

INCH-POUND
MIL-DTL-82633A (OS)
10 February 2011
SUPERSEDING
MIL-C-82633(OS)
27 August 1973

DETAIL SPECIFICATION COMPOUND, POLYMERIC ELASTOMER, THERMOSETTING

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all departments and agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers a two-part, cured-in-place, polymeric thermosetting compound having elastomeric and thermal properties for sealing or padding the tail portion of the explosive cavities of bombs. Curing takes place at room temperature with a minimum of exotherm.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

INTERNATIONAL STANDARDIZATION AGREEMENTS

STANAG 4240

Liquid Fuel/External Fire, Munition Test Procedures

(Copies of this document are available from NATO/MAS, Bvd Leopold 111, 1110 Brussels, BE online at <https://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

Comments, suggestions, or questions on this document should be addressed to DEPARTMENT OF THE NAVY, Indian Head Division, NSWC, E12AP, Document Control, 4123 Artisans Court, Suite 103, Indian Head, MD 20640-5085 OFFICIAL BUSINESS, or emailed to amanda.penn@navy.mil. Since contact information can change, you may want to verify the currency of this information using the ASSIST Online database at <https://assist.daps.dla.mil>.

AMSC N/A

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DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-1916

DOD Preferred Methods for Acceptance of Product

(Copies of this document are available online at <https://assist.daps.dla.mil/quicksearch/> or from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 70	Standard Test Method for Density of Semi-Solid Bituminous Materials (Pycnometer Method)
ASTM D 92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D 140	Standard Practice for Sampling Bituminous Materials
ASTM D 395	Standard Test Methods for Rubber Property--Compression Set
ASTM D 1084	Standard Test Methods for Viscosity of Adhesives

(Copies of these documents are available online at <http://www.astm.org> or from the American Society for Testing and Materials Customer Service, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS**3.1 General.**

3.1.1 First article. When specified (see 6.2), a sample (see 6.3) shall be subjected to first article inspection in accordance with 4.2.

3.1.2 Material. The two-component material shall polymerize in situ at room temperature when thoroughly blended together in equal parts by weight. The thermosetting compound may contain a hydroxy-modified, polydiene-isocyanate system polymerized by a curing agent with asphalt as a filler material.

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3.1.3 Workmanship. The individual components shall contain no volatiles or toluene diisocyanate ingredient and shall be products of high quality, suitable for the purpose intended, and so manufactured as to meet all requirements specified herein. Both components furnished under this specification shall be uniform in quality and consistency after stirring and free of agglomerates or other contaminants. The cured compound shall be free of low or high density areas and shall present an appearance of smooth homogeneity.

3.1.4 Storage (shelf) life. The cured compound (see 6.4.1) shall meet all requirements of this specification when produced from components that have been stored in unopened original containers no longer than 8 months at ambient temperature.

3.2 Product characteristics.

3.2.1 Physical properties of components. The components shall have the physical properties specified in Table I.

TABLE I. Component physical properties.

Property	Component A	Component B	Test procedure
Specific gravity	0.91 ± 0.03	0.96 ± 0.03	4.4.1
Viscosity, cp (at 75 ± 5 °F)	7,200 max.	¹ 12,000 max.	4.4.2
Flash point, °F	500 min.	400 min.	4.4.3

¹Not to exceed 25,000 cp after 8 months of storage.

3.2.2 Exothermic temperature. The peak exothermic temperature of the reacting polymeric compound shall not exceed 100 degrees Fahrenheit (°F) when tested in accordance with 4.4.4.

3.2.3 Gel time. The gelation (reaction) time of the reacting components shall be 6 ± 1 ½ minutes when tested in accordance with 4.4.5.

3.2.4 Slump test. The gelled compound (see 6.4.2) shall not slump beyond the edge of the test container when tested in accordance with 4.4.6.

3.2.5 Alkalinity. The cured compound shall have a pH value of 7.0 or less when tested in accordance with 4.4.7.

3.2.6 Acidity. The cured compound shall have less than 0.01 percent acidity when tested in accordance with 4.4.8.

3.2.7 Stability. The cured compound shall show no evidence of oil or other materials leaching out when tested in accordance with 4.4.9.

3.3 Performance requirements.

3.3.1 Resistance to cold temperature. A disc of the cured compound shall not crack, chip, or show deterioration when tested in accordance with 4.4.10.

3.3.2 Compression set. The cured compound shall have a compression set no greater than 50 percent when conditioned at 160 °F and no greater than 2 percent when conditioned at -65 °F and tested in accordance with 4.4.11.

