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DOCUMENT DESCRIPTION: Military Specification - Cement, Insulation, High Temperature

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MIL-C-28610
6 December 1967
SUPERSEDING
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17 Sep 1965
(See 6.2)

MILITARY SPECIFICATION

CEMENT, INSULATION, HIGH TEMPERATURE

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers high temperature insulation cement for thermal control of irregular surfaces of equipment and piping operating at temperatures between 100 and 1800°F.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein:

SPECIFICATION

FEDERAL
UU-S-48 - Sacks, Shipping Paper.

STANDARDS

MILITARY
MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

C 166 - Covering Capacity and Volume Change Upon Drying of Thermal Insulating Cement.
C 177 - Thermal Conductivity of Materials by Means of the Guarded Hot Plate.
C 353 - Adhesion of Dried Thermal Insulating Cement.
C 354 - Compressive Strength of Thermal Insulating Cement.
C 356 - Linear Shrinkage of Performed High Temperature Thermal Insulations Subjected to Soaking Heat.
C 405 - Consistency of Wet-Mixed Thermal Insulating Cement.
C 421 - Weight Loss by Tumbling of Performed Thermal Insulation.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

UNIFORM CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Material. The insulation cement shall be composed of a dry mixture of refractory material of rock or mineral fiber, asbestos fibers, and clay binder, thoroughly mixed to obtain uniform distribution of the ingredients. The composition of the cement shall be such that, when properly mixed with fresh water, it can be applied with a trowel or by hand.

3.2 Sulfur content. The sulfur content shall not exceed 0.50 percent (see 4.3.1).

3.3 Physical requirements. The cement shall conform to the physical requirements shown in Table I.

TABLE I - Physical Requirements

Coverage (wet), board feet per 100 pounds of dry material, minimum	50.0
Shrinkage volumetric, wet to dry, percent, maximum	20.0
Density, after being molded and dried, pounds per cubic feet, maximum	30.0
Compressive strength, at 5 percent deformation, minimum psi	10.0
Mechanical stability, loss in weight, percent, maximum:	
After first 10 minutes	40.0
After second 10 minutes	60.0
Dry adhesion to steel, minimum psi	3.0
Linear shrinkage, percent, maximum:	
After 6 hours at 750°F	1.0
After 6 hours at 1200°F	2.0
After 6 hours at 1500°F	3.0
Thermal conductivity, maximum Btu in. per hr. sq. ft. degree Fahrenheit at mean temperature of:	
200°F	0.70
500°F	0.85
700°F	0.95
Corrosion of steel	None

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Sampling for quality conformance inspection. Sampling for quality conformance inspection shall be performed in accordance with the provisions set forth in MIL-STD-105, except where otherwise indicated hereinafter. For purposes of sampling, an inspection lot for inspection and tests shall consist of all material offered for delivery at one time.

4.2.1 Examination of filled containers. A random sample of filled containers shall be taken from each lot in accordance with MIL-STD-105 at Inspection Level I and acceptable quality level - 4.0 percent defective to verify compliance with requirements regarding fill closure, marking and all other requirements not involving tests. Containers shall be examined for defects of construction of the container and the closure, for evidence of leakage, and for unsatisfactory markings; each sample filled container shall also be weighed to determine the amount of contents. Any container in the sample, having one or more defects, or under required fill, shall not be offered for delivery. If the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, this shall be cause for rejection of the lot represented by the sample.

4.2.2 Testing. From each inspection lot, sample containers shall be selected at random, as follows, for the tests specified in 4.3.

Lot Size	Sample Size
15 or less	1
16 to 300	2
301 to 800	3
801 and over	4

There shall be no evidence of failure to meet the specified requirements.

4.2.2.1 Thermal conductivity. The test of 4.3.9 need only be conducted for one of the following reasons:

(a) If, within five years preceding the date of invitation for bids, the cement has not been tested by an acceptable testing laboratory and found in compliance with the requirements of 3.3.
(b) If the cement offered for delivery is not the same in all respects as that previously tested.

4.3 Test procedures.

4.3.1 Sulfur content. The sulfur content shall be determined by either the combustic or evolution method.

4.3.2 Water-cement ratio for proper troweling consistency. A weighed quantity of dry cement shall be mixed with a weighed quantity of water to determine the water-cement ratio for satisfactory troweling consistency. For tests to determine compliance with this specification the water-cement ratio shall be that which gives the measured consistency of 35 to 45 percent by Method A, or 7 to 9 inches by Method B when determined by the procedure outlined in ASTM-C 405.

4.3.3 Coverage capacity and volumetric shrinkage. The coverage capacity and volumetri shrinkage shall be determined in accordance with ASTM-C 166.

4.3.4 Density. Molded specimens shall be air dried for 24 hours and then dried at 300°F in an electric oven to constant weight and the density computed on the oven-dried volume.

4.3.5 Compressive strength. Compressive strength shall be determined in accordance with ASTM-C 554.

4.3.6 Mechanical stability. Mechanical stability as measured by weight loss shall be determined in accordance with ASTM-C 421.

4.3.7 Dry adhesion to steel. Dry adhesion to steel shall be determined in accordance with ASTM-C 353.

4.3.8 Linear shrinkage. Linear shrinkage shall be determined in accordance with ASTM-C 356, at the temperature and duration specified in Table I.

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4.3.9 Thermal conductivity. Thermal conductivity shall be determined in accordance with ASTM-C 177.

4.3.10 Corrosion-resisting properties. Cement in plastic form shall be applied to a polished steel test plate 4 inches wide and 5 inches long. The test plate shall be of clear finish color rolled strip steel, 0.020 inch thick, American quality quarter hard, temper No. 3, weighing 0.85 pound per square foot. The cement shall be built up to a 3-inch thickness on the test plate in a wooden mold 4 inches wide and 5 inches long and allowed to stand at room temperature for 30 days. Then the material shall be removed from the test plate. The test plate shall be immediately cleaned with water, wiped dry, and examined for corrosion. Corrosion along the edges of the plate will be disregarded.

4.4 Preparation for shipment. Examination of packing and marking for shipment shall be made for conformance with the requirements of Section 5.

5. PREPARATION FOR DELIVERY

(Preparation for delivery requirements specified herein apply only to direct Government procurement. Preparation for delivery requirements between contractors and sub-contractors shall be as specified in the individual order.)

5.1 Packing. Packing shall be Level A, B, or C as specified (see 6.1).

5.1.1 Level A. The cement shall be packed in quantities of 50 pounds in paper shipping sacks conforming to the requirements of UU-S-48, sack number as applicable.

5.1.2 Level B. The cement shall be packed in quantities of 50 pounds in paper shipping sacks conforming to the requirements of UU-S-48, sack number as applicable.

5.1.3 Level C. The cement shall be packed in containers in a manner to insure safe delivery and acceptance at destination. Containers shall comply with the Uniform Freight Classification Rules or other carrier regulations applicable to the mode of transportation.

5.2 Marking. In addition to any special marking required by the contract or order, marking for shipment shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Selection of applicable level of packing required (see 5.1).

6.2 CHANGES FROM PREVIOUS ISSUE. THE EXTENT OF CHANGES (DELETIONS, ADDITIONS, ETC.) PRECLUDE THE ANNOTATION OF THE INDIVIDUAL CHANGES FROM THE PREVIOUS ISSUE OF THIS DOCUMENT.

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