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METRIC

DOD-C-2667B
11 February 1980
SUPERSEDING
MIL-C-2667A
25 October 1972
(See 6.4)

MILITARY SPECIFICATION

COMPOUND, BATTERY-SEALING (METRIC)

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

1. SCOPE

* 1.1 Scope. This specification covers compounds for sealing lead-acid storage batteries.

1.2 Classification. The compound shall be furnished in but one type as hereinafter specified.

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.
PPP-D-711 - Drum: Metal, Shipping, Steel, Lightweight (55 Gallon).
PPP-P-704 - Pails, Metal: (Shipping, Steel, 1 through 12 Gallon).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Nava 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.

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STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.
MIL-STD-147 - Palletized and Containerized Unit Loads 40" x 48" Pallets, Skids, Runners, or Pallet-Type Base.

(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 5 - Test for Penetration of Bituminous Materials.
D 36 - Test for Softening Point of Bitumen (Ring and Ball Apparatus).
D 92 - Test for Flash and Fire Points by Cleveland Open Cup.
D 113 - Test for Ductility of Bituminous Materials.

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

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification Ratings, Rules, and Regulations.

(Application for copies should be addressed to the Uniform Classification Committee Agent, Tariff Publication Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC. AGENT

National Motor Freight Classification.

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., ATA Traffic Dept., 1616 "P" Street, N.W., Washington, DC 20036.)

(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.)

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3. REQUIREMENTS

3.1 General. The compound shall not shrink, crack, or separate from a holding surface such as hard rubber or glass, at any temperature between -18° and 66° Celsius (C). Between these two temperatures it shall adhere sufficiently to the holding surface to maintain an acidtight joint.

3.2 Softening point. The softening point of the compound shall be between 77°C and 100°C when determined by the method prescribed in 4.4.1.

3.3 Flash point. The flash point of the compound shall be not lower than 292°C when determined by the method prescribed in 4.4.2.

3.4 Penetration. When the compound is tested as specified in 4.4.3, the penetration values shall be not less than those shown in table I.

TABLE I. Penetration.

Condition of test			Minimum penetration
Temperature	Mass	Time	
Degrees C	Grams	Seconds	Tenths of a millimeter
25	100	5	45
0	200	60	30

3.5 Hot test. When subjected to the hot test specified in 4.4.4, the compound shall not flow below the bottom edges of the slot at the expiration of 24 hours.

3.6 Cold test. When subjected to the cold test specified in 4.4.5, the average breaking point of the three samples of the compound, in angular degrees, shall be not less than 30 degrees.

3.7 Adhesion. When subjected to the test specified in 4.4.6, the adhesion of the compound, expressed in newtons (pounds) pull to break, shall be not less than 250 (55).

3.8 Ductility. When subjected to the test specified in 4.4.7, the ductility of the compound, expressed in centimeters elongation, shall be not less than the values shown in table III.

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TABLE II. Ductility.

Condition of test	Minimum elongation
Temperature	
Degrees C	Centimeters
25	3.0
0	2.0

3.9 Stain. When the compound is subjected to the test specified in 4.4.6, there shall be no appearance of stain beyond the outside diameter of the ring.

3.10 Solubility in sulfuric acid. When tested as specified in 4.4.9, the residue shall not exceed 0.01 grams (g) and there shall be no discoloration of the solution.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, 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.

* 4.1.1 Test reports. The contractor shall prepare a test report, including all tests in table IV, in accordance with the data ordering documents included in the contract or order (see 6.2.2 and 6.3).

4.2 Sampling for quality conformance inspection.

4.2.1 Lot. For purposes of sampling, a lot shall consist of all compound from one production batch.

4.2.2 Sampling for quality conformance tests. A sample shall be taken from each lot of compound at the time the compound is poured into shipping containers. In the event the sample is to represent a lot of compound which has already been poured into shipping containers, the sample shall be taken from five randomly selected containers. If there are less than five containers, each container shall be sampled.

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4.2.3 Sampling for quality conformance examination. A random sample of filled containers shall be selected in accordance with MIL-STD-105 at inspection level S-1 and acceptable quality level (AQL) = 2.5 percent defective to verify compliance with all requirements regarding fill, closure, marking, and other requirements not requiring tests.

4.3 Lot inspection.

4.3.1 Tests. The sample selected in accordance with 4.2.2 shall be subjected to the tests specified in 4.4. If the sample tested is found not to be in conformance with this specification, it shall be cause for rejection of the lot represented by the sample.

4.3.2 Examination. Each sample filled container selected in accordance with 4.2.3 shall be examined to verify conformance with the requirements of this specification. Any 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, it shall be cause for rejection of the lot represented by the sample.

