



Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics¹

This standard is issued under the fixed designation E2231; 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 practice describes procedures for specimen preparation and mounting when testing pipe and duct insulation materials to assess flame spread and smoke development as surface burning characteristics using Test Method E84.

1.2 If the pipe or duct insulation materials to be tested are reflective insulation materials (see 3.2.10 and 3.2.11), the materials shall be tested using the procedures for specimen preparation and mounting described in Practice E2599 and not the procedures described in 6.1 through 6.6.

1.3 Testing is conducted with Test Method E84.

1.4 This practice does not provide pass/fail criteria that can be used as a regulatory tool.

1.5 Use the values stated in inch-pound units as the standard, in referee decisions. The values in the SI system of units are given in parentheses, for information only; see IEEE/ASTM SI-10 for further details.

1.6 This fire standard cannot be used to provide quantitative measures.

1.7 Fire testing of products and materials is inherently hazardous, and adequate safeguards for personnel and property shall be employed in conducting these tests. Fire testing involves hazardous materials, operations, and equipment. This standard gives instructions on specimen preparation and mounting, but the fire-test-response method is given in Test Method E84. See also Section 8.

1.8 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered requirements of the standard.

1.9 *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.

1.10 *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

C168 Terminology Relating to Thermal Insulation

C1186 Specification for Flat Fiber-Cement Sheets

C1224 Specification for Reflective Insulation for Building Applications

C1396/C1396M Specification for Gypsum Board

E84 Test Method for Surface Burning Characteristics of Building Materials

E176 Terminology of Fire Standards

E2599 Practice for Specimen Preparation and Mounting of Reflective Insulation, Radiant Barrier and Vinyl Stretch Ceiling Materials for Building Applications to Assess Surface Burning Characteristics

IEEE/ASTM SI-10 International System of Units (SI) The Modernized Metric System

2.2 UL Standards:

UL 181 Standard for Safety for Factory-Made Air Ducts and Connectors³

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice refer to the terminology contained in Terminology E176.

3.2 *Definitions of Terms Specific to This Standard:*

¹ This practice is under the jurisdiction of ASTM Committee E05 on Fire Standards and is the direct responsibility of Subcommittee E05.22 on Surface Burning.

Current edition approved Dec. 15, 2021. Published January 2022. Originally approved in 2002. Last previous edition approved in 2019 as E2231-19. DOI: 10.1520/E2231-21.

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 Available from Underwriters Laboratories (UL), Corporate Progress, 333 Pfingsten Rd., Northbrook, IL 60062.

3.2.1 *composite, n—as related to a pipe or duct insulation*, see *duct insulation system* or *pipe insulation system*.

3.2.2 *duct, n—as related to heating ventilating, air conditioning or exhaust systems*, a passageway made of sheet metal or other suitable material used for conveying air or other gases.

3.2.3 *duct insulation system, n—as related to fire testing*, system intended to insulate and cover, continuously for an extended length, the outside surface of a duct; the system shall have an insulation core, with or without a covering or vapor retarder facing which includes longitudinal closure systems (if used) and perhaps other duct insulation supplementary materials such as adhesives, fasteners, or tapes (if used).

3.2.3.1 *Discussion*—Duct system components, including tapes, sealants, and fitting covers, that do not cover the duct continuously for an extended length, but which are associated with the duct insulation system are considered separately (see duct insulation supplementary materials). An extended length is not intended to imply a length of 25 ft, but a length of at least 3 ft.

3.2.4 *duct insulation supplementary materials, n—as related to fire testing*, components, including tapes and sealants used for transverse joints as well as fitting covers that are intermittently spaced, as needed, within the duct insulation system, as well as adhesives used to bond the insulation to the duct substrate and that do not cover the duct continuously for an extended length.

3.2.5 *duct lining, n*—material such as an insulation, coating or film, including adhesive, used to line the inside surface of a duct.

3.2.6 *insulation blanket, n*—a relatively flat and flexible insulation in coherent sheet form furnished in units of substantial area.⁴

3.2.7 *pipe, n—as related to heating, ventilating, or air conditioning systems*, a cylindrical conduit for the conveyance of liquids or semi-solids.

3.2.8 *pipe insulation system, n—as related to fire testing*, system intended to insulate and cover, continuously for an extended length, the outside surface of a pipe; the system shall have an insulation core, with or without a covering or vapor retarder facing which includes longitudinal closure systems (if used) and perhaps other pipe insulation supplementary materials such as adhesives, fasteners, or tapes (if used).

3.2.8.1 *Discussion*—Pipe system components, including tapes, sealants, and fitting covers, that do not cover the pipe continuously for an extended length, but which are associated with the pipe insulation system are considered separately (see pipe insulation supplementary materials). An extended length is not intended to imply a length of 25 ft, but a length of at least 3 ft.

3.2.9 *pipe insulation supplementary materials, n—as related to fire testing*, components, including tapes and sealants used for transverse joints as well as fitting covers that are intermittently spaced, as needed, within the pipe insulation

system, as well as adhesives used to bond the insulation to the pipe substrate and that do not cover the pipe continuously for an extended length.

3.2.10 *reflective insulation, n*—thermal insulation consisting of one or more low emittance surfaces bounding one or more enclosed air spaces.

3.2.10.1 *Discussion*—Reflective insulation materials are defined in Specification **C1224**.

3.2.11 *reflective plastic core insulation, n*—an insulation material packaged in rolls, that is less than 0.5 in. (12.7 mm) thick, with at least one exterior low emittance surface (0.1 or less) and a core material containing voids or cells.

3.2.11.1 *Discussion*—Reflective plastic core insulation materials are one specific type of reflective insulation materials.

3.2.12 *self-supporting specimen, n*—a specimen that remains in place by its own structural characteristics both before and during the fire test.

4. Summary of Practice

4.1 This practice describes procedures for specimen preparation and mounting when testing pipe and duct insulation materials to assess flame spread and smoke development as surface burning characteristics using Test Method **E84**.

4.2 Pipe or duct insulation systems (or composites related to pipe or duct insulation) consist of an insulation core, with or without a jacket, and with or without an adhesive. Pipe or duct insulation systems shall be tested in accordance with the specimen preparation and mounting procedures described in this practice, using Test Method **E84**.

4.3 Supplementary materials for pipe or duct insulation systems, including tapes, joint sealants, and fitting covers, that are intermittently spaced, shall be tested for flame spread and smoke development as single-component systems, using Test Method **E84**.

5. Significance and Use

5.1 Pipe and duct insulation systems are often evaluated with Test Method **E84** to comply with building or mechanical code requirements. This practice describes, in detail, specimen preparation and mounting procedures for single-component pipe or duct insulation systems and for multi-component pipe or duct insulation systems.

5.2 The material, system, composite, or assembly tested shall be representative of the completed insulation system used in actual field installations, in terms of the components, including their respective thicknesses.

5.3 Pipe and duct insulation systems consist of a variety of materials and constructions.

5.4 Some testing laboratories have developed a number of protocols for testing pipe or duct insulation systems which utilize one generic type of materials, all of them with an insulation core and a jacket. Those protocols are the origin of this practice, which makes them generic, to reduce material bias in the standard; they have resulted in the procedures presented in **6.1**. The procedures presented in **6.2 – 6.5** address other types of pipe or duct insulation systems.

⁴ This definition is similar to the definition of “blanket insulation” in Terminology **C168** from committee C16 on Thermal Insulation.