Designation: ~~E3368/E3368M – 23~~ E3368/E3368M – 23a

Standard Specification for Ballistic-Resistant Helmets Worn by U.S. Public Safety Officers[1]

This standard is issued under the fixed designation E3368/E3368M; 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.

1. Scope

1.1 This specification specifies minimum performance requirements and test methods for the ballistic resistance of helmets used by U.S. public safety officers and intended to protect the head against handgun and rifle ammunition.

1.1.1 The test methods within this specification were developed and validated for broadly available helmet designs. Some helmet designs may require additional or different testing than that specified in this specification.

1.2 This specification addresses ballistic performance in terms of:

1.2.1 Helmet resistance to penetration (RTP) of shell, fasteners, and weak points;

1.2.2 Helmet shell ballistic limit (V50); and

1.2.3 Face shield RTP and deformation.

1.3 Helmets covered by this specification are classified into RTP ballistic protection levels (see Section 8).

1.4 This specification addresses non-ballistic performance in terms of:

1.4.1 Helmet impact attenuation;

1.4.2 Helmet shell compression resistance;

1.4.3 Face shield resistance to blunt impact, deflection, and projectile impact;

1.4.4 Face shield optics; and

1.4.5 Retention system strength.

1.5 Backface deformation (BFD) measurement is not addressed as a requirement for compliance with this specification. If the user of this specification is interested in BFD measurement, see 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.

Current edition approved ~~Jan. 1, 2023~~May 1, 2023. Published ~~February 2023~~June 2023. Originally approved in 2023. Last previous edition approved in 2023 as E3368/E3368M – 23. DOI: ~~10.1520/E3368_E3368M-23.~~10.1520/E3368_E3368M-23A.

1.6 Armor appliques are not addressed within this version of the specification.

1.7 This specification is applicable for compliance testing, verification testing, certification testing, or research and development testing.

1.8 This specification is divided into the following sections:

Section	Title
1	Scope
2	Referenced Documents
3	Terminology
4	Significance and Use
5	Test Threats, Equipment, and Materials
6	Test Item Requirements
7	Procedure for Visual Examination
8	Helmet Resistance to Penetration (RTP) Ballistic Protection Levels and Test Threats
9	Ballistic Performance Requirements for Helmet Shell RTP and BFD
10	Ballistic Performance Requirements for Face Shields
11	Ballistic Performance Requirements for Helmet Shell Ballistic Limit (V50)
12	Ballistic Performance Requirements for Fasteners
13	Ballistic Performance Requirements for Weak Points
14	Non-ballistic Performance Requirements for Helmets and Face Shields
15	Product Documentation Requirements
16	Product Label and Package Label Requirements
17	Test Report
18	Keywords
Annex A1	ASTM Helmet RTP Ballistic Protection Levels and Associated Test Threats
Annex A2	Ballistic Testing Summary
Annex A3	Non-ballistic Testing Summary
Appendix X1	Optional Backface Deformation Measurement Acceptance Criteria and Test Procedure

1.9 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.10 *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.*

1.11 *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:*[2]

E3005 Terminology for Body Armor

E3062/E3062M Specification for Indoor Ballistic Test Ranges for Small Arms and Fragmentation Testing of Ballistic-resistant Items

E3111/E3111M Test Methods for Ballistic Resistant Head Protection

~~E3236/E3236M Specification for Ballistic-resistant Barriers Used in Homeland Security or Public Safety Applications~~

E3299/E3299M Test Methods for Compression Resistance of Helmets

E3342/E3342M Specification for Nonballistic-resistant Helmets Specifically Designed to be Worn by Law Enforcement and Corrections Officers When Maintaining Order in Violent Situations

E3343/E3343M Test Methods for Nonballistic-resistant Helmets Worn by Law Enforcement and Corrections

2.2 *Other Standards:*

ANSI/SAAMI Glossary of Terms[3]

ANSI/ISEA Z87.1 American National Standard for Occupational and Educational Personal Eye and Face Protection Devices[3]

[2] 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.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories[4]
MIL-DTL-46593B (with Amendment 1) Detail Specification: Projectile, Calibers .22, .30, .50, and 20 mm Fragment Simulating[5]

3. Terminology

3.1 *Definitions:*

3.1.1 The following terms and definitions from Terminology E3005 are applicable.

3.1.2 *ammunition, n*—one or more loaded cartridges consisting of case, primer, propellant, and one or more projectiles.

