

MIL-STD-652D (AR)  
4 August 1978  

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SUPERSEDING  
MIL-STD-652C (MU)  
30 November 1973

MILITARY STANDARD  
PROPELLANTS, SOLID, FOR CANNONS  
REQUIREMENTS AND PACKING



FSC: 1376

MIL-STD-652D (AR)  
4 August 1978

DEPARTMENT OF DEFENSE  
WASHINGTON, D. C. 20301

Propellants, Solid For Cannons, Requirements and Packing, MIL-STD-652D  
(AR).

1. This standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document, should be addressed to: Commander, US Army Armament Research & Development Command, ATTN: DRDAR-QAR, Dover, NJ 07801, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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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 Sulfite (For Ordnance Use)
MIL-D-204	Dinitrotoluene (For Use in Explosives)
MIL-D-218	Dibutylphthalate (For Use in Explosives)
JAN-D-242	Diethylphthalate (For Use in Explosives)
MIL-N-244	Nitrocellulose (For Use in Explosives)
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 (ABC-STD-105)  
MIL-STD-286 -Propellants, Solid; Sampling, Exam-  
ination and Testing  
MIL-STD-417 -Rubber Composition Vulcanized  
General Purpose Solid (Symbols and Test)  
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  
3853577 Marking Diagram and Sealing of Container,  
Metal, Universal M25 for Shipping of  
Propellants  
3858848 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

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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).")

### 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-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 II)
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.

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 ( $W_o$ ) and the average inner web thickness ( $W_i$ ) shall not exceed 15 percent of the average web thickness ( $W_a$ ).

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. -Thirty flakes shall be examined as specified in method 504.1 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, 138439 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 packing, containers listed in 4.3.1 shall be subjected to an internal pressure of 1/2 to 1 pound per square inch for the M24 and metal lined containers and 1/2 to 1 psi for 15 seconds for the M2 and MARK 7 containers 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 RN-715 or RS-715 of Standard MIL-STD-417.

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 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 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 moistureproof 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 by 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

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be white, tan or kraft color. All marking shall be with black ink using letters approximately one half inch high.

4.3.3 Palletization. -Level A shipments shall be palletized when specified by the procuring activity. Palletization is not required for Level B shipments.

4.3.4 Calibration. -The amount of propellant selected for use as Master Calibration Lot or Reference Calibration Lot in accordance with TECOM Regulation 702-1 shall be packed in Level A containers, (see 4.3.1).

4.3.5 Solvent type, double base propellants (M2, M5, M9, M10, M26, and M26E1) Solvent type double base propellants shall only be packed in Level A containers, (see 4.3.1).

#### 4.4 Sampling for testing

4.4.1 Sampling plans and procedures for the following classifications of defects shall be in accordance with Standard MIL-STD-105. Standard MIL-STD-1235 may be used if approved by the procuring activity. Also, at the option of the procuring activity, AQL's and sampling plans may be applied to the individual characteristics listed using an AQL of 0.40 percent for each major defect and an AQL of 0.65 percent for each minor defect.

4.4.1.1 Container prior to filling (as applicable) (see drawings 76-4-46, 76-4-53, 76-4-56, 138439, 7549033, and 9256486.

Categories	Defects	Method of Inspection
Critical: None defined.		
Major:	AOL 0.40 percent	
101.	Foreign material, propellant or corrosion.....	Visual
102.	Gasket missing or damaged.....	Visual
103.	Holes in cover or end.....	Visual
104.	Locking device damaged.....	Visual
105.	Bare areas on exterior coating of metal container, the sum of which is in excess of 1/2 square inch.....	Visual
Minor:	AOL 1.50 percent	
201.	Protective finish incomplete.....	Visual
202.	Wood split terminating at edge of board.....	Visual

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- 203. Board broken or piece missing...Visual
- 204. Loose boards.....Visual
- 205. Nails or staples protruding or  
loose.....Visual
- 206. Split boards insufficiently  
nailed.....Visual
- 207. Wood rot.....Visual
- 208. Large dents or damaged seam.....Visual

4.4.1.2 Fiber drums before filling

Categories	Defect	Method of Inspection
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Critical: None defined.

