

MIL-C-22395B  
9 December 1980  
SUPERSEDING  
MIL-C-22395A  
29 August 1963  
(See 6.3)

MILITARY SPECIFICATION

COMPOUND, END SEALING, THERMAL INSULATION PIPE  
COVERING-FIRE-, WATER-, AND WEATHER-RESISTANT

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

1. SCOPE

1.1 Scope. This specification covers flexible, fire resistant and water-proof end sealing compounds for thermal insulation exterior steam systems operating at temperatures up to 400°F.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

PPP-C-96 - Cans, Metal, 28 Gage and Lighter.

MILITARY

MIL-C-2861 - Cement, Insulation, High Temperature.

MIL-A-3316 - Adhesive, Fire Resistant, Thermal Insulation.

MIL-C-19565 - Coating Compound, Thermal Insulation, Pipe Covering - Fire, Water and Weather Resistant.

MIL-C-20079 - Cloth, Glass; Tape, Textile Glass; and Thread, Glass.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 3112, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MIL-C-22395B

STANDARDS

FEDERAL

FED-STD-791 - Lubricants, Liquid Fuels, and Related Products; Methods of Testing.

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting 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)

D 92-78 - Flash and Fire Points by Cleveland Open Cup.  
D 217-68 - Cone Penetration of Lubricating Grease.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 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 Composition. The compound shall be composed of resinous vehicles and inorganic fillers suitable for the purpose intended and applicable without heating or the addition of any other ingredients. It shall be free of all ingredients which may affect the serviceability or have a harmful effect on thermal insulation, metal surfaces, or service personnel. The compound shall be asbestos-free, and an attesting certificate of compliance shall be required (see 6.2.2).

3.2 Stability. The compound shall not liver, settle, or otherwise deteriorate when stored for a period of 1 year in airtight containers.

3.2.1 The compound shall not be adversely affected on returning to room temperature after subjection to  $16^{\circ}\text{F} \pm 1^{\circ}\text{F}$  temperature for a period of 16 hours (hrs).

3.3 Consistency. The compound shall have a cone penetration not less than 20 nor more than 28 millimeters (mm).

MIL-C-22395B

3.4 Flexibility. The compound shall not chip, scale, crack, or separate from the surface of the metal strip when bent 180 degrees over a mandrel of 1/2-inch pipe.

3.5 Flash point. The compound shall have a flash point not less than 300°F.

3.6 Fire resistance. The compound shall not burn for more than 30 seconds after removal of a test flame.

3.7 Thermal cycling. The compound shall not drip or run, crack or spall, nor lose adhesion to metal surfaces or lagging materials.

3.8 Water permeability. The compound specimens subjected to required thermal cycling shall not absorb water as measured by gain in weight.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by 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.

4.2.1 Lot. A lot shall consist of all compound from one production batch offered for delivery at one time.

4.2.2 Sampling for examination of filled containers. A random sample of filled containers shall be selected from each inspection lot in accordance with MIL-STD-105 at inspection level I and acceptable quality level (AQL) equal to 2.5 percent defective for the examination specified in 4.3.1.

4.2.3 Sampling for quality conformance inspection. From each inspection lot, a random sample of two containers shall be selected. From each of the containers, a two-quart sample shall be taken for the tests specified in 4.3.2.

4.3 Inspection.

4.3.1 Examination of filled containers. Each filled container selected in accordance with 4.2.2 shall be examined to verify compliance with the requirements of Sections 3 and 5. Any filled container in the sample having one or more defects shall be rejected, and if the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, the lot represented by the sample shall be rejected.

4.3.2 Quality conformance inspection. The sample specimens selected in accordance with 4.2.3 shall be separately subjected to all of the tests specified in 4.4. If any one of the samples tested is found to be not in conformance with the lot represented by the sample, the lot shall be rejected.

## MIL-C-22395B

4.4 Test procedures.

4.4.1 Stability. The manufacturer of the compound shall certify (see 6.2.2), that after being sealed in an airtight container and held in storage for a period of 1 year at a temperature of  $70^{\circ}\text{F} \pm 2^{\circ}\text{F}$ , the compound shall be capable of conformance with 3.2.