4.4 Tests. The tests listed in table III shall be performed on each sample selected in accordance with 4.2.2.

TABLE III. Tests.

Test	Requirement paragraph	Applicable paragraph
Softening point	3.2	4.4.1
Flash point	3.3	4.4.2
Penetration	3.4	4.4.3
Hot test	3.5	4.4.4
Cold test	3.6	4.4.5
Adhesion	3.7	4.4.6
Ductility	3.8	4.4.7
Stain	3.9	4.4.8
Solubility in sulfuric acid	3.10	4.4.9
Chemical analysis		4.4.10
Specific gravity		4.4.10

* 4.4.1 Softening point. The softening point of the compound shall be determined by the ring and ball method in accordance with ASTM D 36.

4.4.2 Flash point. The flash point of the compound shall be determined by the Cleveland Open Cup method in accordance with ASTM D 92.

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4.4.3 Penetration. The penetration values of the compound shall be determined in accordance with ASTM D 5.

* 4.4.4 Hot test. The compound shall be melted by heating to the pouring temperature specified by the manufacturer on the container and then poured to a depth of 1.3 centimeter (cm) (0.50 inch) into a cylindrical brass cup having an inside diameter of 5 cm (2 inches) and a base of 0.30 cm (0.125 inch) thick. The base shall have a slot 2.50 ± 0.01 cm by 0.08 ± 0.01 cm (1.000 ± 0.005 by 0.0312 ± 0.0005 inch) located near its center and shall be supported so there is at least 0.50 (0.25 inch) free space below the slot. After the compound has been cooled for at least 16 hours, it shall be placed in an oven and held at a temperature of 66°C for 24 hours.

4.4.5 Cold test. Three specimens of the compound shall be poured at the pouring temperature specified by the manufacturer on the containers into a form 0.30 cm by 2.5 cm by 15 cm (0.125 by 1 inch by 6 inches). After cooling to room temperature, the specimen shall be subjected to a temperature of minus 18°C for 24 hours. A bending test shall then be made by holding one-half of the specimen in place and slowly applying a load to the free end until the specimen fractures. The angle of bend at the time of fracture shall be noted and an average of the three results shall be obtained. To prevent the specimens from becoming warm, they shall be tested without removing from the minus 18°C ambient temperature and gloves shall be used in handling. The specimens shall be clamped the full length with flat clamps except that 1.0 cm (.375 inch) of the compound shall be free 8.6 cm (3.375 inches) from the fixed end to allow for bending. The specimen shall be bent at approximately 6 angular degrees per second. The cold bend apparatus is illustrated by figures 1 and 2.

4.4.6 Adhesion test. Two hard rubber disks, each with a surface area of 12.9 cm^2 (2 square inches) and mounted on steel shafts, shall be arranged facing each other 0.24 cm (0.09375 inch) apart. A phenolic cylinder with a 1.3 cm (0.50 inch) section removed, shall be used as a spacer and retainer for the compound, which shall be heated and poured between the disks. The disks and spacers shall be pre-heated for 1 hour at 77°C before pouring the compound, and the inner surface of the phenolic cylinder shall be coated with a thin film of grease before pouring. The edges of the spacer shall be forced apart to allow for the entrance of the disks with no acquisition of grease. The compound shall be poured at the pouring temperature specified by the manufacturer on the container. After pouring, the asembly shall be allowed to cool to 25°C and shall then be pulled apart at the rate of 1.3 cm (0.50 inch) per minute. The testing apparatus is illustrated by figure 3.

4.4.7 Ductility. The ductility of the compound shall be determined in accordance with ASTM D 113.

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4.4.8 Stain test. The compound shall be poured at the pouring temperature specified by the manufacturer on the container into a standard softening point ring (see 4.4.1). After allowing the assembly to cool to room temperature, the compound shall be trimmed flush with a heated knife, and the ring shall be placed on a piece of filter paper similar to Whatman No. 40 filter paper for 24 hours at 60°C.

4.4.9 Solubility in sulfuric acid. A cube of the compound, approximately 2.5 cm (1 inch) on the side, shall be completely immersed in 200 milliliter (mL) of water--white sulfuric acid electrolyte of 1.315 specific gravity, at a temperature of 21°C to 27°C for a period of 24 hours. After removing the compound completely, the acid shall be taken to dryness and the mass of residue determined.

4.4.10 Chemical analysis and specific gravity. The percentage of ash, chloroform insoluble matter, and fatty matter as well as the specific gravity of the compound shall be determined for information and for marking containers (see 5.4).

4.4.11 If a sample fails to pass any of the above tests, the lot shall be rejected.

4.5 Inspection of preparation for delivery. Sample packages and packs and the inspection of the packaging, packing, and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

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

5.1 Packaging. Packaging shall be level A or C, as specified (see 6.2.1).

* 5.1.1 Level A. Battery sealing compound shall be furnished in 8, 25, or 100 pound (approximate 4, 12, or 50 kilogram, respectively) quantities in cans, pails, or drums as specified (see 6.2).