- Major: AOL 0.40 percent
- 101. Foreign material .....Visual
  - 102. Gasket missing or damaged.....Visual
  - 103. Holes in cover or end .....Visual
  - 104. Locking device damaged .....Visual

- Minor: AOL 0.65 percent
- 201. Poor workmanship, such as:  
nicks, dents, body bulged or  
scratches.....Visual

4.4.1.3 Applicable to reusable fiber drums before filling

Categories	Defect	Method of Inspection
------------	--------	-------------------------

Critical: None defined

- Major: 100% Inspection
- 101. Top chime bent, deformed  
or cut.....Visual
  - 102. Bottom chimes collapsed (annular  
grove closed or partially  
closed) or deformed.....Visual
  - 103. Body bulged, cut or dented.....Visual
  - 104. Gasket in cover missing or  
damaged.....Visual
  - 105. Cover bent, creased or deformed  
in gasket area or around edge...Visual
  - 106. Locking ring damaged so as  
to prevent closing.....Visual

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- Minor: AOL 1.50 percent
- 201. Outer body surface seriously scuffed or metal scratched through galvanized surface.....Visual
  - 202. Nicks or dents in chimes or cover not affecting function....Visual
  - 203. Locking rings bent or deformed..Visual

4.4.1.4 Sealed container (as applicable) (see drawings 7549033, 138439, 76-4-46, 76-4-53, 76-4-56 and 9256486)

Categories	Defect	Method of Inspection
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Critical: None defined

- Major: AOL 0.65 percent
- 101. Holes in container.....Visual
  - 102. Damaged seams.....Visual
  - 103. Damaged locking devices.....Visual
  - 104. Gasket missing or incomplete...Visual

- Minor: AOL 1.50 percent
- 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 drums

Categories	Defect	Method of Inspection
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- Major: AOL 1.00 percent
- 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: AOL 1.00 percent
- 201. Marking misleading or unidentifiable.....Visual
  - 202. Exterior torn or delaminated...Visual

4.4.2 Sampling for chemical and physical testing. Ten (10) containers shall be selected at random from each lot of propellant (or lesser quantity as determined for actual

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need). 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. Five (5) pounds of the sample shall be forwarded to Commander ARRADCOM, ATTN: DRDAR-LCE-MP, Dover, New Jersey 07801, for the 65.5 degree centigrade (°C) surveillance test. The remained ten pounds shall be used for the chemical and physical test. All samples shall be packed in air tight containers and shall be marked to show the propellant designation, lot number, manufacturer, date of sampling, contract number, and number of pounds in the lot. If the sample fails to comply with the requirements the lot shall be rejected.

4.4.3 Sampling for Ballistic Testing. Ten (10) containers (or as required by item specification) shall be selected for ballistic testing at each temperature specified in the applicable item specification. The total sample size at each temperature shall consist of the weight in pounds specified on the applicable assembly drawing multiplied times the sample size (10) times the factor 1.3. The samples shall be selected from individual containers, packaged separately and shipped to the Proving Ground, if specified by the basic propellant specification. Duplicate sampling of containers shall be accomplished if necessary to prepare the required number of samples.

#### 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-236 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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Nitroguanidine (2)	213.1
	213.2
Ethyl Centralite	202.2
	208.3
	208.4
	208.5
Barium Nitrate	304.1
	316.1
Potassium Nitrate	310.4
	316.1
Potassium Sulfate	310.4
	316.1
Diphenylamine	201.1
	201.4
	208.4
	208.5
	217.3
	226.2
Dinitrotoluene	205.1
	205.2
	205.3
	208.4
	208.5
	226.2
Dibutylphthalate	204.1
	204.2
	208.3
	208.4
	208.5
	222.1
	226.2
Diethylphthalate	204.2
	208.3
	208.4
	208.5
	222.1
	226.2
2-Nitrodiphenylamine	208.4
	208.5
	218.1
	218.4
	226.2

