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MILITARY SPECIFICATION

INSULATION PIPE COVERING, THERMAL, FIBROUS GLASS

1. SCOPE

1.1 This specification covers fibrous glass pipe covering for use as thermal insulation on pipes, valves and fittings for temperatures up to 370° Fahrenheit (F).

2. APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein:

SPECIFICATIONS

FEDERAL
PPP-B-585 - Boxes; Wood, Wirebound.
PPP-B-591 - Boxes, Fiberboard, Wood-Cleated.
PPP-B-601 - Boxes, Wood, Cleated-Plywood.
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636 - Boxes, Fiber.

MILITARY
MIL-B-10377 - Boxes: Wood-Cleated, Veneer, Paper Overlaid.

NAVY DEPARTMENT
General Specifications for Inspection of Materials

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 contractors 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 shall apply.

OFFICIAL CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules.

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd St., New York 16, N. Y.)

AMERICAN SOCIETY FOR TESTING MATERIALS
C302 - Density of Preformed Pipe Covering-Type Thermal Insulation, Tentative Method of Test for.
C335 - Thermal Conductivity of Pipe Insulation, Tentative Method of Test for.

(Application for copies should be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.)

3. REQUIREMENTS

3.1 Material. - The basic material shall be glass, processed from a molten state into fibrous form containing not more than 0.50 percent of nonfibrous material (shot), impregnated with a suitable binder and compressed or otherwise formed into pipe covering (see 4. 4. 1).

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3.1.1 Fiber diameter. - The average fiber diameter shall not exceed 0.00025 inch (see 4.4.2).

3.2 Dimensions and density. - The dimensions and density shall be as follows:

3.2.1 Length. - Pipe covering sections shall be furnished in lengths of 3 feet. Sections may be split in half lengthwise or slit lengthwise. A tolerance of plus or minus 3/16 inch in length will be permitted.

3.2.2 Sizes. - The pipe covering shall be furnished to fit standard iron pipe and copper tube sizes (see 6.1).

3.2.3 Thickness. - The pipe covering shall be furnished in thicknesses of 1/2, 3/4, 1, 1-1/2, 2 inches, or in special thicknesses as specified (see 6.1). A tolerance of plus or minus 3/32 inch in thickness will be permitted.

3.2.4 Density. - The pipe covering shall have a density of 3.5 pounds per cubic foot. A tolerance of plus or minus 0.50 pound in density will be permitted (see 4.4.3).

3.3 Alkalinity. - The alkalinity of the pipe covering expressed as equivalent sodium oxide (Na_2O) shall not exceed 0.60 percent (see 4.4.4).

3.4 Resistance to smoldering. - The pipe covering shall not be smoldering at the expiration of the test specified in 4.4.5.

3.5 Fire resistance. - The pipe covering shall be rated as incombustible or fire retardant when tested as specified in 4.4.6.

3.6 Thermal conductivity. - The thermal conductivity (k) expressed as British thermal units (B.t.u.) per square foot per hour per °F. for a thickness of one inch shall not exceed the following values:

Mean temperature (°F.)	"k"
40	0.23
75	.24
200	.30

3.7 Loss in weight. - The pipe covering shall have a loss in weight of not more than 2 percent when tested as specified in 4.4.8.

3.8 Workmanship. - The workmanship shall be first class in every respect.

4. QUALITY ASSURANCE PROVISIONS

4.1 Unless otherwise specified herein the supplier is responsible for the performance of all inspection requirements prior to submission for Government inspection and acceptance. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order.

4.2 Sampling. -

4.2.1 Lot. - For purposes of sampling, a lot shall consist of all pipe covering of the same inner diameter and thickness produced under essentially the same conditions and offered for delivery at one time.

4.2.2 Sampling for acceptance inspection. -

4.2.2.1 Sampling for visual and dimensional examination. - A random sample of pipe covering sections shall be selected by the inspector from each lot offered for Government examination in accordance with Standard MIL-STD-105 at inspection level II. The acceptable quality level shall be 2.5 percent defective.

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4.2.2.2 Sampling for acceptance tests. - A random sample of sections shall be selected from each lot in accordance with the table for small samples shown in Standard MIL-STD-105 at inspection level L-4 for the tests specified in 4.3.2.

4.3 Inspection. -

4.3.1 Examination. - Each of the sample sections selected in accordance with 4.2.2.1 shall be surface examined, weighed, and measured to determine conformance with the requirements of this specification which do not require tests. Any section in the sample containing one or more visual or dimensional defects shall be rejected, and if the number of defective sections in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected. Rejected lots may be offered again for examination provided the contractor has removed all nonconforming sections. The inspector shall again select and examine samples from such rejected lots to verify compliance with this specification.

4.3.2 Acceptance tests. - The samples selected in accordance with 4.2.2.2 shall be subjected to the tests specified in 4.4 to determine conformance with this specification except that the thermal conductivity test (see 4.4.7) shall be conducted only when specified (see 6.1).

