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INCH-POUND

MIL-DTL-32123A (OS)
18 October 2006
SUPERSEDING
MIL-DTL-32123 (OS)
22 August 2003

DETAIL SPECIFICATION

LINER

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 three types of polybutadiene base liner materials. They are as follows:

Type I – CCU-22B/A and CCU-149/A Impulse Cartridges
Type II – CKU-5C/A Rocket Catapult
Type III – CKU-7A/A, CKU-10A/A and CKU-11A/A Rocket Catapults and CKU-10A/A and CKU-11A/A Catapult Grains

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.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-C-85498	Curing agents, Dimeryl-Di-Isocyanate and Isophorone Di-Isocyanate

Comments, suggestions, or questions on this document should be addressed to Commander, Indian Head Division, Naval Surface Warfare Center, Technical Information Products Branch (E143), 101 Strauss Avenue, Indian Head, MD 20640 5035, 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 http://assist.daps.dla mil.

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(Copies of these documents are available online at http://assist.daps.dla.mil/ or from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications 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.

SPECIFICATIONS

Naval Sea Systems Command (CAGE Code 53711)

WS 19738	Antioxidant, T-Butylphenol type
WS 20700	Hydroxyl Terminated Polybutadiene
WS 20883	Triphenylbismuth

DRAWINGS

Naval Air Systems Command (CAGE Code 30003)

673AS131	Liner Filler

(Application for copies should be addressed to the Commander, Indian Head Division, Naval Surface Warfare Center (E143), 101 Strauss Avenue, Indian Head, MD 20640-5035.)

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 these documents are those cited in the solicitation or contract.

CHEMICAL PROPULSION INFORMATION AGENCY (CPIA)

Publication No. 21: JANNAF Solid Propellant Physical Behavior Manual

(Applications for copies should be addressed to Chemical Propulsion Information Agency, The Johns Hopkins University Applied Physics Laboratory, Johns Hopkins Road, Laurel, MD 20707.)

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 Material. The material shall be a polybutadiene-based composition as described herein.

3.2 Chemical composition. The chemical composition and ingredients shall be in accordance with TABLE I. The ingredients shall be in accordance with the referenced documents.

3.3 Modification of liner formulation. The properties of the liner may be varied by changing the ratio of curing agent, Dimeryl-Di-isocyanate (DDI) or Isophorone-Di-isocyanate (IPDI), to Hydroxyl-Terminated Polybutadiene (HTPB). The amounts of curing agent and HTPB shall be determined by

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adjusting the ratio of chemical equivalents of the curing agent to the chemical equivalents of the HTPB. The value of this ratio shall nominally be 1.5/1.0 based on the functional equivalence values from the vendor's ingredient certifications. The total weight percent of the HTPB, DDI, and antioxidant for the Type I material must remain constant at 70%. The total weight percent of the HTPB, curing agent, and antioxidant for the Type II and III materials must remain constant at 80%.

TABLE I. Liner ingredients and composition.

Ingredients	**Specification/Type**	**Percent by Weight Type I**	**Percent by Weight Type II**	**Percent by Weight Type III**
HTPB	WS 20700, Type 1	51.60	58.96	70.35
Antioxidant	WS 19738	0.50	0.59	0.59
Liner filler	673AS131	30.00	20.00	20.00
Dimeryl-Di-isocyanate	MIL-C-85498, Type 1	17.90	20.45	-
Isophorone-Di-Isocyanate	MIL-C-85498, type 2	-	-	9.03
Triphenylbismuth	WS 20883	-	-	0.03

3.4 Liner bond strength

3.4.1 Propellant to liner. Propellant to liner bond strength testing (see 4.4.3) shall be required before a new liner ingredient lot set or liner formulation modification (see 4.3.1) is used. The propellant to liner bond shall exhibit cohesive failure in the propellant or cohesive failure in the propellant at the liner interface when tested at 77 ± 5°F.

3.5 Liner cure. The type I and II liners shall be cured at 140 ± 5°F for a minimum of 48 hours. The type III liner shall be cured at 140 ± 5°F for a minimum of 16 hours (see 6.5).

3.6 Workmanship. The material shall be uniform in consistency and free from contamination, foreign matter, or any other defect that would prevent its use for the purpose intended.

4. VERIFICATION

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

a. Conformance inspection (see 4.3).

4.2 Inspection conditions. Unless otherwise specified (see 6.2) all inspections shall be performed as specified in the applicable test method of 4.4.

4.3 Conformance inspections. Conformance inspection shall consist of the tests specified in 4.4.1, 4.4.2, and 4.4.3. When specified in the contract, the contractor shall prepare a report giving the results obtained for all inspections and tests performed and a certified statement that meets all requirements of this specification (see 6.2).

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4.3.1 Inspection lot. An inspection lot shall consist of a single liner mix.

4.3.1.1 Liner mix. A liner mix may consist of a liner premix consisting of the HTPB, antioxidant, and carbon black; with the curative, DDI or IPDI and Triphenylbismuth, added after the premix is complete.

4.3.1.2 Ingredient lot set. The ingredient lot set shall be a set of the materials as specified in Table 1 for each type of liner material, where each of the materials is from a single material lot that is acceptable under the quality provisions of this specification. If one or more of the material lots is changed from an established ingredient lot set this constitutes a new ingredient lot set. As long as the formulation (the weight percent of the individual ingredients) established with a new ingredient lot set is maintained, no additional testing (see 3.4.1) is required. The testing of 3.4.1 shall be performed if any formulation modification is required with an ingredient lot set, or if the ingredient lot set changes.