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Graphite Content (Glaze)	308.1
Cryolite	307.1 316.1
Surveillance Test	407.1
Candelilla Wax	228.1
Dimensions of Grains	504.1 504.5
Residual or Volatile Solvent	103.4 103.5
Total Volatiles	103.1 103.3 103.5
Moisture (3)	102.1 103.1 103.5
Hygroscopicity	503.2
Compressibility	505.1
Lead Carbonate	311.1 311.5 316.1

(1) Except that pentane methylene chloride azeotrope (Two volumes of technical grade pentane to one volume of methylene chloride) shall be used as the solvent for extraction of triple base propellant.

(2) Except that pentane methylene chloride azeotrope shall be used as the solvent for extraction.

(3) Method 103.1 is used for M8 Sheet propellant.

5.3 Heat tests shall be conducted in accordance with Method 404.1, Standard MIL-STD-286. For single base propellants, the test shall be conducted at 134.5 degrees Centigrade. For M1, M6 and M14, the color of the methyl violet test paper shall not change to a salmon pink color in less than 40 minutes and shall not explode in less than 5 hours. For M10, the color of the methyl violet test paper shall not change to salmon pink color in less than 60 minutes and shall not explode in less than 5 hours. For double or triple base

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propellants, the test shall be conducted at 120 degrees Centigrade. The propellant shall not change the color of the methyl violet test paper to a salmon pink color in less than 40 minutes.

