



Designation: E3113 – 23

Standard Specification for Ballistic-resistant Vehicle Door Panels Used by Public Safety Agencies¹

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1. Scope

1.1 This specification specifies requirements for ballistic-resistant panels to be mounted in or on public safety vehicle doors to protect against complete penetration of projectiles from small arms.²

1.2 The purpose of this specification is to define minimum performance for ballistic-resistant vehicle door panels.

1.2.1 In addition to the required tests, optional tests with specific conditions are provided that allow testing beyond the minimum requirements of this specification. Statements of conformance with this specification do not include any optional test unless the optional test is conducted, and the results are included in the test report.

1.3 This specification requires ballistic testing of vehicle door panels mounted either in a test fixture or mounted on a vehicle door for which the panel is designed.

1.3.1 Door panels intended to be mounted inside a vehicle door shall be assessed in a test fixture with air backing.

1.3.1.1 Two optional ballistic tests are provided for vehicle door panels intended to be mounted inside a vehicle door:

(1) The preferred optional ballistic test assesses the panel in a vehicle door for which the panel is designed.

(2) If a vehicle door for which the panel is designed is not available, a second optional ballistic test assesses the panel in a test fixture with air backing and a door skin simulant in front of the strike face of the panel.

1.3.2 Door panels intended to be mounted on the exterior of a vehicle door shall be assessed on a vehicle door for which the panel is designed.

1.3.3 An optional extreme temperature ballistic test is provided for purchasers concerned with performance of vehicle door panels in very hot or very cold environments.

1.3.4 The optional ballistic tests are provided in **Appendix X1**.

¹ This specification is under the jurisdiction of ASTM Committee E54 on Homeland Security Applications and is the direct responsibility of Subcommittee E54.04 on Public Safety Equipment.

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² Small arms are defined as portable firearms, typically including handguns, shotguns, rifles, and light machine guns (Terminology E3005).

1.4 Selection and procurement guidance is provided in **Appendix X2** to assist purchasers in using this specification to procure vehicles with ballistic-resistant door panels or to retrofit existing vehicles with ballistic-resistant door panels.

1.5 *Units*—The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to non-SI units that are provided for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

- 2.1 *ASTM Standards*:³
- E3005 Terminology for Body Armor
 - E3062 Specification for Indoor Ballistic Test Ranges for Small Arms and Fragmentation Testing of Ballistic-resistant Items
 - E3078 Practice for Conditioning of Hard Armor Test Items
 - E3112 Test Method for Ballistic-resistant Products and Shoot Packs
- 2.2 *ISO/IEC Standards*:⁴
- ISO/IEC 17050-1 Conformity assessment – Supplier’s declaration of conformity – Part 1: General requirements
 - ISO/IEC 17050-2 Conformity assessment – Supplier’s declaration of conformity – Part 2: Supporting documentation

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

⁴ Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

ISO/IEC 17065 Conformity assessment – Requirements for bodies certifying products, process and services

3. Terminology

3.1 For terms not defined in this test method, the following definitions apply:

3.1.1 From Terminology **E3005**: *ballistic material, complete penetration, obliquity, small arms, test item, test threat.*

3.1.2 From Practice **E3078**: *controlled ambient.*

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *ballistic layup, n*—the layering and arrangement of ballistic materials through the thickness of a protective product.

3.2.2 *door skin, n*—the metal that comprises the outer surface of a vehicle door.

3.2.3 *shoot pack, n*—a test item prepared with materials, or with materials and construction features, utilized in body armor or other ballistic-resistant products, but not intended to be used as body armor, an accessory, or a protective product.

Adapted from Terminology E3005

3.2.4 *supplier, n*—the party that is responsible for ensuring that products meet and, if applicable, continue to meet, the requirements.

Adapted from ISO/IEC 17065

3.2.5 *supplier's declaration of conformity (SDOC), n*—the procedure by which a first party or supplier conveys assurance that the object of conformity fulfills specified requirements.⁵

4. Design and Configuration Requirements

4.1 The panel may be single-piece or multiple-piece.

4.2 The panel shall allow for proper operation and functioning of the vehicle door handles, door pulls, door locks, windows, and window controls.

4.3 The panel shall not impede vehicle door operations.

4.4 The panel shall be free of any unintended holes, voids, bulges, protrusions, or dents. The surfaces of the panel shall be free from any blisters, cracks, crazing, chipped corners or edges, sharp edges, or delamination.

5. Test Item Requirements

5.1 *Test Items for Required Testing:*

5.1.1 Two test items are required per test threat. One test item shall be for the left side of the vehicle, and one shall be for the right side of the vehicle.

NOTE 1—It is recommended that spare test items be provided.

5.1.2 The two test items shall be complete door panels representative of the ballistic layup, composition, configuration (for example, shape, with attachments, seams, mounting method), and size as intended for use.

