

MIL-STD-652D (AR)
 Notice 2
 13 March 1981

MILITARY STANDARD
PROPELLANTS, SOLID FOR CANNONS
REQUIREMENT 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NEW PAGE	DATE	SUPERSEDED PAGE	DATE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	13 March 1981	1	4 Aug 78
2	"	2	5 Oct 79
3	"	3	" "
4	Reprinted without change		4 Aug 78
5	13 March 1981	5	" "
6	Reprinted without change		5 Oct 79
20	13 March 1981	20	" "
21	Reprinted without change		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.

Custodians
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Preparing Activity
 Army-AR

Project 1376-A171

FSC 1376

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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-perforated grain (MP) (Type I)
Cylindrical single-perforated grain (SP) (Type II)

2. REFERENCED DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request 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
MIL-E-255	Ethyl Centralite (Carbamite)
MIL-N-494	Nitroguanidine (Picrite)
MIN-N-3399	2-Nitrodiphenylamine
MIL-R-3065	Rubber, Fabricated Products
MIL-L-18618	Lead Carbonate, Basic Dry (For Ordnance Use)

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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

76-4-46 Box, Packing with Metal Liner, M24 for Smokeless Powder, Assembly and Details
76-4-53 Box, Steel, M2 for Smokeless Powder, Assembly
76-4-55 Box, Steel, M2 for Smokeless Powder, Detail
76-4-56 Box, Packing, Metal-Wood, M17 for Smokeless Powder Assembly
9282946 Marking Diagram and Sealing of Steel Packing Boxes for Shipment of Propellants
7549033 Container, Metal, Universal M25 for Propellants and Explosives Assembly and Detail
8858577 Marking Diagram and Sealing of Container Metal, Universal M25 for Shipping of Propellants
8858848 Marking Diagram and Sealing of Metal Lined Wooden Packing Boxes for Shipment of Propellants
138439 Packing Box, MARK 7
138441 Packing Box, MARK 7 Cover Details
9256486 Container, Packing PA54 Wood with Metal Liner (Modified M24 Box) for Smokeless Powder

(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).

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.

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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 revision). (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 consistuent 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-162, 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 or 3
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)

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</u>	<u>Standard</u>
	<u>Mean Variation</u>	<u>Deviation</u> Maximum
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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4.2.3.3.2.2 Type II. -The average grain diameter (D) shall be approximately three times the average diameter of the perforation (d).

4.2.3.3.2.3 Web measurements.

4.2.3.3.2.3.1 Type I. -The difference between the average outer web thickness (Wo) and the average inner web thickness (Wi) shall not exceed 15 percent of the average web thickness (Wa).

4.2.3.3.2.3.2 Type II. -The standard deviation of the web measurements, expressed as a percent of the average web measurement, shall not be greater than 20 percent.

4.2.4 Form. -Determination of the form of the propellant shall be by visual examination.

4.2.5 Dimensions

4.2.5.1 Thirty normal grains of propellant shall be selected at random and tested as specified in paragraph 5. If the sample fails to comply with the requirements, the lot shall be rejected.

4.2.5.2 Flakes. -Sixty flakes shall be examined as specified in method 504.5 of MIL-STD-286 for length or thickness and diameter.

4.2.5.3 Sheets. -The dimensions of the sheets shall be tested as specified in the applicable drawing or item specification.

4.2.6 Total graphite content, when applicable. The total graphite content shall not exceed 0.55 percent.

4.3 Packing

4.3.1 Level A. -The propellant shall be packed in containers conforming to Drawings 76-4-46, 76-4-53, 76-4-56, 7549033, 9256486, 13839 and marked, sealed and tested in accordance with Drawings, 8858848, 9282946, or 8858577. The net weight of propellant in the container shall not exceed 160 pounds provided the propellant surface is one (1) inch minimum below top surface of the container. The tolerance for the established net weight of any given propellant or propellant lot shall be plus or minus one pound.

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4.3.1.1 Immediately prior to filling all containers listed in 4.3.1 shall withstand a 1/2 to 1 psi air pressure test for a minimum of 15 seconds without leakage. The containers shall be tested by a method satisfactory to the contracting officer's representative.

4.3.1.2 When replacing cover gaskets for the M2 Steel Box, Dwg. 76-4-55, solid rubber gaskets as described on Dwg. 138441 for the MK7 Packing Box (Navy) may be used in lieu of Gasket Part No. 76-4-55H. Solid rubber gaskets shall comply with Specification MIL-R-3065 and AA-715 or BA-715 of ASTM 2000.

