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Standard Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation[1]

This standard is issued under the fixed designation C 1410; 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 covers the type, physical properties, and dimensions of open-cell melamine foam intended for use as thermal and sound-absorbing insulation for temperatures from −40 to +350°F (−40 to +177°C) in industrial environments.

1.2 The use of thermal insulation materials covered by this specification may be governed by building codes that address fire performance.

1.3 The use of an appropriate vapor retarder is required on cold surface applications where water vapor could condense and cause a decrease in thermal performance. Refer to Practice C 755 for selection of vapor retarders. Facings shall be agreed upon between the purchaser and the manufacturer or supplier. This specification addresses the foam alone.

1.4 The values stated in inch-pounds are to be regarded as the standard. The SI units given in parentheses are provided for information only and may be approximate.

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 limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 168 Terminology Relating to Thermal Insulating Materials[2]

C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus[2]

C 236 Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box[2]

C 335 Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulation[2]

C 356 Test Method for Lineal Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat[2]

C 390 Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots[2]

C 423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method[2]

C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus[2]

C 585 Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS Systems)[2]

C 755 Practice for Selection of Vapor Retarders for Thermal Insulation[2]

C 976 Test Method for Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box[2]

C 1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions[2]

C 1104/C 1104M Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation[2]

D 2863 Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastic (Oxygen Index)[3]

D 3574 Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams[3]

E 84 Test Method for Surface Burning Characteristics of Building Materials[4]

E 176 Terminology of Fire Standards[4]

E 662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials[4]

E 795 Practices for Mounting Test Specimens During Sound Absorption Tests[2]

E 800 Guide for Measurement of Gases Present or Generated During Fires[4]

3. Terminology

3.1 *Definitions*—Terms used in this specification are defined in Terminology C 168 and also in Terminology E 176 as appropriate

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *melamine foam*—a low-density, semirigid, open-cell foam made from a melamine-formaldehyde or aldehyde polymer.

[1] This specification is under the jurisdiction of ASTM Committee C–16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.22 on Organic and Nonhomogeneous Inorganic Thermal Insulation.

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[2] *Annual Book of ASTM Standards*, Vol 04.06.

[3] *Annual Book of ASTM Standards*, Vol 08.02.

[4] *Annual Book of ASTM Standards*, Vol 04.07.

4. Classification

4.1 Melamine thermal insulation may be furnished in the following types and grades:

4.1.1 *Type I*—Flat slab:

4.1.1.1 *Grade 1*—Regular (uncovered).

4.1.1.2 *Grade 2*—Faced.

4.1.2 *Type II*—Pipe and tubing insulation:

4.1.2.1 *Grade 1*—Regular (uncovered).

4.1.2.2 *Grade 2*—Faced.

4.1.3 *Type III*—Special shapes.

4.1.4 Special Facings.

5. Ordering Information

5.1 Purchase orders for melamine thermal insulation shall specify any or all of the following:

5.1.1 Title, number, and year of this specification.

5.1.2 Type and grade designation (see 4.1).

5.1.3 Length, width and thickness required (see Table 1).

5.1.4 Tolerance, if other than specified (see Table 2).

5.1.5 Quantity of material.

5.1.6 Special packaging or marking, if required.

5.1.7 Special requirements for inspection and for testing.

5.1.8 Thermal conductivity at mean temperature of flat stock.

5.1.9 Manufacturers name, address, and telephone number.

5.1.10 Jacket facing type.

6. Materials and Manufacture

6.1 Typically a pentane blowing agent is used to foam a melamine-aldehyde precondensate. The result is an open-cell melamine foam.

6.2 Facing materials incorporated into the design of pipe insulation or flat slab shall be agreed upon between the purchaser and the manufacturer or seller. Typical materials are as follows:

6.2.1 *Aluminum Foil*—Aluminum foil laminated to a supporting membrane.

6.2.2 *Aluminized Mylar*—Aluminized mylar film laminated to a supporting membrane.

6.2.3 *Polyvinylchloride*—Polyvinylchloride either plain or reinforced with polyester.

