

INCH-POUND

MIL-P-00223C (AR)
5 February 1993
USED IN LIEU OF
MIL-P-223B
26 February 1962

MILITARY SPECIFICATION

POWDER, BLACK

This specification is approved for use by the US Army Armaments, Munitions and Chemical Command, based upon currently available technical information but it has not been approved for promulgation as a coordinated revision of MIL-P-223B. It is subject to modification. However, pending its promulgation as a coordinated military specification, it may be used in acquisition.

1. SCOPE

1.1 Scope. This specification covers black powder intended for use in ammunition.

1.2 Classification. The black powder furnished under this specification shall be of the designated classes analogous to the corresponding nominal granulations as specified in Table II.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 supplemented thereto, cited in the solicitation.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document, should be addressed to: Commander U.S. Army ARDEC, ATTN: SMCAR-BAC-S, Picatinny Arsenal, New Jersey 07806-5000 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 1376--

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SPECIFICATIONS

FEDERAL

- RR-S-366 - Sieves: Standard for Testing Purposes
- PPP-B-26 - Bag, Plastic (General Purpose)

MILITARY

- MIL-G-155 - Graphite, Dry (For Use in Ammunition)
- MIL-P-156 - Potassium Nitrate (KNO₃)
- JAN-C-178 - Charcoal (For Use in Munitions)
- MIL-S-14929 - Sulfur: Commercial Grade (For Use with Ammunition)
- MIL-A-48078 - Ammunition, Standard Quality Assurance Provisions, General Specification For

STANDARD

FEDERAL

- FED-STD-101 - Test Procedures for Packaging Materials
- FED-STD-406 - Plastics: Methods of Testing

MILITARY

- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-286 - Propellants, Solids: Sampling, Examination, and Testing
- MIL-STD-1218 - ACS Chemicals
- MIL-STD-1235 - Single and Multi-Level Continuous Sampling Procedures and Table for Inspection by Attributes

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Document Order Desk, Bldg 4D, 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 are those cited in the solicitation.

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CODE OF FEDERAL REGULATIONS

Title 49 - Transportation, CFR 49 Part 0-190

(The Interstate Commerce Commission Regulations are now a part of the Code of Federal Regulations, available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders for the above publications should cite, "49 CFR 0-190 (latest revision)").

DRAWINGS

U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

7548077	- Container, Metal, Packing for Black Powder, Assembly
7548078	- Container, Metal, Packing for Black Powder, Details
7548321	- Drum Steel Packing for Black Powder, Assembly Details, Packing and Marking
7548322	- Drum Steel Packing for Black Powder, Details
8863394	- Primer, Percussion, M92E1, Loading and Assembling

BUREAU OF NAVAL WEAPONS

LD299212 - Container, Powder, Mk 3 Mod 0

(Copies of other Government documents, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the Contracting Officer).

2.2 Non-government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E11	- Wire-Cloth Sieves for Testing Purposes
ASTM E70	- pH of Aqueous Solutions With The Glass Electrode

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ASTM D2905

- Statement on Number of Specimens
Required to Determine the Average
Quality of a Textile Material

(Application for copies of ASTM publications should be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103).

2.3 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 constituent materials used in the manufacture of black powder shall comply with the requirements of the following specifications:

CONSTITUENT MATERIALS	CONFORMING TO:
Graphite	MIL-G-155, Grade C (see 6.6)
Potassium Nitrate	MIL-P-156, Class 1
Charcoal	JAN-C-178, Class 1 (see 6.6)
Sulfur	MIL-S-14929

3.2 Composition. The composition of the black powder shall comply with the requirements specified in Table I, when determined as specified in 4.5.3.

Table I - Composition

CONSTITUENT	CLASSES 1 THRU 7, AND CLASS 9 (%)	CLASS 8 ONLY (%)
Potassium Nitrate	74 ± 1.0	74 ± 2.0,
Sulfur	10.4 ± 1.0	10.4 ± 1.5
Charcoal	15.6 ± 1.0	15.6 ± 1.5

3.3 Moisture content.

3.3.1 Applicable to class 2, and classes 4 through 9. The moisture content of the black powder shall be 0.70 percent maximum when determined as specified in 4.5.2.

3.3.2 Applicable to class 1 only. The moisture content of the black powder shall be 0.60 percent maximum when determined as specified in 4.5.2.

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3.3.3 Applicable to class 3 only. The moisture content of the black powder shall be 0.30 percent maximum when determined as specified in 4.5.2.

3.4 Ash content. The ash content of the black powder shall be 0.80 percent maximum when determined as specified in 4.5.5.

3.5 Specific gravity. The specific gravity of the black powder shall not exceed the limits of 1.72 minimum and 1.80 maximum for glazed powder, or 1.69 minimum and 1.76 maximum for unglazed powder, when determined as specified in 4.5.6.

3.6 Apparent density. The apparent density of the black powder shall be based on its use in ammunition as follows:

3.6.1 General bulk loading. For general bulk loading of components in which the weight-volume ratio is not critical, the apparent density (applicable to classes 1 and 2 only) shall be 1.03 g/mL minimum, when determined as specified in 4.5.7.

