

MIL-R-82657(OS)
31 January 1977
Superseding
(See Section 6)

MILITARY SPECIFICATION

RESIN, EPOXY, TRIFUNCTIONAL

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 one type of trifunctional epoxy resin.

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.

STANDARDS

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipping and Storage
MIL-STD-1218	ACS Chemicals

(Copies of specifications, standards, drawings, and publications required by suppliers 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 the date of invitation for bids or request for proposal shall apply.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Ordnance Station, Standardization Division (611), Indian Head, Maryland 20640 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 6810

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AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM D 70-72	Specific Gravity of Semi-Solid Bituminous Materials
ASTM D 445-74	Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D 1726-73	Hydrolyzable Chlorine Content of Liquid Epoxy Resins

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

CODE OF FEDERAL REGULATIONS

49 CFR 100-199	Transportation
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(The Code of Federal Regulations is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Orders should specify "49 CFR 100-199 (latest revision)").

INTERNAL REVENUE SERVICE

IRSP No. 368	Formula for Denatured Alcohol and Rum
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(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT
National Motor Freight Classification

(Application for copies should be addressed to American Trucking Associations, Attn: Tariff Order Section, 1616 P Street, Washington, DC 20036.)

UNIFORM CLASSIFICATION COMMITTEE, AGENT
Uniform Freight Classification

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

(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 Material. The material shall be a light amber to dark brown triglycidyl ether of p-aminophenol.

3.2 Chemical and physical properties. The chemical and physical properties shall be in accordance with TABLE I.

TABLE I. Chemical and physical properties.

Property	Minimum	Maximum
Specific gravity, 25°/25°C	1.205	1.225
Viscosity, cps, 25°C	550	850
Epoxy assay, g/g . mole	95	107
Hydrolyzable Chlorine content, wt%	--	0.5
Water content, wt%	--	0.2

3.3 Workmanship. The resin shall be uniform, free from contamination, foreign material or any other defect that would prevent its use for the purpose intended.

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 that supplies and services conform to prescribed requirements.

4.2 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed under the following conditions:

- Temperature: Room ambient 18 to 35°C (65 to 95°F)
- Altitude: Normal ground
- Vibration: None
- Humidity: Room ambient to 95 percent relative, maximum

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4.3 Sampling.

4.3.1 Lot. Unless otherwise specified in the contract (see 6.2), a lot shall consist of all resin manufactured in one continuous production run or in one batch, under essentially identical conditions, from the same raw materials, and to be offered for acceptance at one time. Several batches, manufactured from the same raw materials, may be blended to form a uniform larger batch which shall then constitute a lot for inspection purposes.

4.3.2 Sampling. Sampling for quality conformance inspection shall be in accordance with inspection level I of MIL-STD-105. The sample unit shall be one unit package or container of material. Each sample shall consist of sufficient material to perform the quality conformance tests as specified in 4.4.

4.4 Quality conformance inspection. Each sample obtained in accordance with 4.3.2 shall be subjected to the tests of 4.5. The acceptable quality level (AQL) shall be 2.5% defective. When specified in the contract (see 6.2), the contractor shall furnish test reports showing quantitative results for all quality conformance tests specified for each lot of resin.

4.5 Tests. Unless otherwise specified herein, all chemicals shall be ACS grade in accordance with MIL-STD-1218.

4.5.1 Specific gravity. Specific gravity, 25/25°C, shall be determined in accordance with ASTM D 70-72.

4.5.2 Viscosity. The viscosity at 25°C shall be determined in accordance with ASTM D 445-74.

4.5.3 Epoxy assay. The epoxy assay shall be determined in accordance with the following:

a. Apparatus:

1. Erlenmeyer flask, 250 milliliter (ml), 24/40 joint.
2. Condenser, West-type, water cooled drip tip, 24/40 joint, 300 millimeter (mm) jacket.
3. Hot plate.
4. Pipet, 25 ml.

b. Reagents:

1. Pyridine hydrochloride, reagent grade.
2. Pyridine hydrochloride solution, 0.2 normal (N), 23 grams (g) pyridine hydrochloride/liter pyridine.
3. Sodium hydroxide, 0.1 N standard.
4. Phenolphthalein indicator, 1 percent alcoholic.
5. Ethyl alcohol, absolute, denatured, Formula D-30 conforming to Internal Revenue Service Publication No. 368.

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c. Procedure: Weigh a 0.2 to 0.3 g sample to the nearest 0.1 mg, into a 250 ml Erlenmeyer flask. Pipet 25.0 ml of 0.2 N pyridine - hydrochloride solution into the flask, Prepare a blank, omitting only the sample, and run as outlined. Place a condenser on the flask and reflux on a hot plate for a minimum of 1 hour. Remove the flask from the hot plate with condenser attached, and allow to cool to room temperature. Rinse the inner tube of the condenser with 50 ml of ethyl alcohol and titrate the sample with 0.1 N sodium hydroxide to a phenolphthalein endpoint.

d. Calculation: Epoxy assay, $(\text{g/g} \cdot \text{mole}) = \frac{1000 W}{(V_1 - V_2)N}$

where: N = normality of sodium hydroxide

V_1 = volume of sodium hydroxide used for titration of blank, ml

V_2 = volume of sodium hydroxide used for titration of sample, ml

W = weight of sample, g

1000 = factor for calculation

e. Report the results of a minimum of 2 determinations and their average.

4.5.4 Hydrolyzable chlorine content. The hydrolyzable chlorine content shall be determined in accordance with ASTM D 1726-73.