6.2.4 *Polyvinylfluoride*—Polyvinylfluoride reinforced with fiberglass and rubber.

7. Physical Properties

7.1 Melamine thermal insulation shall conform to the physical requirements in Table 3, which shall constitute acceptance or rejection values for this specification when tested by test methods specified in Section 14.

NOTE 1—Data in Table 3 is for unfaced products; facings may affect the properties listed.

TABLE 1 Common Dimensions

	Type I	Type II
Width, in. (mm)	12 to 50 (305 to 1270)	N/A
Length, in. (mm)	48 to 100 (1219 to 2540)	36 or 48 (914 or 1219)
Thickness, in. (mm)	¼ to 20 (6.4 to 508)	½ to 5 (12.7 to 127)

TABLE 2 Insulation Tolerances

Type	Type I	Type II
Width, in. (mm)	±¼ (6.4)	N/A
Length, in. (mm)	±¼ (6.4)	±⅛ (3.2) −0
Thickness, in. (mm)	±⅛ (3.2) or 2 % whichever is smaller	±⅛ (3.2) –0 or 2 % whichever is smaller

TABLE 3 Physical Properties

Property	Requirement
Oxygen index, minimum % oxygen	33
Specific optical smoke density, max, Dm:	
Flaming mode	86
Non-flaming mode	40
Surface burning characteristics, max:	
Flame spread index smoke development at 1-in. thickness	25/50
Density, lb/ft^3(kg/m^3)	0.70 ± 0.10 (11.2 ± 1.6)
Tensile strength, min, lb/in.^{2}(kPa)	14 (96.52)
Percent elongation, max	30
Indentation force deflection, min, lb 50 in.^{2}(kg/323 cm^3)	
Compression at 25 %	80 (36.3)
Compression at 65 %	160 (72.6)
Thermal conductivity, max, Btu in./h ft^2°F (W/mK)	
at −40°F mean	0.26 (0.038)
at 75°F mean	0.30 (0.044)
at 300°F mean	0.50 (0.073)
Water vapor sorption by weight, max, % (by volume, max, %)	25 (0.30)
High-temperature linear shrinkage at 350°F, max, %	5
Smoke toxicity, max ppm	
Carbon monoxide	50
Hydrogen cyanide	10

7.2 The sound-absorption results for unfaced melamine foam shall conform to the performance requirements in Table 4 of this specification.

7.3 The values stated in Tables 3 and 4 should not be used as design values. It is the buyer's responsibility to specify design requirements and obtain supporting documentation from the material supplier.

8. Inspection Requirements

8.1 The physical requirements for density and thermal conductivity at 75°F mean temperature (unless otherwise agreed upon between the purchaser and the supplier) as listed in Table 3 are defined as inspection requirements (refer to Criteria C 390).

8.2 All dimensional requirements, as described in Tables 1 and 2, are defined as inspection requirements.

8.3 All workmanship and appearance requirements, as described in Section 11, are defined as inspection requirements.

9. Qualification Requirements

9.1 All physical requirements listed in Tables 3 and 4 that are not considered inspection requirements are defined as qualification requirements (refer to Criteria C 390).

9.2 For the purpose of initial material qualification, compliance with qualification requirements for each type of insulation

TABLE 4 Unfaced Sound-Absorption Coefficients Versus Frequency

Frequency, Hz	125	250	500	1000	2000	4000
Minimum coefficient at 2-in. (50-mm) thickness	0.15	0.32	0.77	0.95	0.94	0.92

shall be in accordance with Criteria C 390.

9.3 Other properties, such as odor or corrosion, agreed upon between the purchaser and the manufacturer or supplier shall be considered to comply with this specification.

10. Dimensions and Permissible Variations

10.1 *Type I, Flat Sheet*—Sheets shall be rectangular sections and shall be true to form and dimensions, the corners square and the sides and edges parallel. Typical sizes are shown in Table 1. Other sizes as agreed upon between the purchaser and the manufacturer or supplier shall be considered to comply with this specification.