* 5.1.1.1 Cans. Eight pound (4 kilogram) quantities shall be furnished in 1-gallon (approximate 4 liter) type V, round, class 2 cans of PPP-C-96. Plan B exterior coating shall be required.

* 5.1.1.2 Pails. Twenty-five pound (12 kilogram) quantities shall be furnished in pails conforming to type II, class 3 of PPP-P-704.

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* 5.1.1.3 Drums. One-hundred pound (50 kilogram) quantities shall be furnished in drums conforming to type III or IV of PPP-D-711 except that the drum dimensions and capacity do not apply.

* 5.1.2 Level C. Battery sealing compound in the quantity specified (see 6.2.1), shall be packaged to afford protection against deterioration and physical damage or loss during shipment from the supply source to the first receiving activity for immediate use. The contractor's retail or wholesale packaging methods may be utilized when such meet the requirements of this level.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2.1).

* 5.2.1 Level A.

* 5.2.1.1 Cans. Cans shall be packed in accordance with the level A requirements specified in the Appendix to PPP-C-96 for filled cans.

* 5.2.1.2 Pails and drums. Pails and drums shall require no over-packing.

* 5.2.2 Level B.

* 5.2.2.1 Cans. Cans shall be packed in accordance with the level B requirements specified in the Appendix to PPP-C-96 for filled cans.

5.2.3 Level C. Battery sealing compound, packaged as specified (see 6.2.1), shall be packed in containers of the type, size, and kind commonly used for the purpose in a manner acceptable to the common carrier and which will insure safe delivery at destination in a satisfactory condition at the lowest applicable rate. Containers, packing, or method of shipment shall comply with Uniform Freight or National Motor Freight Classification Rules or regulations or other carrier rules as applicable to the mode of transportation.

5.3 Palletized unit loads. When applicable, battery sealing compound, packed as specified (see 6.2.1), shall be palletized in accordance with MIL-STD-147.

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5.4 Marking. In addition to any special marking required by the contract or order, each can, pail, drum, or exterior shipping container and palletized or containerized loads shall be marked in accordance with MIL-STD-129. Each container shall also be marked with the following:

(a) Pouring temperature.
(b) Flash point.
(c) Precautions against overheating.
(d) Chemical analysis and specific gravity.

6. NOTES

6.1 Intended use. The sealing compound covered by this specification is intended to be used for sealing the cells of various types of lead-acid storage batteries. The compound should provide an acid-resistant and acid-tight seal between the cover and the jars (or case) of individual battery cells. The compound should have good adherence to hard rubber materials used for covers and jars and be soft enough to stand the movement of jars relative to covers without cracking.

6.2 Ordering data.

* 6.2.1 Acquisition requirements. Acquisition documents should specify the following:

(a) Title, number, and date of this specification.
(b) Levels of packaging and packing required (see 5.1 and 5.2).
(c) Quantity and container required (see 5.1.1 and 5.1.2).
(d) When palletization is required (see 5.3).
(e) Special marking required (see 5.4).

* 6.2.2 Data requirements. When this specification is used in a contract which invokes the provison of the "Requirements for Data" of the Defense Acquisition Regulation (DAR), the data identified below, which are required to be developed by the contractor, as specified on an approved Data Item Description (DD Form 1664), and which are required to be delivered to the Government, should be selected and specified on the approved Contract Data Requirement List (DD Form 1423) and incorporated in the contract. When the provisions of the "Requirements for Data" of the DAR are not invoked in a contract, the data required to be developed by the contractor and required to be delivered to the Government should be selected from the list below and specified in the contract.

Paragraph	Data requirements	Applicable DID	Option
4.1.1	Reports, tests	DI-T-2072	Paragraph 10.1.b

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(Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.)

* 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 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 Test reports shall be submitted to the Defense Contract Administration Service (DCAS) prior to shipment of the compound. After DCAS review, the test data shall be retained by the contractor for one year after delivery of the compound. One copy of the final test report shall be forwarded to the contracting activity concurrent with delivery of the compound.

6.4 Changes from previous issue. The margins of this specification are marked with an asterisk (*) to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previus issue.