3.6.2 Close weight-volume tolerance. At the option of the procurement agency the apparent density of classes 1 to 6 may be specified as follows: For specific applications involving close weight-volume tolerances, the apparent density of classes 1 and 2 shall be 1.10 g/mL minimum, and the apparent densities of classes 3 to 6 inclusive shall be 1.03 g/mL minimum and 1.10 g/mL maximum, when determined as specified in 4.5.7.

3.7 Granulation. The granulation for the applicable class of black powder shall be as specified in Table II, when determined as specified in 4.5.8.

TABLE II - Granulation

CLASS	RETAINED ON U.S. STANDARD SIEVE		PASSING THROUGH U.S. STANDARD SIEVE	
	SIEVE #	% MAX.	SIEVE #	% MAX.
1	4	3	8	5
2	6	3	12	5
3	8	3	16	5
4	16	3	30	5
5	16	3	40	5
6	20	3	50	5
7	40	3	100	5
8	100	3	270	5
9(a)				

(a) 128 ± 2 grains/pound, 0.6 inch diameter spherohexagonal shaped.

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3.8 Gritty or fibrous particles. The powder shall be free of all gritty or fibrous particles, when determined as specified in 4.5.4.

3.9 Glaze finish (not applicable to classes 7, 8, or 9). Unless otherwise specified in the contract, the black powder shall be glazed with graphite, when determined as specified in 4.5.1.

3.10 Functioning (see 6.6 and 6.8). This test is applicable to the glazed black powder on a first article only. The glazed black powder, when loaded in a M92E1 primer, shall function 100 percent when tested as specified in 4.5.9.

3.11 pH. The pH of black powder shall be between 6.0 minimum and 8.0 maximum, when determined as specified in 4.5.10.

3.12 First article testing. This specification makes provisions for first article testing. Requirements for the submission of first article samples by the contractor shall be as specified in the contract (See 4.3).

3.13 Workmanship. Examination for workmanship shall be conducted on each sample selected for testing in accordance with 4.4 and 4.5. If any sample fails to meet any test requirement, the lot represented by the sample shall be rejected. The black powder lot shall be homogeneous through the lot, and of uniform texture/color, free from any foreign materials and contaminants.

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 (examinations and tests) 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 ensure supplies and services conform to the prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of section 3 and 5. The inspections set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any

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inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as parts of manufacturing operations, is an acceptable practice to ascertain conformance requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Standard quality assurance provision. Unless otherwise specified herein or in the contract, the provision of MIL-A-48078 shall apply and are hereby made a part of this detail specification.

4.1.3 Submission of product. At the time each completed lot of items deliverable under the contract is submitted to the Government for acceptance, the contractor shall supply the following information accompanied by a certificate which attests that the information provided is correct and applicable to the product being submitted:

a. A statement that the lot complies with all of the quality assurance provisions specified in this specification.

b. Drawing, specification number and date, together with identification and date of changes thereto.

c. Certificates of analysis on all materials used directly by the contractor when such material is controlled by Government specifications shall be made available upon request by the Contracting Officer.

d. Quantity of product in the lot.

e. Date submitted.

The certificate shall be signed by a responsible agent of the certifying organization. The initial certificate submitted shall be substantiated by evidence of the agent's authority to bind his principal. Substantiation of the agent's authority will not be required with subsequent certificates unless, during the course of the contract, this authority is vested in another agent of the certifying organization.

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

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- a. First article inspection (see 4.3)
- b. Quality conformance inspection (see 4.4)

4.3 First article inspection.

4.3.1 Submission. Prior to the start of regular production the contractor shall submit a first article sample (see 6.2) to a Government approved facility as designated by the contracting officer for evaluation in accordance with the provisions of 4.4.2. The first article shall consist of 25 lbs. of Class 1 glazed black powder with instructions issued by the contracting officer. If the contract is for classes of other than Class 1 glazed black powder (Class 2 through 6), Class 1 glazed black powder still shall be submitted and made from the same process as the other classes. Prior to submission of the glazed black powder, the contractor shall inspect the sample in accordance with 4.5.1 through 4.5.10 to assure that it conforms to the requirements of the contract and submit a test record with the sample. Functioning tests, 4.5.9, will be performed by the Government. All samples submitted shall be obtained from the first production lot which has been produced by the contractor using the same production processes, procedures and equipment as will be used in fulfilling the contract. All materials, including packaging and packing, shall be obtained from the same sources of supply as will be used in regular production. The sample shall be accompanied by certificates as directed. Supplemental first article samples or portion thereof, as directed by the contracting officer, shall also be submitted in accordance with the contract provision: Instructions Regarding Submission of First Article.

4.3.2 Inspections to be performed. The sample will be subjected by the Government to any or all of the examinations or tests specified in 4.5.1 through 4.5.10.1 of this specification. Sample size shall be specified in 4.3.1.

4.3.3 Rejection of first article samples. If any sample fails to comply with any of the applicable requirements, the first article quantity shall be rejected. The Government reserves the right to terminate its inspection upon any failure of a sample to comply with any of the stated requirements.

4.4 Quality conformance inspection.

4.4.1 Inspection lot formation. A lot shall consist of one or more batches of black powder, produced by one manufacturer, in

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accordance with the same specification, or same specification revision, under one continuous set of operating conditions. Each lot shall contain black powder of one class only. Each batch shall consist of that quantity that has been subjected to the same unit chemical or physical process intended to make the final product homogeneous.