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3.3.3 Bomb sealing suitability. The polymeric compound furnished under this specification shall be suitable for use as a sealer in Mk 80 Series explosive loaded bombs. Suitability shall be determined by incorporating the material into Mk 82 Mod 2, 500 pound (lb), thermally protected bombs (see 6.4.3) in accordance with the loading requirements of the applicable drawings. The number of bombs loaded shall be determined by the procuring activity. The loaded bombs shall have a cook-off time of 9 minutes or more when subjected to the fast cook-off test of 4.4.12.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2)
- b. Conformance inspection (see 4.3).

4.2 First article inspection. The first article inspection shall consist of all tests of this specification as described in 4.4. The first article sample shall be examined and tested for all requirements of this specification. The procuring activity reserves the right to accept the manufacturer's certification of testing, when available, in lieu of Government testing. Unless otherwise specified in the contract, a first article inspection shall be required if:

- a. There has been more than 12 months since production of the latest accepted lot
- b. There has been a relocation of the production facility
- c. There has been a major change in personnel or procedures
- d. There has been a change in the source of supplies for the materials used in the manufacture of the coating compound.

4.2.1 First article sample. When specified, a test report from the manufacturer or a commercial laboratory shall be forwarded to the procuring activity before the first article sample (see 6.3) is tested showing the following:

- a. formula number of the compound
- b. formulation
- c. composition of the thermosetting compound including:
 - (1) the identification of ingredient samples by specific chemical name and trade name
 - (2) laboratory data showing complete test results required by this specification except ignition.

4.2.1.1 Sample identification. The first article sample shall consist of 3 gallons (gal) of each component. The sample shall be tested by the manufacturer or forwarded to a testing facility as directed by the procuring activity (see 6.2). If the sample is to be forwarded to a testing facility, the material shall be packaged in suitable containers and forwarded to testing activity as designated by the procuring activity (see 6.2). Each sample submitted shall be plainly identified by securely attached durable labels marked with the following information:

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- a. Sample for first article inspection
- b. Compound, Polymeric Elastomer, Thermosetting
- c. Components A and B
- d. Name and address of manufacturer
- e. Location and identity of the plant which produced the samples
- f. Manufacturer's identification
- g. Date of manufacture
- h. Submitted by (name), (date), for first article tests in accordance with the requirements of MIL-DTL-82633.

4.3 Conformance inspection. For each inspection lot of compound submitted for acceptance, the conformance inspection shall consist of an examination for acceptability of quality control methods used by the manufacturer, an examination of filled containers for conformance to packaging, packing, and marking requirements, and examinations and tests of samples for the requirements of 3.1.2 through 3.3.2, of this specification.

4.3.1 Conformance samples. The conformance samples shall consist of a sample for tests and a sample for examination of filled containers. The sample for test shall be labeled with complete information on each component designation, on the lot and batch number, date of sampling, contract number, and applicable specification.

4.3.1.1 Inspection lot. An inspection lot shall consist of the same type polymeric compound produced by one manufacturer, at one plant, from the same materials, and under essentially the same manufacturing conditions.

4.3.1.2 Sample for tests. A 2-gal sample of each component shall be taken at random from each lot in accordance with ASTM D 140 and subjected to tests of 4.4. Unless otherwise specified, the values specified in section 3 apply to the average of the results obtained from duplicate determinations for each particular test. The lot shall be unacceptable if a sample fails to meet all requirements of this specification except as noted in 4.3.

4.3.1.3 Sample for examination of filled containers. A random sample of filled containers shall be selected from each lot of compound in accordance with MIL-STD-1916, verification level II and examined for fill, closure and damaged or leaking container, improper container, and marking. The sample containers shall be shipped as part of the lot if the lot is accepted.

4.3.1.4 Workmanship. Conformance of the compound to the requirement for workmanship and any other requirements not covered by specific tests shall be determined by appropriate visual examination.

4.4 Test methods.

4.4.1 Specific gravity. Determine the specific gravity for both component A and component B by the pycnometer method for roads, oils, and tars described in ASTM D 70.

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4.4.2 Viscosity.**4.4.2.1 Equipment.**

- a. Brookfield Synchroelectric Viscosimeter, Model RVT or RVF, or equivalent, with No. 5 spindle

4.4.2.2 Method. Determine the viscosity in centipoises of both component A and component B by Method B of ASTM D 1084. Use a 1-pint paint can as the standard container and the viscosimeter without cylindrical calibration sleeves. Condition samples at 75 ± 5 °F for a minimum of 2 hours (hr) prior to determining the viscosity. For both components, use spindle No. 5 at 10 revolutions per minute.

