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## Standard Specification for Rigid Cellular Polystyrene Geofoam<sup>1</sup>

This standard is issued under the fixed designation D6817/D6817M; 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 covers the types, physical properties, and dimensions of rigid cellular polystyrene intended for use as geofoam.

1.2 This specification does not cover the layout, placement, and workmanship for proper installation and performance of rigid cellular polystyrene geofoam.

1.3 Rigid cellular polystyrene geofoam covered by this specification may need protection from certain chemicals, environmental exposure, and concentrated loads. Additional design considerations may include thermal conductivity and buoyancy. Guidelines regarding these ~~end-use~~ end-use considerations are included in [Appendix X1](#).

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 *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 requirements prior to use.*

1.6 *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:*<sup>2</sup>

[C165 Test Method for Measuring Compressive Properties of Thermal Insulations](#)

[C203 Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation](#)

[C303 Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation](#)

[C390 Practice for Sampling and Acceptance of Thermal Insulation Lots](#)

[C578 Specification for Rigid, Cellular Polystyrene Thermal Insulation](#)

[D1621 Test Method for Compressive Properties of Rigid Cellular Plastics](#)

[D1622/D1622M Test Method for Apparent Density of Rigid Cellular Plastics](#)

[D2863 Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics \(Oxygen Index\)](#)

[D4439 Terminology for Geosynthetics](#)

[D7557/D7557M Practice for Sampling of Expanded Polystyrene Geofoam Specimens](#)

[E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

### 3. Terminology

3.1 *Definitions:*

3.1.1 Terms used in this specification are defined in Terminology [D4439](#).

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee [D35](#) on Geosynthetics and is the direct responsibility of Subcommittee [D35.03](#) on Permeability and Filtration.

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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.

TABLE 1 Physical Property Requirements of RCPS Geofoam<sup>A</sup>

Type	EPS12	EPS15	EPS19	EPS22	EPS29	EPS39	EPS46	XPS20	XPS21	XPS26	XPS29	XPS36	XPS48
Density, min., kg/m <sup>3</sup> [lb/ft <sup>3</sup> ]	11.2 [0.70]	14.4 [0.90]	18.4 [1.15]	21.6 [1.35]	28.8 [1.80]	38.4 [2.40]	45.7 [2.85]	19.2 [1.20]	20.8 [1.30]	25.6 [1.60]	28.8 [1.80]	35.2 [2.20]	48.0 [3.00]
Compressive Resistance, min., kPa [psi] at 1 % strain	15 [2.2]	25 [3.6]	40 [5.8]	50 [7.3]	75 [10.9]	103 [15.0]	128 [18.6]	20 [2.9]	35 [5.1]	75 [10.9]	105 [15.2]	160 [23.2]	280 [40.6]
Flexural Strength, min., kPa [psi]	69 [10.0]	172 [25.0]	207 [30.0]	240 [35]	345 [50.0]	414 [60.0]	517 [75.0]	276 [40.0]	276 [40.0]	345 [50.0]	414 [60.0]	517 [75.0]	689 [100.0]
Oxygen index, min., volume %	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Oxygen Index, min., volume %	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0

<sup>A</sup> For products that have an external skin, testing shall be undertaken with skins intact.

3.1.2 *geofoam*—block or planar rigid cellular foam polymeric material used in geotechnical engineering applications.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *EPS, XX*—number designation for expanded polystyrene geofoam type(s) having a minimum density of XX kg/m<sup>3</sup> [lb/ft<sup>3</sup>].

3.2.2 *RCPS*—letter designation for EPS and XPS rigid cellular polystyrene geofoam covered by this specification.

3.2.3 *XPS, XX*—number designation for extruded polystyrene geofoam type(s) having a minimum density of XX kg/m<sup>3</sup> [lb/ft<sup>3</sup>].

#### 4. Ordering Information

4.1 Acquisition documents shall specify the following:

4.1.1 Title, number, and year of this specification.

4.1.2 Type, as per Table 1.

4.1.3 Total product volume required of each type.

#### 5. Materials and Manufacture

5.1 RCPS geofoam shall be formed by the expansion of polystyrene resin beads or granules in a molding process (EPS) or by the expansion of polystyrene base resin in an extrusion process (XPS). RCPS geofoam may be manufactured with reprocessed polystyrene foam (regrind).

5.2 RCPS geofoam shall be of uniform density and have essentially closed cells. RCPS geofoam is an organic material and is considered combustible. It should not be exposed to flames or other ignition sources.

#### 6. Qualification Requirements

6.1 The physical properties listed in Table 1 constitute the minimum product qualification requirements for commonly manufactured types of RCPS geofoam. The compressive resistance at 1 % strain is typically within the elastic limit of the geofoam product types in Table 1 and is accepted as the compressive resistance to limit long-term deformation under structural load.

6.2 *RCPS Geofoam Types*—It is the user's responsibility to specify the required type as in Table 1 and to obtain supporting documentation regarding physical properties from the material supplier.

