

MIL-STD-652D (AR)
NOTICE 6
28 April 1990

MILITARY STANDARD
PROPELLANTS, SOLID FOR CANNONS
REQUIREMENTS AND PACKING

TO ALL HOLDERS OF MIL-STD-652D (AR)

1. The following pages of MIL-STD-652D (AR) have been revised and supersede the pages listed:

New Page	Date	Superseded Page	Date
1	28 April 90		29 Aug 84
2	28 April 90	2	29 Aug 84
2a	28 April 90	New page	
3	28 April 90	3	13 March 81
3a	28 April 90	New page	
4	Reprinted without change		13 March 81
9	28 April 90	9	13 March 81
9a	28 April 90	New page	
9b	28 April 90	New page	
10	28 April 90	10	21 Nov 83
18	28 April 90	18	4 Aug 78

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-652D (AR) will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the Military Standard is completely revised or canceled.

Custodian:
Army-AR

Preparing activity:
Army-AR

(Project 1376-A381)

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1. SCOPE

1.1 This Standard covers the chemical, physical and packing requirements for cannon propellants. The ballistic requirements for the detailed propellants are covered in their detailed specifications.

1.2 Purpose. The purpose of this Standard is to provide a single publication as a Military Standard containing requirements and tests pertinent to the propellants.

1.3 Classification. The propellant shall be of the following forms and types as specified:

FORM A	FLAKE
FORM B	SHEET
FORM C	GRAIN

Cylindrical multiple-perforate grain (MP) (Type I)
Cylindrical single-perforate grain (SP) (Type II)

2. REFERENCED DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or required for proposal form a part of this Standard to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-D-98	Diphenylamine
MIL-G-155	Graphite
MIL-P-156	Potassium Nitrate
MIL-B-162	Barium Nitrate
JAN-W-181	Wax, Candelilla
MIL-P-193	Potassium Sulfate (For Ordnance Use)
MIL-D-204	Dinitrotoluene (For Use in Explosives)
MIL-D-218	Dibutylphthalate (Technical)
JAN-D-242	Diethylphthalate (For Use in Explosives)
MIL-N-244	Nitrocellulose
MIL-N-246	Nitroglycerin

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MIL-E-255	Ethyl Centralite (Carbamite)
MIL-N-494	Nitroguanidine (Picrite)
MIL-R-3065	Rubber, Fabricated Products
MIL-N-3399	2-Nitrodiphenylamine
MIL-L-18618	Lead Carbonate, Basic Dry (For Ordnance Use)
MIL-C-70469	Container, Steel
MIL-C-70470	Container, Fiber

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-286	Propellants, Solid: Sampling, Examination and Testing
MIL-STD-1235	Single and Multilevel Continuous Sampling Procedures and Tables for Inspection by Attributes

DRAWINGS

76-4-53	Box, Steel, M2 for Smokeless Powder, Assembly
76-4-55	Box, Steel, M2 for Smokeless Powder, Detail
9282946	Marking Diagram and Sealing of Steel Packing Boxes for Shipment of Propellants
138439	Packing Box, MARK 7
138441	Packing Box, MARK 7 Cover Details
9342857	Container, Fiber
9345265	Container, Steel
9381476	Packing and Marking for Container, Steel for Bulk Propellants
9381477	Packing and Marking for Container, Fiber for Bulk Propellants

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

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2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

**CODE OF FEDERAL REGULATIONS, Title 49, Transportation
Parts 100-199**

**American Society for Testing and Material ASTM-D2000-Elastomeric
Materials for Automotive Applications Classification System.**

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
ASTM E300 - Sampling Industrial Chemicals**

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(The Code of Federal Regulations is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should specify "49 CFR 100-199 (latest revisions)." (ASTM from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103).

