

HH-I-1751/4
August 6, 1973

FEDERAL SPECIFICATION
 INSULATION SLEEVING, THERMAL,
 PIPE COVERING (URETHANE)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the requirements for rigid cellular urethane thermal insulation fabricated or preformed into standard shapes for pipe and tubing operating within a temperature range of minus 100°F. to plus 220°F.

1.2 Classification.

1.2.1 Types and grades. Expanded urethane thermal insulation sleeving shall be of the following types, and grades, as specified (see 6.2).

- Type I - Density less than 1.7 pounds per cu. ft. (PcF).
- Type II - 1.7 to 2.49 pounds per cu. ft. density (PcF).
- Type III - 2.5 to 4.0 pounds per cu. ft. density (PcF).

- Grade 1 - Flame spread 75.
- Grade 2 - Flame spread 25.

1.2.2 Standard sizes and dimensions.

1.2.2.1 Unless other wise specified (see 6.2) cellular urethane thermal pipe insulation shall be furnished in lengths of at least 36 inches, thicknesses up to 4 inches, and inside diameters to fit iron pipe and copper tubing sizes. It shall be supplied as cylindrical shapes slit in half length wise or as curved segments as specified (see 6.2). Forms for sizes larger than 8 inches may be in sections.

1.2.2.2 Dimensional tolerances. Dimensional tolerances of pipe and tubing insulation segments shall be in accordance with ASTM C 585.

1.3 The complete requirements for procuring thermal insulation sleeving described herein shall consist of this document and the latest issue of specification HH-I-1751/GEN and documents referenced therein.

2. APPLICABLE DOCUMENTS

2.1 The latest issue of Federal Specification HH-I-1751/GEN and documents referenced therein.

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

American Society for Testing and Materials (ASTM) Standards:

- C 203 - Breaking Load and Calculated Flexural Strength of Preformed Block-Type Thermal Insulation.
- C 591 - Specification for Rigid Preformed Cellular Urethane Thermal Insulation.
- C 585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
- D 1621 - Test for Compressive Strength of Rigid Cellular Plastics.
- D 1692 - Test for Flammability Plastics Sheet and Cellular Plastics.
- D 2126 - Test for Resistance of Rigid Cellular Plastics to Simulated Service Conditions.
- D 2842 - Test for Water Absorption of Rigid Cellular Plastics.
- E 171 - Specification for Standard Atmosphere for Conditioning and Testing Materials.

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

3. REQUIREMENTS

3.1 Material. Rigid preformed cellular urethane thermal insulation covered by this specification is composed of poly-isocyanates reacted with polyhydroxy compounds, expanded with a fluorocarbon blowing agent. Unless otherwise specified shall meet the requirements of ASTM C 591, except for quality assurance, packing, marking and packaging requirements.

3.1.1 Fire hazard classification. Grade 1 thermal sleeving shall be tested in accordance with paragraph 4.4.2 of HH-I-1751/GEN, and shall have a flame spread rating not greater than 75. The smoke developed rating shall not be greater than 200. Grade 2 thermal sleeving shall be tested in accordance with paragraph 4.4.2 of HH-I-1751/GEN and shall have a flame spread not greater than 25. The smoke developed rating shall not be greater than 200. Test specimens for fire hazard classification shall be 1 inch in thickness.

3.1.2 Thermal conductivity. When tested in accordance with 4.4.1 of HH-I-1751/GEN, at a mean temperature of 75°F. the thermal conductivity shall meet the requirements of table I.

3.1.3 Compressive strength. When tested in accordance with 4.4.1 of this specification, the minimum compressive strength when tested both parallel and normal to the direction of rise of the foam shall be in accordance with table I, for type I, type II and type III. When sleeving less than 1-inch thick is specified 1-inch samples representative of the material shall be tested.

3.1.4 Density. When tested in accordance with 4.4.4 of HH-I-1751/GEN, the density rating shall be as specified in 1.2.1.

3.1.5 Flexural strength. When tested in accordance with 4.4.5 of HH-I-1751/GEN, the flexural strength for type I, type II, and type III shall be in accordance with table I. When block or board specimens are used to test flexural strength, ASTM C 203 may be used as an alternate test procedure.

