INCH-POUND

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 two 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

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 documents 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.

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 supplements thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

Department of Defense

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Indian Head Division, Naval Surface Warfare Center, Documentation Branch (Code 4230), 101 Strauss Ave., Indian Head, MD 20640-5035, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by sending a letter.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

AMSC N/A FSC 1377

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 are those cited in the solicitation.

SPECIFICATIONS

Naval Sea Systems Command (CAGE Code 53711)

WS 19738	Antioxidant, t-butylphenol type
WS 20700	Hydroxyl Terminated Polybutadiene

(Application for copies should be addressed to Commander, Naval Surface Warfare Center, Indian Head Division, 101 Strauss Avenue, Documentation Branch (Code 4230), Indian Head, MD 20640-5035.)

DRAWINGS

Naval Air Systems Command (CAGE Code 30003)

673AS131	Liner Filler

(Application for copies should be addressed to Commander, Naval Surface Warfare Center, Indian Head Division, 101 Strauss Avenue, Documentation Branch (Code 4230), 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 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 the documents not listed in the DODISS are the issues of the documents cited in the solicitation.

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 1. 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) to Hydroxyl-Terminated Polybutadiene (HTPB). The amounts of DDI and HTPB shall be determined by adjusting the ratio of chemical equivalents of the DDI 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, DDI, and antioxidant for the Type II material must remain constant at 80%.

Table 1. Liner ingredients and composition

Ingredients	Specification/Type	Percent by Weight Type I	Percent by Weight Type II
HTPB	WS 20700, Type 1	51.60	58.96
Antioxidant	WS 19738	0.50	0.59
Liner filler (a)	673AS131	30.00	20.00
Dimeryl-Di-isocyanate	MIL-C-85498, type 1	17.90	20.45

(a) - The Liner Filler (Carbon Black) weight may vary by ± 5 percent to allow for viscosity control

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 web when tested at 77 ± 5°F.

3.5 Liner cure. The liner shall be cured at 140 ± 5°F for 48 ± 8 hours.

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

a. Quality 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 Quality conformance inspections. Quality 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).

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, 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 48 ± 8 hours and 140 ± 5°F)

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

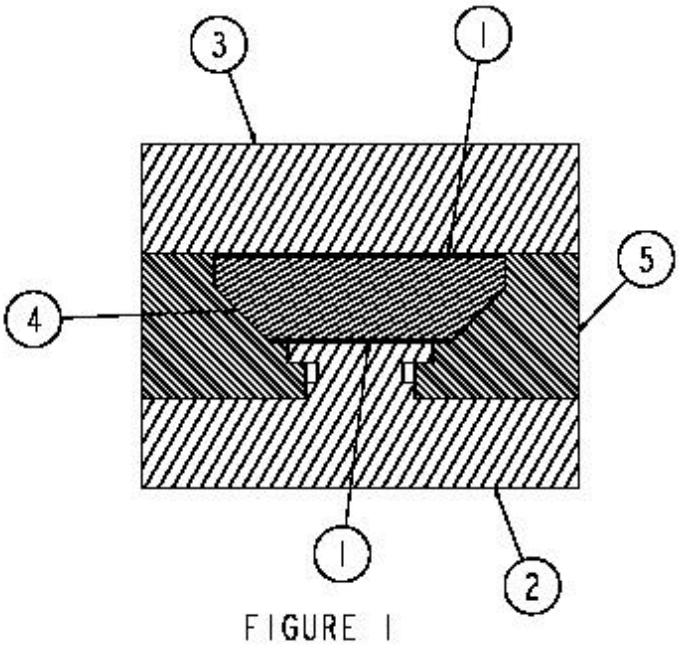

FIGURE 1

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

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 must 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, 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 Subject term (keyword) listing.

Cartridges
Rocket Motors
HTPB

Preparing Activity
Navy – OS
(Project 1377-0199)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-32123	2. DOCUMENT DATE (YYMMDD) 030822

3. DOCUMENT TITLE
LINER

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*)	d. TELEPHONE (*Include Area Code*) (1) Commercial (2) DSN (*If applicable*)	7. DATE SUBMITTED (*YYMMDD*)

8. PREPARING ACTIVITY

a. NAME Commander, Indian Head Division Naval Surface Warfare Center	b. TELEPHONE (*Include Area Code*) (1) Commercial 301-744-1973 (2) DSN 354-1973
c. ADDRESS (*Include Zip Code*) Engineering Documentation Branch (Code 4230) 101 Strauss Avenue Indian Head, MD 20640-5035	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888

DD FORM 1426, FEB 1999 (EG) PREVIOUS EDITION IS OBSOLETE.