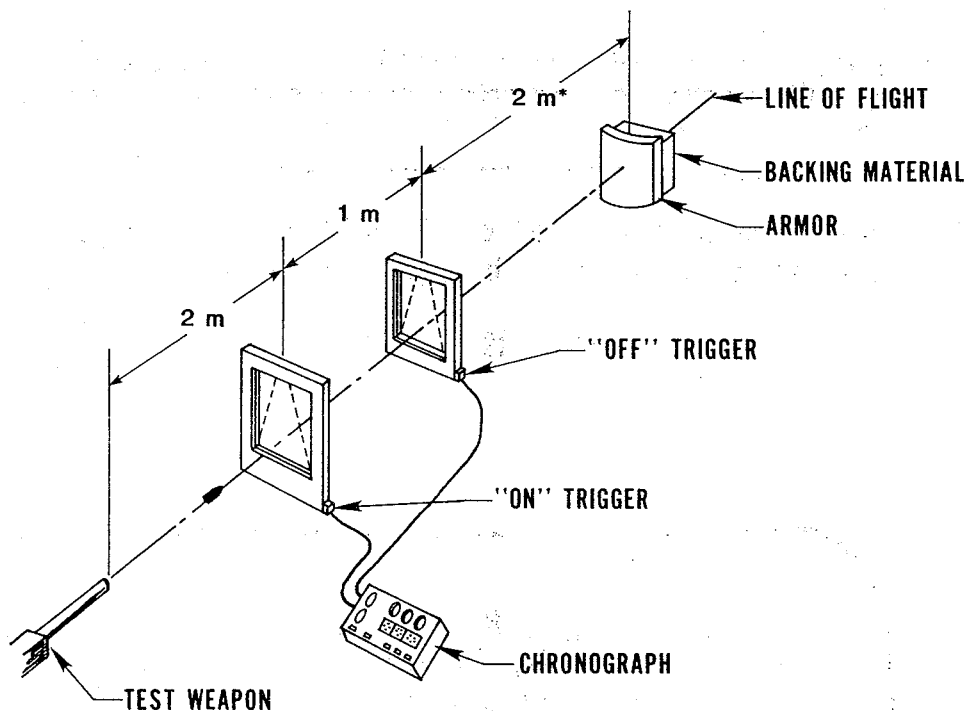
5.3 Test Setup

Set up the test equipment as shown in figure 2. Use the test weapon appropriate for the threat level to which the armor is to be tested and firmly clamp it in place with the barrel horizontal.

Allow all electronic equipment to warm up until stability is achieved. During testing, maintain the ambient temperature at 20–28 °C (68–82 °F) and the relative humidity at 30 to 70 percent.

Condition the armor test backing material and test it for consistency in accordance with section 5.2.9. Reshape and smooth the backing material to its defined dimensions, and maintain it at the temperature required to maintain the required consistency.

Place the chronograph triggering screens 2 and 3 m (6.6 and 9.8 ft), respectively, from the muzzle of the test weapon and arrange them so that they define planes perpendicular to the line of flight of the bullet. Measure the distance between the triggering planes with an accuracy of 1 mm (0.04 in).



*2 m for type I, II-A, II, and III-A armors;
12 m for type III and IV armors.

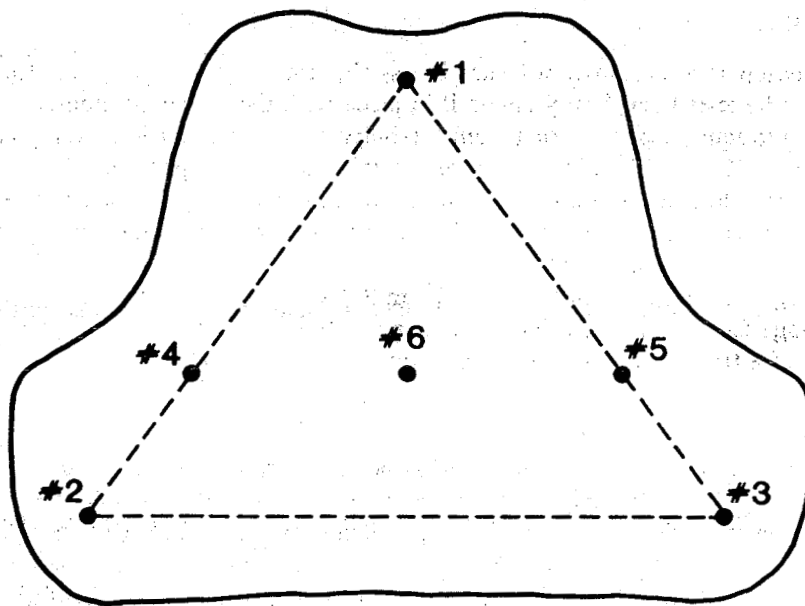
FIGURE 2. Ballistic test setup.

