



Designation: ~~C516-02~~ Designation: **C 516 – 08**

Standard Specification for Vermiculite Loose Fill Thermal Insulation¹

This standard is issued under the fixed designation C 516; 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 specification covers the composition and physical properties of expanded or exfoliated vermiculite loose fill insulation. The specification also includes the testing procedures by which the acceptability of the material ~~may~~ shall be determined. These testing procedures deal primarily with material performance in the temperature range associated with the thermal envelope of buildings; however, the commercially usable temperature range for this insulation is from -119 to 850°F (-84 to 454°C). For specialized applications, refer to manufacturer's instructions.

1.2 The specification also covers the composition and properties of vermiculite that has been surface-treated to produce water repellency for ~~installations where liquid moisture may be a factor.~~ installations.

1.3 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, and shall also recommend protective measures to be employed in their safe utilization.

~~1.4~~

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 The following safety hazards caveat pertains only to the test methods portion, Section 9, 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.* For specific hazard statements, see Section 12.

2. Referenced Documents

2.1 *ASTM Standards:*²

C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates

C 168 Terminology Relating to Thermal Insulation

C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

C 390 Practice for Sampling and Acceptance of ~~Preformed~~ Thermal Insulation Lots

C 518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C 520 Test Methods for Density of Granular Loose Fill Insulations

E 84 Test Method for Surface Burning Characteristics of Building Materials

E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at ~~750°C~~ 750°C

3. Terminology

~~3.1 The terms used in this specification are defined in Terminology C 168.~~

3.1 Definitions—Refer to Terminology C 168 for definitions relating to insulation.

4. Classification

4.1 Vermiculite insulation shall be specified by two type designations and five classes, as follows:

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 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* Vol 04.02, volume information, refer to the standard's Document Summary page on the ASTM website.

4.1 Vermiculite insulation is classified by type and grade designations, as follows:

4.1.1 ~~Vermiculite Loose Fill Insulation—Type I~~—~~The product~~—Product that results from the expanding or exfoliating of natural vermiculite ore by grading and heating to meet the requirements of this specification.

4.1.2 ~~Vermiculite Loose Fill Insulation—Type II~~—Expanded vermiculite that has been surface-treated to produce water repellency and limit absorption of moisture from both liquid and vapor phase.

~~Vermiculite loose fill insulation has five grade designations established by range of particle size distribution as shown in~~
 4.1.3 Grade designations established by range of particle size distribution and bulk density are shown in Table 1 and Table 2.

5. Ordering Information

5.1 All purchase orders ~~should~~shall designate both type and grade of insulation desired. If type designation is omitted, Type I will be furnished. The type and grade classifications in this specification differ from the classifications in earlier issues. Purchasers referencing this specification ~~should~~shall include the date of issue.

6. Materials and Manufacture

6.1 Vermiculite is a micaceous mineral which is mined and processed to produce a high-purity concentrate. The concentrate, in the form of flakes of varying size and thickness weighing 55 lb/ft³(880 kg/m³), is expanded in high-temperature furnaces to densities in the range from 3.0 to 8.0 lb/ft³ (~~148~~48 to 128 kg/m³). As a naturally occurring mineral, it is classifiable as an elementary building material. It is noncombustible as determined by Test Method E 136. Material ~~must~~shall pass combustion test criteria of Test Method E 136.

7. Physical Requirements—Physical Requirements

7.1 The physical requirements listed in this section are defined as Inspection Requirements (see Practice C 390, 5.1.2; see also Terminology C 168C 390), section 5.1.2). The insulation shall conform to the following requirements:

	Type I		Type II
Bulk density, lb/ft ³ (kg/m ³)		See Table 1	
Grading (particle size)		See Table 3	
Grading (particle size)		See Table 2	
Water properties, max g wicked in 5 min	N.A.		3

7.2 The physical properties listed in this section of the specification are defined as Qualification Requirements (see Practice C 390, section 5.1.1). The insulation shall conform to the following requirements:

Thermal resistance, °F·h·ft ² /Btu —(K·m ² /W)		See Table 2	
Thermal resistance, °F·h·ft ² /Btu (K·m ² /W)		See Table 3	
Moisture absorption, max, % by weight/ 14 days	3.5		3.5
Combustibility		No flaming, glowing, or smoking	
Surface-burning characteristics (Test Method E 84):			
Flame spread, max	0		0
Smoke developed, max	0		0
Water properties, min, mL of water repelled	N.A.		175

8. Sampling

8.1 For purposes of standard tests, sampling shall be in accordance with Practice C 390.

9. Test Methods

9.1 The physical properties, as enumerated in Section 7, shall be determined in accordance with the following methods:

9.1.1 *Bulk Density*—Test Methods C 520, Method A.

9.1.2 *Grading*—Test Method C 136, except that when a mechanical sieving device is used, the sieving time shall be 5 min and the test specimen shall be 50 g of material.

TABLE 1 Density Specifications

Grade Designation	Bulk Density, lb/ft ³ (kg/m ³)	
	min	max
0—Premium	3.0 (48)	5.0 (80)
1—Large	3.7 (59)	5.5 (88)
2—Medium	4.0 (64)	6.0 (96)
3—Fine	4.5 (72)	7.0 (112)
4—Super Fine	5.5 (88)	8.0 (128)