



Designation: E2740 – 12

## Standard Specification for Trash Receptacles Subjected to Blast Resistance Testing<sup>1</sup>

This standard is issued under the fixed designation E2740; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification provides performance requirements for trash receptacles when subjected to the explosive tests described in Test Method E2639.

1.1.1 These trash receptacles are intended for use in public spaces.

1.2 *Units*—The values stated in SI units are to be regarded as the standard. The values stated in parentheses are for information only.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

D638 Test Method for Tensile Properties of Plastics

D747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam

D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D882 Test Method for Tensile Properties of Thin Plastic Sheeting

D883 Terminology Relating to Plastics

D5947 Test Methods for Physical Dimensions of Solid Plastics Specimens

E2639 Test Method for Blast Resistance of Trash Receptacles

2.2 *Government Standards:*

DOD 4145.26 M Department of Defense: DOD Contractors' Safety Manual for Ammunition and Explosives<sup>3</sup>

DOD 6055.9 STD Department of Defense: DOD Ammunition and Explosives Safety Standards<sup>4</sup>

UFC 3-340-02 Department of Defense: Structures to Resist the Effects of Accidental Explosions (supersedes TM 5-1300)<sup>5</sup>

### 3. Terminology

3.1 For terminology generally associated with explosives, refer to the glossaries given in DOD 4145.26 M and DOD 6055.9 STD.

3.1.1 Some of the definitions in this standard (3.2) are either adopted as exact copies, or are adapted, from DOD 4145.26 M. Where adapted, changes to the DOD definitions were made only to clarify the meaning or to incorporate related terms that also are defined in this terminology section.

3.1.2 The DOD source is identified parenthetically at the right margin following the definition.

3.2 *Definitions:*

3.2.1 *bare charge, n*—explosive charge that is either not encased or is encased by a material, such as a cardboard tube, that will not produce primary fragments.

3.2.2 *detonation, n*—(1) a violent chemical reaction within a chemical compound or mechanical mixture resulting in heat and pressure; (2) a reaction that proceeds through the reacted material toward the unreacted material at a supersonic velocity.

3.2.2.1 *Discussion*—The result of the chemical reaction is exertion of extremely high pressure on the surrounding medium forming a propagating shock wave that is originally of supersonic velocity. **DOD 4145.26 M**

3.2.3 *explosion, n*—chemical reaction of any chemical compound (or mechanical mixture) that, when initiated, undergoes

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from the Defense Technical Information Center, 8725 John J. Kingman Road, Suite 0944, Ft. Belvoir, VA 22060 6128.

<sup>4</sup> Available from the worldwide web at: <http://www.doesb.pentagon.mil/DoD6055.9-STD%205%20Oct%202004.pdf>.

<sup>5</sup> Available from the worldwide web at: [http://www.wbdg.org/ccb/DOD/UFC/ufc\\_3\\_340\\_02\\_pdf.pdf](http://www.wbdg.org/ccb/DOD/UFC/ufc_3_340_02_pdf.pdf).

a very rapid combustion or decomposition releasing large volumes of highly heated gases that exert pressure on the surrounding medium. **DOD 4145.26 M**

3.2.4 *explosive, n*—any chemical compound (or mechanical mixture) that, when subjected to heat, impact, friction, detonation, or other suitable initiation, undergoes a very rapid chemical change with the evolution of large volumes of highly heated gases that exert pressures in the surrounding medium. **DOD 4145.26 M**

3.2.5 *fragment, n*—solid material propelled from an explosion as a result of fragmentation.

3.2.5.1 *primary fragment, n*—fragment produced from the explosive device itself.

3.2.5.2 *secondary fragment, n*—fragment produced from the container or environment where the container is placed; a piece of receptacle broken off as a result of the charge being detonated inside of it.

3.2.6 *fragmentation, n*—breaking up of the confining material of a chemical compound (or mechanical mixture) when an explosion takes place. **DOD 4145.26 M**

3.2.7 *overpressure, n*—pressure, exceeding the ambient pressure, manifested in the shock wave of an explosion. **DOD 4145.26 M**

3.2.8 *rigid plastic, n*—for purposes of general classification, a plastic that has a modulus of elasticity, either in flexure or in tension, greater than 700 MPa (100 000 lbf/in.<sup>2</sup>) at 23°C (73°F) and 50 % relative humidity when tested in accordance with Test Method **D747**, Test Methods **D790**, Test Method **D638**, or Test Method **D882**.