3.1.3 *backface deformation, BFD, n*—the indentation in the backing material caused by a projectile impact on the test item during testing; synonymous with *backface signature*.

3.1.4 *ballistic resistance, n*—a characteristic of protective equipment or materials describing their ability to provide protection from projectiles.

3.1.5 *cartridge, n*—a single assembled unit consisting of a bullet, propellant, primer, and the case; synonymous with *round*.

3.1.6 *conditioning, n*—a process that exposes an item, prior to testing, to a specified controlled environment or physical stresses, or both.

3.1.7 *fair hit, n*—a test threat impact (on a test item) that meets all specified requirements in a particular test method.

3.1.8 *model, n*—the manufacturer's design, with unique specifications and characteristics, of a particular item.

3.1.9 *shot-to-edge distance, n*—the distance from the center of the projectile impact to the nearest test item edge.

3.1.10 *shot-to-shot distance, n*—the distance from the center of the projectile impact to the center of any other projectile impact on the test item.

3.1.11 *supplier, n*—the party that is responsible for ensuring that products meet and, if applicable, continue to meet, the requirements of an ASTM specification, a purchase specification, a contract, or an independent, third-party conformity assessment body (e.g., certifier, testing laboratory).

3.1.12 *test item, n*—a single article intended for testing.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *armor applique, n*—a removable unit of protective material (soft armor or hard armor) intended to be placed over the strike face of a protective product, such as a ballistic-resistant helmet or shield, to enhance ballistic protection in a localized area.

4. Significance and Use

4.1 The purpose of this specification is to provide performance requirements and test methods for the evaluation of ballistic helmets worn by public safety officers.

4.2 This specification may be used by suppliers, certification bodies, testing laboratories, research and development organizations, and others assessing the performance of ballistic helmets.

4.3 The specification may be used by purchasers in their evaluation of products to meet their needs and requirements.

[4] Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, https://www.iso.org.
[5] Available online at ASSIST Quick Search, http://quicksearch.dla.mil.

5. Test Threats, Equipment, and Materials

5.1 The test range shall meet the requirements of Specification E3062/E3062M (including the temperature and humidity requirements).

5.1.1 No firearms shall be used for testing.

NOTE 1—Specification E3062/E3062M allows the use of a universal receiver or firearm for testing. This specification does not allow use of firearms for testing.

5.2 The following equipment shall meet the requirements of Test Methods E3111/E3111M, Section 6, Test Equipment and Apparatus: yaw-measuring equipment, headforms, test item fixtures, witness panels, conditioning chambers, dunk tanks, weatherometers, and laser scanning equipment.

5.3 Equipment for non-ballistic testing shall meet the requirements of the relevant sections of Test Methods E3343/E3343M and E3299/E3299M.

5.4 Equipment for test item conditioning shall be as described in Test Methods E3111/E3111M, Section 10, Conditioning of Test ~~Items~~Items.

6. Test Item Requirements

6.1 Test items shall be actual products that are sized as specified in Sections 9 – 14 of this specification.

6.2 All test items shall be identical in materials of construction and material configuration.

NOTE 2—According to Test Methods E3111/E3111M the supplier shall supply a build sheet and dimensioned diagram.

6.3 Test items of the same size shall be identical in construction.

7. Procedure for Visual Examination

7.1 Verify the group of test items for correct quantity and sizes.

7.2 Examine the group of test items for variations in appearance, materials, and manner of construction.

7.3 Prior to conditioning, photograph at least one test item of each size to document the features.

7.4 Following conditioning, examine the test items for visible damage due to conditioning and photograph any test items showing such damage.