4.4.3 Flash point. Determine the flash point of component A and component B in accordance with ASTM D 92.

4.4.4 Exothermic temperature.

4.4.4.1 Preparation of test sample. Prior to mixing, condition component A and component B at 75 ± 5 °F for 4 hr, without a constant temperature bath. Condition all containers and probes to be used in the test at the test temperature at the same time.

4.4.4.2 Procedure. Use the following procedure to determine exothermic temperature.

- a. Use 1-gal cans to contain the two individual components and to contain the final mixture. Weigh 1 ½ lb of each component into individual containers and slowly stir each component separately by hand with a wooden paddle for 3 minutes, avoiding the entrapment of air.
- b. Combine the components in the recommended ratio to provide a convenient working quantity.
- c. Start the stopwatch, and mix the components thoroughly for 3 minutes, avoiding air entrapment by slow agitation with a stirring rod or mixing paddle. To avoid transfer of heat, do not hold the container by hand during the mixing operation. Record the start of mixing as the “starting time.”
- d. Place the sample container on a nonconducting surface in still air at the test temperature.
- e. Insert a thermocouple, or other temperature-measuring device, into the geometric center of the reacting mass, and record the observed temperature changes to the end of the test.
- f. Every 15 seconds, probe the center surface of the reacting mass with the applicator stick perpendicular to the material surface.
- g. Continue recording the time and temperature until the temperature starts to drop. Record the highest temperature reached as the peak exothermic temperature.

4.4.5 Gel time.

4.4.5.1. Preparation of test sample. Prior to mixing, condition component A and component B at 75 ± 5 °F for 4 hr, without a constant temperature bath. Condition all containers and probes to be used in the test at the test temperature at the same time.

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4.4.5.2 Procedure. Use the following procedure to determine gel time.

- a. Weigh 100 grams (g) of each component into individual containers, and slowly stir each component separately by hand with a wooden paddle for 3 minutes, avoiding the entrapment of air.
- b. Combine each 100 g component into an appropriate sized mixing container in the recommended ratio.
- c. Start the stopwatch, and mix the components thoroughly for 3 minutes, avoiding air entrapment by slow agitation with a stirring rod or mixing paddle. To avoid transfer of heat, do not hold the container by hand during the mixing operation. Record the start of mixing as the “starting time.”
- c. Place the sample container on a nonconducting surface in still air at the test temperature.
- d. Every 15 seconds, probe the center surface of the reacting mass with the applicator stick perpendicular to the material surface.
- e. When the reacting material no longer adheres to the end of a clean probe, record the gel time as the elapsed time from the start of mixing.

4.4.6 Slump test. For 1 minute, thoroughly hand-mix 100 g of component A with 100 g of component B. Pour mixture immediately into a 3-ounce ointment can or other suitable container (2 1/8 inches (in) in diameter by 1 3/8 in deep) filling to within 3/8 in of top. Measure time from start of mixing. After 15 minutes, place container on its side. Reacting mixture shall not have slumped beyond the edge of the container when observed 30 minutes after start of mixing. Conduct entire procedure at an ambient temperature of 75 ± 5 °F.

4.4.7 Alkalinity. Break or dice into small pieces (approximately 1/16 by 1/16 in) the cured material retained from the slump test of 4.4.6. Weigh accurately approximately 10 g of the sample into a 250-ml beaker. Add 100 ml of distilled water and boil for 30 to 45 minutes. Wash down sides of beaker with 10 to 20 ml of distilled water. Allow to cool to room temperature. Test the solution with red litmus paper. If paper does not become blue (pH 7), consider the sample have no alkalinity. Proceed with the acidity test of 4.4.8.

4.4.8 Acidity. Add 5 drops of phenolphthalein to the solution from 4.4.7. Titrate with 0.01N sodium hydroxide to the end point. Pink color should last for 30 seconds. Run a blank. Calculate percent acidity (as H₂SO₄) as follows.

$$\text{Percent acid} = \frac{4.9 (A - B) N}{W}$$

Where:

A = ml of sodium hydroxide for the sample

B = ml of sodium hydroxide for the blank

N = normality of the sodium hydroxide

W = weight of sample, g

4.4.9 Stability. For the stability test, use the test specimens of the compression set tests of 4.4.11a. After heat treating at 160 °F for 48 hr, examine the specimens for evidence of oil or other materials leaching out.

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4.4.10 Resistance to cold temperature.**4.4.10.1 Equipment.**

- a. Gardner Impact Tester, Variable, Cat. No. 1G-1120, 160 in-lb range, with a 4-lb rod as accessory

4.4.10.2 Method.

- a. Mold a disc of cured compound approximately $2\frac{3}{8}$ in diameter by $\frac{1}{2}$ in thick.
- b. Subject the thoroughly cured sample to -65 °F for 3 hr.
- c. Immediately upon removal from cold chamber, impact test the disc with a Gardner impact tester using 150 in-lb impact.
- d. Examine the sample for signs of cracking, chipping, or other deterioration.