4.4 Test Methods. Unless an alternative inspection method is proposed, tests shall be performed using the apparatus and procedures specified herein. Alternative inspection methods may be proposed by the supplier but must be approved by the contracting activity prior to use in acceptance testing.

4.4.1 Ingredient weight. Each liner ingredient shall be weighed to determine compliance with 3.2 prior to mixing. Weights shall be measured with equipment having an accuracy of ±1 percent of the ingredient weight calculated from the percentages specified in the applicable table (see 3.2).

4.4.2 Raw material. Each liner material shall be tested to determine compliance with 3.2.

4.4.3 Bond strength. The liner bond strength specimens shall be prepared and tested in accordance with CPIA Publication 21 "Flapped Conical Bond line Test" (C-BIT), section 4.7.9. In lieu of the machined specimen, a cast specimen as shown in Figure 1 shall be used. Note that Plug (Find numbers 2) and Cap (Find number 3) can be changed to best adapt to the available tension tester. A pull rate of 0.2 inches/minute is required. A minimum of 4 samples shall be tested to determine compliance with 3.4.1.

4.4.3.1 Liner test specimen. The propellant from the propellant mix used to cast the test specimens shall meet the propellant mechanical properties specified in the applicable propellant specification before the liner bond test is completed. If the propellant does not meet the mechanical properties specified in the applicable propellant specification, all bond testing completed with that propellant mix shall be deemed invalid.

a. The C-BIT test specimen shall be made using a uniformly distributed amount of liner on the one inch diameter surface of the Plug (Find number 2) that emulates the thickness (+/- 20%) of the liner used to line the motor tubes or sleeves

b. The Cap (Find number 3) in Figure 1 will also have liner coating it to provide adhesion to propellant.

c. The Cap (Find number 3) and Plug (Find number 2) will be cured at the same temperature and time as the lined propellant tubes. (usually 60 ± 12 hours at 140 ± 5°F for the Type I and II liners and 20 ± 4 hours at 140 ± 5°F for the Type III liner)

d. Cast propellant into the assembly assuring that the Cap (Find number 3) and Plug (Find number 2) are axially aligned.

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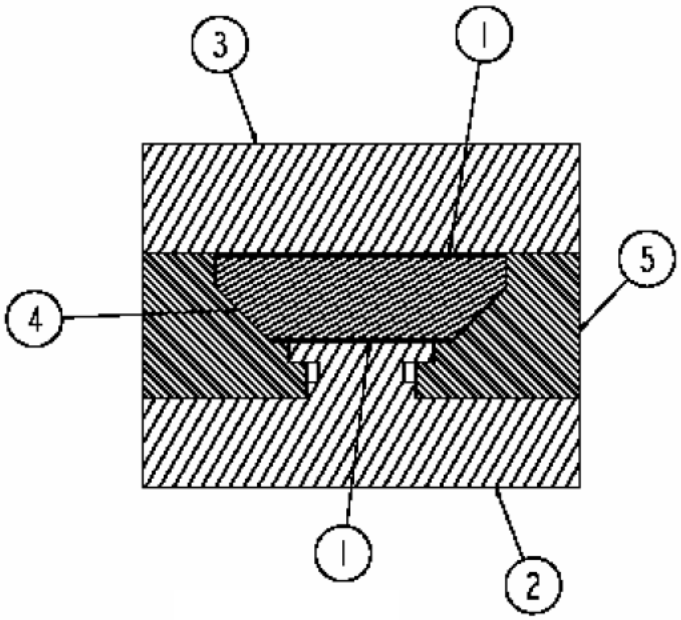

FIND NUMBER	DESCRIPTION
1	LINER
2	PLUG
3	CAP
4	PROPELLANT
5	MOLD

FIGURE 1. Cast test specimen for C-BIT.

5. PACKAGING

This section is not applicable to this specification.

6. NOTES

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

6.1 Intended use. Liner materials in accordance with this specification are intended to be used as the liner between the case or tube wall and the propellant of various cartridge and rocket motor devices. The liner was designed for use in military cartridge and rocket motor devices, and thus has no commercial application.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification.

b. Inspection conditions, if other than as specified (see 4.2).

c. Issues of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2 and 2.3).

d. Whether a quality conformance test report is required (see 4.3)

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The specific acquisition should be reviewed to ensure that only essential data are requested/provided. To ensure correct contractual application of the data requirements,

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a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplements 27.475-1 exempts the requirements of a DD Form 1423.

Reference Paragraph	Title
4.3	Reports, Tests

6.4 Manufacturing conditions. This material has been manufactured (processed, applied and cured) successfully under the following conditions.

a. Humidity: 50 grains of water per pound of dry air, maximum

b. Temperature: 21 to 32°C (70 to 90°F)

6.5 Liner Cure Test. Liner cure can be determined as follows:

a. Using a nitrile rubber glove, touch the surface of the liner with a gloved hand.

b. Liner can be tacky but should not stick to or come off onto the glove.

6.6 Subject term (keyword) listing.

Cartridges
Rocket Motors
HTPB

6.7 Changes from previous issue. Marginal notations are not used to identify changes with respect to the previous issue because of the extensiveness of the changes.

Custodian:
Navy – OS

Preparing Activity
Navy – OS
(Project 1377-2007-002)

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