

INCH-POUNDS

MIL-P-19264B(OS)  
10 November 1993  
 SUPERSEDING  
 MIL-P-19264A(OS)  
 4 September 1959  
 (see 6.9)

## MILITARY SPECIFICATION

### PROPELLANT, BS-NACO, FOR THE 5"/54 CALIBER PROPELLING CHARGE

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 for BS-NACO Propellant for use in the 5"/54 Caliber Propelling Charge (see 6.1).

**1.2 Classification.** The propellant shall be cylindrical multiperforated grains.

#### 2. APPLICABLE DOCUMENTS

##### 2.1 Government documents.

**2.1.1 Specifications and standards.** The following specifications and standards form a part of this document to the extent specified here in. 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 there to, cited in the solicitation (see 6.2).

#### SPECIFICATIONS

##### Military

MIL-G-155	Graphite (For use in Ammunition)
MIL-P-193	Potassium Sulfate (For Ordnance Use)
MIL-N-244	Nitrocellulose
MIL-N-255	Ethyl Centralite (Carbamite)

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, Standardization Branch (Code 8420), 101 Strauss Avenue, 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.

AMSC N/A

FSC 1376

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

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MIL-P-270	Propellant, Artillery
MIL-I-18618	Lead Carbonate, Basic, Dry (For Ordnance Use)
MIL-B-21465	Butyl Stearate, Normal

## STANDARDS

## Military

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-286	Propellants, Solid; Sampling, Examination and Testing
MIL-STD-652	Propellants, Solid, For Cannon, Requirements and Packing
MIL-STD-1168	Ammunition Lot Numbering
MIL-STD-1171	Acceptance and Description Sheet for Propellants and Explosives
DOD-STD-2101	Classification of Characteristics

(Unless otherwise indicated, copies of Federal and Military Specifications and Standards, are available from Standardization Documents Order Desk, Bldg. 40, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

**2.1.2 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 shall be those cited in the solicitation.

## DRAWINGS

## Naval Sea Systems Command (CAGE Code 10001)

138439	Packing Box Mark 7 (For Smokeless Powder), General Arrangement
3208375	Charge, Propelling, 5-Inch, 54-Caliber, Full, Mark 67 Mod 3

## US Army Material Command

76-4-53	Box, Steel M2 For Smokeless Powder Assembly
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(Application for copies of NAVSEA drawings should be addressed to: Commander, Naval Surface Warfare Center, Crane Division, Louisville Detachment, Attn: Code 802, Louisville, KY 40214.)

## PUBLICATIONS

## Naval Sea Systems Command (CAGE Code 10001)

WR-53/724-1	Palletizing Domestic Unit Load For MK 7 Packing Box
OD-40807	Screen Loading Density, Determination of

(Application for copies of WR's should be addressed To: Commanding Officer, Naval Publications and Forms Center, Attn: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

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## CODE OF FEDERAL REGULATIONS (CFR)

49 CFR 100-199

Transportation

(The Code of Federal Regulations is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.)

**2.2 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 (see 6.3) in accordance with 4.4.

**3.2 Composition (M101).** The propellant shall meet the requirements of table I when analyzed (see 4.7.1).

TABLE I. NACO composition.

Material	Specification	Percent by Weight
Nitrocellulose, Grade E, Type I	MIL-N-244 <sup>1/</sup>	93.55 (nominal)
n-Butyl Stearate	MIL-B-21465 <sup>2/</sup>	3.00 ± 0.30
Ethyl Centralite, Class 2	MIL-E-255	1.20 ± 0.20
Basic Lead Carbonate	MIL-L-18618 <sup>3/</sup>	1.00 ± 0.20
Potassium Sulfate, Type I	MIL-P-193	1.25 ± 0.30
Moisture	—	1.00 (min) to 3.00 (max)
Total Volatiles	MIL-STD-652, Figure 1	5.0 max
Graphite, Grade IV	MIL-G-155	0.10 ± 0.05

1/ The nitrocellulose shall have an average nitrogen content of  $12.00 \pm 0.10$  percent, and shall have a viscosity of  $5 \pm 2$  seconds. The required nitrogen content may be obtained by blending nitrocellulose containing 11.90 to 12.20 percent nitrogen. This determination shall be made only when specifically requested in the contract (see 6.2).

