

MIL-C-70781 (AR)  
17 October 1988

## MILITARY SPECIFICATION

### CARTRIDGE, 60MM: SMOKE, MARKING, M722 ASSEMBLING, MARKING AND PACKING

This Specification is approved for use within the U.S. Army Armament, Munitions and Chemical Command, and is available for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers requirements and quality assurance provisions for the assembling, marking, and packing for one type of WP cartridge, M722.

#### 2. APPLICABLE DOCUMENTS

##### 2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

#### SPECIFICATIONS

##### MILITARY

MIL-A-48078

- Ammunition, Standard Quality Assurance Provisions, General Specification for.

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 Armament, Munitions and Chemical Command, Attn. AMSMC-QA, 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

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

FSC 1310

## MIL-C-70781 (AR)

## STANDARDS

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-410 - Nondestructive Testing Personnel  
- Qualification and Certification (Eddy Current, Liquid Penetrant, Magnetic Particle, Radiographic and Ultrasonic)
- MIL-STD-453 - Inspection, Radiographic

2.1.2 Other Government documents, drawings and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

US ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (ARDEC)

## PRODUCT DRAWINGS (See 6.5)

## PRODUCT AND PACKAGING DRAWINGS

- 15-12-345 - Cartridge, 60MM, Smoke, Marking, M722
- 15-12-352 - Packing and Sealing for: 60MM Cartridge, Smoke, Marking, M722 with M745 Fuze.
- 15-12-358 - Intermediate Packing and Marking
- 15-12-359 - Marking for Fiber Tube
- 15-12-361 - Marking for Shipping Container
- 9293440 - Box, Wirebound, Packing, Ammunition for 60MM Cartridge, HE, M720 w/Fuze M734, Packing and Marking.

## INSPECTION EQUIPMENT DRAWINGS

- 7256281 - Alignment Check Plug
- 7256348 - Alignment Gage
- 7257962 - Limit Check Gage
- 9246386 - Inspection Equipment for Measuring Leakage of Metal Ammunition Containers

## MIL-C-70781 (AR)

(Copies of specifications, standards, drawings and other Government documents required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

#### 3.1 Materials and components.

3.1.1 Materials. All materials cited on Drawing 15-12-345 or the subsidiary drawings shall conform to the specifications listed thereon and to the specific characteristics set forth on the drawings.

3.1.2 Components. All components of the cartridge shall conform to the specifications and drawings listed on Drawing 15-12-345 and subsidiary drawings.

3.1.3 Burster. When installed in the cartridge, the burster shall not rattle when tested as specified in 4.5.2.

3.2 Parts and assemblies. Parts and assemblies shall comply with all requirements specified on drawing (dwg.) 15-12-345 and associated drawings, and with all requirements specified in applicable specifications and standards.

## MIL-C-70781 (AR)

3.3 Proving ground test. The cartridge shall comply with the following requirements when tested as specified in first article and 4.4.3.1.

3.3.1 Misfire. The cartridge shall not fail to fire from the weapon.

3.3.2 Premature burst. There shall be no premature functioning in the mortar tube or within 100 meters travel from the gun tube.

3.3 Duds. There shall be visible evidence of functioning upon impact as indicated by presence of a smoke cloud.

3.3.4 Metal parts separation. There shall be no metal parts separation in the gun bore or in flight.

3.3.5 Range precision. The horizontal range standard deviation shall be no greater than 15 meters when fired at charge zero, no greater than 55 meters when fired at charge two and no greater than 75 meters when fired at charge four.

3.3.6 Short rounds. No cartridge shall have a horizontal range less than 80 percent of the average horizontal range when calculated without short rounds.

3.4 First article inspection. This specification contains technical provisions for first article inspection. Requirements for the submission of first article samples by the contractor shall be as specified in the contract.

3.5 Workmanship. Parts shall be free from chips, burrs, cracks, dirt, grease, corrosion, rust and other foreign material. The cleaning method shall not be injurious to any of the parts nor shall the parts be contaminated by the cleaning agent.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements. Unless otherwise specified herein or in the contract, the provisions of MIL-A-48078 shall apply and are hereby made a part of this detail specification.

