INCH-POUND
MIL-DTL-32124A (OS)
13 October 2006
SUPERSEDING
MIL-DTL-32124 (OS)
27 August 2003

DETAIL SPECIFICATION

PROPELLANT, NSWC/IH-BC-15, NSWC/IH-BC-16, NSWC/IH-BC-17, NSWC/IH-BC-20, NSWC/IH-BC-21 and NSWC/IH-BC-22

This specification is approved for use within 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 the requirements of six types of propellant, designated as follows:

Type I - NSWC/IH-BC-15
Type II - NSWC/IH-BC-16
Type III - NSWC/IH-BC-17
Type IV - NSWC/IH-BC-20
Type V - NSWC/IH-BC-21
Type VI - NSWC/IH-BC-22

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-DTL-82655 Ferric Oxide

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.

AMSC N/A . FSC 1377

MIL-L-82661	Lecithin, Technical
MIL-A-82667/2	Ammonium Perchlorate
MIL-S-82858	Silicon Dioxide, Microfine
MIL-C-85498	Curing Agents, Dimeryl-Di-Isocyanate & Isophorone Di-Isocyanate

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-286	Propellants, Solid: Sampling, Examination and Testing

(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 19733	Imine Curing/Bonding Agents
WS 19738	Antioxidant, T-Butylphenol type
WS 19740	Dioctyl Adipate
WS 20700	Hydroxyl Terminated Polybutadiene

Naval Sea Systems Command (CAGE Code 10001)

OS 10170	Aluminum Powder

DRAWINGS

Naval Air Systems Command (CAGE Code 30003)

673AS131	Liner Filler

(Application for copies of these specifications and drawings 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.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 792	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
D 2240	Standard Test Method for Rubber Property - Durometer Hardness

(Copies of these documents are available online at http://www.astm.org or from the American Society for Testing and Materials Customer Service, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

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. Unless otherwise specified in the contract (see 6.2), a first article sample (see 6.4) of the cured propellant consisting of one batch (see 6.8.2) is required and shall be manufactured using the methods and procedures proposed for production (see 4.3.1). The contractor shall furnish a copy of the propellant mixing procedure and applicable casting procedure to the contracting activity prior to delivery of the first article sample (see 6.3). Prior to starting production the sample shall be tested as specified in 4.3 and 4.5 for the purpose of determining that the contractor's production methods are capable of producing propellant that complies with the technical requirements of the contract. No process changes shall be made, subsequent to approval of the first article sample, without prior written approval of the procuring activity. Failure to meet the requirements of 3.1.1 and 3.4 shall result in the rejection of the first article sample.

3.1.1 Aging Characteristics. Unless specified in the contract or purchase order (see 6.2), all contractors shall test the propellant in accordance with the applicable end item specification to assure compliance to Table 2.

3.2 Material. The material shall be a solid composite propellant as described herein.

3.3 Chemical composition and ingredients. The chemical composition and ingredients shall be in accordance with Table I and Sections 3.3.2, 3.3.3 and 3.3.4. The contractor shall submit a record of the ingredient weights and ingredient lot/batch number for each batch of propellant to the contracting activity (see 6.3).

TABLE I. Chemical composition of NSWC/IH-BC-15, NSWC/IH-BC-16, NSWC/IH-BC-17, and NSWC/IH-BC-20.

Ingredients	Specification/ Type	NSWC/IH-BC-15 Percent by Weight	NSWC/IH-BC-16 Percent by Weight	NSWC/IH-BC-17 Percent by Weight	NSWC/IH-BC-20 Percent by Weight
HTPB	WS 20700, Type 1	15.97	14.46	13.06	10.4
Isophorone Di-Isocyanate	MIL-C-85498, Type 2	1.10	1.11	1.01	0.8
Antioxidant	WS 19738	0.17	0.17	0.17	0.15
Dioctyl Adipate	WS 19740	-	1.50	3.00	3.00
HX-752	WS 19733, Type 1	0.30	0.30	0.30	0.30
Cab-O-Sil, Microfine SiO_2	MIL-S-82858	0.50	0.50	0.50	-
Liner Filler	673AS131	0.10	0.10	0.10	-
Ferric Oxide	MIL-DTL-82655, Class 2	1.50	1.50	1.50	2.00
Aluminum Powder	OS 10170B, Class 1	2.00	2.00	2.00	2.00
Ammonium Perchlorate	MIL-A-82667/2, Type III, Class 1	78.36 (2 sizes): 200µ, [1]55µ	78.36 (2 sizes): 200µ, [1]55µ	78.36 (2 sizes): 200µ, [1]55µ	81.35 (2 sizes): 200µ, [1]30µ

[1] Particle size shall be ground from the same 200µ stock, and as listed, is the 50% Microtrac nominal value by weight.

