

MIL-P-63196A (AR)
27 May 1980

MILITARY SPECIFICATION
POLYURETHANE ELASTOMER BINDER
(For Use in Ammunition)

This specification is approved for use by the US Army Armament Research and Development Command and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers two types of polyurethane elastomers for use as a binder for explosive composition: (See 6.4 and 6.5)

Type I: Polyurethane with Calcium Stearate

Type II: Polyurethane with Talc

2. APPLICABLE DOCUMENT

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

SPECIFICATION

MILITARY

JAN-C-263	-	Calcium Sterate
MIL-A-48078	-	Ammunition, Standard Quality Assurance Provision, General Specification for
MIL-T-50036		Talc, Technical (T1)

FSC: 6810

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research and Development Command, Attn. DRDAR-QA, Dover, New Jersey 07801 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-129 - Marking for Shipping and Storage
- MIL-STD-1218 - ACS Chemicals

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS

- D412 - Tension testing of Vulcanized Rubber.
- D624 - Tear Resistance of Vulcanized Rubber.
- D746 - Brittleness temperature of plastics and rubber by impact test.
- D792 - Specific Gravity and Density of Plastics by Displacement.
- D1898 - Plastics, Recommended Practice for Sampling of
- D2240 - Indentation Hardness of Rubber and Plastics by means of a Durometer.

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

3. REQUIREMENTS

3.1 Physical form. The polyurethane elastomer shall be supplied in granular or flake form. It shall be dusted with approximately 0.1% of calcium stearate (JAN-C-263) or commercial talc (MIL-T-50036) to facilitate handling. The certificate of compliance furnished with the shipment shall certify which dusting agent has been used.

3.1.1 Solubility. A minimum of 99.9% of the polyurethane elastomer shall be soluble in methyl ethyl ketone (MEK) when tested as described in 4.5.1.2.

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3.1.2 Viscosity. Solution viscosity of the polyurethane elastomer shall be between 225 and 900 centipoises when tested as described in 4.5.2.

3.1.3 Physical properties. The physical properties of polyurethane elastomer shall conform to the following requirements:

<u>Property</u>	<u>Acceptable Value</u>	<u>Applicable Test</u>
Specific Gravity	1.20 \pm 0.02	4.5.6
Durometer Hardness "A"	70 \pm 10	4.5.7
Tensile Strength (psi)	4000 (Min.)	4.5.8
Ultimate Elongation (%)	600 (Min.)	4.5.9
Graves Tear (lbs/0.1")	15 (Min.)	4.5.10
Brittle Point (No Break)	-70°F	4.5.11

3.1.4 Volatile. The volatile content of the polyurethane elastomer shall be no greater than 0.4% when tested as specified in 4.5.3.

3.1.5 Color. The color of the polyurethane elastomer shall be a light amber to light brown when determined as specified in 4.5.4.

3.1.6 Foreign matter. The polyurethane elastomer shall be free of metal inclusions, wooden particles, and other foreign matter when tested as specified in 4.5.5.

3.2 First article inspection. This specification contains provisions for first article inspection. Requirements for submission of first article samples by the contractor shall be as specified in the contract.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection and standard quality assurance provisions. Unless otherwise specified herein or in the contract, the provisions of MIL-A-48078 shall apply and are hereby made a part of this detail specification.

4.2 Classification of inspections. The following types of inspections shall be conducted on this item:

- a. First Article Inspection (See 4.3)
- b. Quality Conformance Inspection (see 4.4)

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4.3 First article inspection.

4.3.1 Submission. The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with provisions of 4.3.2. The first article sample shall consist of 2 kilograms of the polyurethane elastomer. The sample shall be obtained from a production lot which has been produced by the contractor using the same process, procedures and equipment as will be used in fulfilling the contract. All materials shall be obtained from the same sources of supply as will be used in regular production.

4.3.2 Inspections to be performed. The sample will be subjected by the Government to any or all of the examinations or tests specified in 4.5 of this specification.

4.3.3 Rejection. See MIL-A-48078.

4.4 Quality conformance inspection.

4.4.1 Inspection lot formation. Inspection lots shall comply with lot formation provisions of MIL-A-48078.

4.4.2 Examination. Unless otherwise specified in the Classification of Defects and test tables, sampling plans for major and minor defects shall be in accordance with MIL-STD-105, Inspection Level II (See MIL-A-48078).

4.4.3 Testing. Precaution. - This specification covers sampling and testing with toxic materials. Accordingly, it is emphasized that all applicable safety rules, regulations, and procedures must be followed in handling and processing these materials.