NOTE 2—The composition and configuration of the pieces of a multi-piece panel may or may not be identical to each other.

5.2 *Test Items for Optional Testing:*

5.2.1 One or more additional test items may be needed to fit the necessary shots for testing with a door skin simulant. The additional test item(s) shall be either a 60 cm by 60 cm (24 in. by 24 in.) shoot pack or a complete door panel.

5.2.2 One or more additional test items may be needed to fit the necessary shots for testing at extreme temperatures. The additional test item(s) shall be either a 60 cm by 60 cm (24 in. by 24 in.) shoot pack or a complete door panel.

6. Performance Requirements

6.1 There shall be no visible separation or delamination of the test item upon the completion of each conditioning procedure.

6.2 There shall be no complete penetration of any test item when tested in accordance with this specification.

7. Test Item Conditioning

7.1 The conditioning requirements of this section are not applicable for the optional tests of **Appendix X1**.

7.2 Test items shall be stored at controlled ambient conditions for at least 24 h prior to the start of the required conditioning.

7.3 Each test item shall be subjected sequentially to the conditioning steps below.

7.3.1 Subject the test item to one cycle of Temperature Conditioning as specified in Test Method **E3112** – 17, subsection 9.3.

7.3.2 Subject the test item to conditioning by submersion in plain water as specified in Test Method **E3112** – 17, subsection 9.7.

7.4 Ballistic testing of each test item shall be completed within two hours of the completion of the last conditioning procedure.

8. Required Ballistic Testing

8.1 Each test item shall be installed in a test setup which represents how the panel is mounted in or on the vehicle door, using the panel's mounting holes, mounting points, or attachments.

8.1.1 For door panels intended to be installed inside a vehicle door, the test item shall be mounted in a test fixture and air-backed.

8.1.2 For door panels intended to be installed on the exterior of a vehicle door, the test item shall be mounted on the actual vehicle door for which the panel is designed, with the structural door components and door skin intact. Other vehicle door components shall be removed.

8.1.3 The supplier shall be responsible for providing the test fixture to the test laboratory, unless the test laboratory has a test fixture that is acceptable to the supplier.

8.1.4 The test fixture shall be capable of maintaining the position of the test item, witness panel, and actual vehicle door or door skin simulant (when required) and withstanding the forces from the test.

8.2 The witness panel shall meet the requirements of Test Method **E3112** – 17 with the modifications listed below:

⁵ Definition source: https://www.standardsportal.org/usa_en/conformity_assessment/suppliers_declaration.aspx.

8.2.1 Subsection 10.2 of Test Method E3112 – 17 shall not apply.

8.2.2 The witness panel shall be mounted to the test fixture parallel to the test item at the intended point of impact.

NOTE 3—Typically the test item mounting holes are used to establish a reference plane for the test item, and the witness panel is positioned parallel to that plane.

8.2.3 The witness panel shall be mounted at a distance of 152 mm ± 25 mm (6 in. ± 1 in.) from the back side directly behind the test item at the intended point of impact. The measurement direction is normal to the reference plane used for positioning the witness panel.

8.2.4 The witness panel shall be sized to catch all debris from the back of the test item.

8.3 The test range setup and relative distances shall be as defined in Specification E3062.

8.4 The vehicle door panel performance levels, test threats, and shot requirements are specified in Annex A1.

8.4.1 Table A1.1 specifies the performance levels and test threat details.

8.4.2 Table A1.2 specifies shot requirements for air-backed or car door-backed test items, including minimum number of shots. Additional shots shall be allowed and are recommended.

8.4.3 Fig. A1.1 specifies the shot locations for the 5-shot dice pattern. The 3-shot triangle pattern is the same as shots 1, 2, and 3 of the 5-shot dice pattern. The pattern may be rotated on the face of the test item as needed.

8.4.4 Each performance level is independent of the others.

8.4.5 For each performance level, ballistic testing shall be performed using all listed threats for that performance level.

8.5 Potential weak points can be present in vehicle door panels, and a sampling of each type of potential weak point shall be shot.

8.5.1 The supplier shall provide to the testing laboratory a drawing that shows the location of all potential weak points in the panel.

TABLE 1 Common Types of Potential Weak Points and Shot Details

Types of Potential Weak Points	Number of Shots	Location of Shot Impact Relative to Weak Point
Mounting holes, mounting points, or mounting brackets	1	45 mm ± 6 mm (1¾ in. ± ¼ in.)
Adjacent to cutouts for vehicle door mechanisms	1	45 mm ± 6 mm (1¾ in. ± ¼ in.)
Corners	1	45 mm ± 6 mm (1¾ in. ± ¼ in.) of corner midpoint
Seams, folds, or bends	1	0 mm + 6 mm (0 in. + ¼ in.) of seam midpoint
Joints in multi-part panels	1	0 mm + 6 mm (0 in. + ¼ in.) of joint centerline
Edges	2	45 mm ± 6 mm (1¾ in. ± ¼ in.)