2/ The n-butyl stearate specific gravity shall be determined at 25°/25°C and the sample weight shall be 2.5 to 3.2 grams for the iodine test.

3/ The compatibility tests for lead carbonate with Cordite-N propellant shall not be performed.

**3.3 Grain form and dimensions (M102).** The grain form and dimensions shall meet the requirements listed in MIL-P-270 for Type I propellants (see 4.7.2, 4.7.3, and 6.6).

**3.4 Glaze.** The propellant shall be glazed with graphite, MIL-G-155, Grade IV (see 4.7.3).

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**3.5 Integrity.** The propellant grains shall be without cracks or incipient cracks between the perforations or between the perforations and the outside edge of the grain (see 4.7.3).

**3.6 Stability (C1).** Using the 134.5° centigrade (C) heat test the methyl violet test paper shall not fade to a salmon-pink color in less than 40 minutes and the propellant shall not explode in less than 5 hours (see 4.7.4).

**3.7 Packing depth (M103).** The minimum production packing depth of the assessed charge weight shall be 3.5 inches (measured from the case mouth) (see 4.7.5).

**3.8 Gun ballistic assessment requirements.**

**3.8.1 Velocity (M104).** The charge weight of the propellant lot under test shall be assessed to result in a nominal average new gun velocity of 2650 feet per second (ft/sec) (see 4.7.6).

**3.8.2 Pressure (M105).** The maximum allowed chamber pressure shall be 20.5 long tons per square inch (tsi) (copper crusher gauge pressure) (see 4.7.6).

**3.8.3 Velocity variation (M106).** The maximum allowed velocity standard deviation shall be 10 ft/sec (see 4.7.6).

**3.8.4 Pressure variation (M107).** The maximum allowed pressure standard deviation shall be 0.63 tsi (see 4.7.6).

**3.9 Propellant interface test.** All first article lots must be subjected to the propellant interface test and production lots when directed by the procuring activity (see 4.7.9 and 6.5).

**3.10 Workmanship.** The propellant shall be manufactured using good workmanship and shall be a product free from foreign material. It shall be uniform in quality and manufactured in a manner to assure compliance with the requirements of this specification when examined in accordance with 4.7.3.

#### **4. QUALITY ASSURANCE PROVISIONS**

**4.1 Responsibility for inspection.** Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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

- a. First article inspection (see 4.4)
- b. Quality conformance inspection (see 4.5)

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**4.3 Inspection conditions.** All test activities identified in the contract shall submit to the technical activity and the design agent for review, prior to first article, a description of the proposed procedures and equipment to be used to perform the examination and test.

**4.4 First article inspection.** First article inspection shall be performed by the contractor, after award of contract and prior to production, at a location acceptable to the Government. First article inspection shall be performed on sample units which have been produced with equipment and procedures normally used in production. First article approval is valid only on the contract under which it is granted, unless extended by the Government to other contracts. The first article sample is intended to provide necessary information to establish the propellant granulation needed to meet the required ballistic parameters.

**4.4.1 Submission.** The contractor shall select three propellant granulations which, from experience, are expected to bracket the requirements of this specification. The contractor shall submit a first article sample as designated by the contracting officer for evaluation in accordance with 4.4.2, consisting of three pilot lots of a maximum of 1000 pounds each, representing the three candidate granulations.

**4.4.2 Inspections to be performed.** Each of the granulations comprising the first article sample and submitted in accordance with 4.4.1 shall be tested by the Government. First article inspection shall consist of the tests specified in table II.

**4.4.3 Authorization.** Government engineering and product assurance personnel and the contractor shall review the pilot lot test data and shall select a granulation size which best fits the requirements of this specification. The technical agency shall notify the contracting officer of the selected granulation. The contractor shall request approval from the contracting officer to produce the selected granulation. If none of the pilot lots submitted meets the requirements of this specification, a new first article sample shall be submitted in accordance with 4.4.1. All future production lots shall be of the same basic granulation.

TABLE II. First article and quality conformance tests.

Characteristic	Requirement	Test Method
Composition	3.2	4.7.1
Grain Form and Dimensions	3.3	4.7.2, 4.7.3
Integrity	3.4	4.7.3
Glaze	3.5	4.7.3
Stability	3.6	4.7.4
Packing Depth	3.7	4.7.5
Velocity and Pressure	3.8	4.7.6
Workmanship	3.10	4.7.3

**4.4.4 Failure.** Failure of the sample to meet the requirements of this specification shall be cause for rejection of the first article sample.