Custodian:  
ARMY-AR

Preparing Activity:  
ARMY-AR

Project Number:  
1376-A132



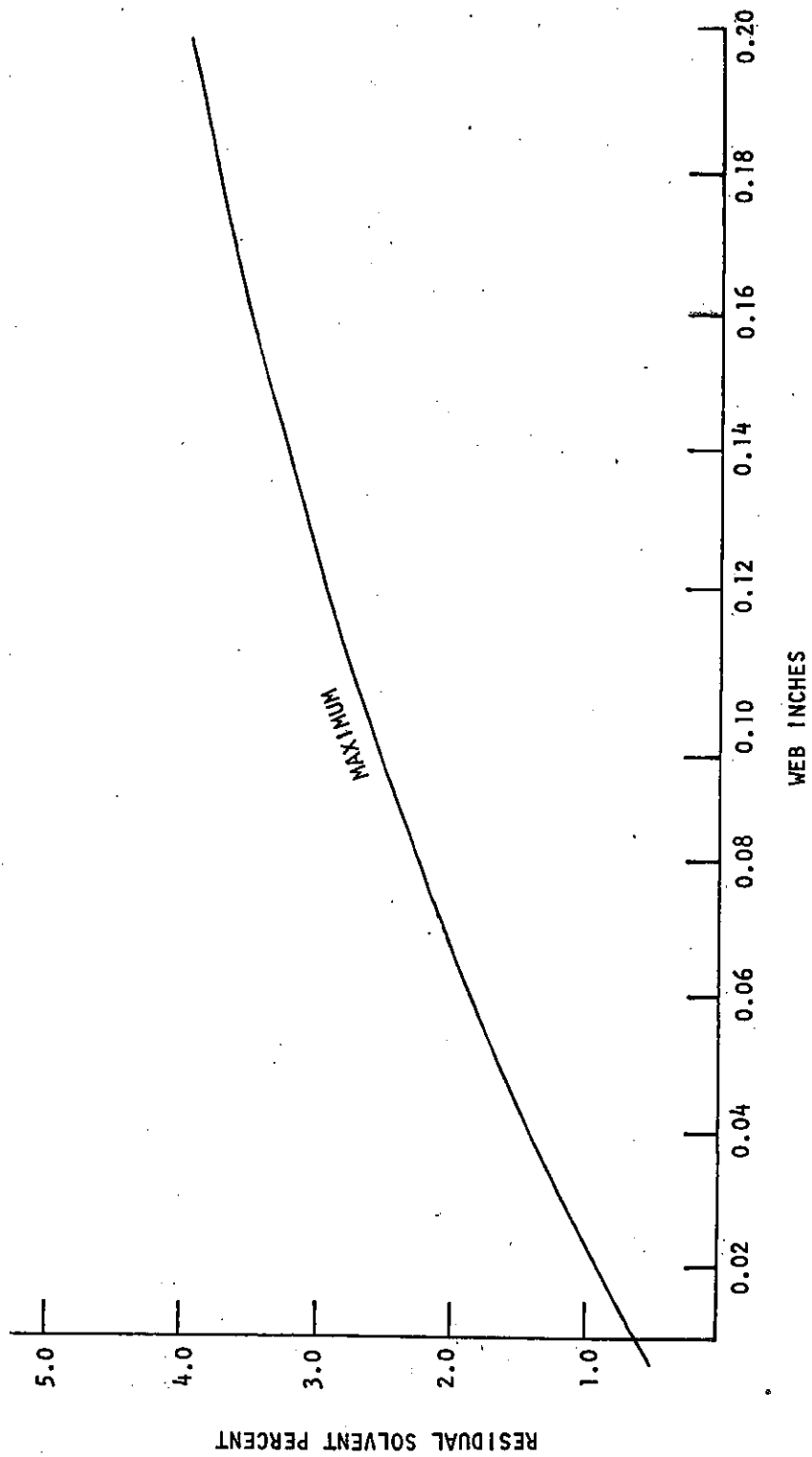


FIGURE 1 - CURVE FOR RESIDUAL SOLVENT IN CANNON PROPELLANT POWDER, M1 AND M6 - VOLATILE SOLVENT = TOTAL VOLATILES - TOTAL MOISTURE

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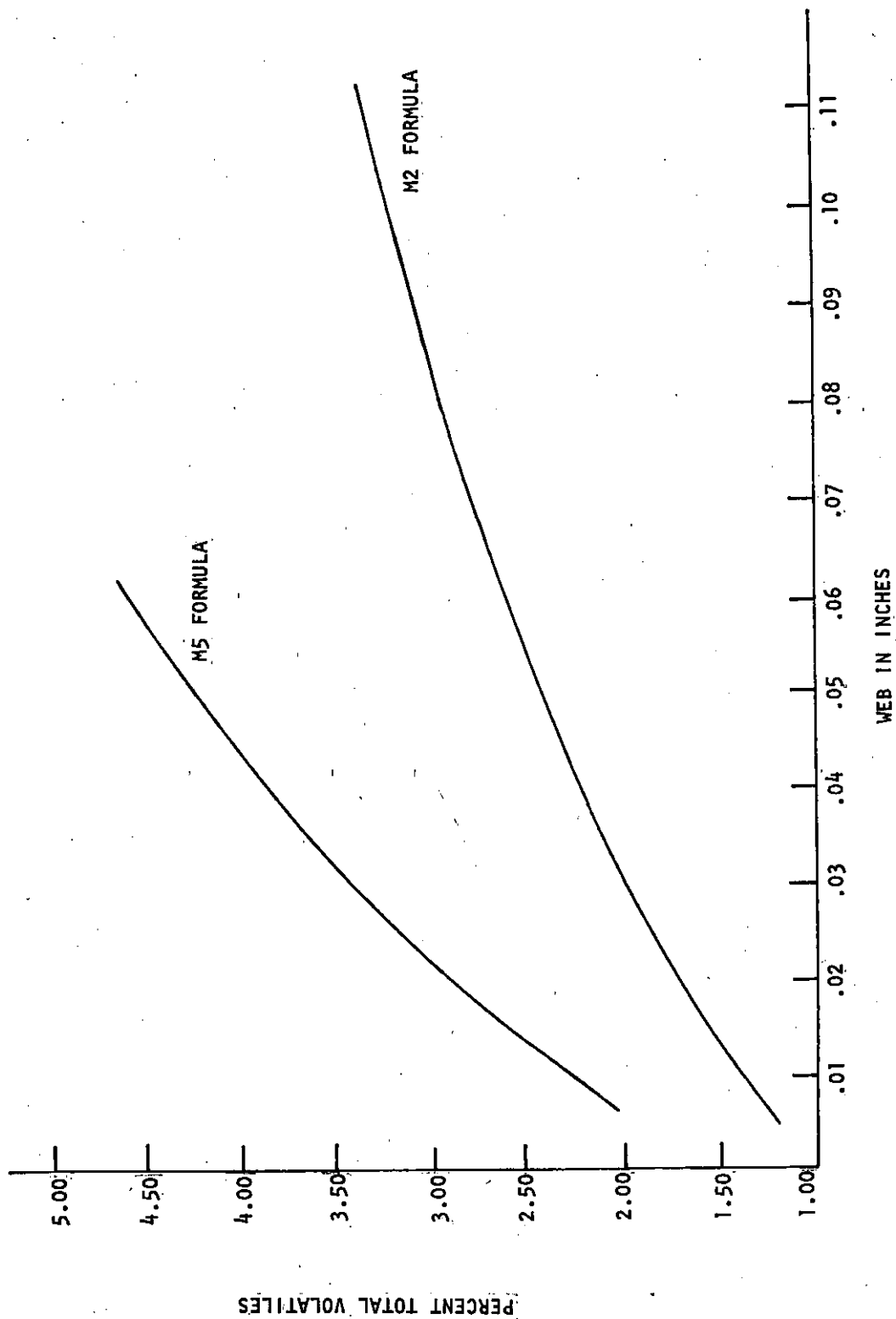