3. DEFINITIONS

3.1 Not applicable.

4. GENERAL REQUIREMENTS

4.1 Constituent material. The constituent materials shall comply with the requirements of the applicable specification as follows:

<u>Constituent Material</u>	<u>Conforming to Specification</u>
Wax, Candelilla	JAN-W-181
Barium Nitrate	MIL-B-161, Class 3
Dibutylphthalate	MIL-D-218
Diethylphthalate	JAN-D-242
Dinitrotoluene	MIL-D-204
Diphenylamine	MIL-D-98
Ethyl Centralite	MIL-E-255, Class 2 or Class 3 (see note)
Graphite	MIL-G-155, Grade III or IV
Nitrocellulose	MIL-N-244, (See Table III)
Nitroglycerin	MIL-N-246, Type I
Nitroguanidine	MIL-N-494, Class to be specified in contract
Potassium Nitrate	MIL-P-156, Class 2, 3, or 4
Potassium Sulfate	MIL-P-193, Type I
2-Nitrodiphenylamine	MIL-N-3399
Lead Carbonate	MIL-L-18618
Cryolite (Technical) sodium aluminum fluoride.)	COMMERCIAL GRADE

NOTE: Any class permitted when added in solution (1)

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4.2 Form and dimension.

4.2.1 Flake propellant shall conform to the requirements listed in the detail propellant specification or drawings (see 4.2.5.2).

4.2.2 Sheet propellant shall conform to the requirements listed in the detail propellant specification or drawing.

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4.2.3 Grain.

4.2.3.1 Type I. The grain shall be cylindrical with 7 longitudinal perforations, one in the center of the grain and six at the vertices of a symmetrical hexagon.

4.2.3.2 Type II. The grain shall be cylindrical with a single longitudinal perforation through the center of the grain.

4.2.3.3 The following requirements regarding grain dimensions shall govern unless authorization for departure is given by the procuring activity concerned prior to manufacture of the propellant.

4.2.3.3.1 Length. Diameter Ratio.

4.2.3.3.1.1 Type I. The average grain length (L) shall be from 2.10 to 2.50 times the average grain diameter (D).

4.2.3.3.1.2 Type II. The average grain length (L) shall be from 3.0 to 6.0 times the average grain diameter (D).

4.2.3.3.1.3 The length and diameter of grain shall comply with either the mean variation or the standard deviation uniformity requirements shown in Table I.

TABLE I

Mean variation and standard deviation of individual dimensions expressed as a percentage of the mean dimension.

<u>Acceptance Criterion Dimensions</u>	<u>Percent Mean Variation Maximum</u>	<u>Standard Deviation</u>
Length	6.25	6.25
Diameter (grains 0.2 inch or more in diameter)	3.125	4.75
Diameter (grains less than 0.2 inch in diameter)	6.25	6.25

4.2.3.3.2 Grain diameter. Perforation diameter ratio.

4.2.3.3.2.1 Type I. The average grain diameter (D) shall be from 5.0 to 15 times the average diameter of the perforation (d).

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Minor: None defined.

4.4.1.4 Sealed container (as applicable) (see drawings 138439, 76-4-53, and 9345265).

	Categories	Defects	Method of Inspection
	Critical: None defined		
Major:	AQL 0.65%		
101.	Holes in container		Visual
102.	Damaged seams		Visual
103.	Damaged locking devices		Visual
104.	Gasket missing or incomplete		Visual
Minor:	AQL 1.50%		
201.	Metallic seal missing, unsealed or improperly positioned		Visual
202.	Hardware improperly engaged		Visual
203.	Marking misleading or unidentifiable		Visual
204.	Excess dents		Visual

4.4.1.5 Sealed fiber containers.

	Categories	Defects	Method of Inspection
	Critical: None defined		
Major:	AQL 0.65%		
101.	Locking device damaged or improperly closed		Visual
102.	Holes or breaks in cover or body		Visual
103.	Damage to coating or cover		Visual
Minor:	AQL 1.00%		
201.	Marking misleading or unidentifiable		Visual

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	Categories	Defects	Method of Inspection
202.	Exterior torn or delaminated		Visual
203.	Metallic seal missing, unsealed or improperly positioned		Visual

4.4.2 Sampling for Chemical and Physical Testing.

4.4.2.1 Batch process. Ten (10) containers shall be selected at random from each lot of propellant. One and one half (1 1/2) pounds of propellant shall be removed from each container and mixed to form a composite sample of 15 pounds. All samples shall be packed in air tight containers and shall be marked to show the propellant designation, lot number manufacturer, date of sampling, container number and number of pounds in the lot. Each sample will be analyzed in duplicate for composition, form, dimensions, and chemical/physical properties in accordance with this document. If the sample fails to comply with the requirements the lot shall be rejected. Five (5) pounds of the sample shall be forwarded to Commander, AMCCOM, ATTN : SMCAR-AEE-WE (D), Picatinny Arsenal, NJ 07806-5000, for the 65.5 degrees centigrade (C) surveillance test.