4.4.1.1 The compound shall be subjected to a temperature of  $16^{\circ}\text{F} \pm 1^{\circ}\text{F}$  for 16 hrs before testing for stability after 1 year storage.

4.4.2 Consistency.

4.4.2.1 Apparatus. The apparatus shall be as specified in ASTM D 217-68. The total weight of the cone and rod shall be 150 grams (g).

4.4.2.1.1 Procedure. The open cup portion of the grease worker (see method 311 of FED-STD-791) shall be completely filled with the well-mixed sample at a temperature of  $77^{\circ}\text{F} \pm 1^{\circ}\text{F}$ . A straight edge shall be drawn across the surface of the sample to remove any excess material and to present a smooth surface. A thin film of water shall be floated on top of the test material during the test to prevent nonconformity due to evaporation or skinning. The apparatus shall be leveled and the plunger lowered until the tip of the penetrometer cone just touches the surface of the sample. The scale shall then be adjusted so that the scale actuating device is in contact with the top of the rod holding the penetrometer cone and the scale reading recorded. The plunger shall be released suddenly and kept released for 5 seconds. The scale actuating device shall be moved until it is again in contact with the top of the rod holding the penetrometer cone, and the scale reading recorded. The penetration is the difference between the two readings. Five tests shall be made and the average value shall be in accordance with 3.3. The sample shall be smoothed over before each test.

4.4.3 Flexibility.

4.4.3.1 Material and apparatus. The apparatus shall consist of the following:

- (a) A panel 8 by 8 inches, 0.11 inch thick, and made from bright tin plate (solvent cleaned).
- (b) A film applicator with a clearance of 1/16-inch and a gap of sufficient size to make a film at least 3 inches wide.
- (c) A mandrel made from a 6-inch long section of 1/2-inch size pipe (0.84 inch outside diameter (o.d)), supported at each end.

4.4.3.2 Procedure. The 8 by 8-inch tin panel shall be placed on a flat surface. Using the film applicator, a film of the compound 8 inches long and not less than 3 inches wide shall be applied on the panel. The coated panel shall be air dried for 72 hrs. Four 1-1/2-inch wide strips shall be cut from the coated panel. The strips shall be placed in an electric air circulating oven and baked at a temperature of  $212^{\circ}\text{F}$  to  $220^{\circ}\text{F}$  for 75 minutes. The strips shall be removed from the oven and allowed to cool to room temperature then bent rapidly over the surface of the mandrel until the strips ends are paralleled. The material in the bent portion shall be in accordance with 3.4. Slight surface cracks shall be disregarded.

## MIL-C-22395B

4.4.4 Flash point. The flash point of the compound shall be determined by ASTM D 92-78, and shall be in accordance with 3.5.

4.4.5 Fire resistance. Strips of fibrous glass tape, 6 inches long, 1-1/2 inches wide and 0.007 inch thick shall be coated with the compound in such a manner that the interstices of the strips are completely filled. The coated strips shall be air dried for 72 hrs, then dried in an electrically heated oven for 20 hrs at 200°F. The specimens shall then be removed from the oven and individually suspended vertically from a clamp covering the upper 1/2 inch of the strip. A Meker burner, with a 30 mm diameter grid, shall then be placed below the specimen in such a position that 1/2 inch of the specimen is in the 1-1/2 inch high test flame. After 5 seconds of flame application to the strip, the burner shall be removed and the length of time the coating continues to burn shall be in accordance with 3.6.

