Designation: ~~C196 – 00 (Reapproved 2010)~~ C196 – 00 (Reapproved 2016)

Standard Specification for Expanded or Exfoliated Vermiculite Thermal Insulating Cement[1]

This standard is issued under the fixed designation C196; 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 U.S. Department of Defense.

1. Scope

1.1 This specification covers expanded or exfoliated vermiculite thermal insulating material in the form of dry cement or plaster, intended to be mixed with a suitable proportion of water, applied as a plastic mass, and dried in place, for use as insulation on surfaces operating at temperatures between 100°F (38°C) and 1800°F (982°C). The cement shall not be used where it will be exposed to combustion conditions, such as the hot face lining of a furnace.

1.2 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.

1.3 The following safety hazards caveat pertains only to the test method portion, Section 10, of this specification. *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.*

1.4 When the installation or use of thermal insulation materials, accessories and systems, may pose safety or health problems, the manufacturer shall provide the user with appropriate current information regarding any known problems associated with the recommended use of the company's products. The manufacturer shall also recommend protective measures to be employed in the safe utilization of said products.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C163 Practice for Mixing Thermal Insulating Cement Samples

C166 Test Method for Covering Capacity and Volume Change Upon Drying of Thermal Insulating Cement

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

C353 Test Method for Adhesion of Dried Thermal Insulating or Finishing Cement (Withdrawn 2002)[3]

C354 Test Method for Compressive Strength of Thermal Insulating or Finishing Cement (Withdrawn 2002)[3]

C356 Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat

C390 Practice for Sampling and Acceptance of Thermal Insulation Lots

C405 Practice for Estimating Consistency of Wet-Mixed Thermal Insulating Cement (Withdrawn 2006)[3]

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

C1058 Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation

3. Terminology

3.1 *Definitions:*

3.2 Terminology C168 shall be considered as applying to the terms used in this specification.

---

[1] This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.20 on Homogeneous Inorganic Thermal Insulations.

Current edition approved ~~Sept. 1, 2010~~March 1, 2016. Published ~~January 2011~~March 2016. Originally approved in 1944. Last previous edition approved in ~~2005~~2010 as C196 – 00 (2010).~~(2005).~~ DOI: ~~10.1520/C0196-00R10.~~10.1520/C0196-00R16.

[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] The last approved version of this historical standard is referenced on www.astm.org.

4. Materials and Manufacture

4.1 The cement shall be composed predominantly of expanded or exfoliated vermiculite, with a suitable proportion of heat-resistant binder. Asbestos shall not be used as an ingredient or component part of the product.

5. Other Requirements

5.1 The cement shall conform to the requirements given in Table 1. Conformance shall be based on results of tests on specimens first mixed with water, according to the ratio for proper troweling consistency determined in accordance with Section 10.

6. Qualification Requirements

6.1 The following requirements are employed for purposes of initial material or product qualification:
6.1.1 Consistency,
6.1.2 Compressive strength,
6.1.3 Linear shrinkage,
6.1.4 Apparent thermal conductivity, and
6.1.5 Dry adhesion to steel.

7. Sampling

7.1 The cement shall be sampled, for the purpose of tests using one of the following procedures.
7.1.1 *Inspection Requirements:*
7.1.1.1 Use Practice C390. Each bag shall represent a unit.
7.1.1.2 In a single sampling plan by attributes the acceptability of a lot will be determined by the number of units of product in the sample that do not conform to the specifications. The acceptable quality level (AQL) and limiting quality level (LQL) of an acceptance sampling plan, expressed as percentages of the units nonconforming, are characteristics of the sampling plan and are not to be viewed as product specifications.
7.1.2 *Qualification Requirements:*
7.1.2.1 Use the average of the test data from the number of test specimens required by the appropriate test method to represent the average for the entire lot.

7.2 The specimen for test is to be taken from the middle of a bag, so as to be representative of material from the entire bag.

8. Number of Tests and Retests

8.1 If the average of the test data obtained using 7.1.2.1 fails to conform to the requirements of this specification, a second sample shall be taken from the lot. Average the results of the retest with the results of the original test to determine compliance with this specification.

9. Specimen Preparation

9.1 Mix specimens for testing in accordance with Practice C163.

9.2 The amount of water to be used in preparing samples for all tests shall be that amount which results in the specified consistency, determined in accordance with Practice C405.

TABLE 1 Other Requirements

Consistency	
Method A, %	35 to 45
Method B, in. (mm)	7 (178) to 9 (229)
Dry covering capacity, min, ft^2, 1 in. in thickness per 100 lb of dry cement (m^2, 1 cm. in thickness per 100 kg of dry cement)	50 (26)
Volume change upon drying, max,%	20
Compressive strength, min, psi (kPa) at 5 % deformation	5 (34.5)
Linear shrinkage max % 24 h at 1800°F (980°C)	5
Apparent thermal conductivity, max, Btu·in./ $h·ft^2·°F$ (W/m·K)	
At mean temperatures of:	
200°F (95°C)	0.95 (0.137)
500°F (260°C)	1.10 (0.159)
700°F (370°C)	1.20 (0.173)
Dry adhesion to steel, min, psi(kPa)	3.5 (24.2)