



Designation: E3141/E3141M – 24

Standard Test Method for Ballistic Resistant Shields for Law Enforcement¹

This standard is issued under the fixed designation E3141/E3141M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

This test method for the ballistic resistance of shields has been prepared after consideration of the features of ballistic-resistant shields and of potential vulnerabilities. Specifically, the tests have been designed to target the face of the shield, the viewports, the handle support structures, and lights or any other attachments to the body of the shield. This test method addresses ballistic resistance of shields used by law enforcement and corrections.

This test method is to be used in conjunction with documents created by other concerned parties that establish performance levels through the specification of threats and other requirements.

1. Scope

1.1 This test method² applies to personal protective ballistic-resistant shields.

1.2 The intent of this test method is to evaluate the ballistic resistance of shield products for law enforcement.

1.3 Certifiers, purchasers, and other users of this test method will specify the ballistic test threats to be used. Within this test method, the reference defining the ballistic test threats will be called the “test threats document.”

1.4 In this test method, “other standards and specifications” and “unless specified elsewhere” refer to documents (for example, military standards, purchase specifications) that require the use of this test method. Certifiers, purchasers, and other users are responsible for the “other standards and specifications” and for specifying any requirements that supersede those of this test method.

1.5 *Units*—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. Tests conducted using either system maintain repeatability and reproducibility of the test method and results are comparable.

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 and Ballistic Protection
E3062/E3062M Specification for Indoor Ballistic Test Ranges for Small Arms and Fragmentation Testing of Ballistic-resistant Items
E3078/E3078M Practice for Conditioning of Hard Armor Test Items

E3112/E3112M Test Method for Ballistic-resistant Products and Shoot Packs

2.2 *U.S. Department of Defense Standard*:⁴

MIL-STD-810H Environmental Engineering Considerations and Laboratory Tests

2.3 *ISO/IEC Standard*:⁵

ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories

¹ This test method 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 This test method is subject to revision as indicated by changes to threats experienced by law enforcement practitioners and subject to review at least every five years.

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

⁴ Available from U.S. Department of Defense or http://everyspec.com/MIL-STD/MIL-STD-0800-0899/MIL-STD-810H_55998/.

⁵ 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>.



3. Terminology

3.1 For terms not defined in this test method, the following definitions of Terminology E3005 apply: *angle of incidence*, *complete penetration* (see 3.2.2), *shot-to-edge distance*, *shot-to-shot distance*, *strike face*, *test item*, *witness panel*, and *yaw*.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *ballistic layup, n*—the layering of ballistic materials through the thickness of the ballistic-resistant item under consideration.

3.2.1.1 *Discussion*—Ballistic materials are typically recorded from strike face to body side.

3.2.2 *complete penetration*—for purposes of this test method, definition 4 from Terminology E3005 applies: the result of a test threat impact if a hole is created through the witness panel.

3.2.3 *fastener, n*—hardware device or hardware system that mechanically joins or affixes two or more objects together; for helmets, shields, and other protective products, a fastener passes into or through the protective material and includes such devices as bolts, anchors, screws, and rivets.

3.2.3.1 *Discussion*—An example of a hardware device as a fastener is a bolt that joins a handle or light to the body of the shield. An example of a hardware system as a fastener is the combination of a bolt, washer, and nut.

3.2.4 *in conjunction with armor applique, n*—an armor applique that is designed to provide a specific level of ballistic protection only when layered with a specified model(s) of ballistic-resistant shield, helmet, or other protective product.

3.2.5 *opaque, adj*—not able to be seen through; not transparent.

3.2.5.1 *Discussion*—Functionally, non-opaque, transparent shield components act as viewports.

3.2.6 *perimeter corner, n*—location where two or more edges or curves meet on the perimeter of the shield body.

3.2.7 *shield handle, n*—a part of the shield designed to be grasped by the user's hand when the shield is deployed for protection against bullets.

3.2.7.1 *Discussion*—The shield handle may be made of rigid or flexible materials.

3.2.8 *spall, n*—particles of material from either the test item or the impacting projectile that are broken off as a result of the ballistic impact.

3.2.8.1 *Discussion*—For the purposes of this test method, spall includes secondary projectiles such as bolts or other fastenings that may be propelled toward the witness panel as a result of a test threat impact.

3.2.9 *strike face, n*—the surface of an armor panel or plate intended to face the incoming threat (Terminology E3005).

3.2.9.1 *Discussion*—For purposes of this test method, the term strike face refers to the surface of the test item intended to face the incoming threat.

3.2.10 *viewport, n*—for ballistic-resistant shields, the transparent protective material through which a person can see things on the other side of the shield.

4. Test Items

4.1 Test Item Requirements:

4.1.1 In this test method, a test item is a fully assembled product; however, when the shield contains a viewport (that is, transparent material or glazing material), the test item is allowed to be a viewport coupon.

4.1.1.1 A viewport coupon shall contain the viewport, its interface with the shield body, and the surrounding shield body, all of which shall be identical to the actual shield; when the shield contains a viewport, additional test items are allowed to be viewport coupons for viewport center, corner, and edge shots only.

4.1.1.2 For a viewport coupon, the distance from the viewport edge to any adjacent shield body edge shall be the minimum distance from the viewport edge, ± 6.0 mm [0.25 in.], to the shield body edge of the shield test items submitted for testing.

4.1.1.3 The viewport coupon may contain one or more viewports. If the viewport coupon contains multiple viewports, the distance between adjacent viewport edges shall be no more than twice the distance listed in 4.1.1.2. See Fig. 1 for a graphical representation of the distance requirements for viewport coupons.

4.1.2 Additional test item requirements, such as size and quantity, shall be specified in other standards and specifications.

4.2 Inspect all test items for defects, including wrinkles, blisters, cracks or fabric tears, fraying, crazing, or chipped or sharp corners and edges. Document all defects in the test report.

4.3 Inspect all test items for variations in size, appearance, materials, and manner of construction compared to other submitted test items. Document all observed variances in the test report.

4.4 *Examination of Test Item Subcomponents*—This section provides guidelines for identifying regions of identical construction and regions of unique construction.

4.4.1 *Ballistic Layup*—Evaluate the shield to identify regions of identical construction. Regions are considered identical if they have identical layups of ballistic materials through the thickness of the shield. Each region of the ballistic shield that is not identical is considered to be unique.

4.4.2 *Viewport Features*—If the shield design incorporates a viewport, examine the viewport to identify identically constructed corners and edges.

4.4.2.1 Corners may be rounded or squared. Two corners are considered to be identically constructed if the design is determined to be identical in form and function exclusive of corner angle or radius. Any corners that are not found to be identically constructed are considered to be unique.

(1) For a viewport corner within 2 in. of the shield body edge, the viewport corner shot shall be taken at that corner even though the shot-to-edge distance requirement is not met.

4.4.2.2 Edges are considered identical if the design is determined to be identical in form and function exclusive of edge length. Any edges that are not found to be identically constructed are considered to be unique.