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**4.5 Quality conformance inspection.** Quality conformance inspection shall consist of the examinations and tests of 4.7 to determine conformance to the requirements of this specification. Failure of any sample to conform to any requirement specified herein shall be cause for rejection of the lot represented. Alternate methods and test procedures may be used provided prior written approval has been obtained from the procuring activity and the gun ammunition propelling charge design agent, Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland. Requirements and their corresponding tests are summarized in table II.

**4.5.1 Lot size.** Unless otherwise specified in the contract or purchase order, the propellant shall be produced in lots of not less than 100,000 nor greater than 500,000 pounds.

**4.5.2 Sampling.** The samples shall be selected from full Mark 7 boxes (Drawing 138439) so as to be representative of the lot. All samples shall be selected following the final packing of the lot. All samples shall be packed in moisture-proof airtight containers and marked with the following in accordance with MIL-STD-129:

- a. Propellant description
- b. Propellant lot number
- c. Number of pounds in lot
- d. Manufacturer
- e. Contract number

**4.5.2.1 For gun performance tests.** Sample size shall be approximately 2420 pounds randomly selected from full Mark 7 boxes.

**4.5.2.2 For physical characteristic tests.** A 10-pound sample shall be randomly selected from full Mark 7 boxes.

**4.5.2.3 For surveillance tests.** A 5-pound sample shall be randomly selected from full Mark 7 boxes and forwarded to the Navy's designated surveillance activity for propellants: Indian Head Division, Naval Surface Warfare Center, Indian Head, MD 20640-5035.

**4.6 Classification of characteristics.** The characteristics verified by the tests and examinations herein are classified as critical, major, or minor in accordance with DOD-STD-2101. Requirements for critical characteristics are identified by the symbol (C) and major characteristics by the symbol (M). The number following the classification symbol indicates the serial number of the characteristic. Requirements not annotated with a classification code are classified minor.

**4.7 Methods of inspection.**

**CAUTION**

This specification covers sampling and testing of chemical, toxic, or explosive materials which are potentially hazardous to personnel.

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**4.7.1 Chemical analysis.** The chemical composition shall be determined using the methods specified in table III. The requirements of 3.2 shall be met or the lot shall be rejected.

TABLE III. Chemical analysis test methods.

Material	Test Method of MIL-STD-286
Nitrocellulose	209.2.1
n-Butyl Stearate	222.1
Ethyl Centralite	202.2.3
Basic Lead Carbonate	311.1.3 or 316.1
Potassium Sulfate	310.3.1, 310.4.2, or 316.1
Moisture	103.5
Total Volatiles	103.5
Graphite	308.1.4

**4.7.2 Grain dimensions.** Grain dimensions shall be determined in accordance with MIL-STD-286, method 504.1.1 or 504.6.1. The requirements of 3.3 shall be met or the lot shall be rejected.

**4.7.3 Visual examination.** The propellant grains selected for the physical characteristic tests shall be visually examined prior to conducting the physical characteristic tests (4.7.1 and 4.7.2) to verify that:

- a. Grain form conforms to the requirements of 3.3.
- b. Grains are uniformly coated with graphite, conforming to the requirements of 3.4.
- c. Workmanship conforms to the requirements of 3.10.

**4.7.4 Stability.** Stability shall be determined in accordance with MIL-STD-286, method 404.1.2 (134.5°C heat test). The requirements of 3.6 shall be met or the lot shall be rejected.

**4.7.5 Packing depth.** The maximum packing depth (MPD) is the distance, measured to the nearest tenth of an inch, from the case mouth to the upper level of any given propellant charge in a loaded cartridge case. MPD is determined by pouring the propellant charge steadily from a height of 30 inches above the mouth of a primed case, over an interval of one minute while the outside of the case is briskly tapped with a soft mallet adjacent to the rising level of the propellant during pouring. The MPD must be determined for each lot of propellant by pouring three charges preconditioned for a minimum of four days at  $90 \pm 3^\circ$  Fahrenheit (F) at each of three charge levels covering the range expected to be used in acceptance tests of the lot of propellant. A curve shall be fitted through the means of the data. The production packing depth (PPD) is the MPD less the empirical value of 0.7 inches (in both brass and steel 5-inch, 54-caliber cartridge cases). A curve is fitted to the PPD values derived from the MPD pouring data. Subsequent to acceptance tests of each lot of propellant, the assessed charge shall be poured a minimum of three times to determine the MPD and the resultant PPD.