3.1.6 Humid aging. When tested in accordance with 4.4.2 of this specification, the maximum percent of change in linear dimension shall be 4 percent in accordance with table I. Any sample tested showing evidence of cell collapse or visible distortion in any axis shall be rejected.

3.1.7 Temperature rating. When tested in accordance with 4.4.3 of this specification, the change in length between bench marks on test specimens shall be not more than plus 4 percent, for high temperature and shall not exceed minus 2 percent for low temperature rating. Any sample tested showing evidence of cell collapse or visible distortion in any axis shall be rejected.

3.1.8 Water absorption. When tested in accordance with 4.4.4 of this specification, the water absorption shall be not more than 2 percent by volume.

3.1.9 Moisture vapor permeability. When tested in accordance with 4.4.5 of this specification, the moisture vapor permeability shall be as specified in table I.

3.2 Physical properties. The physical properties of urethane thermal insulation sleeving shall conform to the requirements of table I.

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TABLE I. Physical properties

	Type I	Type II	Type III
Thermal conductivity max. mean tem. of 75°F., BTU-IN./hr. sq. ft. deg. F. 1/.	0.17	0.17	0.17
Compressive strength min. at 10 percent deformation or at yield point which ever occurs first, PSI.	15	17	30
Water Vapor permeability, max., perm-in.	4	3	2.5
Flexural strength min. PSI.	15	20	40
Closed cell content, min., percent.	85	85	85
Humid aging, max., percent change in linear dimension.	4	4	4

1/ After 3 months dry aging at 140°F.

4. QUALITY ASSURANCE PROVISIONS

4.1 The applicable Quality Assurance Provisions of Federal Specification HH-I-1751/GEN and the documents therein, shall apply with the following additional requirements.

4.2 Sampling.

4.2.1 In accordance with 4.2.1 of HH-I-1751/GEN, unless otherwise specified (see 6.2).

4.3 Examination.

4.3.1 End item. Insulation selected in accordance with 4.2.2 of HH-I-1751/GEN shall be examined for defects listed in table I of HH-I-1751/GEN.

4.3.2 Inspection of preparation for delivery. An inspection shall be made to determine that the packaging, packing, and marking requirements comply with section 5. Defects shall be scored in accordance with table II of HH-I-1751/GEN.

4.4 Test methods.

4.4.1 Compressive strength. Determination of the compressive strength shall be in accordance with ASTM C 1621 (see 3.1.3).

4.4.2 Humid aging. Determination of the humid aging shall be in accordance with ASTM D 2126, procedure D (see 3.1.6).

4.4.3 Temperature rating. Determination of the temperature rating shall be in accordance with ASTM D 2126 procedure B for conducting low temperature test, and procedure A for conducting high temperature test (see 3.1.7).

4.4.4 Water absorption. Determination of the water absorption shall be in accordance with ASTM D 2842 (see 3.1.8).

4.4.5 Moisture vapor permeability. Determination of moisture vapor permeability shall be in accordance with ASTM C 355 by the desiccant method (see 3.1.9).

4.4.6 Test specimens. Boards or blocks from which the thermal insulation sleeving is produced, may be used as the test specimens, (see 3.1.5).

5 PREPARATION FOR DELIVERY. In accordance with Federal Specification HH-I-1751/GEN and documents referenced therein.

6. NOTES

6.1 Intended use. Insulation units covered by this specification are intended as indicated, for use on surfaces at low and high temperatures.

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6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Type, grade, (see 1.2.1) and temperature rating (see 3.1.7).
- (c) Size of insulation, length and thickness (see 1.2.2.1 and 1.2.2.2).
- (d) Size of lot, if different from 4.2.1 of HH-I-1751/GEN.
- (e) Selection of applicable levels of packaging and packing (see 5.1 and 5.2) of HH-I-1751/GEN.

6.3 Temperature limits. Insulation is produced in a large range of temperature ratings. For specific applications, depending on humidity conditions and allowable linear expansion, the actual temperature limits should be agreed upon between the manufacturer and the purchasers.

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