Each lot shall contain:

- (a) Graphite from one manufacturer with one lot number.
- (b) Potassium nitrate from one manufacturer with one lot number.
- (c) Charcoal from one manufacturer with one lot number.
- (d) Sulfur from one manufacturer with one lot number.

4.4.2 Examination and tests See MIL-A-48078.

a. Classification of Characteristics. Quality conformance examinations and tests are specified in the following Classification of Characteristics paragraphs. The contractor's quality program or detailed inspection system shall provide assurance of compliance of all characteristics with the applicable drawing and specification requirements utilizing as a minimum the conformance criteria specified. When cited herein, attributes sampling inspection shall be conducted in accordance with Table III below, using the inspection levels stated in the Classification of Characteristics paragraphs.

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Table III
Attributes sampling inspection

Lot size (# of containers)	<u>Inspection levels</u>	
	<u>I</u>	<u>II</u>
2 to 8	*	5
9 to 15	*	5
16 to 25	*	5
26 to 50	32	5
51 to 90	32	13
91 to 150	32	13
151 to 280	32	20
281 to 500	32	20
501 to 1200	80	20
1201 to 3200	80	32
3201 to 10000	125	32
10001 to 35000	125	50
35001 to 150000	125	50
150001 to 500000	200	50
500001 and over	200	50

Numbers under inspection levels indicate sample sizes; asterisks (*) indicate one hundred percent inspection. If sample size exceeds lot size, perform one hundred percent inspection. Accept on zero and reject on one or more for all inspection levels.

b. Alternative quality conformance provisions. Unless otherwise specified herein or provided for in the contract, alternative quality conformance procedures, methods, or equipment, such as statistical process control, tool control, other types of sampling procedures, etc. may be used by the contractor when they provide as a minimum the level of quality assurance required by the provisions herein. Prior to applying such alternative procedures, methods, or equipment, the contractor shall describe them in a written proposal submitted to the Government for evaluation (see 6.12). When required, the contractor shall demonstrate that the effectiveness of each proposed alternative is equal to or better than the specified quality conformance provision(s) herein. In case of dispute as to whether the contractor's proposed alternative(s) provides equivalent assurance, the provisions of this specification shall apply. All approved alternative provisions shall be specifically incorporated into the contractor's quality program or inspection system, as applicable.

QUALITY CONFORMANCE INSPECTION
CLASSIFICATION OF CHARACTERISTICS

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PARAGRAPH	TITLE	SHEET 1 of 1		DRAWING NUMBER
4.4.2.1	Powder, Black			
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical -----	None Defined			
Major -----				
101	Potassium Nitrate determination	4.4.2.4	3.2	4.5.3.1
102	Sulfur determination	4.4.2.4	3.2	4.5.3.2
103	Charcoal determination	4.4.2.4	3.2	4.5.3.3
104	Moisture content	4.4.2.4	3.3	4.5.2
105	Ash Content	4.4.2.4	3.4	4.5.5
106	Specific gravity	4.4.2.4	3.5	4.5.6
107	Apparent density	4.4.2.4	3.6	4.5.7
108	Granulation	4.4.2.4	3.7	4.5.8
109	Gritty or fibrous particles	4.4.2.4	3.8	4.5.4
110	Glaze finish	4.4.2.4	3.9	4.5.1
111	Functioning	4.3	3.10	4.5.9
112	pH determination	4.4.2.5	3.11	4.5.10
Minor -----				
201	Evidence of poor workmanship	4.4.2.4	3.13	Visual
NOTES:				

QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF CHARACTERISTICS

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PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	NEXT HIGHER ASSEMBLY
				INSPECTION METHOD REFERENCE
4.4.2.2	Container Prior to Sealing			
Critical	None Defined			
Major	None Defined			
Minor				
201	Liner improper	Level II	5.2.1.3	Visual
NOTES:				

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF CHARACTERISTICS

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PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
		CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	
CLASSIFICATION	EXAMINATION OR TEST	INSPECTION METHOD REFERENCE		
4.4.2.3	Container Sealed (See Drawings 7548321, 7548322, 7548077 or 7548078)			
Critical -----	None Defined			
Major -----	Weight maximum	Level I	5.1.1 & 5.2.2.2	Scale
101	Improperly sealed	Level I	5.1 & 5.2	Visual
102				
Minor -----	Marking misleading or unidentifiable	Level II	5.3	Visual
201				
NOTES:				

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4.4.2.4 Test sampling. An approximately 2 pound sample shall be withdrawn from each selected batch discharged from the glazing barrel. Batches are units of product that shall be selected for inspection IAW the procedure in MIL-STD-1235, CSP-1 plan, Code Letter D, $f=1/5$, $i=11$. The sample shall be subjected to all tests except tests for granulation. If any sample fails to meet any test requirements as specified in Section 3., the batch represented by the sample shall be rejected. All untested batches produced since the last batch tested shall be subjected to the test that failed. This test shall be conducted on each succeeding batch until "i" number of batches are accepted. All other tests may be conducted at the prevailing test frequency "f". A 1 pound sample shall be selected from one container selected at random from each day's production of finished black powder. The 1 pound sample shall be tested for granulation. If any sample fails to comply with the granulation requirement, the quantity represented by the sample shall be rejected.

4.4.2.5 Sampling for pH. Take a sufficient sample from each completed glazing barrel batch for one pH determination. If the sample fails to comply with the requirement of 3.11, the batch shall be rejected.