10.2 *Type II, Pipe and Tubing Insulation*—Pipe insulation shall be fabricated in sizes to conform to Practice C 585 or as agreed upon between the manufacturer and the user.

10.3 *Type III, Special Shapes*—Dimensions of special shapes shall be as decided upon between the manufacturer and the user.

10.4 *Dimensional Tolerances*—The insulation shall not differ from the manufacturer's standard dimensions by more than the tolerances listed in Table 2.

11. Workmanship and Appearance

11.1 Since several requirements for this material are not easily defined by a numerical value but affect the workmanship of the finished job, the insulation shall be free of visual defects that will adversely affect the service quality. For example, blowholes and tears when occurring to an excessive degree shall be judged to adversely affect the service quality of the material.

12. Sampling

12.1 Unless otherwise specified in the purchase order or contract, sampling shall be in accordance with Criteria C 390.

13. Test Methods

13.1 *Apparent Thermal Conductivity*—Test in accordance with Test Methods C 177, C 236, C 335 for Type II products, C 518, or C 976 in conjunction with Practice C 1045. Test Methods C 177 and C 518 are the preferred test methods with Test Method C 177 as the referee.

13.2 *Sound Absorption Coefficients*—Test in accordance with Test Method C 423 using Type A mounting defined in Practices E 795. This specification addresses the foam alone; coatings and facings may affect the properties listed.

13.3 *Oxygen Index*—Test in accordance with Test Method D 2863.

13.4 *Density*—Test in accordance with Test Methods D 3574, Test Method A.

13.5 *Tensile Strength*—Test in accordance with Test Methods D 3574, Test Method E.

13.6 *Compressibility*—Test in accordance with Test Methods D 3574, Test Method C.

13.7 *Elongation*—Test in accordance with Test Methods D 3574, Test Method E

13.8 *Surface Burning Characteristics*—Test 1-in. thick sample in accordance with Test Method E 84.[5]

13.9 *Specific Optical Smoke Density*—Test 1-in. thick sample in accordance with Test Method E 662.

13.10 *High-Temperature Shrinkage*—Test in accordance with Test Method C 356 at 350°F.

13.11 *Indentation Force Deflection*—Test in accordance with Test Methods D 3574, Test Method B.

13.12 *Water Vapor Sorption*—Test in accordance with Test Method C 1104.

13.13 *Smoke Toxicity*—Test in accordance with Guide E 800.

14. Inspection

Unless otherwise specified in the purchase order or contract, Criteria C 390 shall be used for the basis of inspection requirements and qualification requirements.

15. Rejection and Rehearing

15.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection shall be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the tests, the producer or the supplier may request a rehearing.

15.2 At the agreement of the buyer and the seller, the seller shall have the right to reinspect a rejected shipment and resubmit same after removal of the non-conforming portion.

16. Certification

16.1 Unless otherwise specified in the purchase order or contract, Criteria C 390 shall be the basis for the certification. When specified in the purchase order or contract, a report of the test results shall be furnished.

17. Packaging and Package Marking

17.1 *Packaging*—Unless otherwise agreed upon and specified between the purchaser and the manufacturer or supplier, the insulation shall be packaged by the manufacturer's standard commercial practice.

17.2 *Marking*—Unless otherwise specified, each container shall be plainly marked with this specification number, type and grade (see 4.1), and the following:

17.2.1 *Sheet (Type I)*—The name of the manufacturer, address, telephone number, size, and quantity of the material in the container.

17.2.2 *Pipe and Tubing Insulation (Type II)*—The name of the manufacturer, address, telephone number, pipe size, quantity, and nominal thickness of the material in the container.

17.2.3 *Special Shapes (Type III)*—The name of the manufacturer, address, telephone number, shape, and quantity of the material in the container.

17.2.4 *Facing Materials*—The type of facing material and adhesive.

18. Keywords

18.1 acoustical insulation; formaldehyde and aldehyde; melamine; melamine formaldehyde; pipe insulation; thermal conductivity; thermal insulation

[5] For thickness other than 1-in., contact the manufacturer or the supplier for surface burning characteristics.