

MIL-I-2819E
9 November 1967
SUPERSEDING
MIL-I-2819D
9 August 1963
(See 6.5)

MILITARY SPECIFICATION
INSULATION BLOCK, THERMAL

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

1. SCOPE

1.1 Scope. This specification covers thermal insulation block for use on machinery and equipment at surface temperatures up to the approximate limits for the classes specified.

1.2 Classification. Thermal block insulation shall be of the following classes as specified (see 6.1):

- Class 1 - Temperatures up to 600° Fahrenheit (F).
- Class 2 - Temperatures up to 1,200°F.
- Class 3 - Temperatures up to 1,500°F.
- Class 4 - Temperatures up to 2,000°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
PPP-B-636 - Box, Fiberboard.

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.

UNIFORM CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules.

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS

- C165 - Compressive Strength of Preformed Block-Type Thermal Insulating, Standard Method of Test for.
- C177 - Thermal Conductivity of Materials by Means of the Guarded Hot Plate, Standard Method of Test for.
- C209 - Breaking Strength and Calculated Flexural Strength of Preformed Block Type Insulation, Standard Method of Test for.
- C303 - Density of Preformed Block-Type Thermal Insulation, Standard Method of Test for.

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- C356 - Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat, Method of Test for.
 C411 - Hot Surface Performance of High Temperature Thermal Insulation, Method of Test of.
 C421 - Weight Loss by Tumbling of Preformed Insulation, Method of Test for.

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

(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 Qualification. The insulation block furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.2 and 6.3).

3.2 Material. The insulation block shall be composed of heat-resisting compounds suitable for the temperature conditions and the purpose intended.

3.3 Dimensions and tolerances.

3.3.1 Dimensions. Insulation shall be furnished in block form in 18-inch length by 3-inch width or 36-inch length by 6- or 12-inch width (see 6.1). Blocks shall be furnished in thicknesses of 1, 1-1/2, 2, 2-1/2, 3, 3-1/2, or 4 inches (see 6.1).

3.3.2 Tolerances. A tolerance of plus or minus 1/8 inch in length, plus or minus 1/16 inch in width and thicknesses will be permitted.

3.4 Physical requirements. The insulation block shall conform to the physical requirements shown in table I.

Table I - Physical requirements

Averages	Class 1	Class 2	Class 3	Class 4
Density, pounds per cubic foot, maximum	14.0	14.0	22.0	26.0
Compressive strength, at not more than 5 percent deformation min. p.s.i.	50.0	50.0	50.0	50.0
Weight loss by tumbling, loss in weight, maximum				
After first 10 minutes	50.0	50.0	55.0	55.0
After second 10 minutes	80.0	80.0	80.0	80.0
Modulus of rupture, pounds per square inch, minimum	1/	1/	2/	2/
Change under soaking heat, 6 hours at °F.	600	1,200	1,500	2,000
Loss in weight, percent, maximum	18.0	12.0	16.0	10.0
Linear shrinkage, percent, maximum	2.0	2.0	2.0	3.0
Thermal conductivity, B.t.u. in. per hr. sq. ft. °F. maximum, at a mean temperature of				
200°F.	0.40	---	---	---
300°F.	0.45	---	---	---
400°F.	0.50	---	---	---
500°F.	---	0.60	0.66	0.72
600°F.	---	0.65	0.71	---
700°F.	---	0.70	0.76	---
750°F.	---	---	---	0.79
1000°F.	---	---	---	0.86

1/ Three times density (pounds per cubic foot) of the sample tested.

2/ Two and one-half times density (pounds per cubic foot) of sample tested.

3.5 Simulative performance. Insulation block shall be in satisfactory condition upon completion of the test specified in ASTM C411.

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3.6 Workmanship. The block insulation shall not have visual defects that will adversely affect its serviceability.

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 Qualification tests. Qualification tests shall be conducted at a laboratory satisfactory to the Naval Ship Engineering Center. Qualification tests shall consist of the tests specified in 4.4. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification SD6" (see 6.3 and 6.4).

4.2.1 Sampling for qualification tests. Three samples shall be tested for each test specified in 4.4.2, 4.4.3, 4.4.4, 4.4.5, and 4.4.6; two samples shall be tested for the test specified in 4.4.7 and one sample shall be tested for the test specified in 4.4.8. The average test results shall be within the limits specified in table I and the individual test results shall not exceed these limits by more than 10 percent.

4.3 Sampling for quality conformance inspection. For purposes of sampling, an inspection lot shall consist of all block insulation of the same class, size and thickness offered for delivery at one time.

4.3.1 Inspection of end item.

4.3.1.1 Examination of the end item. Examination of the end item shall be made in accordance with 4.3.1.1.1 through 4.3.1.1.3. The lot size, for determining the sample size in accordance with MIL-STD-105, shall be in units of insulation block (see 4.3.1.1.1 and 4.3.1.1.2) and units of shipping containers (see 4.3.1.1.3).

4.3.1.1.1 Examination of the end item for defects in appearance and workmanship. The sample unit for the following examination shall be one insulation block. The inspection level for determining the sample size shall be level II, with an acceptable quality level (AQL) of 2.5 percent defective.

<u>Examination</u>	<u>Defect</u>
Appearance and workmanship	Cracked, broken or damaged. Bad edges. Excessive voids. Warped.
Classification	Class not as specified.

4.3.1.1.2 Examination of the end item for defects in dimensions. The sample unit for the following examination shall be one block. The inspection level for determining the sample size, shall be inspection level II, with an acceptable quality level (AQL) of 2.5 percent defective.