4.3.2 Level B. - The propellant shall be packed as specified in 4.3.1 or in fiber drums as described in 4.3.2.1. Fiber drums are approved for truck or trailer on flat car (TOFC) shipment only and for storage not exceeding two years.

4.3.2.1 Fiber drums. - Fiber drums shall comply with DOT Specification 21C, 250 pounds, MINIMUM, Code of Federal Regulations, Title 49, Parts 100-199, and the following additional requirements. Size shall be 15 1/2 + 1/2 inches in diameter by 26 + 1 inches in height, inside dimensions. The drum shall have a 23 or 24 gauge steel cover with rubber gasket, lever locking band with provision for sealing wire and wide bottom chime (2 inch minimum formed height). All metal parts shall be hot-dipped galvanized. Top and bottom chime shall be 23 or 24 gauge steel and shall be welded. The body shall be wound with a hot melt or thermoplastic adhesive. The bottom shall be a waterproof laminated fiberboard. Body and bottom disc shall also have a laminated aluminum foil barrier. The bottom crimp shall be caulked. The finished drum with closure assembled shall be moisture proof and leak tight. The fiber drums may be reused if the drums comply with the inspection requirements of 4.4.1.3.

4.3.2.2 Alternative fiber drum. - Alternatively, fiber drums shall be constructed as specified in 4.3.2.1 except that a layer of aluminum foil 0.010 thick shall be laminated to the inside of the body and the aluminum foil between the layers of Kraft paper in the body shall not be required.

4.3.2.3 Marking. - Drums shall be marked on the sidewall only with the same information as required for the side of the box Dwg. 8858848. Alternatively, marking may be placed on a commercial water resistant label, securely and completely adhered to the side wall. The label stock shall

TABLE III (CONTINUED)
 PROPELLANT COMPOSITIONS AND CHEMICAL PROPERTIES

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PROPELLANT	M26	M26A1	M30	M30A1	M30A2	M31	M31A1
Nitrocellulose	67.25 ± 1.80	68.70 ± 1.80	28.00 ± 1.30	28.00 ± 1.30	27.00 ± 1.30	20.00 ± 1.30	20.00 ± 1.30
Type	I	I	I	I	I	I	I
Grade	C	C	A	A	A	A	A
Nitroglycerin	25.00 ± 1.00	25.00 ± 1.00	22.50 ± 1.00	22.50 ± 1.00	22.50 ± 1.00	19.00 ± 1.00	19.00 ± 1.00
Nitroguanidine	---	---	47.70 ± 1.00	47.00 ± 1.00	46.25 ± 1.00	54.70 ± 1.00	54.00 ± 1.00
N-Ethyl Centralite	6.00 ± 0.50	6.00 ± 0.50	1.50 ± 0.10	1.50 ± 0.10	1.50 ± 0.10	---	---
Barium Nitrate	0.75 ± 0.20	---	---	---	---	---	---
Potassium Nitrate	0.70 ± 0.25	---	---	---	2.75 ± 0.25	---	---
Potassium Sulfate	---	---	---	1.00 ± 0.30	---	---	1.00 ± 0.30
Diphenylamine	---	---	---	---	---	---	---
Dinitrotoluene	---	---	---	---	---	---	---
Dibutylphthalate	---	---	---	---	---	4.50 ± 0.30	4.50 ± 0.30

TABLE III (CONTINUED)
PROPELLANT COMPOSITIONS AND CHEMICAL PROPERTIES

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PROPELLANT	<u>M26</u>	<u>M26A1</u>	<u>M30</u>	<u>M30A1</u>	<u>M30A2</u>	<u>M31</u>	<u>M31A1</u>
Diethylphthalate	---	---	---	---	---	---	---
2- Nitrodiphenylamine	---	---	---	---	---	1.50 ± 0.30	1.50 ± 0.30
Graphite	0.30 ± 0.10	0.30 ± 0.10	---	---	---	---	---
Cryolite	---	---	0.30 ± 0.10	---	---	0.30 ± 0.10	---
Total Volatiles, Max.	Type I - 2.00 Type II - 1.50	Type I - 2.00 Type II - 1.50	0.50	0.50	0.50	0.30	0.30
Moisture, Max.	0.70	0.50	---	---	---	---	---
Graphite, Glaze, Max.	0.15	0.15	0.2	0.15	0.15	0.15	0.15

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