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Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation¹

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1. Scope

1.1 The specification covers the physical properties of self-supported spray applied cellulosic fibers intended for use as thermal insulation or an acoustical absorbent material, or both.

1.2 This specification covers chemically treated cellulosic materials intended for pneumatic applications where temperatures do not exceed 82.2°C and where temperatures will routinely remain below 65.6°C.

1.2.1 *Type I*—Material applied with liquid adhesive and suitable for either exposed or enclosed applications.

1.2.2 *Type II*—Materials containing a dry adhesive that is activated by water during installation and intended only for enclosed or covered applications.

1.3 This is a material specification only and is not intended to deal with methods of application that are supplied by the manufacturer.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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, health, and environmental practices and determine the applicability of regulatory limitations 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.*

¹ This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.23 on Blanket and Loose Fill Insulation.

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2. Referenced Documents

2.1 ASTM Standards:²

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

C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings

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

E84 Test Method for Surface Burning Characteristics of Building Materials

E605 Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members

E736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

E759 Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members

E859 Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members

3. Terminology

3.1 *Definitions*—Definitions in Terminology C168 shall apply in this specification.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *constant mass*—no change in successive weighings in excess of 0.5 % of specimen mass taken at 4-h intervals unless otherwise specified.

3.2.2 *cured*—the state of the finished product after it has achieved constant mass.

² 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.

3.2.3 *curing*—the process in which the liquid vehicle is removed. Normally achieved in ambient building conditions with forced air convection to hasten the evaporation process.

3.2.4 *prepared sample*—samples prepared in accordance with Section 5 and cured to constant mass prior to conducting the specific tests. The prepared samples, after reaching constant mass, as defined in 3.2.1, shall have a density within $\pm 10\%$ of the manufacturer's recommended design density.

3.2.5 *self supporting*—a product that can be tested by the criteria imposed by this specification and that will require no support other than itself or the substrate to which it is attached.

3.2.6 *specimen*—definition of specimen as used in this specification shall be the same as that for *prepared sample* in 3.2.4.

3.2.7 *sprayed fiber*—chemically treated cellulosic materials, that are pneumatically conveyed and mixed with water or adhesive, or both, at the spray nozzle and become self-supporting when cured.

4. Physical Properties

4.1 Materials and Manufacture:

4.1.1 The basic material shall consist of virgin or recycled wood based cellulosic fiber.

4.1.2 Suitable chemicals shall be introduced to provide flame resistance, improved processing, adhesive/cohesive properties, and handling and application characteristics.

4.1.3 The basic material shall be processed into a form suitable for installation by pneumatic conveying equipment and the simultaneous mixing with liquid at the spray nozzle.

4.2 *Density*—Type I and Type II samples shall be within $\pm 10\%$ of the manufacturer's stated values when tested in accordance with 6.1.

4.3 *Thermal Resistance*—Type I and Type II samples shall be within $\pm 10\%$ of the manufacturer's stated values when tested in accordance with 6.4.

4.4 *Surface Burning Characteristics*—Type I and Type II samples shall have a maximum flame spread rating of 25 and a maximum smoke developed rating of 50 when tested in accordance with 6.2.

4.5 Adhesive/Cohesive Strength:

4.5.1 *Type I*—The applied material shall have a minimum adhesive/cohesive bond strength per unit area of five times the weight of the material under the test plate when tested in accordance with Test Method E736.

4.5.2 *Type II*—The applied product shall have a minimum adhesive/cohesive bond strength per unit area of two times the weight of the material under the test plate when tested in accordance with Test Method E736.

4.6 *Smoldering Combustion*—Type I and Type II products, when tested in accordance with 6.5, shall have a weight loss no greater than 15 % of the specimen weight and shall exhibit no evidence of flaming.

4.7 *Fungi Resistance*—Type I and Type II products, when tested in accordance with 6.6, shall not promote more fungal

growth than the control in at least two of the three replicate specimens. (See Test Method C1338.)

4.8 *Corrosion*—Type I and Type II products, when tested in accordance with 6.7, shall demonstrate no perforations in the 3-mil metal coupons when observed in close proximity to a 40-W appliance light bulb. Notches extending less than 3 mm into the coupon edge can be ignored.

4.9 *Moisture Vapor Absorption*—Moisture absorption of Type I and Type II products shall be no more than 15 % when tested in accordance with 6.8.

4.10 *Odor*—Type I and Type II, applied products shall have no strong, objectionable odor when tested in accordance with 6.9.

4.11 Additional Characteristics for Type I Product:

4.11.1 *Substrate Deflection*—Type I applied product shall not spall, crack, or delaminate when tested in accordance with 6.11 of this specification.

4.11.2 *Air Erosion*—Report the results of the air erosion test described in 6.10 of this specification for Type I applied product.

5. Specimen Preparation

5.1 Prepare specimens using manufacturer's recommended equipment and procedures and at manufacturer's maximum recommended thickness. Cure specimens to constant mass at $23 \pm 3^\circ\text{C}$ and $50 \pm 5\%$ relative humidity unless otherwise specified in a specific test procedure. All specimens shall be within $\pm 10\%$ of the manufacturer's recommended installation density.

6. Test Methods

6.1 *Density*—Density of each sample shall be determined in accordance with Test Methods E605.

6.2 *Surface Burning Characteristics*—The surface burning characteristics of Type I and Type II products shall be determined in accordance with Test Method E84.

6.3 *Adhesive/Cohesive Strength*—The adhesive/cohesive strength of the spray applied fiber insulation shall be determined in accordance with Test Method E736.

6.4 *Thermal Resistance*—Samples shall be prepared as in Section 5. The thermal resistance of the spray applied cellulosic fiber insulation shall be as determined by the average of four specimens tested in accordance with Test Methods C177, C518, or C1363. The referee method shall be Test Method C177. When Test Method C518 or C177 is used, the surface irregularities will be trimmed to provide uniform thickness. When the hot box method is used, the test will be on the insulation component only or alternatively; if tested as a system, the results reported shall include all components of system evaluated.

6.5 Smoldering Combustion:

6.5.1 *Scope*—This test method determines the resistance of the insulation to smolder, under specific laboratory conditions.

6.5.2 *Significance and Use*—Insulation materials that readily smolder could have an adverse effect on the surrounding structure in the event of exposure to fire or heat sources.