4.4.2.6 Sample preparation for analysis. A 1 ounce portion of the primary sample shall be ground in a suitable mortar to pass through a No. 60 U.S. Standard sieve complying with RR-S-366 or ASTM E11 (Class 8 need not be ground or screened unless, upon examination, the powder exhibits lumps or clusters). All precautions shall be taken to avoid unnecessary exposure of the sample to the air; hence, as soon as a portion is ground, it shall be placed in a bottle and tightly stoppered. If the grinding and sifting does not require more than 3 minutes per portion, there will be no appreciable change in the moisture content due to hygroscopicity. Additional 1 ounce portions shall be ground as needed. The powdered sample shall be mixed well before analysis.

4.4.3 Inspection equipment. For the performance of all tests and examinations specified in 4.4 and 4.5, commercial inspection equipment should be employed. The contractor shall have available, and utilize correctly, this equipment and is charged with the responsibility of assuring that proper calibration procedures are followed. Government approval of all inspection equipment is required prior to its use for acceptance purposes (see 6.9).

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4.4.4 Precautionary note. This specification covers the sampling and testing of toxic and hazardous materials. Accordingly, it is emphasized that all applicable safety rules, regulations and procedures must be followed in the handling and processing of black powder.

4.5 Methods of inspection. All tests given in this section shall be performed using prescribed procedures for replicate determination given in standard analytical chemistry textbooks or ASTM D2905. Also, unless otherwise specified herein, all chemicals shall be Reagent Grade or ACS Grade in accordance with MIL-STD-1218. See 6.10 for use of equivalent test methods.

4.5.1 Glaze finish. The black powder shall be examined visually to ascertain that it has been glazed with graphite and that surfaces of the grains do not have a mottled appearance, which may indicate inadequate glazing or high moisture content.

4.5.2 Moisture. From the ground portion of the primary sample, a weighed portion of approximately 2 g shall be transferred to a tared weighing dish or covered watch glass and dried for 4 hours at 70 degrees C to 75 degrees C. The dish shall be covered, cooled in a dessicator and weighed. The loss in weight shall be calculated in terms of percent moisture. (As an alternative method, the portion may be dried for 72 hours at room temperature in a desiccator over concentrated Sulfuric acid). Three such determinations shall be made and the average of the three results reported as the percent moisture in the lot.

4.5.2.1 Alternate method for moisture. Exactly 10 g of bulk black powder or pressed pellets shall be weighed in an aluminum disposable pan liner, properly positioned, on the Ohaus Moisture Determination Balance. The infrared heat lamp that is built into the machine shall be moved directly over the powder sample, heat adjusted to the desired temperature, and time and wattage controls regulated to a setting based on a predetermined drying curve. The moisture determination shall then be read directly in either grams or percent moisture loss with the accuracy of the final percent moisture or percent moisture loss based on the accuracy of the initial 10 g sample. The pan and dried powder shall be weighed until constant weight is obtained, or until the weight between weighings does not exceed one milligram.

4.5.2.2 Alternate method for moisture. The moisture shall be determined in accordance with MIL-STD-286, Method 101.4.

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4.5.3 Composition.4.5.3.1 Potassium nitrate content.

4.5.3.1.1 Gravimetric method. From the ground portion of the primary sample, a weighed portion of approximately 10 g shall be transferred to a 400 mL beaker and 200 mL of distilled water added. The beaker shall be placed on a steam bath and the contents brought to a boil and held for 15 minutes. The contents of the beaker shall be filtered through a tared filtering crucible and washed with successive portions of 10 to 15 mL of the water. The bath water passing through the crucible shall be tested with an excess of concentrated Sulfuric acid containing a few crystals of diphenylamine, until there is no blue color. (A blue color indicates the presence of nitrate). The crucible shall be dried for 4 hours at 70 degrees C to 75 degrees C or until all moisture is removed, cooled in a desiccator, and weighted. The loss in weight represents moisture and Potassium nitrate. The percent Potassium nitrate shall be calculated on a moisture free basis, utilizing the result obtained in 4.5.2 as the percent moisture. The crucible and contents shall be reserved for the determination of Sulfur (see 4.5.3.2).

4.5.3.1.2 Nitrometer method. The Potassium nitrate shall be determined in accordance with MIL-STD-286, Method 209.3. In case of dispute or doubt, the Nitrometer method shall be used as the standard method.

4.5.3.2 Sulfur content. After the determination of Potassium nitrate, as specified in 4.5.3.1, the crucible shall be placed in an extractor on a water bath, and extracted for 4 hours with Carbon disulfide. After the extraction, the crucible shall be washed once with Alcohol and once with Ether, using suction, dried for 1 hour at 100 degrees \pm 3 degrees C, cooled in a desiccator, and weighted. The loss in weight shall be obtained by subtracting this weight from the weight of the crucible and contents, after extraction, obtained in 4.5.3.1 and the result calculated to percent Sulfur on a moisture-free basis. The crucible and contents shall be reserved for the determination of charcoal (see 4.5.3.3).

4.5.3.3 Charcoal content. The residue remaining in the crucible, reserved from 4.5.3.2, shall be considered to be charcoal. Its weight shall be determined by subtracting the tare weight of the filtering crucible from the total weight of the crucible and residue. This weight shall be calculated to percent charcoal on a moisture-free basis.