Table I (cont.). Chemical composition of NSWC/IH-BC-21 and NSWC/IH-BC-22

Ingredients	Specification/Type	NSWC/IH-BC-21 Percent by Weight	NSWC/IH-BC-22 Percent by Weight
HTPB	WS 20700, Type 1	11.65	10.87
Isophorone Di-Isocyanate	MIL-C-85498, Type 2	0.90	0.84
Antioxidant	WS 19738	0.15	0.15
Dioctyl Adipate	WS 19740	3.00	2.70
HX-752	WS 19733, Type 1	0.30	0.30
Cab-O-Sil, Microfine SiO_2	MIL-S-82858	-	-
Liner Filler	673AS131	-	-
Lecithin	MIL-L-82661	-	0.30
Ferric Oxide	MIL-DTL-82655, Class 2	2.00	2.50
Aluminum Powder	OS 10170B, Class 1	2.00	5.00
Ammonium Perchlorate	MIL-A-82667/2, Type III, Class 1	80.00 (2 sizes): 200µ, [1]10µ	77.34 (3 sizes): 200µ, [1]13µ, [1]6µ

[1] Particle size shall be ground from the same 200µ stock, and as listed, is the 50% Microtrac nominal value by weight.

3.3.1 Weight tolerances. Each ingredient shall be weighed to ensure compliance with Table I prior to mixing. Weights shall be measured with equipment having a minimum accuracy of ± 1.0 percent of the nominal ingredient weight specified in Table I.

3.3.2 Ammonium perchlorate (AP) ratio of particle sizes. Control of the propellant burn rate shall be maintained by varying the ratio of weight fractions of the unground (coarse) and ground (fine) ammonium perchlorate (see Table I). The weight fractions are the weight of the coarse AP or fine AP divided by the total weight of the coarse and fine AP. The ratio of the coarse (200μ) AP/fine (55μ) AP for NSWC/IH-BC-15, NSWC/IH-BC-16 and NSWC/IH-BC-17 shall be nominally 30/70 but may be adjusted as needed. The ratio of the coarse (200μ) AP/fine (30μ) AP for NSWC/IH-BC-20 shall be nominally 38/62 but may be adjusted as needed. The ratio of the coarse (200μ) AP/fine (10μ) AP for NSWC/IH-BC-21 shall be nominally 40/60 but may be adjusted as needed. The ratio of the coarse (200μ) AP/fine (13μ) AP/ fine (6μ) AP for NSWC/IH-BC-22 shall be nominally 16/41/43 but may be adjusted as needed.

3.3.3 Binder.

3.3.3.1 Binder, NSWC/IH-BC-15. Control of the physical properties of the propellant shall be maintained by varying the amounts of HTPB polymer (WS 20700), Isophorone Di-Isocyanate (IPDI, MIL-C-85498) and HX-752 (WS 19733) bonding agent. The amounts of HTPB polymer and IPDI shall be determined by adjusting the ratio of chemical equivalents of the curative (IPDI) to the chemical equivalents of the HTPB polymer. The value of this ratio shall be nominally 0.80/1.0 based on the functional equivalence values from the vendor's ingredient certifications. The amount of the HX-752 shall be nominally 0.30% and can be adjusted as needed to improve cold temperature strain properties. Total amounts of the HTPB polymer, IDPI, and HX-752 shall remain constant at 17.37 ± 1 percent.

3.3.3.2 Binder, NSWC/IH-BC-16. Control of the physical properties of the propellant shall be maintained by varying the amounts of HTPB polymer (WS 20700), Isophorone Di-Isocyanate (IPDI, MIL-C-85498) and HX-752 bonding agent. The amounts of HTPB polymer and IPDI shall be determined by adjusting the ratio of chemical equivalents of the curative (IPDI) to the chemical equivalents of the HTPB polymer. The value of this ratio shall be nominally 0.90/1.0 based on the functional equivalence values from the vendor's ingredient certifications. The amount of the HX-752 shall be nominally 0.30% and can be adjusted as needed to improve cold temperature strain properties. Total amounts of the HTPB polymer, IDPI, and HX-752 shall remain constant at 15.87 ± 1 percent.