6.3 *Combustibility Requirements*—All RCPS geofoam shall contain sufficient flame retardants to meet a minimum Oxygen Index as required in Table 1.

6.4 *Curing*—Unless otherwise specified in the contract, RCPS geofoam shall be cured for a minimum of 24 h before delivery and inspection.

#### 7. Availability and Dimensional Tolerance

7.1 *Availability*—The RCPS geofoam materials covered by this specification are commonly available in the size range shown in Table 2. Specific RCPS geofoam block dimensions vary by manufacturer equipment characteristics.

7.2 *Dimensional Tolerance*—Unless otherwise specified, the acceptable length, width, thickness, flatness, and squareness tolerance criteria on RCPS geofoam shall not exceed  $\pm 0.5$  %.



TABLE 2 Common Manufactured Dimensions of RCPS Geofoam

Dimension, mm [in.]	All EPS Types	All XPS Types
Width	305 to 1219 [12 to 48]	406 to 1219 [16 to 48]
Length	1219 to 4877 [48 to 192]	1219 to 2743 [48 to 108]
Thickness	25 to 1219 [1 to 48]	25 to 102 [1 to 4]

## 8. Damage and Degradation

8.1 *Damage*—RCPS geofoam as delivered to the project site shall have no defects that will adversely affect its service and workability qualities. Material units that manifest unacceptable surface or volumetric damage shall be replaced.

8.1.1 *Surface Damage*—Damage to ~~load-bearing-load-bearing~~ RCPS geofoam surfaces shall be limited to less than 20 % of the equivalent ~~load-bearing-load-bearing~~ area of the unit.

8.1.2 *Volume Damage*—Volumetric damage of RCPS geofoam shall be limited to less than 1 % of the volume of a single unit.

8.1.3 *UV (Ultra-Violet)(Ultraviolet) Degradation*—Discoloration and dusting of RCPS geofoam caused by the extensive exposure to sunlight is a defect that will adversely affect its service and is grounds for rejection. Refer to X1.6.

## 9. Inspection

9.1 *Sampling*—Unless otherwise specified in the purchase order or contract, the material shall be sampled for inspection in accordance with Practice [D7557/D7557M](#) for EPS types or Practice [C390](#) for XPS types.

9.2 *Weight*—Determine the weight of selected ~~full-size~~ full-size units in accordance with Test Method [D1622/D1622M](#), or as specified.

9.3 *Dimensions*—Verify specified dimensions and tolerances, as prescribed in Test Method [D1622/D1622M](#) and 7.2 of this specification.

9.4 *Density*—Compute the density of test samples in accordance with Test Method [D1622/D1622M](#).

## 10. Acceptance or Rejection

10.1 Material that fails to conform to this specification shall be rejected promptly in writing. The manufacturer or supplier shall have the right to re-inspect the rejected shipment and resubmit selected units for acceptance under tightened inspection.

## 11. Certification

11.1 Unless otherwise specified in the purchase order or contract, the manufacturer or supplier shall furnish ~~third-party~~ third-party certification that the representative material has either been tested or inspected as directed in the specification and the requirements have been met. When specified in the purchase order or contract, a report of the test results shall be furnished.

## 12. Product Marking

12.1 The following shall be marked on each whole unit of product:

12.1.1 ~~Manufacturers Identification;~~ Manufacturer's identification,

12.1.2 ~~Date of Manufacture;~~ manufacture, and

12.1.3 ~~Type.~~ (See Type (see Table 1).

## 13. Test Methods

13.1 *Conditioning:*

13.1.1 Samples shall be conditioned at a standard laboratory temperature of  $23 \pm 2^\circ\text{C}$  [ $73.4 \pm 4^\circ\text{F}$ ] for a minimum of ~~24 h~~ 24 h prior to the start of tests.

13.2 *Dimensions and Density*—Test in accordance with Test Method [C303](#) or Test Method [D1622/D1622M](#).

13.3 *Compressive Resistance*—Test in accordance with Test Method [C165](#) or Test Method [D1621](#) using ~~50 mm [2 in.]~~ 50 mm [2-in.] cubes. The rate of cross-head movement shall be  $5.0 \pm 0.5$  ~~mm/min~~ mm/min [ $0.2 \pm 0.02$  in./min] equivalent to 10 % strain per minute.

13.4 *Flexural Strength*—Test in accordance with Test ~~Method~~ Methods [C203](#).

13.5 *Oxygen Index*—Test in accordance with Test Method [D2863](#).

## 14. Precision and Bias<sup>3</sup>

14.1 The precision of ~~this~~ the test method described in 13.3 is based on an interlaboratory study of ~~13.3~~ of Specification D6817, conducted in 2011. A total of seven laboratories participated in this study, testing three materials at 1 %, 5 %, and 10 % compressive

<sup>3</sup> Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D35-1014. Contact ASTM Customer Service at service@astm.org.