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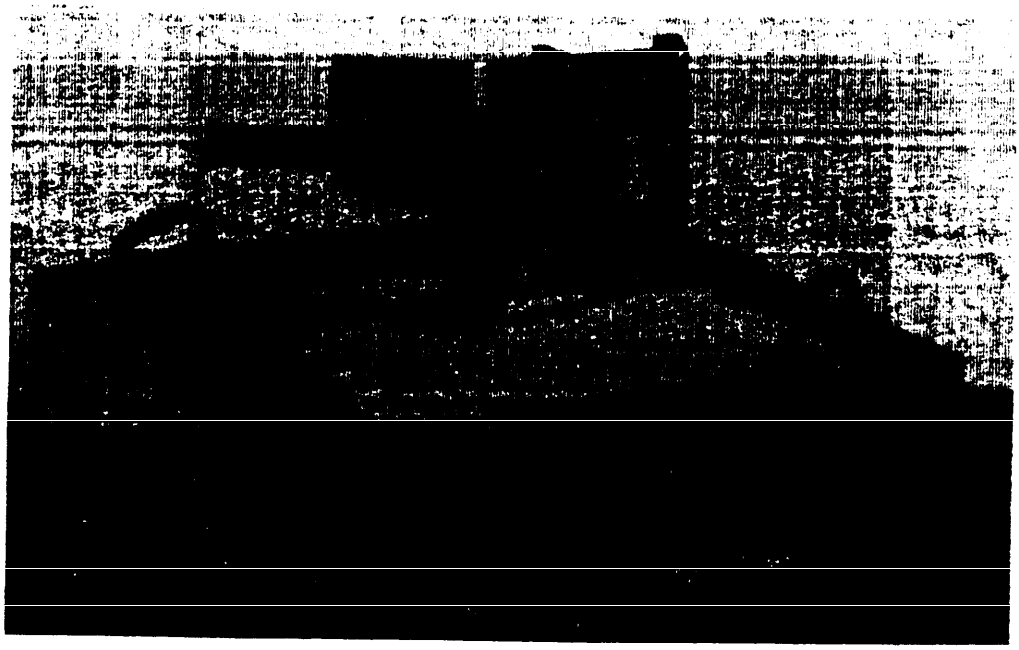

FIGURE 1. Cold bend test apparatus for battery sealing compounds (front view).

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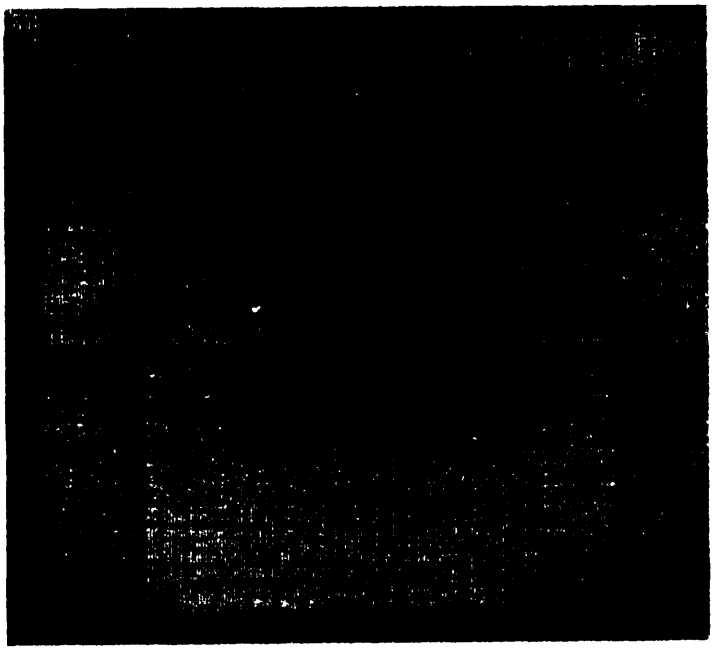

FIGURE 2. Cold bend test apparatus for battery seal compound (top view).

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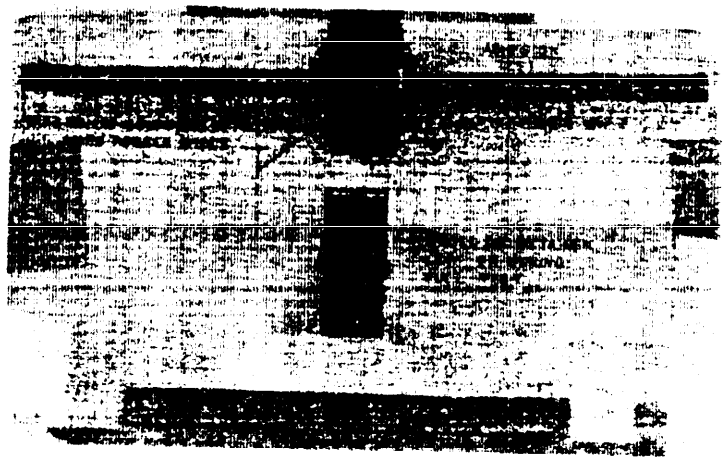

FIGURE 3. Adhesion test for battery sealing compounds.

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