FIGURE 2 - CURVES FOR TOTAL VOLATILES IN M2 AND M5 SMOKELESS CANNON POWDER

TABLE III

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PROPELLANT	PERCENT					
	<u>M1</u>	<u>M2</u>	<u>M5</u>	<u>M6</u>	<u>M8</u>	<u>M8E1<sup>1</sup></u>
Nitrocellulose	85.00 $\pm$ 2.00	77.45 $\pm$ 2.00	81.95 $\pm$ 2.00	87.00 $\pm$ 2.00	52.15 $\pm$ 1.50	52.15 $\pm$ 1.50
Type Grade	I C	II C	II C	I C	II C	II C
Nitroglycerin	---	19.50 $\pm$ 1.00	15.00 $\pm$ 1.00	---	43.00 $\pm$ 1.50	43.00 $\pm$ 1.50
Nitroguanidine	---	---	---	---	---	---
Ethyl Centralite	---	0.60 $\pm$ 0.15	0.60 $\pm$ 0.15	---	0.60 $\pm$ 0.15	0.60 $\pm$ 0.15
Barium Nitrate	---	1.40 $\pm$ 0.25	1.40 $\pm$ 0.25	---	---	---
Potassium Nitrate	---	0.75 $\pm$ 0.25	0.75 $\pm$ 0.25	---	1.25 $\pm$ 0.25	1.25 $\pm$ 0.25
Potassium Sulfate	**1.00 $\pm$ 0.30	---	---	*1.00 $\pm$ 0.30	---	---
Lead Carbonate	**1.00 $\pm$ 0.20	---	---	---	---	---
Diphenylamine	*1.00 $\pm$ 0.20 - 0.10	---	---	*1.00 $\pm$ 0.20 - 0.10	---	---
Dinitrotoluene	10.00 $\pm$ 2.00	---	---	10.00 $\pm$ 2.00	---	---