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**4.7.6 Ballistic Testing.**

**4.7.6.1 Warming or conditioning rounds.** Warming or conditioning rounds shall be fired to stabilize gun temperature and to eliminate the biasing effects of firing the propellant at various charge levels or temperatures. The first round fired in a gun during a test is the warming round. The first round fired as part of a temperature conditioning group or charge level group wherein the velocity is expected to differ from the previous group by approximately 100 ft/s or more is a conditioning round. Warming and conditioning rounds may have unusual ballistics and therefore the results are disregarded. These rounds are in addition to those specified in subsequent paragraphs.

**4.7.6.2 Gun performance tests.** All ballistic testing shall be conducted using fleet-released 5-inch, 54-caliber gun barrels which have met the acceptance criteria during proofing and which have a velocity loss of 50 feet per second (ft/s) or less. The Mark 42 or the Mark 45 gun mount shall be used, with the Mark 45 mount being preferred. The non-test components (e.g., case, primer, etc.) of the complete round of ammunition shall be from one acceptable lot per component and the cartridge shall be assembled in accordance with Drawing 3208375. Deviations in propelling charge assembly shall consist of (1) adjustment of charge/production packing depth (PPD) to vary ballistics and (2) the allowance for pressure gauges. The projectiles shall be inert loaded and shall weigh  $70.0 \pm 0.1$  pounds. The ballistic test shall be performed on the first article and production lot except that:

- a. For the first article sample, the test of 6.5 herein is mandatory.
- b. For the production lot, the test of 6.5 herein shall be performed at the discretion of the government when (1) the government deems the test necessary or (2) when the test results of other parameters are marginal.

**4.7.6.3 Charge assessment.** Charge assessment shall be conducted using the firing programs described below. Only one gun shall be fired each day and the velocities shall be corrected to the muzzle. The cases, primers, and propellant for all propelling charges shall be preconditioned at  $90 \pm 3^\circ\text{F}$  for a minimum of 4 days immediately prior to assembly and shall be fired at  $90 \pm 3^\circ\text{F}$ . For the verification firing program, the cartridges shall be reconditioned after assembly for a minimum of 48 hours at  $90 \pm 3^\circ\text{F}$  prior to firing. For all tests, the cartridges shall be fired within 5 minutes of removal from temperature conditioning.

- a. A probing round firing program shall be conducted to determine the estimated charge weight of the test propellant (TP) required to match the mean velocity of the master propellant (MP). The test shall consist of firing a series of MP rounds and a series of TP rounds wherein the TP charge and PPD are adjusted to vary the velocity and pressure. Sufficient rounds should be fired to obtain at least two rounds below and two rounds at or above the MP mean velocity. An estimate shall be made from the TP velocity-charge data of the TP charge weight required to match the MP mean velocity. If the estimated pressure for the estimated TP charge, as determined from the pressure-charge data, exceeds the maximum service pressure limits by more than 0.5 long tons per square inch, copper (tsi(Cu)), the probing round program shall be repeated. If the estimated TP charge again has an estimated pressure which exceeds the maximum chamber pressure by 0.5 tsi (Cu), the lot of propellant shall be rejected without further testing.



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TABLE IV. Firing schemes.