4.3.2.1 Action in case of failure. - If any of the samples tested is found to be not in conformance with this specification, the lot which it represents shall be rejected. A rejected lot may be resubmitted for test after the manufacturer, having been informed of the reasons for rejection, has so reworked the entire lot as to remove or correct all nonconforming material.

4.4 Test procedures. -

4.4.1 Nonfibrous material (shot) content. - The nonfibrous material (shot) content shall be determined for each sample by separating by hand 10 grams of fiber as fine as possible over a U.S. Standard No. 30 sieve having a U.S. Standard No. 50 sieve and a pan underneath. Breaking up the material facilitates its separation so that the fiber can be picked up readily. The material remaining after the fiber is picked out shall be screened by hand and all the fiber remaining on the No. 30 and No. 50 sieves shall be picked off. The fine splinters and dust shall be aspirated and the remainder on the No. 30 and No. 50 sieves shall be combined and weighed as the nonfibrous material (shot) content.

4.4.2 Diameter of fiber. - Diameter of fibers shall be determined microscopically on the basis of measuring ten fibers on each of the samples selected in accordance with 4.2.2.2. The average diameter for purposes of determining conformance with 3.1.1 shall be the average of all measurements on all samples.

4.4.3 Density. - The density of the pipe covering shall be determined by ASTM method C302.

4.4.4 Alkalinity. - The alkalinity test shall be performed as follows: Weigh a 5-gram (±0.01 gram) representative sample[1] of the insulation pipe covering and introduce into a 500-milliliter (mℓ.), pyrex Erlenmeyer flask. Wet with 5 mℓ. of 95 percent ethyl alcohol, and add 400 mℓ. of distilled water. Reflux for 4 hours plus or minus 5 minutes. At the end of this period, disconnect the condenser and filter at once through No. 41 Whatman paper supported in a Buechners funnel. Wash the flask and material three times with 25-mℓ. portions of hot distilled water using suction. Titrate immediately with 0.02N H_2SO_4, using six to eight drops of 1 percent solution of phenol-red indicator, to the disappearance of the pink color. Run a blank determination on the same amount of distilled water and alcohol and correct for any alkalinity shown. The percentage alkalinity as Na_2O shall be calculated from the following formula:

$$\text{Percent } Na_2O = 0.0124 \text{ (mℓs. } H_2SO_4 \text{ used by sample minus mℓs. } H_2SO_4 \text{ used by blank)}$$

4.4.5 Smolder test. - The specimen shall be mounted in a horizontal position. The flame from a Bunsen burner shall be directed against the lower surface of the specimen at one end for 3 minutes. Then the flame shall be removed. The specimen shall be examined.

4.4.6 Fire resistance. -

4.4.6.1 Test specimen. - A section of pipe covering, 36 inches in length, shall be secured to a 36-inch length of steel pipe with wire or metal bands.

[1] A representative sample is conveniently prepared by taking borings with a large cork borer through the cross section of the insulation pipe covering.

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4.4.6.2 Procedure.- The specimen shall be placed in a horizontal position with the surface to be exposed to the fire facing downward, and shall be supported on the flat surface of a 2 by 2 by 1/8-inch steel angle frame. (Standard laboratory equipment has a 30 by 30-inch clear opening.) The flame from a 3/4 to 7/8-inch gas-air burner shall be directed against the center of the lower surface of the specimen. The top of the burner shall be directed against the center of the lower surface of the specimen. The top of the burner tube shall be 28-3/4 inches below the specimen. Temperature indications shall be obtained with a chromel-alumel thermo element made of 0.12849-inch wire placed in a 3-inch horizontal coil 1 inch below the center of the specimen. The wires shall be bare for a distance of 2 inches from the junction. Temperature readings shall be taken at intervals not exceeding 2 minutes. The test duration shall be 40 minutes and the flame shall be regulated to give temperature indications according to the time temperature curve shown on figure 1. The flame shall touch the specimen during the entire test period. Exceptions can be made for the first 5 minutes, if required, for proper temperature regulation. The area under the time temperature curve obtained from the thermo element readings shall be within 5 percent of that of the reference curve being followed. The test shall be conducted in a room which is free from appreciable air currents and which has a temperature between 60° and 85°F.

4.4.6.3 Rating.- For incombustible and fire retardant materials, the specimen as a whole and the different units or portions thereof shall remain in place until the end of the flame exposure period specified in 4.4.6.2. No glow shall progress to the ends of the specimen at any point during or after the test.

4.4.6.3.1 Incombustible.- No flame shall issue from the specimen during or after flame application.

4.4.6.3.2 Fire retardant.- During or after flame application no sustained flaming shall issue from the specimen. Any flame which occurs shall be limited to intermittent short flames from the area directly exposed to the test flame. No flame from the specimen shall reach the angle frame at any point. No flaming shall occur more than 2 minutes after the test flame is discontinued.

4.4.7 Thermal conductivity.- The sample shall be a 3-foot sectional cover for a 3-inch pipe. The thermal conductivity shall be determined by ASTM method C335.

