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Standard Guide for
Development of Coverage Charts for Loose-Fill Thermal Building Insulations[1]

This standard is issued under the fixed designation C1630; 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 guide provides information to manufacturers for the development of a loose-fill thermal insulation product coverage chart. This guide is limited to developing a coverage chart from density versus thickness, apparent thermal conductivity versus density, and thickness versus area mass relationships obtained through product testing.

1.2 This guide applies to a wide variety of loose-fill thermal insulation products including mineral fiber (Specification C764), or cellulosic fiber (Specification C739) materials; granular types including vermiculite (Specification C516) and perlite (Specification C549); pelletized products; and any other insulation materials that are installed pneumatically or poured in place.

1.3 Coverage charts for loose-fill insulation products are required by regulation under the United States Federal Trade Commission's 16 CFR Part 460. Other countries or local governing agencies may have coverage chart requirements in addition to, or that differ from, those presented in this guide; see the Appendix for examples.

1.4 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.

1.5 *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~~ safety, health, and ~~health~~environmental practices and ~~to~~ 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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]
C168 Terminology Relating to Thermal Insulation
C516 Specification for Vermiculite Loose Fill Thermal Insulation
C549 Specification for Perlite Loose Fill Insulation
C739 Specification for Cellulosic Fiber Loose-Fill Thermal Insulation
C764 Specification for Mineral Fiber Loose-Fill Thermal Insulation
C687 Practice for Determination of Thermal Resistance of Loose-Fill Building Insulation
C1374 Test Method for Determination of Installed Thickness of Pneumatically Applied Loose-Fill Building Insulation
C1574 Guide for Determining Blown Density of Pneumatically Applied Loose-Fill Mineral Fiber Thermal Insulation
E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

2.2 *Other Referenced Documents:*
16 CFR Part 460 ,United States Federal Trade Commission Labeling and Advertising of Home Insulation[3]

3. Terminology

3.1 *Definitions* – For definitions of terms used in this guide, see Terminology C168.

3.2 *Definitions of Terms Specific to This Standard:*

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[1] This guide 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] 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] United States Code of Federal Regulations, Title 16, Part 460.

3.2.1 *constant density*—The uniformity in mass per unit volume of a loose-fill insulation throughout its recommended thickness installation range.

3.2.2 *installed thickness*—The thickness, as measured, immediately after application of a loose-fill insulation.

3.2.3 *settled density*—The mass per unit volume of a loose-fill insulation after which time and/or forces have exerted their effect upon thickness.

3.2.4 *settled thickness*—The thickness, as measured, after which neither time nor forces effect a measurable change.

4. Summary of Guide

4.1 This guide provides ~~several~~two procedures for use in developing loose-fill product coverage chart values from test-derived, best-fit settled density versus settled thickness, apparent thermal conductivity versus density, and installed thickness versus mass per unit area relationships. The settled density versus settled thickness relationship is determined using long-term aging studies or other methods as identified in the material standard. The apparent thermal conductivity relationship is a result from calculations within Practice C687. The installed thickness versus mass per unit area is determined from Test Method C1374, Guide C1574, or other procedures as identified in the material standard.

NOTE 1—Initial installed thickness is a coverage chart column requirement of the United States Federal Trade Commission 16 CFR Part 460, Labeling and Advertising of Home Insulation, revised and issued in 2005 (Home Insulation Labeling Rule). The values listed are to be derived using Test Method C1374.

5. Significance and Use

5.1 Coverage charts list the required installed and product in-service parameters of minimum thickness, maximum net coverage per package, and minimum mass per unit area to achieve each listed thermal performance (R-value) level. Chart information corresponds to numerous standard R-value levels representing common building codes, industry standards, or legislated requirements (see example in the Appendix X1) and therefore additional chart columns may be required, that is, number of packages per 1 000 ft^2 (100m^2), and initial installed thickness.

5.2 This guide applies to coverage charts for installations in open, horizontal attic floor spaces. Chart maximum net coverages are based upon net floor area; framing area deducted. Sloped ceilings, HVAC equipment and ductwork, and other factors can significantly influence product coverage and are to be considered by the manufacturer.

6. Procedures

6.1 ~~Three~~Two procedures are used to develop coverage chart values. The choice of procedure used depends on the end use and the type of insulation material being evaluated and the individual developing the chart. Regardless of which procedure is used, all require thermal conductivity, thickness, and density measurements to have been made before product coverage is calculated. The ~~three~~two procedures are as follows:

6.1.1 Select an R-value (usually from a standardized list) and determine what settled thickness will be necessary to achieve the desired R-value. The settled thickness is determined by combining apparent thermal conductivity versus density data with settled density versus settled thickness data using Eq 1. An iterative or trial and error solution is usually required. Alternatively, a settled density versus R-value relationship is used to determine required settled density, then settled thickness.

$$R\ value = \text{thickness}/\lambda \tag{1}$$

where:

λ = apparent thermal conductivity

6.1.2 Select a settled thickness and determine a corresponding settled density. Once the settled density is known, the apparent thermal conductivity versus density equation is used along with Eq 1 to determine the R-value for the chosen settled thickness.

6.1.3 ~~Select a constant settled density for coverage chart development. This method is used for insulation materials that do not exhibit significant density change with varying thickness. The apparent thermal conductivity value at that density is used in Eq 1 to determine R-value at chosen thickness, or the thermal resistivity is used in equation 2 to determine minimum settled thickness at each R-value.~~

$$\text{Minimum settled thickness} = R\ value/thermal\ resistivity \tag{2}$$

~~where:~~

~~*thermal resistivity* = 1/λ~~

6.2 *Coverage Chart Values:*

6.2.1 Select the desired or required chart R-values or minimum settled thickness. Using one of the procedures described in 6.1, calculate the minimum settled thickness or R-value for the range selected. Once these values are calculated and listed, along with settled density, the following coverage chart columns values are then calculated.

6.2.1.1 Minimum mass per unit area, lb/ft^2 (kg/m^2), is determined by multiplying settled density by settled thickness.