1 Lot			2 Lots			3 Lots		
Round number	Propellant	Charge <sup>1</sup>	Round number	Propellant	Charge <sup>1</sup>	Round number	Propellant	Charge <sup>1</sup>
1 <sup>2</sup>	TP <sup>3</sup>	C <sub>2</sub>	1 <sup>2</sup>	TP-1	C <sub>2</sub>	1 <sup>2</sup>	TP-1	C <sub>2</sub>
2	TP	C <sub>2</sub>	2	TP-1	C <sub>2</sub>	2	TP-1	C <sub>2</sub>
3	TP	C <sub>2</sub>	3	TP-2	C <sub>2</sub>	3	TP-2	C <sub>2</sub>
4	TP	C <sub>2</sub>	4	TP-1	C <sub>2</sub>	4	TP-3	C <sub>2</sub>
5	TP	C <sub>1</sub>	5	TP-2	C <sub>2</sub>	5	TP-1	C <sub>2</sub>
6	MP <sup>3</sup>	AC	6	TP-1	C <sub>2</sub>	6	TP-3	C <sub>2</sub>
7	TP	C <sub>1</sub>	7	TP-2	C <sub>2</sub>	7	TP-2	C <sub>2</sub>
8	MP	AC	8	TP-2	C <sub>1</sub>	8	TP-2	C <sub>2</sub>
9	TP	C <sub>1</sub>	9	TP-1	C <sub>1</sub>	9	TP-3	C <sub>2</sub>
10	MP	AC	10	MP <sup>3</sup>	AC	10	TP-1	C <sub>2</sub>
11	TP	C <sub>3</sub>	11	TP-1	C <sub>1</sub>	11	TP-1	C <sub>1</sub>
12	TP	C <sub>3</sub>	12	TP-2	C <sub>1</sub>	12	TP-3	C <sub>1</sub>
13	TP	C <sub>3</sub>	13	MP	AC	13	TP-2	C <sub>1</sub>
14 <sup>2</sup>	TP	MC	14	TP-2	C <sub>1</sub>	14	MP	AC
15	TP	MC	15	TP-1	C <sub>1</sub>	15	TP-2	C <sub>1</sub>
16	TP	MC	16	MP	AC	16	TP-3	C <sub>1</sub>
17	TP	MC	17	TP-2	C <sub>3</sub>	17	TP-1	C <sub>1</sub>
			18	TP-1	C <sub>3</sub>	18	MP	AC
			19	TP-2	C <sub>3</sub>	19	TP-3	C <sub>1</sub>
			20	TP-1	C <sub>3</sub>	20	TP-1	C <sub>1</sub>
			21	TP-2	C <sub>3</sub>	21	TP-2	C <sub>1</sub>
			22	TP-1	C <sub>3</sub>	22	MP	AC
			23 <sup>2</sup>	TP-2	MC	23	TP-3	C <sub>3</sub>
			24	TP-2	MC	24	TP-2	C <sub>3</sub>
			25	TP-2	MC	25	TP-1	C <sub>3</sub>
			26	TP-2	MC	26	TP-2	C <sub>3</sub>
			27	TP-1	MC	27	TP-3	C <sub>3</sub>
			28	TP-1	MC	28	TP-1	C <sub>3</sub>
			29	TP-1	MC	29	TP-1	C <sub>3</sub>
						30	TP-2	C <sub>3</sub>
						31	TP-3	C <sub>3</sub>
						32 <sup>2</sup>	TP-1	MC
						33	TP-1	MC
						34	TP-1	MC
						35	TP-1	MC
						36	TP-2	MC
						37	TP-2	MC
						38	TP-2	MC
						39	TP-3	MC
						40	TP-3	MC
						41	TP-3	MC

1/ Symbols are defined as follows: C<sub>1</sub> represents charge of TP estimated (from probing round test) to produce the same velocity at the MP; C<sub>2</sub> is C<sub>1</sub> minus approximately 0.5 lb; C<sub>3</sub> is C<sub>1</sub> plus approximately 0.5 lb; MC is the charge of the TP estimated to produce the MP velocity level on this occasion; AC is the MP assessed charge. Charge levels C<sub>2</sub> and C<sub>3</sub> should be randomized for each gun for each lot evaluated.

2/ Conditioning round; data not used in analysis.

3/ Test propellant (TP) and master propellant (MP). Number after letter indicates which lot is under evaluation. When two or three lots are being evaluated, they should be randomized per charge level.