4.4.8 Loss in weight.- A sample shall be subjected to a temperature of 350°F. for 6 hours. The sample shall be weighed before and after heating under atmospheric conditions of the same relative humidity.

4.5 Inspection procedures.- For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

5. PREPARATION FOR DELIVERY

5.1 Packing.-

5.1.1 Level A.- Insulation pipe covering shall be packed in overseas type wood cleated fiberboard, nailed wood, wirebound wood, corrugated or solid fiberboard, wood cleated paper overlaid, or wood cleated plywood boxes conforming to Specification PPP-B-591, PPP-B-621 (class 2), PPP-B-585 (class 3), PPP-B-636, class 3, MIL-B-10377 or PPP-B-601, respectively, at the option of the contractor. Box closures shall be as specified in the applicable box specification or appendix thereto. The gross weight of wood boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitations of the applicable box specification.

5.1.2 Level B.- The insulation pipe covering shall be packed in domestic type wood cleated fiberboard, nailed wood, wirebound wood, corrugated or solid fiberboard, wood cleated plywood or wood cleated paper overlaid boxes conforming to Specification PPP-B-591, PPP-B-621 (class 1), PPP-B-585 (class 2), PPP-B-636, PPP-B-601 or MIL-B-10377, respectively, at the option of the contractor. Box closures shall be as specified in the applicable box specification or appendix thereto. The gross weight of wood boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitation and shall conform to the special requirements of the applicable box specification.

5.1.3 Level C.- Insulation pipe covering 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.

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5.2 Marking.- In addition to any special marking specified in the contract or order, shipping containers shall be marked in accordance with Standard MIL-STD-129.

6. NOTES

6.1 Ordering data.- Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Nominal iron pipe and copper tube sizes and thickness required (see 3.2.2 and 3.2.3).
(c) When thermal conductivity tests should be conducted (see 4.3.2).
(d) Selection of applicable levels of packing required (see 5.1).

6.2 Thermal insulation pipe covering in accordance with this specification is also furnished with factory applied jackets. Preformed fibrous glass fittings are also available.

Notice.- When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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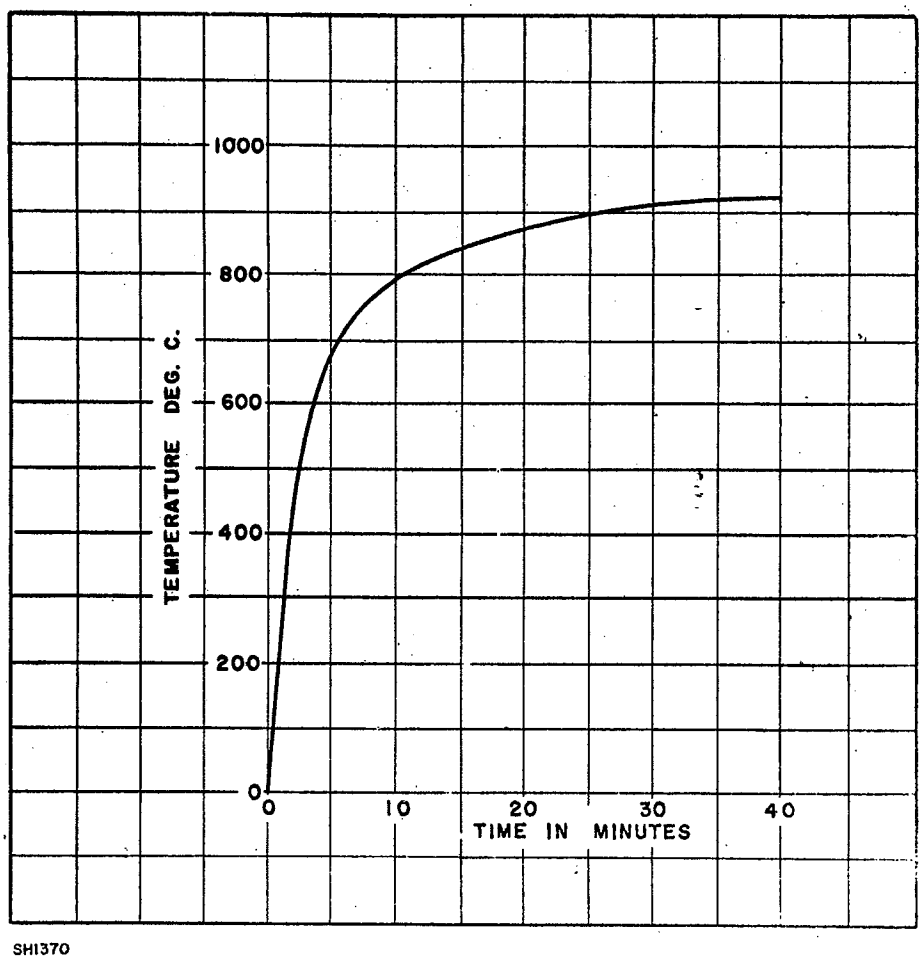

Figure 1 - Time temperature curve.