Designation: C356 – 03

Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat[1]

This standard is issued under the fixed designation C356; 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.

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

1. Scope

1.1 This test method covers the determination of the amount of linear shrinkage and other changes that occur when a preformed thermal insulating material is exposed to soaking heat. This test method is limited to preformed high-temperature insulation that is applicable to hot-side temperatures in excess of 200°F (93°C), with the exception of insulating fire brick which is covered by Test Method C210.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information only.

1.3 *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:*[2]

C168 Terminology Relating to Thermal Insulation

C210 Test Method for Reheat Change of Insulating Firebrick

C411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation

3. Terminology

3.1 *Definitions*—Terminology C168 shall apply to the terms used in this test method.

4. Significance and Use

4.1 Linear shrinkage, as used in this test method, refers to the change in linear dimensions that has occurred in test specimens after they have been subjected to soaking heat for a period of 24 h and then cooled to room temperature.

4.2 Most insulating materials will begin to shrink at some definite temperature. Usually the amount of shrinkage increases as the temperature of exposure becomes higher. Eventually a temperature will be reached at which the shrinkage becomes excessive. With excessive shrinkage, the insulating material has definitely exceeded its useful temperature limit. When an insulating material is applied to a hot surface, the shrinkage will be greatest on the hot face. The differential shrinkage which results between the hotter and the cooler surfaces often introduces strains and may cause the insulation to warp. High shrinkage may cause excessive warpage and thereby may induce cracking, both of which are undesirable. High shrinkage may also open gaps at the insulation joints to an excessive extent rendering the application less efficient and more hazardous. In order to predict the limit of permissible shrinkage in service, the degree of linear shrinkage to be tolerated by specimens of an insulating material when subjected to soaking heat must be determined from experience.

4.3 It is recognized that a fixed relation between linear shrinkage under soaking heat and actual shrinkage in service cannot be established for different types of insulating materials. Generally the amount of shrinkage increases with time of exposure. The amount and rate of increase varies from one material to another. In addition, the various types of materials may have different amounts of maximum permissible shrinkage. Therefore, each product must define its own specific limits of linear shrinkage under soaking heat.

5. Apparatus

5.1 *Furnace*—A gas-fired or electrically heated muffle furnace, having a size sufficient to accommodate at least four test specimens and two dummy specimens, 6 by 2½ by 1½ in. (152.4 by 63.5 by 38.1 mm) (Note 1), spaced so as to allow a clearance of at least ½ in. (12.7 mm) on all surfaces of every test specimen. The temperature of the furnace shall be controlled throughout the volume occupied by the specimens to within ± 1 % of the desired temperature. A furnace-temperature indicator or recorder is required.

[1] This test method is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.31 on Chemical and Physical Properties.

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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.