3.2.9 *silhouette, n*—witness panel that is constructed in the approximate shape of a human.

3.2.10 *trash receptacle, n*—public or commercial use refuse bin that holds discarded items until collected.

3.2.10.1 *Discussion*—The capacity of a trash receptacle specified according to this standard is typically less than 200 L (50 gal).

3.2.11 *trash receptacle lid, n*—a removable or hinged cover that fits over the open hollow of the receptacle.

3.2.11.1 *Discussion*—A lid component is normally fitted to the configuration of the top opening of the trash receptacle and is manufactured by means of a molding process using a rigid plastic having a relatively low tensile or flexural modulus, 1000 MPa (150 000 lbf/in.<sup>2</sup>) maximum. The thickness of a section (for example, top) of a typical lid generally does not exceed 5 mm (3/16 in.).

3.2.12 *trash receptacle liner, n*—a removable lining that is provided within a trash receptacle to retain liquids and fluid-like materials that seep from trash.

3.2.12.1 *Discussion*—This component is normally fitted to the configuration of the interior of the trash receptacle and is manufactured by means of a molding process using a rigid plastic having a relatively low tensile or flexural modulus, 1000 MPa (150 000 lbf/in.<sup>2</sup>) maximum. The wall thickness of a typical liner generally does not exceed 5 mm (3/16 in.).

3.2.13 *trash receptacle rubbish bag, n*—a removable, replaceable container that is provided within a trash receptacle to allow collected trash (that is, rubbish) to be removed from the receptacle and moved to a disposal location.

3.2.13.1 *Discussion*—This bag is normally of a volume capacity to fit the configuration of the interior of the trash receptacle. It is manufactured from a plastic film generally having a thickness of less than 0.16 mm (0.006 in.).

3.2.14 *witness panel, n*—flat, rectangular sheet-construction mounted upright within the explosion test arena for purposes of determining whether fragments are produced during the detonation of the specimen.

### 3.3 Definitions of Terms Specific to This Standard:

3.3.1 *blast resistance, n*—for purposes of this standard specification, the non-numerical attribute of a trash receptacle that is established when the results of explosive testing of the submitted specimens meet all performance requirements given in this specification.

3.3.2 *force protection, n*—numerical level of blast resistance of a trash receptacle expressed in the mass of trinitrotoluene (TNT) explosive.

## 4. Ordering Information

4.1 Purchase orders for each trash receptacle specimen meeting the requirements of this specification shall list the model and desired force protection required in kilograms (pounds) of TNT.

4.2 Purchase orders shall also list the physical trash content size of the receptacle in liters (gallons) along with desired finishes and other requirements associated with the physical attributes of the trash receptacle.

## 5. Materials and Manufacture

5.1 The materials and method of manufacture shall be at the discretion of the manufacturer sufficient to meet the performance requirements of this specification.

## 6. Workmanship

6.1 The trash receptacles shall have no defects that will adversely affect their service qualities.

## 7. Number of Tests and Retests

7.1 *Test Specimens*—Each explosive test shall be performed on a new, undamaged trash receptacle.

7.2 *Number of Test Specimens*—The minimum number of test specimens submitted for each force protection level test shall be three. The manufacturer shall provide all three test specimens at one time.

7.3 *Retests*—Only one retest is allowed per group of submitted test specimens.

7.3.1 If upon testing, one of the trash receptacle specimens in the group submitted does not meet the requirements of this specification, the manufacturer shall provide a new specimen for retesting.

7.3.1.1 If this retest specimen does not meet the requirements of this specification, the entire force protection level

group of specimens including test specimens that may or may not have been tested shall be rejected. The group shall be considered not to meet the requirements of this specification. The manufacturer shall provide three new specimens for retesting.

7.3.2 If upon testing, two or more trash receptacle specimens in the group submitted do not meet the requirements of this specification, the manufacturer shall provide three new specimens, all of which shall be subject to retesting.

## 8. Specimen Mounting

8.1 The trash receptacle test specimen shall be placed on the test platform in accordance with the manufacturer's written instructions subject to the requirements of Test Method E2639, paragraph 13.1.

## 9. Test Method

9.1 *Testing*—The trash receptacle test specimens shall be tested according to the requirements of Test Method E2639. Each test specimen shall be tested separately from the others in the group submitted with the charge at one of three different locations. The testing laboratory shall randomly select the individual test specimen for each test from the group submitted.