3.3.3.3 Binder, NSWC/IH-BC-17. Control of the physical properties of the propellant shall be maintained by varying the amounts of HTPB polymer (WS 20700), Isophorone Di-Isocyanate (IPDI, MIL-C-85498) and HX-752 bonding agent. The amounts of HTPB polymer and IPDI shall be determined by adjusting the ratio of chemical equivalents of the curative (IPDI) to the chemical equivalents of the HTPB polymer. The value of this ratio shall be nominally 0.90/1.0 based on the functional equivalence values from the vendor's ingredient certifications. The amount of the HX-752 shall be nominally 0.30% and can be adjusted as needed to improve cold temperature strain properties. Total amounts of the HTPB polymer, IDPI, and HX-752 shall remain constant at 14.37 ± 1 percent.

3.3.3.4 Binder, NSWC/IH-BC-20. Control of the physical properties of the propellant shall be maintained by varying the amounts of HTPB polymer (WS 20700), Isophorone Di-Isocyanate (IPDI, MIL-C-85498) and HX-752 bonding agent. The amounts of HTPB polymer and IPDI shall be determined by adjusting the ratio of chemical equivalents of the curative (IPDI) to the chemical equivalents of the HTPB polymer. The value of this ratio shall be nominally 0.90/1.0 based on the functional equivalence values from the vendor's ingredient certifications. The amount of the HX-752 shall be nominally 0.30% and can be adjusted as needed to improve cold temperature strain properties. Total amounts of the HTPB polymer, IDPI, and HX-752 shall remain constant at 11.50 ± 1 percent.

3.3.3.5 Binder, NSWC/IH-BC-21. Control of the physical properties of the propellant shall be maintained by varying the amounts of HTPB polymer (WS 20700), Isophorone Di-Isocyanate (IPDI, MIL-C-85498) and HX-752 bonding agent. The amounts of HTPB polymer and IPDI shall be determined by adjusting the ratio of chemical equivalents of the curative (IPDI) to the chemical equivalents of the HTPB polymer. The value of this ratio shall be nominally 0.90/1.0 based on the functional equivalence values from the vendor's ingredient certifications. The amount of the HX-752 shall be nominally 0.30% and can be adjusted as needed to improve cold temperature strain properties. Total amounts of the HTPB polymer, IDPI, and HX-752 shall remain constant at 12.85 ± 1 percent.

3.3.3.6 Binder, NSWC/IH-BC-22. Control of the physical properties of the propellant shall be maintained by varying the amounts of HTPB polymer (WS 20700), Isophorone Di-Isocyanate (IPDI, MIL-C-85498) and HX-752 bonding agent. The amounts of HTPB polymer and IPDI shall be determined by adjusting the ratio of chemical equivalents of the curative (IPDI) to the chemical equivalents of the HTPB polymer. The value of this ratio shall be nominally 0.90/1.0 based on the functional equivalence values from the vendor's ingredient certifications. The amount of the HX-752 shall be nominally 0.30% and can be adjusted as needed to improve cold temperature strain properties. Total amounts of the HTPB polymer, IDPI, and HX-752 shall remain constant at 12.01 ± 1 percent.

3.3.4 Formulation adjustment. The nominal values and nominal limits of the ingredient weight percentages (see Table I), the curative to HTPB polymer ratio (see 3.3.3) were determined experimentally (see 6.5). Decisions to vary these ratios and ingredient weight percentages from their nominal values and nominal limits shall be based on ballistic and physical properties obtained from previous batch history, trends indicated by statistical control charts, or lot changes of raw materials. The nominal limits of these ratios and weight percentages shall not be criteria for accepting or rejecting a batch of propellant. Only the physical properties (see Table 2) and ballistic performance of the end item (see 6.1) shall be propellant acceptance/rejection criteria. Failure to meet the requirements of 3.4 and the ballistic performance of the end item (see 6.1) shall result in the rejection of the propellant lot.

3.4 Physical properties. The physical properties of the cured propellant shall conform to Table II when cured in accordance to 4.4.3. Test specimens shall be tested within 30 days after the end of cure. The contractor shall report all data from the tests specified in 4.5.4 through 4.5.8 (see 6.3).

3.5 Burn rates of the cured propellant. The contractor shall conduct burn rate testing on the propellant cured in accordance with 4.4.3. The contractor shall report all data from the tests specified in 4.5.8 (see 6.3). The burn rate shall be such as to meet the performance required of its intended use. Advisory burn rates are shown in Tables III, IV, V and VI (see 6.6).