8. Helmet Resistance to Penetration (RTP) Ballistic Protection Levels and Test Threats

8.1 Helmets submitted for testing to this specification shall be evaluated for RTP.

8.1.1 The supplier shall declare the intended RTP ballistic protection level for the helmet model being submitted for testing to this specification.

8.2 This specification identifies five ASTM helmet RTP ballistic protection levels, two for handgun (HG) protection and three for rifle (RF) protection:

8.2.1 ASTM-Helmet-HG1,

8.2.2 ASTM-Helmet-HG2,

8.2.3 ASTM-Helmet-RF1,

8.2.4 ASTM-Helmet-RF2, and

8.2.5 ASTM-Helmet-RF3.

8.3 The RTP ballistic protection levels and associated test threats are as shown in Table A1.1 of Annex A1.

9. Ballistic Performance Requirements for Helmet Shell RTP and BFD

9.1 The test item shall be tested as specified in Test Methods E3111/E3111M, Section 11, Helmet Resistance to Penetration (V0) and Back Face Deformation (BFD) Testing, with the following modifications:

9.1.1 The test items shall be ~~submitted in a size that fits~~ complete helmets (including face shields), sized to fit the required headform.

9.1.2 The tolerance for headform dimensions in Test ~~Method~~Methods E3111/E3111M, Figs. A1.1 – A1.6, shall be ±1 mm.

9.1.3 The test items shall be subjected to the sequence of conditioning procedures from Test Methods E3111/E3111M, Section 10, prior to ballistic testing as shown in Fig. 1.

9.1.3.1 The water immersion conditioning procedure from Test Methods E3111/E3111M, subsection 10.3, shall be performed with the modification that ballistic testing shall not directly follow removal of the test item from the liquid.

(1) After removal from the liquid, the test item shall be drained crown side up at controlled ambient conditions for 24 h + 2 h before the subsequent extreme temperature conditioning procedure.

9.1.3.2 There is no specified waiting time required between controlled ambient conditioning, artificial weathering, and water immersion.

9.1.4 Following extreme low or high-temperature conditioning, ballistic testing shall be completed on the test item within 30 min of removal from conditioning.

9.1.4.1 In accordance with Test Methods E3111/E3111M, ~~Section~~subsection 10.2.5, if ballistic testing cannot be completed within 30 min and the test item has been out of temperature conditioning for 1 h or less, recondition the test item at the extreme