4.4.3.1 Sampling for test 4.5.1 thru 4.5.11. The elastomer shall be sampled in accordance with ASTM-D1898. If any sample fails to meet any test requirement, the lot represented by the sample shall be rejected. The classification of defects shall be as specified in the following table:

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<u>Inspection/Requirement</u>	<u>Defect Classification</u>
Solubility	Major
Viscosity	Major
Volatiles	Major
Specific Gravity	Major
Durometer Hardness	Major
Tensile Strength	Major
Ultimate Elongation	Major
Graves Tear	Major
Brittle Point	Major
Color	Minor
Foreign Matter	Minor

4.4.4 Inspection equipment. For the performance of all tests and examinations specified in 4.4.3, commercial inspection equipment should be employed. The contractor shall have available, and utilize correctly, this equipment and is charged with the responsibility of assuring that proper calibration procedures are followed. Government approval of all inspection equipment is required prior to its use for acceptance purposes.

4.5 Test methods and procedures. (See 6.3). The tests to determine compliance with the requirements given in para. 3 shall be performed on the sample obtained in 4.4.3.1. All tests given in this section shall be performed using prescribed procedures for replicate determinations given in standard analytical chemistry textbooks. Also, unless otherwise specified herein, all chemicals shall be ACS Grade in accordance with MIL-STD-1218.

4.5.1 Solubility.

4.5.1.1 Preparation of test solution. Weigh accurately a 45 ± 0.09 gram portion of the sample and transfer this sub-sample into a 1 liter beaker (Note: If necessary, cut the sample into pieces approximately 1 cm long). Add 255 ± 0.05 grams of methylethyl ketone (MEK) to the beaker. Stir the contents of the beaker with a magnetic stirrer for a period not to exceed six (6) hours. Precautions should be taken to prevent the loss of solvent during this procedure. Use this solution for the solubility (4.5.1.2) and viscosity (4.5.2) determinations.

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4.5.1.2 Procedure. Visually inspect the solution obtained in 4.5.1.1 for the presence of insolubles. If the solution appears to contain insolubles (in excess of 0.1%), add 500 ml of MEK, stir for 10 minutes, and quantitatively filter the residue and solvent thru a tared medium porosity glass crucible. Dry the crucible and contents in an oven at $100 \pm 5^{\circ}\text{C}$ for 30 minutes and weight. Calculate the solubility as follows:

$$\% \text{ Solubility} = \frac{(W-A) \times 100}{W}$$

Where: W = weight of sample, g
A = weight of residue, g

4.5.2 Viscosity

Brookfield solution viscosity. The Brookfield solution viscosity shall be run on the sample solution obtained in 4.5.1.1. The instrument shall be a Brookfield Model LVT 4 spindle viscosimeter or equivalent. The viscosity of the solution shall be run at 25°C with a No. 2 spindle.

4.5.3 Volatiles. Determination of the volatile content of a representative sample of the test polyurethane material shall be run on the material as received from the manufacturer. The test shall be run at 60°C in a vacuum oven, and the oven shall be evacuated to an absolute pressure of 150 mm of Hg or lower. The sample shall be 50 ± 5 gms and shall be dried to a constant weight. Volatiles shall be reported to the nearest 0.1%.

4.5.4 Color. the color of the elastomer shall be determined by visual examination.

4.5.5 Foreign matter. The elastomer shall be examined visually to assure that it is free of foreign matter.

4.5.6 Specific gravity. The specific gravity shall be determined in accordance with ASTM-D792.

4.5.7 Durometer hardness "A". The durometer hardness shall be determined in accordance with ASTM-D2240.

4.5.8 Tensile strength. The tensile strength shall be determined in accordance with ASTM-D412.

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4.5.9 Ultimate Elongation. The ultimate elongation shall be determined in accordance with ASTM-D412.

4.5.10 Graves Tear. The Graves tear shall be determined in accordance with ASTM-D624.

4.5.11 Brittle Point. The brittle point shall be determined in accordance with ASTM-D746.

5. PREPARATION FOR DELIVERY

5.1 Packing

5.1.1 Commercial. Unless otherwise specified, the polyurethane elastomer shall be packed in accordance with manufacturer's commercial practice to assure acceptance by common carrier for safe delivery at first destination for use.

5.2 Marking. Unless otherwise specified, the shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Ordering data. See MIL-A-48078.

6.2 Submission of inspection equipment designs for approval (See MIL-A-48078). Submit equipment designs, as required, to Commander, US Army Armament Research and Development Command, ATTN: DRDAR-QAR, Dover, NJ 07801

6.3 Prior approval of the Contracting Officer is required for use of equivalent test methods. A description of the proposed method should be submitted through the Contracting Officer to: Commander, US Army Armament Research and Development Command, ATTN: DRDAR-QAR, Dover, NJ 07801. This description should include but not be limited to, the procedures used, the accuracy and precision of the method, test data to demonstrate the accuracy and precision and drawings of any special equipment required (see 6.2).

6.4 Intended use. The material covered in this specification is intended to be used as a binder for explosives.

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6.5 Polyurethane elastomer binder. Materials that have been found satisfactory for use in explosive compositions as a binder are, Type I: Estane 5702 F1 and Type II: Estane 5703 F1, manufactured by B.F. Goodrich Chemical Co. Use of a binder from another source should be re-evaluated by the US Army Armament Research and Development Command, ATTN: DRDAR-QAR-R, Dover, N.J. 07801.

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