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.

TABLE II. Physical properties of the propellant.

Physical Property		NSWC/IH-BC-15		NSWC/IH-BC-16		NSWC/IH-BC-17		NSWC/IH-BC-20	
	Temp (±5°F)	Min	Max	Min	Max	Min	Max	Min	Max
Maximum tensile stress (psi)	165	86.2	-	80	-	81.2	-	49	-
Strain at maximum stress (%)	-65	7.1	-	6	-	15.5	-	8	-
Heat of explosion (cal) (reference)	77	1125	1135	1125	1135	1125	1135	1280	1300
Shore hardness "A" (reference)	77	55	67	55	67	55	67	65	75
Density (lb/in^3)	77	.059	.061	.059	.061	.059	.061	.0605	.0625

Table II (cont.). Physical properties of the propellant

Physical Property		NSWC/IH-BC-21		NSWC/IH-BC-22	
	Temp (±5°F)	Min	Max	Min	Max
Maximum tensile stress (psi)	165	65	-	70	-
Strain at maximum stress (%)	-65	14	-	10	-
Heat of explosion (cal) (reference)	77	1125	1135	1280	1300
Shore hardness "A" (reference)	77	55	67	65	75
Density (lb/in^3)	77	.0595	.0615	.0605	.0625

TABLE III. Advisory burn rates of the propellant, NSWC/IH-BC-15, NSWC/IH-BC-16, and NSWC/IH-BC-17.

Pressure Versus Temperature	2000 psia (in/sec)		4000 psia (in/sec)		6000 psia (in/sec)		8000 psia (in/sec)	
	Min	Max	Min	Max	Min	Max	Min	Max
-65 ±5°F	.78	-	1.20	-	1.53	-	1.85	-
165 ±5°F	-	1.04	-	1.57	-	2.01	-	2.51

TABLE IV. Advisory burn rates of the propellant, NSWC/IH-BC-20.

Pressure Versus Temperature	1000 psia (in/sec) nominal	2500 psia (in/sec) nominal	3000 psia (in/sec) nominal	4000 psia (in/sec) nominal
-65 ±5°F	.595	.91	.987	1.13
165 ±5°F	.759	1.14	1.25	1.43

Table V. Advisory burn rates of the propellant, NSWC/IH-BC-21

Pressure Versus Temperature	1000 psia (in/sec) nominal	2000 psia (in/sec) nominal	3000 psia (in/sec) nominal	4000 psia (in/sec) nominal
-65 ±5°F	.771	.974	1.19	1.39
165 ±5°F	.939	1.154	1.443	1.707

Table VI. Advisory burn rates of the propellant, NSWC/IH-BC-22

Pressure Versus Temperature	500 psia (in/sec) nominal	1000 psia (in/sec) nominal	1500 psia (in/sec) nominal	2000 psia (in/sec) nominal
77 ±5°F	.901	1.35	1.481	1.645

4. VERIFICATION

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

a. First article inspection (see 4.3),
b. Conformance inspection (see 4.4).

4.2 Inspection conditions. Unless otherwise specified in the contract or purchase order (see 6.2), all inspections shall be performed as specified in the applicable test method of 4.5.

4.3 First article inspection. The first article inspection shall consist of the examination and tests of section 4.5 performed on samples prepared in accordance with Sections 4.3.1 and 4.4.3. Failure to pass any examination or test shall result in rejection of the first article sample.

4.3.1 First article sample. Unless otherwise specified in the contract or purchase order (see 6.2), a sample (see 4.4.1) consisting of one batch of propellant per the contractor's normal practice shall be manufactured in accordance to 3.1. Test samples in accordance with 4.4.3 shall be prepared from propellant drawn from the first article batch and forwarded to an activity designated by the contracting activity (see 6.2) for first article inspection. The sample shall be tested to determine, prior to starting production, that the contractor's production methods are capable of producing propellant that complies with the technical requirements of the contract. No process changes shall be made, subsequent to the approval of the first article sample, without prior approval of the procuring activity. The remainder of the batch may be used, at the contractor's risk, to cast units for use in the first article sample assemblies

required by the applicable end item specification. Rejection of the propellant first article sample will result in rejection of any units cast from the first article batch. Further production of the propellant by the contractor, prior to approval of the first article sample, shall be at the contractor's risk.