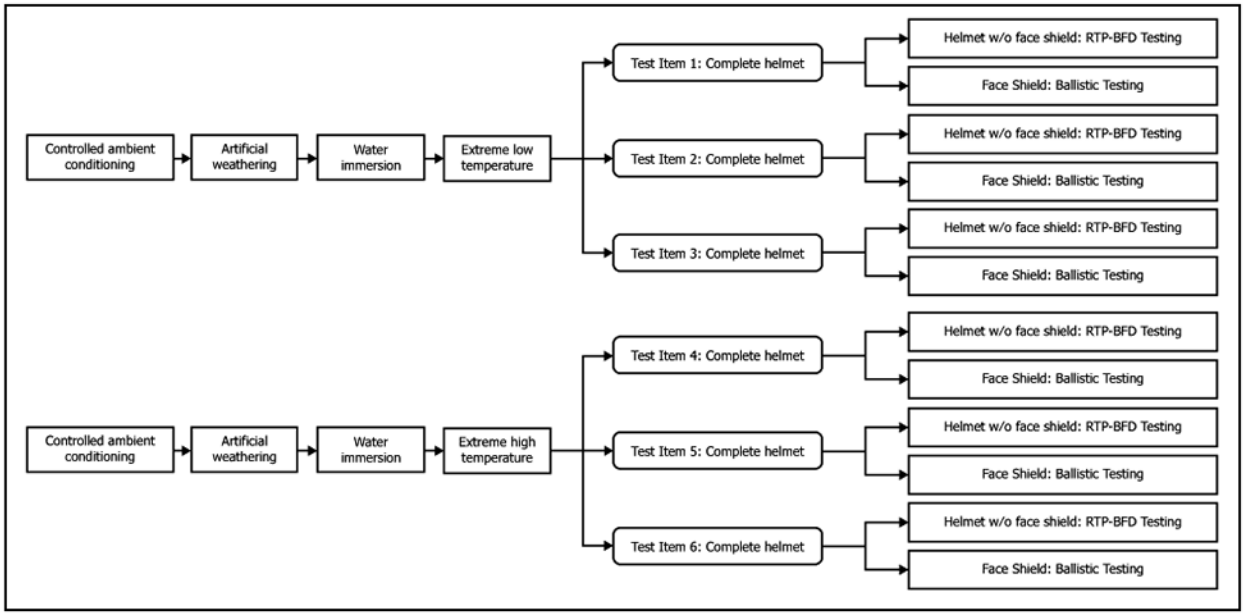

FIG. 1 Conditioning and Testing Sequence for Helmet Shell and Face Shield RTP

temperature for a minimum of 1 h before continuing ballistic testing. If the test item has been out of the temperature conditioning chamber for more than 1 h, recondition the test item at the extreme temperature for at least 24 h before continuing ballistic testing.

9.2 *RTP Performance Requirements:*

9.2.1 Each test item shall withstand the required fair hits and shall experience no complete penetrations.

9.2.1.1 For helmet shell tests, a complete penetration occurs when the projectile or a fragment of the projectile passes through the shell, as evidenced by the presence of that projectile or projectile fragment on, or in, the clay.

9.2.1.2 Nonmetallic material, such as paint, fibrous materials, edging, or edging adhesive that is emitted from the helmet and rests on the outer surface of the clay impression is not considered a complete penetration.

9.2.2 Any complete penetration by a fair hit shall be considered a failure.

10. Ballistic Performance Requirements for Face Shields

10.1 For helmets that have ballistic-resistant face shields, the test item shall be tested as specified in Test Methods E3111/E3111M, Section 13, Face Shield Ballistic Testing, with the following modifications:

10.1.1 At least ~~nine~~six test items are required per test threat.

10.1.2 The test items shall be face shields that are mounted on helmets.

10.1.3 ~~The~~ For ballistic testing, the helmet shall be clamped in the clamping fixture on each side and the rear of the helmet.

10.1.4 The test items shall be subjected to the sequence of conditioning procedures from Test Methods E3111/E3111M, Section 10, prior to ballistic testing as shown in Fig. 1.

10.1.4.1 The water immersion conditioning procedure from Test Methods E3111/E3111M, subsection 10.3, shall be performed with the modification that ballistic testing shall not directly follow removal of the test item from the liquid.
(1) After removal from the liquid, the test item shall be drained crown side up at controlled ambient conditions for 24 h + 2 h before the subsequent extreme temperature conditioning procedure.

10.1.4.2 There is no specified waiting time required between controlled ambient conditioning, artificial weathering, and water immersion.

10.1.5 Following extreme low or high temperature conditioning, ballistic testing shall be completed on the test item within 30 min of removal from conditioning.

10.1.5.1 In accordance with Test Methods E3111/E3111M, subsection 10.2.5, if ballistic testing cannot be completed within 30 min and the test item has been out of temperature conditioning for 1 h or less, recondition the test item at the extreme temperature for a minimum of 1 h before continuing ballistic testing. If the test item has been out of the temperature conditioning chamber for more than 1 h, recondition the test item at the extreme temperature for at least 24 h before continuing ballistic testing.

10.2 *Performance Requirements:*

10.2.1 There shall be no complete penetration as evidenced by the projectile or any fragments from the projectile or face shield being present in the clay witness material.

10.2.2 Face shield deflection shall be less than 30.0 mm [1.18 in.] as evidenced by contact indicator material being present on the rear of the face shield.