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4.5.4 Gritty or fibrous particle content. The residue remaining in the crucible, reserved from 4.5.3.3, shall be visually examined to observe that it is entirely free from all gritty or fibrous particles.

4.5.5 Ash content. The crucible with its residue (see 4.5.3.3) shall be ignited in a muffle furnace or over a Bunsen burner until all the Carbon is burned off, cooled in a desiccator and weighed. The weight of residue shall be calculated as percent ash. If it is desired to perform this analysis simultaneously with the composition analyses specified in 4.5.3, a separate 5 g portion from the ground portion of the 1-pound primary sample shall be transferred to a 400 mL beaker. The Potassium nitrate shall be extracted as specified 4.5.3.1, the residue ignited and the ash determined as specified herein.

4.5.6 Specific gravity.

4.5.6.1 Preferred method (not applicable to classes 7, 8, or 9). A weighed portion of approximately 10 g of the primary sample shall be transferred to a 25 mL specific gravity bottle. Clean Mercury of known temperature, shall be added until the bottle is approximately one half to two thirds full. The remaining air in the bottle shall be displaced with Mercury as follows: A piece of heavy rubber tubing, approximately 2 feet long, shall be attached to the bottle. The other end of the tubing shall be connected to one arm of a Y-tube. By means of another piece of rubber tubing and a short piece of glass tubing, the other arm of the Y-tube shall be extended to dip into a vessel containing Mercury. The stem of the Y-tube shall be connected to a vacuum line. The rubber tubing leading to the Mercury vessel shall be closed by means of a pinchcock. The vacuum line shall be opened in order to evacuate the specific gravity bottle. After evacuation, the vacuum line shall be closed by a pinchcock placed close to the Y-tube. The pinchcock on the tubing leading to the stem of the Mercury vessel shall be opened and the Mercury allowed to flow into the bottle. This operation shall be repeated until the bottle is filled with Mercury. The bottle containing the powder and Mercury shall be weighed. The same bottle, filled with Mercury shall be weighed. The specific gravity shall be calculated as follows:

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$$\text{Specific Gravity} = \frac{AB}{A+C-D}$$

Where:

- A = Weight of sample taken for test
- B = Specific gravity of Mercury at test temperature
- C = Weight of vessel filled with Mercury
- D = Weight of vessel, powder, and Mercury

4.5.6.2 Alternate method (not applicable to classes 7, 8, or 9). In case of dispute or doubt, the preferred method shall be the standard. Add exactly 100 g of primary sample to a clean, standardized bulb. Place the bulb in a vertical position, with the lower stem immersed in the Mercury reservoir, attach the vacuum pump to the upper stem, and proceed to exhaust the air and to fill the space within the bulb with Mercury. Dislodge air bubbles that may cling around the powder grains or to the wall of the bulb by tapping the bulb gently with a rubber stopper while the air is being exhausted. Alternately exhaust the air and allow the Mercury to follow up into the bulb in four repeated operations as described. After finally drawing the Mercury up into the upper stem of the bulb, and after disconnecting the vacuum pump, allow the Mercury to settle back into the bulb. Close both stopcocks, empty both upper and lower stems of all excess Mercury, wipe the exterior globules of Mercury and weigh the bulb containing Mercury and powder. This weight represents the value of "Y" in the formula shown below. Determine the temperature of the Mercury in degrees Centigrade at the time of making the determination. Table IV shows the specified 0 degrees gravity of Mercury "D", at various temperatures ranging from 0 degrees to 40 degrees Centigrade (C):

TABLE IV - Specific gravity of Mercury

TEMP Deg. C	0	1	2	3	4	5	6	7	8	9	
0	13.5	9545	9298	9051	8804	8558	8311	8065	7818	7572	7326
10		7079	6833	6587	6341	6095	5849	5604	5358	5113	4867
20		4622	4376	3886	3641	3396	3151	2906	2906	2661	2416
30		2171	1927	1682	1437	1193	0949	0704	0460	0216	9972
40	13.4	9728	9484	9240	8996	8752	8508	8265	8021	7778	7534

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4.5.6.3 Specific gravity (applicable to classes 7, 8, and 9). Use an apparatus consisting of a Fleming drying jar (See Figure 1) having a capacity of approximately 50 mL. A fritted glass disk of medium porosity is cemented to the bottom of the upper stopcock. The disk should be of the same diameter as the base of the stopcock, beveled so as to have a greater taper than the stopcock, and cemented to the stopcock by means of Canada balsam or equivalent. To fill the jar, attach a piece of rubber tubing to the lower arm of the Fleming jar and immerse the other end in a beaker containing Mercury at room temperature. By means of a piece of heavy rubber tubing connect the upper arm of the jar to a vacuum line and evacuate. Close the upper stopcock, remove the suction tubing, and then close the lower stopcock. Disconnect the tubing from the lower arm, and remove the Mercury from this by tilting and tapping the apparatus. Open the lower stopcock so that the Mercury can flow into the side arm if there is any expansion of the Mercury. Weigh the jar and Mercury. Attach to the lower arm a short piece of rubber tubing closed by means of a pinchcock, and allow approximately half of the Mercury to drain from the jar. Using a small funnel, transfer a weighed portion of approximately 10 g of the sample to the jar. Replace the upper stopcock, attach suction tubing to the upper arm, open the upper stopcock, and remove the pinchcock from the rubber tubing while holding the end of the tubing under Mercury in a beaker. Apply suction so that the pressure in the jar is reduced to between 100 and 120 mm of Mercury and all air replaced by Mercury. Gentle tapping of the jar while the vacuum is being applied facilitates the removal of any air bubbles. When the air is replaced, which ordinarily requires approximately 10 seconds, close the upper stopcock, remove the section tubing and then close the lower stopcock. Remove the rubber tubing and any Mercury remaining in the lower arm. Open the lower stopcock and weigh the jar and contents. Calculate the specific gravity as follows:

