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Standard Test Method for Blast Resistance of Trash Receptacles[1]

This standard is issued under the fixed designation E2639; 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 test method provides a procedure for characterizing the performance of a trash receptacle when an explosive is detonated within the receptacle.

1.1.1 The procedure determines the extent and location of fragments produced during the explosion, and whether breaches are created in the exterior surfaces of the trash receptacle.

1.1.2 Appendix X1 provides guidance for determining the magnitude of blast waves (that is, external overpressures) developed.

1.1.3 Effects due to a fireball resulting from the detonation of an explosive within a trash receptacle are beyond the scope of the test method.

1.2 This test method is intended to be performed in open-air test arenas.

1.3 The values stated in SI units are to be regarded as the standard. The values stated in parentheses are for information only.

1.4 *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.*

1.5 *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]

D638 Test Method for Tensile Properties of Plastics

D747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam (Withdrawn 2019)[3]

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

E2740 Specification for Trash Receptacles Subjected to Blast Resistance Testing

2.2 *Government Standards:*

DOD 4145.26 M Department of Defense: DOD Contractors' Safety Manual for Ammunition and Explosives[4]

DOD 6055.9 STD Department of Defense: DOD Ammunition and Explosives Safety Standards[5]

Voluntary Product Standard PS 1 Structural Plywood[6]

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 *alias, n*—a false low-frequency component that appears when reconstructing analog data that are sampled at an insufficient rate.

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.

[1] This test method is under the jurisdiction of ASTM Committee E54 on Homeland Security Applications and is the direct responsibility of Subcommittee E54.01 on CBRNE Detection and CBRN Protection.

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[2] 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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from the Defense Technical Information Center, 8725 John J. Kingman Road, Suite 0944, Ft. Belvoir, VA 22060 6128.

[5] Available from the worldwide web at: http://www.ddesb.pentagon.mil/DoD6055.9-STD%205%20Oct%202004.pdf.

[6] Available from the worldwide web at http://ts.nist.gov/Standards/Conformity/upload/PS%201%20final%20complete%20w%20cover.pdf.

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*—a chemical reaction of any chemical compound (or mechanical mixture) that, when initiated, undergoes 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 *fireball, n*—a highly luminous, intensely hot cloud of dust, gas, and or vapor generated by an explosion.

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

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

3.2.6.2 *secondary fragment, n*—a 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.

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

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

3.2.9 *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.^{2}) 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. **D883**

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

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

3.2.11.1 *Discussion*—The capacity of a trash receptacle specimen subjected to the test procedure described in this standard is typically less than 200 L (50 gal).

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

3.2.12.1 *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.^{2}) maximum. The thickness of a section (for example, top) of a typical lid generally does not exceed 5 mm (3⁄16 in.).

3.2.13 *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.

3.2.13.1 *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.^{2}) maximum. The wall thickness of a typical liner generally does not exceed 5 mm (3⁄16 in.).

3.2.14 *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.

3.2.14.1 *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.).

3.2.15 *witness panel, n*—a 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.

4. Summary of Test Method

4.1 A trash receptacle is placed on a steel plate in the center of an explosive test arena (as described in Section 11).

4.2 An explosive charge is placed at one of four predetermined locations within the receptacle and detonated.

4.3 After detonation, the trash receptacle is examined for the presence of breaches (such as cracks, fissures, and holes) in its exterior surface, and the extent and location of fragments produced are recorded.

NOTE 1—Users of this standard testing the blast resistance of trash receptacles can, at their own option, measure the magnitude of overpressures created during the explosion. Guidance for performing such measurements is provided in Appendix X1.

5. Significance and Use

5.1 This test procedure is used to measure two of the main effects of an explosive detonated in a trash receptacle as related to the type and amount of explosive charge and the location where the charge is placed in the trash receptacle. The two effects are:

5.1.1 Release of primary and secondary fragments, and

5.1.2 Physical damage to the trash receptacle.

5.2 This test procedure is applicable to all trash receptacles, including lidded or non-lidded as supplied by the manufacturer.

5.3 This test procedure is used to generate data for use in developing performance specifications for trash receptacles.

5.4 For users having interest in determining overpressures created by the detonation, Appendix X1 provides guidance for making such determinations.

6. Test Apparatus and Equipment

6.1 *Barometric Pressure Gauge*—To determine atmospheric pressure at the time of the test, allowed variability is ±0.1 kPa (±1 mbar). The gauge shall be capable of reading pressure at the altitude of the explosion test site.