4.4 Conformance inspection. The conformance inspection shall consist of the examination and tests of 4.5 performed on samples prepared in accordance to 4.4.2 and 4.4.3. Failure to pass any examination or test shall result in rejection of the lot. The contractor shall furnish test reports showing quantitative results of all quality conformance tests required by this specification for each lot (see 6.8.3) of propellant (see 6.3).

4.4.1 Sample size. The quality conformance lot sample size from the propellant lot shall be adequate to perform all examinations and tests necessary to verify the properties listed in Table II and the applicable burn rates of Tables III, IV, V, or VI.

4.4.2 Sampling for conformance inspection. A conformance inspection sample, consisting of sufficient material to allow performance of the quality conformance tests as specified in 4.5, shall be withdrawn from each batch of propellant. Samples shall be cast and cured in accordance to 4.4.3.

4.4.3 Sample preparation. Samples for first article and quality conformance inspections shall be cast, in the same manner used for production units, in pans or blocks of sufficient size and quantity to complete all tests in 4.5.

4.4.3.1 Curing. Propellant grains and samples shall be cured together in the same oven at 140°F ± 5°F until two consecutive Shore "A" hardness measurements, taken at least 24 hours apart, show no more than a 2 durometer point increase (see 6.10).

4.5 Examination and tests. Unless an alternative inspection method is proposed, tests shall be performed using the apparatus and procedures specified herein. Alternate inspection methods must be approved by the contracting activity prior to use in acceptance testing.

4.5.1 Visual examination. All samples shall be visually examined to verify conformance with the workmanship requirements of 3.6. Packaging shall be examined for conformance to section 5.

4.5.2 Aging characteristics. Unless otherwise specified in the contract or purchase order (see 6.2), all contractors shall test the propellant in accordance with the applicable end item specification to assure compliance to 3.1.1.

4.5.3 Chemical composition. The contractor shall submit a record of the ingredient weights and ingredient lot/batch number for each batch of propellant to the contracting activity (see 6.3). Failure to meet the requirements of 3.3, 3.4 and the ballistic performance of the end item (see 6.1) shall result in the rejection of the propellant lot.

4.5.4 Maximum stress and strain at maximum stress. The maximum stress and strain at maximum stress of the cured propellant shall be in accordance with CPIA Publication No. 21, Class C specimen. The average properties of five specimens tested at each temperature shall meet the requirements specified in table 2. Crosshead rate shall be 2.0 inches/minute. Test sample temperature conditioning time shall be 3 hours minimum.

4.5.5 Density. The test specimen shall be tested in accordance with Method 510.3.1 of MIL-STD-286 and the test temperature shall be 77 ± 5°F and shall meet the requirements of 3.4. An alternative test that may be used is ASTM D 792, Method A-1, except isopropyl alcohol shall be used in place of water.

4.5.6 Hardness. Hardness shall be determined in accordance with ASTM D 2240, Type A, at a temperature of 77 ± 5°F. The average of five different hardness readings taken on a single sample of propellant shall be reported as the hardness.

4.5.7 Heat of explosion. The heat of explosion (HOE) of the cured propellant shall be determined in accordance with Method 802.1 of MIL-STD-286. The results of five determinations and their average shall be recorded for each lot.

4.5.8 Burn rate. The burn rate of the cured propellant shall be determined for each batch of propellant in accordance to Method 803.1.1 of MIL-STD-286 for each pressure-temperature combination specified in Tables III, IV, V, and VI.

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 or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service’s system commands. Packaging data retrieval is available from the managing Military Department's 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 that may be helpful but is not mandatory).

6.1 Intended use. NSWC/IH-BC-16 propellant is intended for use in the CCU-22B/A and CCU-149/A Impulse Cartridges. NSWC/IH-BC-20 propellant is intended for use in the CKU-5C/A Aircraft Ejection Seat Catapult. NSWC/IH-BC-21 propellant is intended for use in the CKU-7A/A, CKU-10A/A and CKU-11A/A Aircraft Ejection Seat Catapults. NSWC/IH-BC-22 propellant is intended for use in the CKU-10A/A and CKU-11A/A Aircraft Ejection Seat Catapults. These propellants were developed for use in the cartridges and the catapult, are used in military aircraft only, and have no commercial application.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification.

b. 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).

c. Conditions where a first article sample is not required (see 3.1, 4.3.1, and 6.4).

d. Whether aging characteristics are required (see 3.1.1).

e. Inspection activity

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

g. Assigned activity for first article inspection (see 4.3.1).

h. Lot size, if other than specified (see 6.8.3).

i. That the safety precaution requirements of the "Contractors' Safety Manual for Ammunition and Explosives, "DOD 4145.26M, are applicable. NOTE: When this specification is used as part of the description of work to be accomplished by a Government activity, the safety precaution requirements of "Ammunition and Explosives Ashore", OP 5, are applicable.