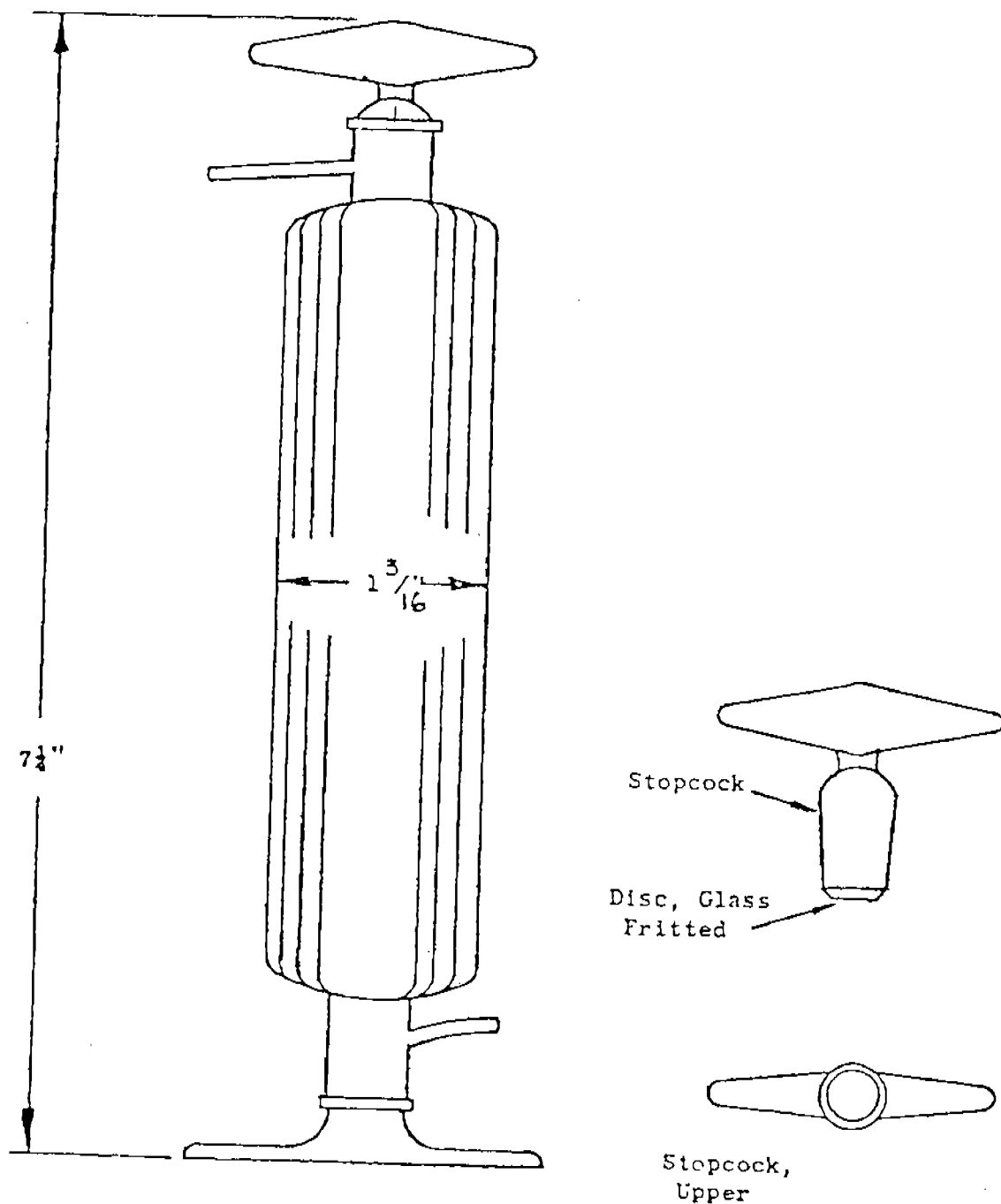
$$\text{Specific Gravity} = \frac{AB}{A + C - D}$$

Where:

- A = Weight of sample taken for test
- B = Density of Mercury at room temperature
- C = Weight of jar filled with Mercury
- D = Weight of jar, powder and Mercury

<u>Temperature</u>	<u>Density</u>
15 degrees C	13.559
20 degrees C	13.546
25 degrees C	13.534
30 degrees C	13.522