5.4 Test Procedure

5.4.1 Penetration and Backface Signature Tests (Levels I, II-A, II, and III-A)

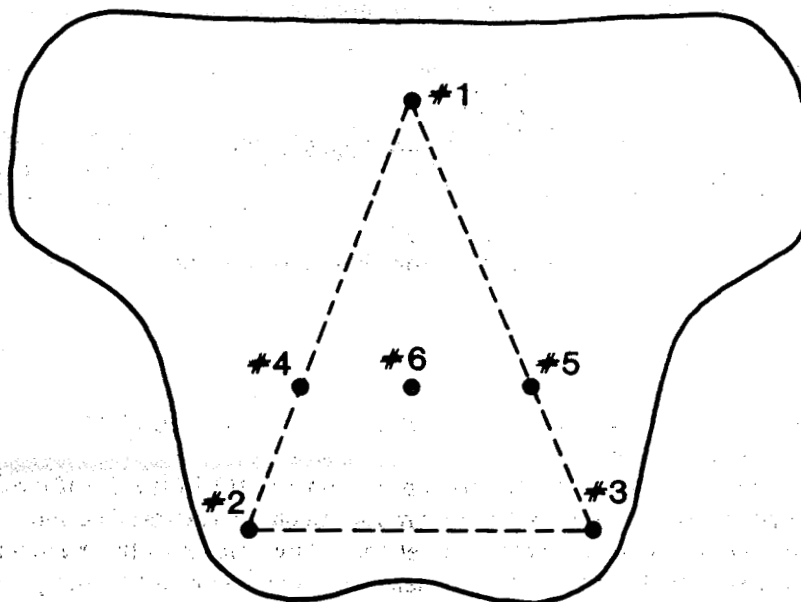
Select one of the two required test ammunitions (table 1) appropriate for the threat level against which the armor is to be tested. Fire a sufficient number of pretest rounds to have a reasonable assurance that the first test round fired at the armor will strike the armor with a velocity not greater than the maximum test velocity for the test round and not less than 10 m/s (32.8 ft/s) below the maximum test velocity. Position a sheet of cardboard 5 m (16 ft) from the muzzle of the test weapon. Fire the last pretest round through the cardboard to determine the line of flight and point of impact of the bullet; alternatively, use an aiming light or other suitable means for positioning.

Precondition one complete armor in accordance with section 5.2.10. Place one of the square faces of the armor backing material in intimate contact with the back face of the armor-specimen under test and secure it with tape, the armor straps or other means which will not interfere with the test. Place this assembly in back of the sheet of cardboard with the armor front face perpendicular to the line of flight of the bullet (0° angle of incidence) so that the desired point of impact touches the bullet hole in the cardboard made by the pretest round, then remove the cardboard. The desired points of impact for the six test hits required by this procedure are shown in figure 3.



All shots at least 7.6 cm (3 in) from any edge
and at least 5 cm (2 in) from another shot

A. Test ammunition shot series



All shots at least 7.6 cm (3 in) from any edge
and at least 5 cm (2 in) from another shot

B. Optional second ammunition shot series

FIGURE 3. Test pattern.

Fire the first test round at the armor. Using the chronograph, determine the bullet velocity. Examine the armor and the backing material to determine whether penetration occurred when a bullet made a fair hit. This round must be not less than 10 m/s (32.8 ft/s) below the maximum test velocity for the threat level. The velocity of the remaining rounds in the test sequence that follows shall meet the requirements shown in table 1, as appropriate for the test ammunition.

If no penetration occurred, measure and record the depth of the depression made in the armor backing material. The depth of the depression is the distance from the original undisturbed surface of the backing material to the lowest point of the depression. Note whether the depth of the depression complies with the requirement of section 4.5.