4.4.11 Compression set. Determine the compression set of the material in accordance with ASTM D 395, method B, using 1.75 ± 0.02 -in-diameter by 0.38 ± 0.02 -in-thick molded specimens, with the following exceptions.

- a. Heat treat the specimens at 160 °F for 48 hr.
- b. Subject additional specimens to -65 °F for 48 hr.
- c. Ensure specimens remain at ambient temperature for 60 minutes prior to final thickness measurements.
- d. Spacer bars shall be 0.250 ± 0.002 in thick.

4.4.12 Fast cook-off test. Subject the thermally protected bombs loaded to the sealing suitability requirement of 3.3.3 to the fast cook-off test in accordance with STANAG 4240.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DOD personnel or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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6. NOTES

(This section contains information of a general or explanatory nature that may be helpful but is not mandatory.)

6.1 Intended use. The polymeric compound covered by this specification is intended for use as a nonexplosive reactive material either for sealing, padding, or a combination of both, in the tail portion of the explosive cavity of bombs where application is made by means of mixing-dispensing equipment. Since the polymeric thermosetting compound covered by this specification was developed for military use, there is no commercial application.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification
- b. If required, the specific issue of individual documents referenced (see section 2)
- c. Quantity of polymeric compound ordered (specify each component amount)
- d. Whether first article inspection is required and, if so, specify the test activity (see 3.1.1 and 4.2)
- e. Test data to be furnished procuring activity on conformance testing
- f. Type and degree of contractor verification program required
- g. Whether material is to be packed in pails or drums
- h. Packaging requirements and special markings, if any (see section 5 and paragraphs 6.5 to 6.5.2)

6.3 First article. When a first article inspection is required, the contracting officer should provide specific guidance to offeror(s) whether the sample(s) should be a preproduction sample, a first article sample, a first production sample, a sample selected from the first production batches, or a standard production sample from the contractor's current inventory. The contracting officer should also include specific instructions in acquisition documents of the first articles. Invitation(s) for bid(s) should provide that the U.S. Government reserves the right to waive the requirements for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the U.S. Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior U.S. Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Definitions.

6.4.1 Cured compound. The polymeric compound is considered the "cured compound" approximately 16 hr after mixing.

6.4.2 Gelled compound. The polymeric compound is considered the "gelled compound" from the time the reacting components gel until approximately 16 hr after mixing.

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6.4.3 Thermally protected bombs. Thermally protected bombs is defined as bombs coated, prior to explosive loading, with insulating materials. These may be exterior, interior, or combination of both that provides a heat resistant barrier between the explosive charge and the elevated temperature environment of a fuel fire. The coating system used on bombs explosive loaded to meet the bomb sealing suitability requirement of this specification should be determined by the procuring activity.

6.5 Preparation for delivery.

6.5.1 Packing. Unless otherwise specified, the polymeric components should be packed Level B utilizing steel shipping pails, PPP-P-704, or 55-gal metal drums, PPP-D-729. The inside surfaces should be treated, as required, to preclude content contamination. Each container should be furnished with a tight-fitting top heading. Pails should be palletized in accordance with MIL-STD-147.

6.5.2 Marking. In addition to any special marking required by the contract or purchase order, shipping containers should be marked in accordance with MIL-STD-129.

6.6 Delivered product. The polymeric compound furnished under contract should be identical in every respect to the first article samples that have been inspected and approved. In the event that the polymeric compound furnished under contract is found to deviate from the composition of the approved product or that the product fails to perform satisfactorily, approval of such product should be subject to immediate withdrawal from being first article approved.

6.7 Sources of supply. The manufacturer listed in Table II is a previously approved source. The procuring activity is cautioned that this manufacturer listed below may no longer produce a product that meets the requirements of this specification.

Table II. Sources of supply.

Government designation	Product Identification	CAGE Code	Notes	Manufacturer's name and address
None	EPI-Seal Bomb Sealant: Component A - 1801124 Component B - 1801123	19092		Abbey Color Incorporated 400 East Tioga Street Philadelphia, PA 19134 www.abbeycolor.com 215-739-9960

6.8 Supersession data. This document supersedes MIL-C-82633 dated 27 August 1973 and QPL-82633-2 dated 22 January 1976.

6.9 Subject term (key word) listing.

Bombs

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6.10 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
Navy – OS

Preparing activity:
Navy – OS
(Project No. 8030-2009-003)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.daps.dla.mil/>.