8.5.2 The testing laboratory shall determine which of the weak points of each type identified will be shot based on visual examination of the test items and the drawing provided by the supplier.

NOTE 4—Every weak point of each type identified is not required to be shot because it is assumed that all similar weak points will perform the same during testing.

8.5.3 Common types of potential weak points and required shots for each are described in Table 1. If any of these weak points is not present on a panel, the respective shot(s) shall be taken at other weak points listed in Table 1.

8.5.4 Other (uncommon) potential weak points not listed in Table 1 may be present in a panel. At least one of each type of uncommon potential weak point shall be shot, and the shot impact shall be 0 mm to 12.7 mm (0 in. to ½ in.) from the weak point.

8.5.5 The purchaser may specify additional weak points to be tested.

8.5.6 When possible, different weak points shall be targeted on the two test items for each threat. However, when assessing areas adjacent to door handle cutouts, the area near the handle location shall be targeted on both test items. Fig. 1 provides an example of shot locations on a single-piece test item, and Fig. 2 provides an example of shot locations on a multi-piece panel.

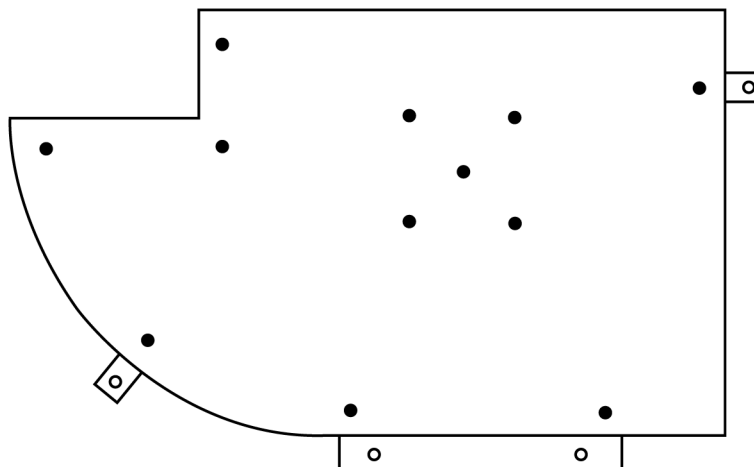
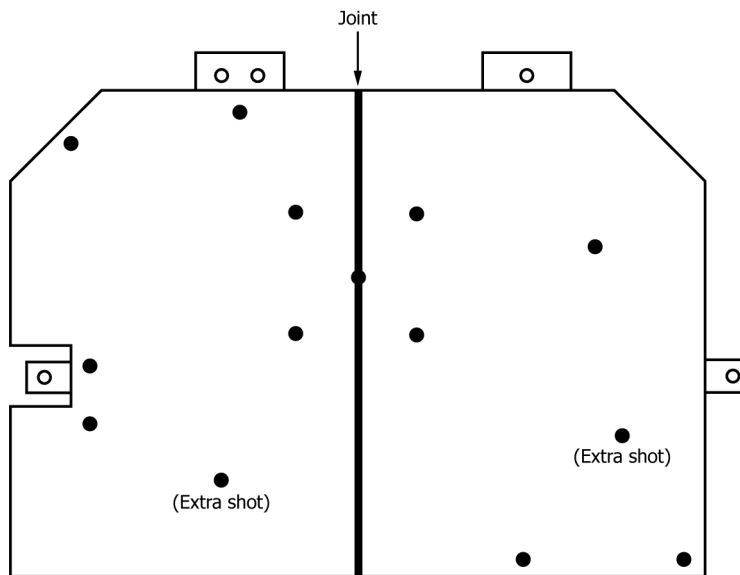


FIG. 1 Example of Shot Locations on a Single-Piece Test Item



Note: This example shows extra shots that may be taken in addition to the required 12 shots.

FIG. 2 Example of Shot Locations on a Multi-piece Test Item

8.6 Perform the ballistic testing and reporting of test results following the requirements of Test Method E3112 – 17.

9. Documentation Requirements

9.1 The supplier shall make available at least the following documentation as part of the written user information:

- 9.1.1 Protection level of the panel.
- 9.1.2 Threats that the product has been tested to protect against.
- 9.1.3 Certification or testing to standards.
- 9.1.4 Drawing showing dimensions of panel with respect to the vehicle door for which the panel was designed.
- 9.1.5 Intended environmental conditions for use (such as operating temperature range).
- 9.1.6 End-of-life recommendations for proper disposal.
- 9.1.7 Warranty information, including time period and what the warranty covers (for example, performance, workmanship, and materials).