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FLEMING JAR

Figure 1

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4.5.7 Apparent density (see 3.6 for applicability). A 50 mL graduated cylinder, having an internal diameter of approximately 1 inch, shall be weighed to the nearest 0.1 g. The cylinder shall be filled with a portion of the primary sample as close as possible to the 50 mL mark. The cylinder shall be suspended in an upright position by a length of cord, and allowed to fall 30 times from a height of 1 inch onto a rubber cushion. (A standard laboratory rubber stopper, having a diameter slightly larger than that of the base of the graduated cylinder, has been found satisfactory for use). Care shall be taken to prevent any oscillation or sidewise motion. Upon completion of the 30 drops, sufficient powder to raise the level to the 50 mL mark shall be added. The cylinder and contents shall be weighed to the nearest 0.1 mg. The apparent density shall be calculated as follows:

$$\text{Specific Gravity} = \frac{A - B}{50}$$

Where:

A = Weight of cylinder plus black powder
 B = Weight of empty cylinder

4.5.8 Granulation (not applicable to class 9). The specified sieves for the applicable granulation (see Table II) shall be properly superimposed and assembled with a bottom pan. The sieves shall comply with RR-S-366 or ASTM E11. A weighed portion of approximately 100 g of the primary sample shall be placed on the topmost sieve of the assembly. The assembly shall be covered and shaken for 3 minutes by hand or by means of a mechanical shaker geared to produce 300 ± 15 gyrations and 150 ± 10 taps of the striker per minute. The portions retained or passed by the various sieves, as required, shall be weighed and the results calculated to a percentage basis.

4.5.9 Functioning. One hundred percussion primers (M92E1) shall be loaded in accordance with drawing 8863394. The loaded primer shall be placed in a static test fixture and struck by means of a spring loaded firing pin with sufficient energy to activate the element. The primer (see 6.8) shall then be observed for completed burning of the black powder. All primers must function. If any primer does not function, the first article sample shall be rejected (see 4.3.3).

4.5.10 pH determination. From each sample selected in accordance with 4.4.2.5, a weighed portion of 6.76 ± 0.05 g shall be placed into a 250 mL beaker. Add 100 mL of neutral distilled

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(or deionized) water. Cover the beaker and digest on a steam bath for 30 minutes. With stirring, cool to 25 degrees C. Determine the pH at 25 degrees C in accordance with ASTM E70. If 25 degrees C is not used, the pH meter shall be recalibrated for that measured temperature.

4.5.10.1 Alternate method. From each sample selected in accordance with 4.4.2.5, a weighed portion of 1.36 ± 0.01 g shall be placed into a 250 mL beaker. Add 100 mL of neutral distilled (or deionized) water. Cover the beaker and digest on a steam bath for 30 minutes. With stirring, cool to 25 degrees C. Determine the pH at 25 degrees in accordance with ASTM E70 (Test for pH of aqueous solution with glass electrode). If 25 degrees C is not used, the pH meter shall be recalibrated for that measured temperature.

5. PACKAGING

5.1 Packaging.

5.1.1 Level A. When specified, black powder should be packaged in easily ignited high strength flax paper bags of either one ounce capacity or four ounce capacity. Either one 4 ounce bag or four 1-ounce bags should be packaged in a plain, bright finish tin can with a slip-on cap. The can shall be sealed with metal foil backed pressure sensitive tape (see 6.5).

5.2 PACKING (see 6.2).

5.2.1 Level A or Level B.

5.2.1.1 Bulk powder. Bulk black powder shall be packed in steel drums complying with Drawings 7548321 and 7548322. The drums shall be lined with a bag made and closed as specified in 5.2.1.3. When specified, drums shall be lined with muslin liner complying with the Drawing LD299212.

5.2.1.2 Cans. Black powder packaged as specified in 5.1.1 shall be packed in boxes complying with Specifications 14, 15A, or 16A of Department of Transportation (DOT) Regulations CFR 49 Part 0-190.

5.2.1.3 Liners. Liners shall be made of conductive polyethylene or polyolefin sheet with a nominal thickness of .003 in. (tolerance = plus or minus 20%); surface resistivity shall not exceed 1000 ohms per centimeter, when tested in accordance with Methods 4041 and 4052 of Standard FED-STD-406. Electrostatic bleed-off shall not exceed 2.00 seconds when tested

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in accordance with Method 4046 of Federal Test Method Standard 101B. Details of the liner shall comply with Type I or II, Style 1 of Specification PPP-B-26 except for the material. After filling, the top of the bag shall be twisted and the twisted portion folded back on itself; it shall be fastened with a suitable tape or tie. The bag size shall be large enough to prevent strain on the bag if the container is dropped or rolled.

5.2.2 Level C.

5.2.2.1 Metal container. Bulk black powder shall be packed in metal containers complying with Drawings 7548077 or 7548078. The containers shall be lined with a bag made and closed as specified in 5.2.1.3.

5.2.2.2 Alternative metal container. Bulk black powder may be packed in metal kegs of 20 or 25 pounds capacity complying with DOT Specification 13. Kegs shall be lined with a bag made and closed as specified in 5.2.1.3.

5.2.2.3 Immediate use containers. Black powder intended for immediate use (no more than 180 days storage) may be packaged, packed and marked by any other method approved by DOT Regulations when specifically authorized by the contracting officer. The date of pack shall be clearly marked on the shipping container. The completed pack shall provide sufficient moisture protection to insure that the moisture limit stated in 3.3 will not be exceeded if the black powder is stored up to 180 days under normal storage conditions.

5.3 Marking.

5.3.1 Packaging. The cans specified in 5.1.1 shall have the contents identified on a paper label attached to the body of the can. Additional information shall be as specified by the contracting officer.

