

INCH-POUND

MIL-PRF-87895A(USAF)

10 April 1998

SUPERSEDING

MIL-C-87895 (USAF)

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PERFORMANCE SPECIFICATION

COMPOUND, POLYMERIC BASED, HOT-MELT (CAVITY LINING), (FOR INTERNAL USE IN AMMUNITION)

This specification is approved for use by the Department of the Air Force 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 polymeric basic hot-melt general purpose bomb cavity lining material for coating the internal wall of bombs prior to loading with EAK (Ethylene diammonium dinitrate Ammonium Nitrate Potassium nitrate) and EALK (Ethylene diammonium dinitrate Aluminium Ammonium nitrate Potassium nitrate) explosives.

2. APPLICABLE DOCUMENTS

2.1 General.

The documents listed in this section are specified in sections 3 and 4 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 documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: ASC/ENSI, Bldg 560, 2530 Loop Road West, Wright-Patterson AFB OH 45433-7101 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.)

AMSC N/A

FSC 1325

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-PRF-87895A(USAF)**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 listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS**DEPARTMENT OF DEFENSE**

MIL-STD-331	Fuze and Fuze Components, Environment and Performance Tests For
MIL-STD-810	Test Method Standard for Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1751	Safety and Performance Tests for Qualification of Explosives

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document 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 which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup (DoD adopted)
ASTM D 937	Standard Test Method for Cone Penetration of Petrolatum (DoD adopted)
ASTM D 1208	Standard Test Methods for Common Properties of Certain Pigments (DoD adopted)
ASTM D 2196	Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer (DoD adopted)
ASTM D 2369	Standard Test Method for Volatile Content of Coatings (DoD adopted)
ASTM E 28	Standard Test Method for Softening Point by Ring-and-Ball Apparatus (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials (ASTM), 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.)

MIL-PRF-87895A(USAF)**2.4 Order of precedence.**

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 First article.**

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

3.2 Materials.

The material shall be composed of two parts: a base, Part A, and a plasticizer, Part B. Part A shall consist of a pure amorphous polypropylene hot melt thermoplastic, conforming to the requirements specified in table I, and Part B shall consist of an Isobutylene-butene copolymer (commonly known as polybutenes) conforming to the requirements specified in table II.

TABLE I. Part A, base characteristics.

CHARACTERISTIC	REQUIREMENT	INSPECTION
Specific gravity at 73°F	.86±.04	4.5.1
Viscosity at 375°F	3500±500 centipoises	4.5.2
Softening point	295±5°F	4.5.3
Flash point	500°F min	4.5.5
Fire point	500°F min	4.5.5
Volatile content	.5% max	4.5.6
Ash content	.5% max	4.5.7
Acidity	.1% max	4.5.8
Glass transition temperature	-40°F min	4.5.13

TABLE II. Part B, plasticizer characteristics.

CHARACTERISTIC	REQUIREMENT	INSPECTION
Specific gravity	.91 ±.04	4.5.1
Viscosity at 210°F	3200 ±200 centipoises	4.5.2
Flash point	450°F min	4.5.5
Fire point	500°F min	4.5.5
Acidity	0.1% max	4.5.8
Glass transition temperature	-65°F min	4.5.13

MIL-PRF-87895A(USAF)**3.2.1 Formulation.**

Parts A and B shall be combined in a ratio of 65 \pm 1 Part A to 35 \pm 1 Part B. The materials shall be combined via melt blending at a temperature of 350°F. Blending shall be sufficient to produce a homogeneous mixture.

3.2.2 Product characteristics.

The compound (combined material) when prepared shall consist of a hot melt thermoplastic and conform to the requirements specified in table III when tested in accordance with 4.5.

TABLE III. Compound characteristics.

CHARACTERISTIC	REQUIREMENT	INSPECTION
Specific gravity	.86 \pm .04	4.5.1
Viscosity at 375°F	1500 \pm 500 centipoise	4.5.2
Softening point	220°F min	4.5.3
Penetration	200 gm/60 sec/0°C (32°F) 5 min 100 gm/5 sec/25°C (77°F) 15 min 50 gm/5 sec/45°C (115°F) 90 max	4.5.4
Fire point	500°F min	4.5.5
Flash point	450°F min	4.5.5
Glass transition temperature	-65°F max	4.5.13

3.2.3 Chemical, electrical and mechanical properties.**3.2.3.1 Flexibility.**

A dried film of the compound on a metal panel shall show no chipping, scaling, or cracking when tested as specified (see 4.5.9).

3.2.3.2 Chemical requirements.

The compound shall conform to the chemical requirements specified in table IV.

TABLE IV. Chemical requirements.

REQUIREMENT	MAXIMUM VALUE	INSPECTION
Volatile content	.5%	4.5.6
Ash content	.5%	4.5.7
Acid content	.1%	4.5.8

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3.3 Environmental conditions.

3.3.1 Temperature and humidity cycling.

The formulation compound must withstand (show no chipping, cracking, or loss of adhesion) temperature extremes from 160°F to -65°F, (see 4.5.12).

3.3.2 Thermal shock.

The compound must withstand (show no chipping, cracking, or loss of adhesion) thermal shock cycling in accordance with MIL-STD-810, Method 503.2.

3.3.3 Stability.

When subjected to vacuum thermal stability test (see 4.5.10) the reactivity of the polymeric compound with EAK and EALK explosives shall not exceed 2.0 mL of gas over and above that generated by the controls when the test is conducted at $100 \pm 5^\circ\text{C}$ for 48 hours. The explosives tested shall be in accordance with established EAK and EALK formulation guidelines.

3.4 Workmanship.

The finished product shall be homogeneous and free of contamination from foreign matter.

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.