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- b. A firing program shall be conducted in each of four guns to determine the charge of the TP required to match the MP mean velocity. (The gun used in the probing round test may also be used in this test.) Three TP charges at each of four charge levels shall be fired in each gun. The first TP charge ( $C_1$ ) shall be that which was determined during the probing round test to match the MP mean velocity. The second charge ( $C_2$ ) shall be approximately 0.5 lbs less than  $C_1$  and third charge ( $C_3$ ) shall be approximately 0.5 lbs greater than  $C_1$ . The fourth charge or matching charge (MC) is that charge of the TP which is predicted to match the MP mean velocity on that day in that gun. The firing scheme for each gun for evaluation of one, two, or three lots is presented in Table IV.
- (1) A linear, least squares equation shall be calculated for the velocity-charge data for each gun. The MC is determined by substituting the MP mean velocity as the dependent variable and solving for the independent variable.
  - (2) Three rounds are fired at the MC in each gun to determine a matching velocity.
- c. The assessed charge (AC) shall be determined by using the formula:

$$AC = \frac{\sum_{i=1}^4 \left( \frac{MC_i}{\Delta_i^2} \right)}{\frac{1}{\sum_{i=1}^4 \Delta_i^2}}$$

where: MC = charge of the test propellant estimated to match the MP mean velocity in the  $i$ th gun.  
 $\Delta_i$  = difference between the mean muzzle velocity obtained with the matching charge in the  $i$ th gun and the MP mean velocity. (If  $\Delta_i$  is zero, replace the zero with 1.)

- d. The validity of the assessed charge shall be determined by a firing program in any of the guns used in the assessment. The program shall consist of 10 MP rounds and 10 TP rounds which have been assembled and preconditioned as noted above. The rounds shall be randomized to eliminate any gun erosion or hot gun effect. This program is fired for information only.

**4.7.6.4 Pressure determination.** The mean pressure produced by the matching charge in each of the guns shall be calculated. To each of these values is added the pressure erosion loss of the master propellant for that gun. The overall estimate of the maximum chamber pressure is then obtained by averaging these four pressures.

**4.7.6.5 Ballistic uniformity.** The velocity and maximum chamber pressure standard deviations shall be determined from the matching charge data per gun. For each standard deviation:

- a. Calculate the sum of the squares of the deviations from the mean for each gun.
- b. Sum across the guns.
- c. Divide by the quantity of the sum of the total number of rounds minus the number of guns.
- d. Take square root to nearest unit of acceptance criteria.

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**4.7.7 Examination of packaging.** Each unit of packaging shall be visually examined for conformance to the requirements of section 5.

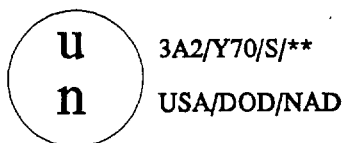
**4.7.8 Relative quickness.** Relative quickness of the propellant shall be conducted in a closed bomb as specified in MIL-STD-286, Method 801.1.2. The reference propellant shall be representative of the nominal composition of the propellant type to be tested (preferably the master propellant for ballistic acceptance tests). The "hot-wire" method of ignition may be used as an alternative to the "squib" method.

**4.7.9 Interface tests.** The procedure is described in the notes (see 6.5). For the first article lot the test is mandatory. For the production lot, the test shall be performed at the discretion of the Government: (1) when the Government deems the test necessary or (2) when the test results for other parameters are marginal.

## 5. PACKAGING

**5.1 Packing.** Packing shall be level A. The propellant shall be packed in containers that are clean, dry, and free of foreign material and that conform to Drawing 138439 and in accordance with the packing requirements of MIL-P-270 and 49 CFR 171-178. Palletizing shall be in accordance with WR 53/724-1. An alternate container is Army M2 steel box, Drawing 76-4-53.

**5.2 Marking.** In addition to any special marking required by the contract or order, shipping containers shall be marked in accordance with the requirements of MIL-STD-129 and 49 CFR 171-178. Proper shipping name and serial number in accordance with CFR 49 is "POWDER, SMOKELESS, UN 0161." The following United Nations Performance Oriented Packaging marking as depicted below shall be applied on side of container opposite the identification marking with letters 0.50 inches minimum height. Encirclement of U/N symbol shall be sufficiently large to provide a minimum clear spacing around letters. The double asterisks (\*\*) indicate the year packed, e.g., 93.



**5.3 Lot numbering.** Ammunition lot numbers shall be in accordance with MIL-STD-1168.

## 6. NOTES

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

**6.1 Intended use.** The propellant covered by this specification is intended for use in the Mk 67 Mod 3, 5-inch, 54-caliber propelling charge. This propelling charge is used in the Mk 42 or Mk 45 gun mount.