<u>Examination</u>	<u>Defect</u>
Length, width and thickness	Not within limits or tolerance specified, or by contract requirement.

4.3.1.1.3 Examination for preparation for delivery. An examination shall be made to determine that the packing and markings comply with the requirements of section 5 of this specification. The sample unit for the following examination shall be one shipping container, selected just prior to closing operation. The inspection level for determining the sample size shall be level I, with an acceptable quality level (AQL) of 2.5 percent defective. Shipping containers, fully prepared for delivery, shall be examined for closure defects.

<u>Examination</u>	<u>Defects</u>
Packing	Not as specified. Container not as specified, closures not accomplished by specified or required methods of material. Any nonconforming component, component missing, damaged or otherwise defective.

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<u>Examination</u>	<u>Defects</u>
Count	No. of blocks per container less than specified or indicated quantity.
Weight	Gross or net weight exceeds specified requirements.
Markings	Omitted, illegible, incorrect, incomplete, or not as specified (see 5.3).

4.3.2 Sampling for tests. The lot size shall be the number of half sections or segments in the lot. The sample size shall be the number of sets of tests, that is, the number of specimens subjected to each test (see table II).

Table II - Sampling for tests

Lot size in half section or segments	Sample size = Number of test specimens for each test (4.4.4 through 4.4.8)	Number of test failures allowed (each test)
Up to 63	None	-
64 to 160	2	0
161 to 400	3	0
401 to 1,000	5	0
1,001 to 2,500	8	0
2,501 to 6,300	13	1
6,301 to 16,000	20	2
16,001 to 40,000	32	3

4.3.2.1 Testing of end item. The end item shall be tested for the applicable characteristic as specified in table III from each lot presented for examination for each class of insulation. The sample unit shall be one block. Samples shall be selected throughout the lot (see table II). If any specimen fails any test, this shall be cause for rejection of the lot.

Table III - Instruction for testing

Characteristic	Specification reference		Number determinations per unit	Results reported as
	Requirement	Test method		Numerically to nearest $\frac{1}{2}$
Density	3.4	4.4.2	1	0.1 lb/cu. ft.
Compressive strength	3.4	4.4.3	1	p.s.i.
Weight loss by tumbling	3.4	4.4.4	1	1 percent
Flexural strength	3.4	4.4.5	1	p.s.i.
Changes under soaking heat				
Loss in weight	3.4	4.4.6	1	0.1 percent
Linear shrinkage	3.4	4.4.6	1	0.1 percent

^{1/} Test reports shall include all values on which results are based.

4.4 Test procedures.

4.4.1 Conditioning samples. Test specimens shall be conditioned by drying to constant weight in an oven at a temperature of 215 to 250°F. preceding a test.

4.4.2 Density. The density shall be determined in accordance with the method specified in ASTM C303.

4.4.3 Compressive strength. The compressive strength shall be determined in accordance with the method specified in ASTM C165.

4.4.4 Weight loss by tumbling. Weight loss by tumbling shall be determined in accordance with the method specified in ASTM C421.

4.4.5 Flexural strength. The flexural strength shall be determined in accordance with ASTM C203.

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4.4.6 Physical changes under soaking heat. Specimens shall be weighed and measured. Then the specimens shall be placed in an electrically heated oven and subjected to the maximum temperature for the respective class for 6 hours for loss of weight and linear shrinkage. The specimens shall be removed from the oven and tested to determine loss of weight and linear shrinkage in accordance with the method specified in ASTM C356 (see table I).

4.4.7 Thermal conductivity. Conductivity shall be determined in accordance with the method specified in ASTM C177.

4.4.8 Simulative performance. Simulative service shall be determined in accordance with the method specified in ASTM C411. The plate shall be maintained at the maximum temperature for the respective class for 30 days.

5. PREPARATION FOR DELIVERY

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

5.1.1 Level A. Insulation block, packaged as specified (see 6.1), shall be packed in containers conforming to class 2 of PPP-B-636. All corners and edge seams, and manufacturer's joint shall be waterproofed in accordance with the appendix to PPP-B-636.

5.1.2 Level B. Insulation block, packaged as specified (see 6.1), shall be packed in containers conforming to class 1 of PPP-B-636, and closed in accordance with the appendix to PPP-B-636.

5.1.3 Level C. Block insulation, packed as specified, (see 6.1) shall be packed in containers of the type, size and kind commonly used for the purpose in a manner which will insure acceptance and safe delivery at destination. Shipping containers shall comply with the Uniform Freight Classification Rules or other regulations as applicable to the mode of transportation.

5.2 Marking. In addition to any special marking required, shipping containers shall be marked 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) Class required (see 1.2).
- (c) Thickness, width and length required (see 3.3).
- (d) Level of packing (see 5.1).

6.2 Commercial sizes. Commercial sizes and thicknesses of block insulation covered by this specification are industry standards. Other sizes and thicknesses may be obtained upon request.

6.3 With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in applicable Qualified Products List QPL-2819 whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification, in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Ship Engineering Center, Department of the Navy, Washington, D. C. 20360, and information pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.4).

6.4 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

6.5 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.

Custodians:

Army - ME
Navy - SH
Air Force - 84

Review activities:

Army - ME
Navy - SH
Air Force - 84, 85

Preparing activity:

Navy - SH
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SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
<p align="center">INSTRUCTIONS</p> <p>This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof). Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).</p>		
SPECIFICATION		
ORGANIZATION (Of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?		
A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE?		
<input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE

DD FORM 1426
1 APR 63REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE
(NAVSHIPS OVPRT 12-66)

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