10.2.3 There shall be no visible damage to the face shield attachment points.

11. Ballistic Performance Requirements for Helmet Shell Ballistic Limit (V50)

11.1 The test item shall be tested as specified in Test Methods E3111/E3111M, Section 12, Helmet Ballistic Limit (V50) Testing, with the following modifications:

11.1.1 At least ~~five~~ three mid-sized test items are ~~required per available helmet size in the marketplace, per~~ required, per test threat, to perform the required ~~conditioning procedures~~controlled ambient conditioning procedure from Test Methods E3111/E3111M, ~~Section 10,~~subsection 10.2.1, prior to ballistic testing as shown in Fig. 2.

~~11.1.2 Following extreme low or high temperature conditioning, ballistic testing shall be completed on the test item within 30 min of removal from conditioning.~~

~~11.1.2.1 In accordance with Test Methods E3111/E3111M, Section 10.2.5, if ballistic testing cannot be completed within 30 min and the test item has been out of conditioning for 1 h or less, recondition the test item for a minimum of 1 h before continuing ballistic testing. If the test item has been out of the conditioning chamber for more than 1 h, recondition the test item for at least 24 h before continuing ballistic testing.~~

11.1.2 The required test threat shall be the 17-grain skirted fragment simulating projectile (FSP) as specified in ~~MIL-DTL46593B,~~ MIL-DTL-46593B, Amendment 1.

11.1.3 A V50 shall be calculated and documented for each ~~helmet size for each conditioning procedure.~~ test item. From all of the documented V50 values, the lowest V50 value obtained shall be reported as the minimum V50 for the helmet.

11.1.4 A complete penetration occurs when the test projectile, any fragment of the test projectile, or any fragment of the helmet shell, has damaged the witness panel such that the light from a light source equivalent to at least ~~800 lumens~~ 800 lm can be seen through the witness panel.

11.1.4.1 If the witness panel is broken by the deformation of the helmet shell, then the determination of a partial penetration or complete penetration shall be made based on whether there is an evident perforation through the helmet shell. In this case, the test laboratory shall determine whether there was a complete penetration. If it is unclear, then the shot will be repeated on the next shot location.

11.2 *Performance Requirements:*

11.2.1 There is no minimum V50 requirement.

12. Ballistic Performance Requirements for Fasteners

12.1 The test item shall be tested as specified in Test Methods E3111/E3111M, Section 14, Fastener RTP Testing, with the following modifications:

12.1.1 The test items shall be submitted in sizes that fit the required headform.

12.1.2 For each unique type of fastener (whether the fastener goes partially into or through the shell), the following shots are required:

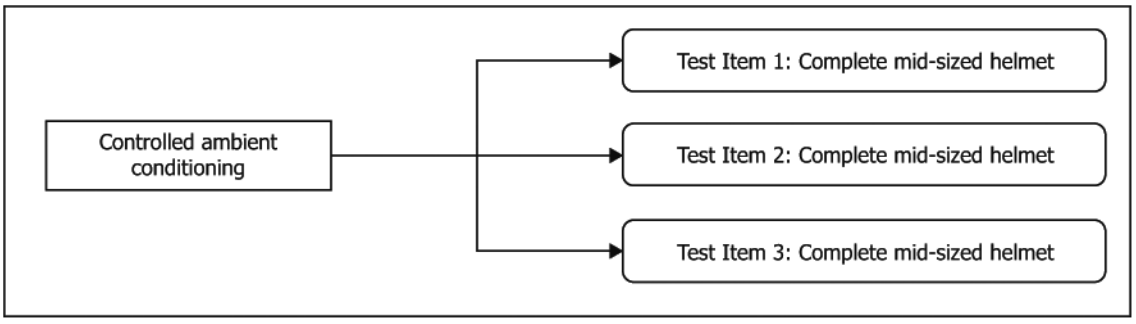

FIG. 2 Conditioning and Testing Sequence for Helmet Shell Ballistic Limit