9.1.1 Trash receptacles including accessory components shall be tested as supplied by the manufacturer for in-use service. For example, if the trash receptacle is intended to have a lid in service, it shall be tested with the lid in place. The lid shall be secured to the receptacle as recommended by the manufacturer.

9.1.1.1 Typical trash receptacle accessory components supplied by manufacturers for in-use service include lids, trash receptacle liners, and trash receptacle rubbish bags.

9.2 *The Explosive Charge*—The mass of the explosive charge shall be agreed upon between the manufacturer and the buyer.

NOTE 1—In practice, the buyer is expected to have knowledge of the force protection level required of the trash receptacles being considered for purchase. Based on this knowledge, the manufacturer and buyer are expected to discuss the availability of products meeting the required force protection level, which in turn would lead to agreement on the mass of charge to be used in the testing.

9.2.1 The mass of the explosive charge shall be the same for all test specimens in the group submitted.

9.2.1.1 The force protection level of the trash receptacle specimen group submitted shall be the numerical mass of the explosive charge expressed in kilograms (pounds) of TNT.

9.3 *Explosive Charge Locations (for purposes of this specification):*

9.3.1 *Fragmentation Charge Test*—This test shall be conducted by placing the explosive charge at location 1, as described in Test Method E2639, paragraph 10.1.1 and Figures 1A and 1B.

9.3.2 *Bare Charge Test 1*—This test shall be conducted by placing the explosive charge at location 2, as described in Test Method E2639, paragraph 10.1.2 and Figures 1A and 1B.

9.3.3 *Bare Charge Test 2*—This test shall be conducted by placing the explosive charge at location 4, as described in Test

Method E2639, paragraphs 10.1.4 and 10.1.5 or 10.1.6, and Figures 1A, 1B, and 2.

9.4 *Testing Laboratory*—Testing shall be performed at an independent commercial or government explosive testing laboratory following conformance with applicable safety standards and laws. The testing laboratory shall have all required licenses and permits for explosive testing.

## 10. Performance Requirements

10.1 Trash receptacle specimens conforming to this specification shall meet the following performance requirements:

10.1.1 *Requirement Specific to the Fragmentation Charge Test:*

10.1.1.1 There shall be no perforation of the vertical exterior wall of the trash receptacle test specimen from a primary fragment. In addition, there shall be no perforation of silhouettes that are located 3 m (10 ft) and further from the center of the test platform.

NOTE 2—The requirement regarding no perforation of silhouettes located 3 m (10 ft) and further from the center of the test platform is based on considerations associated with existing technology and costs of producing trash receptacles that provide blast resistance. These products mitigate the effects of an explosion; in general they are not vessels that provide total containment of an explosion.

10.1.2 *Requirements for Either Fragmentation or Bare Charge Tests:*

10.1.2.1 The test specimen shall remain on the test platform and in the vertical position in which it was mounted or attached prior to detonation.

10.1.2.2 There shall be no release of metallic secondary fragments from either the interior surfaces of the test specimen or from the exterior surfaces including the top of the test specimen, as evidenced by examination of:

- (1) the witness panels, which shall show no impingement or perforation by metallic fragments,
- (2) the grounds within the 76 m (250 ft) diameter of the test arena, which shall show no metallic fragments due to the explosion, and
- (3) the high speed photography, which shall show no release of metallic fragments.

10.1.2.3 There shall be no visible fissure in the outer surface of the trash receptacle specimen exterior wall that is either greater than 15 mm (0.6 in.) in width, or greater than 100 mm (4 in.) in length.

10.1.2.4 There shall be no more than three separate visible fissures of any size in the outer surface of the exterior wall.

10.1.2.5 There shall be no direct opening from the exterior to the interior of the test specimen, as evidenced by probing all visible fissures in the exterior wall with a round, straight 4 mm ( $\frac{3}{16}$  in.) steel rod. A direct opening is present if the steel rod penetrates all the way through from the exterior to the interior of the specimen.

10.2 *Bulging*—Bulging of the exterior wall of a test specimen that conforms to the requirements in 10.1.1 and 10.1.2 does not constitute failure.

10.3 *Pressure Data:*

10.3.1 At the option of the user of this specification, pressure data can be collected using the guidance provided in