5.3.2 Packing. Marking shall be in accordance with applicable drawings. Containers constructed in accordance with DOT Regulations shall be marked in accordance with DOT Regulations and Standard MIL-STD-129.

6. NOTES

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

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6.1 Intended use. Black powder is intended for the following principal uses:

- Class 1 - JATO and rocket igniters, artillery primers and igniter pads
- Class 2 - JATO and rocket igniters, ignition ends for bag charges, primers, propellant charges for line throwing guns
- Class 3 - JATO and rocket igniters, ejection charges for base ejection shell, and in pyrotechnic items
- Class 4 and 5 - JATO rocket igniters, relay pellets, igniting charges for illumination charges, charges in target practice shell, ejection charges for base ejection shell, igniter charges in primer detonators, and fuze delay elements and tracer igniters
- Class 6 and 7 - JATO and rocket igniters, relay pellets, delay and igniter charges in primer detonators; delay elements, practice hand grenade fuzes, and in Navy squibs
- Class 8 - Propellant charges for rocket signals
- Class 9 - Depth charge cartridges

6.2 Acquisition requirements. Acquisition documents shall 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 2.2).
- c. Provisions for submission/resubmission of first article samples.
- d. Acceptance and description sheets - Acceptance and description sheets shall be prepared for each lot in accordance with MIL-STD-1171.
- e. Levels of preservation and packing (see .1 and 5.2).
- f. Name and address of manufacturer.

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6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Description (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. 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.

6.4 Drawings. Drawings prepared prior to the issuance of this Military Specification which specified Black Powder, may have specified them to be in accordance with Specification JAN-P-223A. Figure I illustrates the correlation between the Army and Navy designations in Specification JAN-P-223A and this Military Specification. In addition, the following substitutes shall apply for Navy applications:

<u>Drawing or Specification Requirement</u>	<u>New Classes to be Used</u>
Cannon	Class 2
Musket	Class 4
FFG	Class 4
Shell	Class 6
FFFG	Class 6
Fuze	Class 7
FFFFG	Class 7
Meal	Class 8

6.5 Intended packaging use.

- a. Cans, paragraph 5.1.1. Intended for U.S. Coast Guard use.
- b. Muslin liners, paragraph 5.2.1.1. Intended for U.S. Navy use.

6.6 Submission of first article samples. Instructions as to the location for evaluation of the first article shall be obtained from the contracting officer. Upon receipt of such request, the contracting officer shall advise Picatinny Arsenal and instructions will be issued accordingly. All inquiries should be forwarded to: Commander, ARDEC, AMCCOM, ATTN: SMCAR-QAR-R, Picatinny Arsenal, New Jersey 07806-5000.

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6.7 Classification. In accordance with the designation of classifications, paragraph 5-222 of Defense Standardization Manual 4120.3-M, the following designation changes are part of this specification.

"Grade I, II, III and IV" as specified in MIL-G-155 is changed to "Grade A, B, C, and D", and Class a, b, c, and d" as specified in JAN-C-178 is changed to "Class 1, 2, 3, and 4." In the next revision of the affected specifications, these changes will be implemented.

6.8 Functioning test. Complete procedure for this test may be obtained from the Commander, ARDEC, AMCCOM, ATTN: SMCAR-QAR-R, Picatinny Arsenal, New Jersey 07806-5000.

6.9 Submission of inspection equipment designs for approval. See MIL-A-48078. Submit equipment designs, as required, to Commander, ARDEC, AMCCOM, ATTN: SMCAR-QAR-I, Picatinny Arsenal, New Jersey 07806-5000. This address will be specified on the Contract Data Requirements List, DD Form 1423 in the Contract.

6.10 Equivalent test method approval. Prior approval of the contracting officer is required for use of equivalent test methods. A description of the proposed method should be submitted thru the contracting officer to: Commander, ARDEC, AMCCOM, ATTN: SMCAR-QAR-R, Picatinny Arsenal, New Jersey 07806-5000. This description should include, but not be limited to, the procedures used, the accuracy and precision of the method, test data to demonstrate the accuracy and precision, and drawings of any special equipment required.

6.11 Subject term (Key word) listing

Incendiary composition
Igniter composition
Pyrotechnic
Explosive

6.12 Submission of alternative quality conformance provisions. Unless otherwise specified in the contract, proposed alternative quality conformance provisions will be submitted by the contractor for evaluation by the technical activity responsible for the preparation of this specification.

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6.13 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.

Custodian:
Army - AR

Preparing activity:
Army - AR

Project: (1376 - A443)

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-P-00223C

2. DOCUMENT DATE (YYMMDD)

930205

3. DOCUMENT TITLE

POWDER, BLACK

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets if 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)

7. DATE SUBMITTED (YYMMDD)

(1) Commercial

(2) AUTOVON (if applicable)

8. PREPARING ACTIVITY

a. NAME
U.S ARMY ARDEC
STANDARDIZATION OFFICE

b. TELEPHONE (Include Area Code)

(1) Commercial
201-724-6675

(2) AUTOVON
DSN-880-6675

c. ADDRESS (Include Zip Code)

ATTN: SMCAR-BAC-S
PICATINNY ARSENAL, NJ 07806-5000

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:
Defense Quality and Standardization Office
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466
Telephone (703) 756-2340 AUTOVON 289-2340