First article inspection shall be performed on ten pounds of the hot melt compound and one pound of each ingredient used in formulating the compound when a first article sample is required (see 3.1). This inspection shall include the examination of 4.5 and the tests of 4.5.1 through 4.5.13.

4.3 Conformance inspection.

Conformance inspection shall include the examination of 4.5 and the tests of 4.5.1 and 4.5.13.

4.4 Examination.

Sample shall be examined for compliance with the requirements specified in 3.2 through 3.3.

4.5 Methods of inspection.

4.5.1 Specific gravity.

The specific gravity of the compound shall be determined by gas pycnometry using a Quantachrom Pentapycnometer or other suitable gas pycnometer.

MIL-PRF-87895A(USAF)**4.5.2 Viscosity.**

The viscosity of the compound shall be determined in accordance with ASTM D 2196, except that the temperature of the sample shall be $375 \pm 1^\circ\text{F}$ and a No. 3 spindle at 20 rpm shall be used.

4.5.3 Softening point.

The softening point of the compound shall be determined in accordance with ASTM E28.

4.5.4 Penetration.

The penetration values of the compound shall be determined in accordance with ASTM D937.

4.5.5 Flash and fire points.

The open cup flash and fire points of the compound shall be determined in accordance with ASTM D92.

4.5.6 Volatile content.

The volatile content of the compound shall be determined in accordance with ASTM D2369.

4.5.7 Ash content.

The ash content of the compound shall be determined in accordance with ASTM D1208, Sec 2.

4.5.8 Acidity or alkalinity.

Dissolve 5 gm sample of the compound in 10 mL of toluene, which is neutral to phenolphthalein. Shake the solution with 100 mL of distilled water in a 250 ml separatory funnel for at least five minutes. Filter and titrate with N/100 H_2SO_4 or N/100 NaOH as necessary using phenolphthalein as indicator. A blank shall be run on an equal volume of the water used. Calculate the acidity or alkalinity of the sample as follows:

$$\text{Acidity as sulfuric acid, percent by weight} = \frac{4.9 (C-B) N}{W}$$

$$\text{Alkalinity as sodium hydroxide, percent by weight} = \frac{4.0 (A-B) N}{W}$$

Where:

A = mL of H_2SO_4 solution required for the titration of sample.

B = mL of standard solution required for the blank.

C = mL of NaOH solution required for the titration of sample.

N = normality of the standard H_2SO_4 or NaOH

W = weight of sample in grams

MIL-PRF-87895A(USAF)**4.5.9 Flexibility.**

A strip of No. 30 gauge hot rolled steel sheet, 12 by 8 inches, shall be cleaned by washing with benzol and thoroughly dried. It shall be coated on one side to a thickness of 1/16 inch by flowing on the molten compound and then cooled at room temperature for a period of 48 hours. With the coating on the outside, bend the test panel rapidly 180° over a mandrel, one inch in diameter. No cracking of any kind shall be visible after the bending test.

4.5.10 Reactivity.

The reactivity of the compound in contact with EAK and EALK explosives shall be determined using the vacuum thermal stability test according to 5.5.5, Method 1 of MIL-STD-1751 at 100 ±0.5 °C (212 ±1 °F) for 48 hours.

4.5.11 Temperature shock.

Temperature shock resistance shall be determined in accordance with MIL-STD-810, Method 503.3.

4.5.12 Temperature and humidity cycling.

Temperature and humidity cycling resilience shall be determined in accordance with MIL-STD-331, Method 105.1 except that the test will be modified such that the minimum temperature at any point during the test shall not be below -65 °F.

4.5.13 Glass transition temperature.

The glass transition temperature shall be determined by thermomechanical analysis.

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, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity with the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use.

The hot melt polymeric compound covered by this specification is military unique. It is intended for use as a protective coating for fabricated metal cases in applications where charges of ammonium nitrate based high explosives are melt cast into the case of a weapon. Such coatings provide a barrier to the corrosive effects of the fill upon the case and a cushion to mechanical impact for the explosive. Additionally, the polymeric material does not contain incompatible components such as copper, nickel, zinc, cobalt and sulfur found in natural

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products, and is therefore nonreactive with such explosive fills. This is essential due to the amplification of irreversible growth which results in exudation related maintenance problems of serviceable munitions, rendering them unserviceable.

6.2 Acquisition requirements.

Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
- c. When a first article is required. (see 3.1).
- d. Packaging requirements (see 5.1).

6.3 Subject term (key word) listing.

EAK
EALK
explosives

6.4 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.

6.5 Materials source.

One type of material which satisfactorily fulfills the requirement of Part A is Eastabond G92, a pure amorphous polypropylene, available from Eastman Chemical Products, Inc., Plastics Products Division, P.O. Box 431, Kingsport TN 37662-0431. One type of material that satisfactorily fulfills the requirements of Part B is Indopol H1500, a polybutene polymer, available from AMOCO Chemicals Corp., 200 East Randolph St., Lobby 16., Chicago IL 60601-7126. WL/MNME, 2306 Perimeter Rd., Ste. 9, Eglin AFB FL 32542-5910, prior to usage, must approve use of similar materials from other sources.

6.6 Material name.

The formulated liner material shall be commonly referred to as the PPPB (polypropylene/polybutylene) bomb liner.

Custodians:

Air Force - 11

Review activity:

Air Force - 70, 99

Preparing activity:

Air Force - 11

(Project No. 1325-F495)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
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I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-PRF-87895A(USAF)

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3. DOCUMENT TITLE

COMPOUND, POLYMERIC BASED, HOT-MELT (CAVITY LINING), (FOR INTERNAL USE IN AMMUNITION)

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)
5. REASON FOR RECOMMENDATION
6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (include Zip Code)

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8. PREPARING ACTIVITY

a. NAME

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