\* ADDED BASIS \*\* WHEN SPECIFIED, ADDED BASIS

TABLE III (CONTINUED)  
PROPELLANT COMPOSITIONS AND CHEMICAL PROPERTIES

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PROPELLANT	<u>M1</u>	<u>M2</u>	<u>M5</u>	<u>M6</u>	<u>M8</u>	<u>M8E1</u> <sup>1</sup>
Dibutylphthalate	5.00 $\pm$ 1.00	---	---	3.00 $\pm$ 1.00	---	---
Diethylphthalate	---	---	---	---	3.00 $\pm$ 0.50	3.00 $\pm$ 0.50
2-Nitrodiphenylamine	---	---	---	---	---	---
Graphite	---	0.30 $\pm$ 0.10	0.30 $\pm$ 0.10	---	---	---
<sup>17</sup> Cryolite	---	---	---	---	---	---
Total Volatiles, Maximum (Max)	FIGURE 1	FIGURE 2	FIGURE 2	FIGURE 1	---	---
Moisture	0.6 $\pm$ 0.2	0.70 Max	0.70 Max.	0.6 $\pm$ 0.2	0.40 Max	0.40 Max
Compressibility, Minimum (Min)	30	---	---	30	---	---
Graphite, Glaze*	---	**0.15 Max	**0.15 Max	---	---	---
Candelilla Wax (Added Basis)	---	---	---	---	---	0.2 Nominal

1) For information only

NOTE: The compressibility requirement does not apply to Type II Grain of M1 Propellant

TABLE III (CONTINUED)  
PROPELLANT COMPOSITIONS AND CHEMICAL PROPERTIES

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PROPELLANT	M9	M10	M14 <sup>1</sup>	M15 <sup>1</sup>	M17 <sup>1</sup>
Nitrocellulose	57.75 $\pm$ 1.50	98.00 $\pm$ 1.50	90.00 $\pm$ 2.00	20.00 $\pm$ 1.30	22.00 $\pm$ 1.30
Type	II	I	I	I	I
Grade	C	C	C	C	C
Nitroglycerin	40.00 $\pm$ 1.50	---	---	19.00 $\pm$ 1.00	21.50 $\pm$ 1.00
Nitroguanidine	---	---	---	54.70 $\pm$ 1.00	54.70 $\pm$ 1.00
Ethyl Centralite	0.75 $\pm$ 0.10	---	---	6.00 $\pm$ 0.30	1.50 $\pm$ 0.10
Barium Nitrate	---	---	---	---	---
Potassium Nitrate	1.50 $\pm$ 0.50	---	---	---	---
Potassium Sulfate	---	1.00 $\pm$ 0.30	---	---	---
Diphenylamine	---	1.00 $\pm$ 0.30	*1.00 $\pm$ 0.10	---	---
Dinitrotoluene	---	---	8.00 $\pm$ 2.00	---	---
Dibutylphthalate	---	---	2.00 $\pm$ 1.00	---	---
Diethylphthalate	---	---	---	---	---

TABLE III (CONTINUED)  
PROPELLANT COMPOSITIONS AND CHEMICAL PROPERTIES

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PROPELLANT	<u>M9</u>	<u>M10</u>	<u>M14</u> <sup>1</sup>	<u>M15</u> <sup>1</sup>	<u>M17</u> <sup>1</sup>
2-Nitrodiphenylamine	---	---	---	---	---
Graphite	---	---	---	---	---
Cryolite	---	---	---	0.30 $\pm$ 0.10	0.30 $\pm$ 0.10
Total Volatiles, max.	---	Type I - 3.20 Type II - 2.30	---	---	---
	0.50		1.25	0.30	0.30
Moisture	---	0.50 to 1.20 <sup>2</sup>	0.60 $\pm$ 0.20	---	---
Graphite, Glaze, max. (When Applicable)*	0.40	---	---	---	0.15
Carbon Black, Max. (When Applicable)*	---	0.10	---	---	---

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- 1) For Information Only  
 2) Moisture content of M10 (Form A) propellants to be as specified in item specification.  
 \* Added

TABLE III (CONTINUED)  
PROPELLANT COMPOSITIONS AND CHEMICAL PROPERTIES

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PROPELLANT	M26	M26A1	M30	M30A1	M30A2	M31	M31E1
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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4 August 1978

PROPELLANT	M26	M26A1	M30	M30A1	M30A2	M31	M31E1
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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1 OCT 76

EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.