If no failure occurred, replace the armor on the backing material in its original position without reconditioning the backing material (do not smooth the dent) and without removing the first test bullet if it is trapped in the armor. Reposition the armor and backing material so that the second test shot will impact the armor at the second location shown in figure 3. Fire round No. 2. Without disturbing the relationship between the armor and the backing material (do not remove any trapped bullets from the armor, and do not smooth it), reposition the assembly so that test round No. 3 will impact the armor at the third location shown in figure 3. Fire round No. 3. Without disturbing the relationship between the armor and the backing material, reposition the assembly so that the defined angle of incidence between the perpendicular to the armor and the line of flight of test round No. 4 is 30° and so that the bullet will be directed towards the center of the armor part and so the bullet will impact the armor at location four of figure 3. Fire test round No. 4. Without disturbing the relationship between the armor and the backing material, reposition the assembly so that the angle of incidence for test round No. 5 is 30° and so that the bullet will be directed towards the center of the armor part and so the bullet will impact the armor at location five of figure 3. Fire test round No. 5. Without disturbing the relationship between the armor and the backing material, reposition the assembly so that the angle of incidence for test round No. 6 is 0° and so that the bullet will impact the armor at location six of figure 3. If all of the above rounds were fair hits, examine the armor and backing material for penetrations.

When conducting the above firing sequence, inspect the armor following each test round to verify that the impact was a fair hit. If not, repeat the test at that general location on the armor until a fair hit is obtained before proceeding to the next round number.

For body armor sized and shaped for female officers, the bust cups shall be filled with backing material conditioned at the same time as the main body of the backing material and in the same manner; however, the drop test for consistency does not have to be performed. Further, the above six-shot test shall be modified so that at least one of the 30° angle of incidence shots shall impact on a bust cup. If the bust cup contains one or more seams, the shot shall impact a seam.

Recondition the backing material. If there is room on the armor part, it may be turned upside-down and the test repeated for the second ammunition type in accordance with the requirement of section 4.5. If there is no room on the armor part, repeat the above six-shot test with a new armor part using the second ammunition type.

If no failure occurred, repeat the entire test procedure as described above using the second (dry) armor.

5.4.2 Penetration and Backface Signature Tests (Levels III and IV)

Position a sheet of cardboard 15 m (50 ft) from the muzzle of the test weapon. Fire a pretest round through the cardboard to locate the bullet impact point so that the armor can be correctly positioned; alternatively, use an aiming light or other suitable means.

Precondition one complete armor in accordance with section 5.2.10. Place one of the square faces of the armor backing material in intimate contact with the back face of the armor specimen under test and secure it with tape, the armor straps or other means which will not interfere with the test. Place this assembly in back of the sheet of cardboard with the armor front face perpendicular to the line of flight of the bullet so that the desired point of impact touches the bullet hole in the cardboard made by the pretest round, then remove the cardboard.

Fire a test round at the armor. Using the chronograph, determine the bullet velocity. Examine the armor and the backing material to determine whether penetration occurred when a bullet made a fair hit.

If no penetration occurred, measure and record the depth of the depression made in the armor backing material; do so for the first two (only) fair hits made with each test ammunition on each armor part. The depth of the depression is the distance from the original undisturbed surface of the backing material to the lowest point of the depression. Note whether the depth of the penetration is in compliance with the requirements of section 4.5.

If no failure occurred, reposition the armor so as to space additional impacts evenly over its surface or position another armor specimen (as required) and repeat the procedure with additional test rounds until the required number of fair hits (see table 1) has been obtained on each armor part. Place each successive fair hit as far as possible from the center of each armor part. Reposition the backing material (as required) to avoid any overlap of depressions. If there are seams in the ballistic material, place the required number of fair hits so as to include at least one impact directly on a seam.

If no failure occurred, repeat the entire test procedure as specified above using the second (dry) armor.

5.4.3 Penetration and Backface Signature Test (Special Type)

If the armor is principally made of fabric, use the test procedure of section 5.4.1.

If the armor is principally nonfabric or "hard" (metal plates or ceramic with a small amount of fabric to act as a trauma shield or to catch backface fragments from the main ballistic resistance element) use the test procedure of section 5.4.2.

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