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**6.1.1 "NACO".** "NACO" is the designation for Navy "cool" single-base propellant types which contain low-nitration nitrocellulose (12.0 percent nitrogen, nominal). The type covered by this specification also contains n-butyl stearate as a coolant and potassium sulfate as a flash suppressant.

**6.2 Ordering data.** Acquisition documents should specify the following:

- a. Title, number, and date of this specification
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.1.2)
- c. If first article is required and, if so, sample size (see 3.1 and 4.4.1)
- d. Lot size if other than 4.5.1
- e. Activity to conduct gun performance tests (see 4.7.6.2)
- f. Special markings, if required (see 5.2)
- g. Data required (see 6.4)
- h. Activity to receive surveillance sample (see 4.5.2.3)

**6.3 First article.** When a first article inspection is required, the contracting officer should provide specific guidance to offerors whether the items should be a first article sample or a sample selected from the first production items (see 3.1), and the number of items to be tested as specified in 4.4. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examination, 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 been previously 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.

**6.4 Description sheets and test reports.**

**6.4.1 Propellant description sheets.** The propellant manufacturer shall furnish a propellant description sheet in accordance with MIL-STD-1171 giving a complete history of the manufacture of each propellant lot and the results of all tests performed on it. Unless otherwise specified, copies of each description sheet shall be submitted to each of the following: The Navy's gun ammunition propelling charge design agent, Indian Head Division, Naval Surface Warfare Center (Code 6210), Indian Head, MD 20640-5035; Crane Division, Naval Surface Warfare Center (Code 4025), Crane, IN 47522-5050; and to the activity designated to perform the gun performance tests.

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**6.4.2 Gun performance test reports.** The activity which conducts the gun performance tests (4.7.6.2) shall furnish a complete test report, including all test, gun, projectile, and cartridge components data. Unless otherwise specified, two copies of each test report shall be submitted to the following: Crane Division, NSWC, Code 4025, Crane, IN 47522-5050; Indian Head Division, NSWC, Code 6210, Indian Head, MD 20640-5053.

**6.5 Propellant interface test.** A test firing program shall be conducted in an instrumented mount (instrumentation location to be as specified in NSWC, Dahlgren Laboratory - TOE Drawing 1002) on the first article lot to verify that there is no adverse primer-propellant relationship which could cause problems in the fleet. The test shall consist of twelve data rounds utilizing the assessed charge weight from 4.7.6.3. Three rounds shall be preconditioned for a minimum of 72 hours and fired at each of three temperatures:  $20 \pm 3^{\circ}\text{F}$ ,  $50 \pm 3^{\circ}\text{F}$ , and  $120 \pm 3^{\circ}\text{F}$ . In addition, a minimum of one data round per temperature of the applicable master propellant shall be fired for comparison. The nontest components (e.g., case, primer, etc.) of the propelling charge and the propelled mass of  $70 \pm 0.1$  pounds shall be from the same acceptable lots used for the ballistic tests (see 4.7.6.3). All rounds shall be assembled in accordance with Drawing 3208375. The analyses of the pressure-time plots will be performed by the Navy's gun ammunition propelling charge design agent, Code 6210, Indian Head Division, NSWC, Indian Head, Maryland. Upon completion of analyses the design agent will advise the Naval Sea Systems Command, Washington, D.C., in writing, relative to the results of these analyses.

**6.6 Advisory.** The average relative quickness value should be within 3.0 percent of the reference lot when measured in a closed bomb in order to be certain of meeting the ballistic requirements (see 4.7.8).

**6.7 Safety Precautions.** Safety precaution requirements of DOD 4145.26M are applicable. Note: When this specification is used as part of work to be accomplished by a Government activity, the safety precaution requirements of OP5 are applicable. For Army activities, the safety precautions of AMCR-385-1 00 are applicable.

**6.8 Changes from previous issue.** Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

**6.9 Supersession information.** This revision supersedes revision A dated 4 September 1959 and its associated notices. Notice 1 to revision A, dated 11 January 1966, downgraded the classification to unclassified; Notice 2, dated 20 May 1992, cancelled revision A without replacement; and Notice 3, dated 6 October 92, reinstated revision A. This specification also supersedes WS 16619D dated 5 October 1987.

Custodian:  
Navy - OS

Preparing activity:  
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