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 Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Paragraph	Title
3.1	Operating Procedures
3.1.1, 3.3, 3.4 3.5	Test/Inspections

6.4 First Article. When a first article sample is required, the contracting officer should provide guidance as to the number of items to be tested as specified in 4.3 and whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first production items, or a standard production item from the contractor's current inventory (see 3.1). The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has previously been acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.5 Propellant history. The nominal values shown in Table VII are based on formulations used by Indian Head Division, Naval Surface Warfare Center (IHDIV/NSWC). INDIV/NSWC, which uses Baker-Perkins brand vertical mixers, has successfully met the requirements of this specification using those values. Due to the known effects of moisture-related degradation of AP-based composite propellants, manufacturing processes should be carefully designed to severely restrict the propellant and ingredients exposure to moisture and contaminants prior to unit loading (sealing off the propellant).

Table VII. Properties of NSWC/IH-BC-16 Propellant

Theoretical Property					
FLAME TEMPERATURE (°F, CALCULATED), CHAMBER					4215
GLASS TRANSITION TEMPERATURE (°F)					-97
SPECIFIC HEAT RATIO (GAMMA, CALCULATED)					1.21
SPECIFIC IMPULSE (1000 PSIA IN STANDARD ATMOSPHERE, LBF-S/LBM, CALCULATED					235.9
TEMPERATURE SENSITIVITY (%/°F) RANGE OF –65 TO 165°F					0.043
Approximate exhaust gas composition (mole %, 1Atm.):					
H_2O	27.13	N_2	8.01	H	0.20
CO	24.04	CO_2	5.36	Cl	0.11
H_2	19.05	Al_2O_3 (s)	0.70	SiO (s)	0.08
HCl	14.73	$FeCl_2$	0.43	HO	0.06
Molecular weight of exhaust				23.59	

6.6 Burn rates. Past acceptable lots of propellant have conformed to the burn rates of Tables III, IV, V and VI.

6.7 Propellant properties. The properties of the NSWC/IH-BC-16 propellant are shown in Table VII.

6.8 Definitions.

6.8.1 Process change. A process change is a change in the way the propellant and/or its ingredients are manufactured. Process changes include, but are not limited to, (a) a change in ingredient manufacturer, or in the manufacturer's process, (b) a change in mixing vessel size or type, (c) a change in mix time or temperature, and (d) a change in cure temperature.

6.8.2 Batch. A batch is a quantity of propellant consisting of a mix of all the ingredients including curative manufactured at one time in one mixer per the contractor's normal practice.

6.8.3 Lot. Unless otherwise specified in the contract (see 6.2), each batch of propellant should constitute a lot for inspection purposes. No batch of propellant should contain more than one batch (or lot) of any ingredient.

6.9 Packaging

6.9.1 Packaging. When packaging is required for propellant shipment, the propellant should be individually wrapped in moisture proof packing material and properly identified as to propellant lot and batch number.

6.10 Curing Hardness test. Using a small plastic beaker of propellant as a curing sample the following tests will be performed to determine when the propellant has attained sufficient cure for further processing. A cut section of a pan or carton sample may be also be used.

a. Use a craftsman knife, exacto knife, or equivalent to obtain a cut surface layer of the propellant over an area sufficient to squarely support the Shore "A" gage presser foot. Do not use the same place on the sample for readings done on subsequent days.

b. Perform the Shore "A" durometer test at 140 ± 5°F in accordance with ASTM D2240 Method A. Reading is to be taken 10 ± 1 seconds after presser foot is in contact with specimen.

c. When two measurements taken 24 hours apart show less than a 2 durometer point increase with time then the sample should be deemed sufficiently cured.

d. When the two measurements 24 hours apart indicate a decrease in hardness an additional wait of 24 hours is required to assure that cure has progressed to the point that another reading may be taken.

6.11 Subject terms (keyword) listing.

CCU-22B/A
CCU-149/A
CKU-5C/A
CKU-7A/A
CKU-10A/A
CKU-11A/A
Cartridges
Aircraft Ejection Seat Catapults
AEPS

6.12 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 1377-2007-001)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil/.