



Designation: C578 – 23

Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation¹

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This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification² covers the types, physical properties, and dimensions of cellular polystyrene boards with or without facings or coatings made by molding (EPS) or extrusion (XPS) of expandable polystyrene. Products manufactured to this specification are intended for use as thermal insulation for temperatures from -65 to $+165^{\circ}\text{F}$ (-53.9 to $+73.9^{\circ}\text{C}$). This specification does not apply to laminated products manufactured with any type of rigid board facer including fiberboard, perlite board, gypsum board, or oriented strand board.

1.1.1 Additional requirements for Types IV and XIII for pipe, tank, and equipment thermal insulation for temperatures from -320 to $+165^{\circ}\text{F}$ (-196 to $+73.9^{\circ}\text{C}$) are contained in [Annex A1](#).

1.2 The use of thermal insulation materials covered by this specification is potentially regulated by codes that address fire performance. For some end uses, specifiers need to also address the effect of moisture and wind pressure resistance. Guidelines regarding these end use considerations are included in [Appendix X1](#).

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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 standard-*

ization 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

- [C165 Test Method for Measuring Compressive Properties of Thermal Insulations](#)
- [C168 Terminology Relating to Thermal Insulation](#)
- [C177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus](#)
- [C203 Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation](#)
- [C272 Test Method for Water Absorption of Core Materials for Sandwich Constructions](#)
- [C303 Test Method for Dimensions and Density of Pre-formed Block and Board-Type Thermal Insulation](#)
- [C335 Test Method for Steady-State Heat Transfer Properties of Pipe Insulation](#)
- [C390 Practice for Sampling and Acceptance of Thermal Insulation Lots](#)
- [C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus](#)
- [C550 Test Method for Measuring Trueness and Squareness of Rigid Block and Board Thermal Insulation](#)
- [C870 Practice for Conditioning of Thermal Insulating Materials](#)
- [C1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions](#)
- [C1058 Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation](#)
- [C1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus](#)
- [C1303 Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation](#)

¹ This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.22 on Organic and Nonhomogeneous Inorganic Thermal Insulations.

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² This specification is similar to ISO 4898-1984, “Cellular Plastics—Specification for Rigid Cellular Materials Used in the Thermal Insulation of Buildings,” in title only. The scope and technical content are significantly different.

ISO standards are available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

³ 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.

C1363 Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

C1512 Test Method for Characterizing the Effect of Exposure to Environmental Cycling on Thermal Performance of Insulation Products

D1600 Terminology for Abbreviated Terms Relating to Plastics

D1621 Test Method for Compressive Properties of Rigid Cellular Plastics

D1622 Test Method for Apparent Density of Rigid Cellular Plastics

D2126 Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging

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

E84 Test Method for Surface Burning Characteristics of Building Materials

E96/E96M Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials

E176 Terminology of Fire Standards

2.2 *CAN/ULC Standard*⁴

CAN/ULC S770 Standard Test Method for the Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams

3. Terminology

3.1 Terms used in this specification are defined in Terminology **C168**.

3.2 Terms used in this specification that relate to fire standards are defined in Terminology **E176**.

3.3 *Definitions of Terms Specific to This Standard:*

3.3.1 **EPS**—letter designation for the molded expanded polystyrene thermal insulation classified by this specification. It is defined as cellular plastic product manufactured from pre-expanded polystyrene beads subsequently molded into desired shapes and sizes resulting in a product which is rigid with closed cellular structure.

3.3.2 **RCPS**—letter designations for the rigid cellular polystyrene thermal insulation classified by this specification that identifies the product as rigid cellular polystyrene.

3.3.3 **PS**—used in this specification to represent polystyrene in accordance with Terminology **D1600**.

3.3.4 **XPS**—letter designation for the extruded expanded polystyrene thermal insulation classified by this specification. It is defined as cellular plastic product manufactured in a one stage process by extrusion and expansion of the base polymer in the presence of blowing agent(s) resulting in a product which is rigid with closed cellular structure.

4. Classification

4.1 This specification covers types of RCPS thermal insulations currently commercially available as described by the physical property requirements in **Table 1**.

5. Ordering Information

5.1 Acquisition documents shall specify the following:

5.1.1 Title, number, and year of this specification,

5.1.2 Type (see **Table 1**),

5.1.3 *R*-value or thickness required (see **Tables 1 and 2**),

5.1.3.1 *Thermal Resistance/Thickness Relationship*—It is possible that the thermal resistance (*R*-value) and the thermal resistivity (*R*-value/inch) of RCPS thermal insulation will vary with thickness. Therefore, when ordering, specify the *R*-value or the thickness, or both. For additional information, see Practice **C1045**.

5.1.4 Density, if other than specified in **Table 1**,

5.1.5 Tolerance, if other than specified (see **8.2**),

5.1.6 Length and width required (see **Table 2** and **8.1**),

5.1.7 If other than straight edges are required (see **8.3**),

5.1.8 If either ship-lap or tongue-and-groove edges are required (see **8.6**),

5.1.9 *Tapered Insulation*—Special ordering information. In addition to other applicable requirements in Section **5** (**Note 1**), acquisition documents for tapered RCPS thermal insulation shall specify the following:

5.1.9.1 Minimum starting thickness,

5.1.9.2 Slope, in./ft (mm/m),

5.1.9.3 Average *R*-value,

5.1.9.4 Minimum thickness,

5.1.9.5 *Shop Drawings*—The tapered insulation supplier shall provide shop drawings to illustrate installation patterns and dimensions for each tapered module,

5.1.10 Sampling, if different (see **10.1**),

5.1.11 If a certificate of compliance is required (see **14.1**), and

5.1.12 If marking is other than specified (see **15.1**).

NOTE 1—Physical properties of tapered insulation should be determined on blocks of RCPS thermal insulation before the insulation is tapered.

5.1.13 *Type XIII*—Special ordering information. In addition to other applicable requirements in Section **5**, acquisition documents for Type XIII thermal insulation shall specify if presence of surface skins is required.

6. Materials and Manufacture

6.1 RCPS thermal insulation shall be formed by the expansion of polystyrene resin beads or granules in a closed mold, or by the expansion of polystyrene base resin in an extrusion process. RCPS thermal insulation shall be of uniform density and have essentially closed cells. All RCPS thermal insulation shall contain sufficient flame retardants to meet the oxygen index requirements of **Table 1**.

7. Physical Requirements

7.1 *Inspection Requirements:*

7.1.1 The physical requirements listed in this section are defined as inspection requirements (refer to Practice **C390**).

7.1.2 All dimensional requirements are described in Section **8**.

7.1.3 All workmanship, finish, and appearance requirements are described in Section **9**.

7.1.4 Density shall be in accordance with **Table 1**.

⁴ Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, <http://www.ul.com>.