10. Product Marking Requirements

10.1 The product shall have a product label permanently attached containing the following information:

- 10.1.1 Name and legal address of the supplier or manufacturer.
- 10.1.2 Address of manufacturing location (city, state/province, country).

10.1.3 Date of manufacture (that is, month and year).

10.1.4 Model designation.

10.1.5 Serial number.

10.1.6 Size (for example, mm² or in.²) and weight of the panel.

10.1.7 Applicable standard(s) and ballistic threats tested and passed.

10.1.8 Warranty period.

11. Test Laboratory

11.1 The test laboratory shall develop a test report that meets the requirements of Test Method E3112 – 17 and includes the following:

- 11.1.1 If any testing was subcontracted, include details.
- 11.1.2 Statement that test report applies only to models represented by the items tested.
- 11.1.3 Statement that test report shall be used in its entirety.

11.2 The test laboratory shall assess the documentation and product markings as specified in Sections 9 and 10, and the results shall be documented in the test report.

12. Keywords

12.1 ballistic; ballistic resistant vehicle door panel; vehicle door panel

ANNEX
(Mandatory Information)
A1. VEHICLE DOOR PANEL PERFORMANCE LEVELS, TEST THREATS, AND SHOT REQUIREMENTS

A1.1 This specification identifies three ASTM vehicle door panel (VDP) ballistic protection levels, one for handgun (HG) protection and two for rifle (RF) protection:

ASTM-VDP-HG2
ASTM-VDP-RF1/RF2
ASTM-VDP-RF3

TABLE A1.1 Test Threats and Velocities

NOTE 1—Due to the similarity of other non-conforming projectiles, the projectiles should be traceable to the original manufacturer. Generally, projectiles bought in bulk in the manufacturer’s packaging or projectiles taken from cartridges that confirm provenance either through headstamps or the cartridge manufacturer’s packaging provide this traceability.

Vehicle Door Panel (VDP) Performance Levels	Threat #	Test Threat	Test Threat Velocity
ASTM-VDP-HG2	T1	Handgun, 9 mm Luger FMJ RN 124 grain	448 m/s ± 9.1 m/s (1470 ft/s ± 30 ft/s)
	T2	Handgun, .44 MAG JHP 240 grain	436 m/s ± 9.1 m/s (1430 ft/s ± 30 ft/s)
ASTM-VDP-RF1/RF2	T3	Rifle, 7.62 × 51 mm M80 Ball NATO FMJ Steel Jacket, 147 +0/-3 grain (U.S. military supply or rounds meeting NATO specifications)	847 m/s ± 9.1 m/s (2780 ft/s ± 30 ft/s)
	T4	Rifle, 7.62 × 39 mm, MSC Ball Ammunition Type 56 from Factory 31, 123 grain	732 m/s ± 9.1 m/s (2400 ft/s ± 30 ft/s)
	T5	Rifle, 5.56 mm M193, 56 +0/-2 grain (U.S. military supply or rounds meeting NATO specifications)	990 m/s ± 9.1 m/s (3250 ft/s ± 30 ft/s)
	T6	Rifle, 5.56 mm M855 BT, 61.8 ± 1.5 grain (U.S. military supply or rounds meeting NATO specifications)	950 m/s ± 9.1 m/s (3115 ft/s ± 30 ft/s)
ASTM-VDP-RF3	T7	Armor-piercing Rifle, 30.06 M2 AP, 165.7 +0/-7 grain (U.S. military supply or rounds meeting NATO specifications)	878 m/s ± 9.1 m/s (2880 ft/s ± 30 ft/s)

TABLE A1.2 Shot Requirements for Air-backed or Car Door-backed Test Items

Vehicle Door Panel (VDP) Performance Levels	Threat #	Minimum Shots per Test Item and Shot Details	Obliquity of Shots ^A (Per Test Item)
ASTM-VDP-HG2	T1	12 shots per threat: 5-shot dice pattern in center of test item; 7 shots at perceived weak points	5-shot dice pattern: Shot #4 at 15° Shot #5 at 45° Other shots at 0°
	T2		
ASTM-VDP-RF1/RF2	T3	12 shots per threat: 5-shot dice pattern in center of test item; 7 shots at perceived weak points	5-shot dice pattern: Shot #4 at 15° Shot #5 at 45° Other shots at 0°
	T4		
	T5		
	T6		
ASTM-VDP-RF3	T7	12 shots per threat: 5-shot dice pattern in center of test item; 7 shots at perceived weak points	5-shot dice pattern: Shot #4 at 15° Shot #5 at 45° Other shots at 0°

^A For shot 4, the test item shall be rotated 15° clockwise about the axis of rotation (so that shot is taken toward the axis of rotation). For shot 5, the test item shall be rotated 45° counterclockwise about the axis of rotation (so that shot is taken toward the axis of rotation). The axis of rotation shall be vertical regardless of the orientation of the shot pattern on the face of the test item.