4.4.6 Thermal cycling test.

4.4.6.1 Preparation of test specimen. A 40-inch section of nominal 3-inch steel pipe shall be covered with a 30-inch length of 2-inch thick pipe insulation. The insulation shall be secured to the pipe by means of three equally spaced 1/2-inch wide galvanized steel bands. The ends of the insulation shall be chamfered at a 30 degree angle with the pipe and smoothed with insulation cement of MIL-C-2861. After drying thoroughly, the ends shall be coated with approximately a 1/8-inch thick tack coat of compound. The compound shall extend onto the pipe for at least 3 inches. A single layer of glass cloth lagging, in accordance with the applicable class of type I cloth of MIL-C-20079, shall be applied over the insulation and secured at the longitudinal lap joint with type I adhesive cement in accordance with MIL-A-3316. The ends of the glass lagging cloth shall be tailored to fit the contour of the insulation ends by cutting and removing wedge-shaped sections of the cloth. Then embedded in the tack coating of compound and attached to the pipe with a single 1/2-inch wide galvanized steel band, a layer of compound approximately 3/16-inch thick shall be troweled to a smooth finish over the cloth covered chamfered ends of the assembly. A smooth finish may be obtained by brush coating or hand rubbing the sealer compound with a suitable solvent. After 72 hrs of air drying at room temperature ( $77^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ), the glass cloth of the assembly shall be given two brush coats of water, and weather-resistant coating compound of MIL-C-19565. The waterproofing compound shall extend halfway down the chamfered ends of the assembly. The waterproofing compound shall be air dried 24 hrs between applications.

4.4.6.2 Test. The specimen shall be heated in an electrically heated oven to 400°F in two hrs, subjected to that temperature for six hrs, and then allowed to cool to room temperature for 16 hrs. The specimen shall be subjected to this heating and cooling cycle three times, after which the compound shall be in accordance with 3.7.

4.4.7 Water permeability test. The specimen used in the thermal cycling test (see 4.4.6) shall be used in this test after completion of the thermal cycling test. The specimen shall be weighed and suspended with the long axis vertical so that one sealer-coated chamfered end is immersed in water. The water level shall be maintained 2 inches above the top of the chamfer. After 24 hrs of immersion, the specimen shall be wiped dry on the outer surface and reweighed. The results shall be in accordance with 3.8.

## MIL-C-22395B

4.5 Packaging inspection. Sample packages and packs and the inspection of the packaging for shipment and storage/stowage shall be in accordance with 4.3.1 and Section 5 herein.

## 5. PACKAGING

(The preparation for delivery requirements specified herein apply only for the direct Government acquisitions.)

5.1 Preservation-packaging. Preservation-packaging shall be level A or C as specified (see 6.2.1).

5.1.1 Level A. The compound shall be furnished in 1 gallon quantities in multifriction top cans conforming to type V, class 2 of PPP-C-96. Exterior plan B coating and side seam striping shall be required. Cans shall be provided with wire handles which shall be galvanized or protectively coated to resist corrosion.

5.1.2 Level C. Packaging shall afford protection against deterioration and physical damage during shipment from the supply source to the first receiving activity for immediate use. This Level may conform to the contractor's normal retail practice when such meets the requirements of this level.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2.1), in accordance with the Appendix to PPP-C-96.

5.3 Marking. In addition to any special marking required by the contract or order (see 6.2.1), interior packages and exterior shipping containers shall be marked for shipment in accordance with the Appendix to PPP-C-96. In addition, interior packages and shipping containers shall be marked "ASBESTOS FREE".

## 6. NOTES

6.1 Intended use. The end sealing compounds of this specification are intended for use on thermal insulation on exterior steam systems operating at temperatures up to 400°F.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Level of preservation-packaging and packing required (see 5.1 and 5.2).
- (c) Special markings required (see 5.3).

6.2.2 Data requirements. When this specification is used in a contract which incorporates a DD Form 1423 and invokes the provisions of the Defense Acquisition Regulation (DAR), the data requirements identified below will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List

## MIL-C-22395B

(DD Form 1423) incorporated into the contract. When the provisions of the DAR are not invoked, the data specified below will be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this specification is cited in the following paragraphs:

<u>Paragraph</u>	<u>Data requirements</u>	<u>Applicable DID</u>	<u>Option</u>
3.1 and 4.4.1	Certificate of compliance	DI-E-2121	--

(Copies of data item descriptions required by the contractor in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.

6.2.2.1 The data requirements of 6.2.2 and any task in section 3, 4, or 5 of the specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 Changes from previous issue. Asterisks (\*) are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Preparing activity:  
Navy - SH  
(Project 8030-0465)

Custodian:  
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