4.4.2.2 Continuous process. A unit of product will consist of 8 hour production (1 shift) of propellant. The units of product shall be selected for inspection in accordance with MIL-STD-1235, CSP-1, Plan, AQL 6.5%, code letter B. From each unit of product selected, two (2) drums will be selected at random. A single sample of approximately 10 pounds of propellant shall be taken from each of the drums according to the sampling procedures for solids given in ASTM E300. Each sample will be analyzed in duplicate for composition, form, dimensions, and chemical/physical properties in accordance with this document.

If any unit of product fails to meet any test requirement, the unit of product represented by the sample shall be rejected. All units of product produced between the time of the last acceptable units and the unit of product which failed shall be tested for the requirement which failed in accordance with the applicable test method in this document or in the item specification. If any of these units of product fail to meet the subject

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requirement, that unit of product shall also be rejected. In addition, after any failure of a unit of product for a specified requirement, the contractor will return to 100% inspection requirements, until "1" successive units of product are accepted (as required by MIL-STD-1235). During this period, reduced testing (according to MIL-STD-1235) is still required on all other characteristics at the frequency specified in MIL-STD-1235. In addition, five (5) drums will be randomly selected from the propellant lot. One pound shall be removed from each drum and mixed to form a 5 pound composite sample. The sample shall be forwarded to Commander, AMCCOM, ATTM: SMCAR-AEE-WE (D), Picatinny Arsenal, NJ 07806-5000, for the 65.5 degree centrifuge (C) surveillance test.

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4.4.3 Sampling for Ballistic Testing. At least ten (10) containers shall be selected for ballistic testing. The number of containers selected shall be increased, if necessary, as follows: The weight of propellant in pounds shall be greater than the number of samples ballistically tested times the weight per sample specified on the assembly drawing times the factor 1.3. The samples shall be packaged separately and shipped to the location specified in the item specification or as specified by the contracting officer. For samples selected from the continuous process the unit from which the container was selected shall be marked on the container.

4.4.3.1 Aging of triple base propellants. All triple base propellants shall be aged a minimum of forty-five (45) days at ambient conditions (unless other conditions specified), prior to loading for assessment.

5. TESTING AND PROCEDURES

5.1 The chemical and physical properties shall be determined as specified in Table II and conform to the requirements specified in Table III.

5.2 The composition shall be calculated on total volatiles and added ingredient free basis when required.

Methods from MIL-STD-286 for the chemical and physical properties of the propellant.

TABLE II

Properties	Methods Either/or
Nitrocellulose	209.2 209.3 209.6 209.7
Nitroglycerin (1)	208.1 208.3 208.4 208.5

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TABLE III (Continued)
 PROPELLANT COMPOSITIONS AND
 CHEMICAL PROPERTIES

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PROPELLANT	M9	M10	M14 ¹	M15 ¹	M17 ¹
Nitrocellulose	57.75 ± 1.50	89.00 ± 1.50	90.00 ± 2.00	20.00 ± 1.30	22.00 ± 1.30
Type	II	I	I	I	I
Grade	C	C	C	C	C
Nitroglycerin	40.00 ± 1.50	---	---	19.00 ± 1.00	21.50 ± 1.00
Nitroguanidine	---	---	---	54.70 ± 1.00	54.70 ± 1.00
Ethyl Centralite	0.75 ± 0.10	---	---	6.00 ± 0.30	1.50 ± 0.10
Barium Nitrate	---	---	---	---	---
Potassium Nitrate	1.50 ± 0.50	---	---	---	---
Potassium Sulfate	---	1.00 ± 0.30	---	---	---
Diphenylamine	---	1.00 ± 0.30	*1.00 ± 0.20 0.10	---	---
Dinitrotoluene	---	---	8.00 ± 2.00	---	---
Dibutylphthalate	---	---	2.00 ± 1.00	---	---
Diethylphthalate	---	---	---	---	---

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