4.5.5 Water content. The water content shall be determined in accordance with the following:

a. Reagents:

1. Methanol.
2. Sodium tartrate.
3. Stabilized Karl Fischer reagent, diluted to a water equivalent of 2.5 to 3.0 mg/ml with Karl Fischer diluent.

b. Apparatus: Aquameter, Beckman Model KF-4, or equivalent.

c. Standardization of dilute Karl Fischer reagent: Add 100 ml of methanol to the reaction vessel. Neutralize the methanol with dilute Karl Fischer reagent by automatically titrating to a 30-second endpoint using the Aquameter. Add 0.09 to 0.11 g of sodium tartrate weighed to the nearest 0.1 mg, to the neutralized methanol. Dissolve the sodium tartrate in the methanol by setting the stirring action to the highest speed which will not cause splashing or bubble formation. Automatically titrate with dilute Karl Fischer reagent to a 30-second endpoint. Record the volume of dilute Karl Fischer reagent. Repeat the standardization procedure until three determinations agree within 0.05 mg/ml.

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- d. Calculate the water equivalent of the dilute Karl Fischer reagent as follows:

$$A = \frac{156.6B}{C}$$

where: A = water equivalent of the dilute Karl Fischer reagent, mg/ml

B = weight of sodium tartrate, g

C = volume of dilute Karl Fischer reagent used to titrate the standard, ml

156.6 = factor for sodium tartrate

- e. Procedure: Add 100 ml of the methanol to the reaction vessel. Neutralize the methanol with dilute Karl Fischer reagent by automatically titrating to a 30-second endpoint using the Aquameter. Add 10 to 30 grams of sample weighed to the nearest 0.01 g (weigh and transfer this material as rapidly as possible) to the neutralized methanol in the reaction vessel. Set the stirring action the same as that used in the standardization. Dissolve the sample and automatically titrate with standardized dilute Karl Fischer reagent to a 30-second endpoint. Record the volume of dilute Karl Fischer reagent.

- f. Calculate the water content as follows:

$$\text{water content, wt\%} = \left[\frac{AD}{1000E} \right] \times 100$$

where: A = water equivalent of the dilute Karl Fischer reagent (from d. above), mg/ml

D = volume of standardized dilute Karl Fischer reagent used to titrate sample, ml

E = sample weight, g

1000 = multiplication factor to convert g to mg

- g. Report the results of 2 determinations and their average.

4.6 Packaging inspection. The packaging, packing and marking shall be inspected to verify conformance with the requirements of section 5.

5. PACKAGING

5.1 Packaging and packing. Unless otherwise specified in the contract (see 6.2), packaging and packing shall be level C.

5.1.1 Level C. Unless otherwise specified in the contract (see 6.2), packaging and packing of epoxy resin shall be in accordance with standard commercial practice applicable to the type of material. The packaging and packing shall be of such construction and materials that the contents will be adequately protected against loss or contamination. Container size shall be as specified in the contract (see 6.2). Containers shall conform to Uniform Freight Classification, National Motor Freight Classification or to rules of other carriers applicable to the mode of transportation.

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5.2 Marking. In addition to any special marking required by the contract or order (see 6.2), each container shall be marked in accordance with MIL-STD-129 and Code of Federal Regulations 49 CFR 171-179. Marking shall include, but not be limited to, the following information:

- a. Title, number and date of this specification
- b. Manufacturer's name and location
- c. Material trade name
- d. Net weight
- e. Lot number, batch number(s), and date of manufacture
- f. Storage conditions (see 6.3)
- g. Shelf life (see 6.4)
- h. Contract or purchase order number

6. NOTES

6.1 Intended use. Epoxy resin in accordance with this specification is intended for use as a curative agent in solid propellant formulations for the CCU-22/A impulse cartridge and other cartridge devices.

6.2 Ordering data. Procurement documents should specify the following:

6.2.1 Procurement requirements.

- a. Title, number and date of this specification
- b. Quantity required
- c. Place of delivery
- d. Inspection conditions when other than as specified (see 4.2)
- e. Lot size if other than as specified (see 4.3.1)
- f. Packaging requirements if other than as specified (see 5.1)
- g. Size of container required (see 5.1.1)
- h. Any special markings required (see 5.2)

6.2.2 Contract data requirements. Items of deliverable data required by this specification are cited in the following paragraph herein:

<u>Paragraph</u>	<u>Data Requirement</u>	<u>Applicable DID*</u>
4.4	Quality conformance inspection data	-

*DID's (Data Item Description/DD Form 1664) for the above requirements will be documented in the applicable ADL (Authorized Data List). Such data will be delivered as identified on completed (numbered) DID's when specified on DD Forms 1423 (Contract Data Requirements Lists) and incorporated into applicable contracts.

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6.3 Storage conditions. The epoxy resin should be stored in a temperature regulated area at less than -12°C (10°F).

6.4 Shelf life. The nominal shelf life of this epoxy resin is 6 months from date of manufacture. Resin that has exceeded this shelf life should be retested to the requirements of this specification prior to use.

6.5 Supersession information. MIL-R-82657 is intended to be used in lieu of Grade B resin of AS 3056, Amendment 1 (Code Ident 30003) dated 30 April 1976.

6.6 Suggested source of supply. A product that has met the requirements of this specification in past procurement actions is 0510 manufactured by CIBA-GEIGY Corporation, Resin Department, 444 Saw Mill River Road, Ardsley, NY 10502. This information is for the convenience of the procuring activity and is not to be construed as a waiver of any requirement of this specification nor as any limitation of additional potential sources of supply.

Custodian:
Navy - OS

Preparing Activity:
Navy - OS

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