## MIL-C-70781 (AR)

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 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 inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Alternate inspection provisions. Alternative inspection procedures, methods or equipment (including tool inspection, statistical process control, substitute sampling plans, etc.) may be used by the contractor when they provide, as a minimum the level of quality assurance required by the provisions specified herein. Prior to applying such alternative inspection procedures, methods or equipment, the contractor shall describe them in a written proposal submitted to the Procuring Contracting Officer for evaluation and approval by the Government. When required, the contractor shall demonstrate that the effectiveness of the proposed alternative(s) is equal to or better than the quality assurance provisions herein. In cases of dispute as to whether certain procedures of the contractor's proposed alternative(s) provide equal assurance, the provisions of this specification shall apply.

4.2 Classification of inspections. The following types of inspection shall be conducted on this item:

- a. First article inspection
- b. Quality conformance inspection

4.3 First article inspection.

4.3.1 Submission. The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with the provisions of 4.3.2. The first article sample shall consist of the items as required per Table I.

4.3.2 Inspections to be performed. See MIL-A-48078 and Table I specified herein.

MIL-C-70781 (AR)

4.3.3 Rejection. See MIL-A-48078.

4.3.3.1 Ballistic test. The first article ballistic test shall be rejected if:

- a. One or more misfires occur.
- b. Two or more duds occur.
- c. One or more short rounds occur.
- d. One or more premature bursts occur.
- e. One or more metal parts separations occur.
- f. Horizontal range standard deviation is exceeded (70°F conditioned samples only).

TABLE I. First article inspection

MIL-C-70781 (AR)

**CLASSIFICATION OF DEFECTS & TESTS**

PARAGRAPH	TITLE	SHEET		NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER	
		1	OF				1	See Below
	Cartridge, Assembly and Container							NEXT HIGHER ASSEMBLY
	<u>Cartridge, Prior to Inserting Burster (Dwg. 15-12-345)</u> Examination for Defects	25		3.1.2			4.4.2.1	
	<u>Cartridge, Prior to Assembling Fuze (Dwg. 15-12-345)</u> Examination for Defects	25		3.2			4.4.2.2	
	<u>Cartridge, Prior to Assembly of Ignition Cartridge and Propelling Charge (Dwg. 15-12-345)</u> Examination for Defects	25		3.2			4.4.2.4	
	<u>Cartridge (Dwg. 15-12-345)</u> Examination for Defects Ballistic Test (Proving Ground)	25 144		3.1.2/3.2 3.3			4.4.2.5 4.5.3	
	<u>Metal Ammunition Container (Dwg. 15-12-358)</u> Examination of Defects Air Leakage Test	5 5		5.1 5.1			4.4.2.8/4.4.2.9 4.4.2.9	

FOOTER

MIL-C-70781 (AR)

4.4 Quality conformance inspection.

4.4.1 Inspection lot formation. Inspection lots shall comply with the lot formation provisions of MIL-A-48078. In addition, inspection lots of cartridges shall contain:

a. Body filling assemblies of one lot interfix from one manufacturer.

b. Burstern of one lot interfix from one manufacturer.

c. Fin assemblies of one lot interfix from one manufacturer.

d. Ignition cartridges of one lot interfix from one manufacturer.

e. Propellant charges of one lot interfix from one manufacturer.

f. Obturating rings of one lot interfix from one manufacturer.

g. Fuzes of one lot interfix from one manufacturer.

4.4.2 Examination. See MIL-A-48078. Unless otherwise specified in the Classification of Defects and Test Tables, sampling plans and procedures for major and minor defects shall be in accordance with MIL-STD-105, Inspection Level II.



QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

**CLASSIFICATION OF DEFECTS & TESTS**

PARAGRAPH	TITLE	SHEET		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER	NEXT HIGHER ASSEMBLY	PARAGRAPH REFERENCE / INSPECTION METHOD
		1	OF							
4.4.2.1	Cartridge, Prior to Inserting Burster	1	1					15-12-345		
<u>Critical</u>										
1	Burster pad missing			-		100%	3.1.2			Gage
<u>Major</u>										
101	Foreign matter in burster well					0.40%	3.1.2			Visual
<u>Minor</u>										
201	Poor workmanship					0.65%	3.5			Visual

NOTE:

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE	SHEET		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AGL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER	NEXT HIGHER ASSEMBLY	PARAGRAPH REFERENCE / INSPECTION METHOD
		1	OF							
4.4.2.2	Cartridge, Prior to Assembling Fuze	1	1					15-12-345		
<u>Critical</u>	None defined									
<u>Major</u>										
101	Burster missing					0.40%	3.1.2			Visual
102	Foreign matter in burster well					0.40%	3.1.2			Visual
<u>Minor</u>										
201	Poor workmanship					0.65%	3.5			Visual
<b>NOTE:</b>										

QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

**CLASSIFICATION OF DEFECTS & TESTS**

PARAGRAPH	TITLE	SHEET		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER	NEXT HIGHER ASSEMBLY	PARAGRAPH REFERENCE / INSPECTION METHOD
		1	OF							
4.4.2.3	Charge, Propelling							9312698	15-12-345	
<u>Critical</u>										
1	Container or container seal damaged to the extent that propellant shall escape	(a)	100%	3.1.2	Visual/Gage (see 4.5.4)					
<u>Major</u>										
101	Container or container seal damaged but not to the extent that propellant shall escape	(a)	100%	3.1.2	Visual/Gage (see 4.5.4)					
102	Gross weight of propelling charge, min.	(a)	100%	3.1.2	Gage					
<u>Minor</u>										
	None defined									
<p><b>NOTES:</b> (a) If LAP of the propelling charge and cartridge are performed at the same installation, this inspection is not required.</p>										

## QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

## CLASSIFICATION OF DEFECTS &amp; TESTS

PARAGRAPH	TITLE	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	SHEET		DRAWING NUMBER
				1	1	
CATEGORY				AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE / INSPECTION METHOD
4.4.2.4	Cartridge, Prior to Assembling Ignition Cartridge and Propelling Charge					15-12-345
						NEXT HIGHER ASSEMBLY
<u>Critical</u>						
1	Obturator ring missing			100%	3.2	Gage (note a)
2	Burster loose			100%	3.1.3	Manual
<u>Special</u>						
a	Fin blade distorted			100%	3.2	Gage
<u>Major</u>						
101	Obturator band damaged			0.40%	3.2	Visual
102	Fin assembly torque			0.40%	3.2	Test
103	Fuze torque			0.40%	3.2	Test
104	Fin assembly not fully seated			0.40%	3.2	Visual
105	Fuze not fully seated			0.40%	3.2	Visual
106	Obturator ring not flush or below bourrelet diameter			100%	3.2	Gage (note a)
107	Cartridge assembly fails to fully enter profile and alignment gage			100%	3.2	7256348/7256281/ 7257962
<u>Minor</u>						
201	Pettman cement application improper			0.65%	3.2	Visual
202	Poor workmanship			0.65%	3.5	Visual
<b>NOTE:</b>	(a) The inspection for defects can be performed at a station prior to this station when deemed necessary.					

AMSMC Form 1570, 1 Feb 85

Replaces DRSMC-QA (D) Form 160, 1 Aug 83, which may not be used.

QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

**CLASSIFICATION OF DEFECTS & TESTS**

PARAGRAPH	TITLE	SHEET 1 OF 2		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER 15-12-345 NEXT HIGHER ASSEMBLY	PARAGRAPH REFERENCE / INSPECTION METHOD
4.4.2.5	Cartridge								
<u>Critical</u>									
1				-	Minimum distance from top of ignition cartridge assembly to edge of fin incorrect Propellant charge missing or damaged to the extent that propellant shall escape	100%	3.2	Gage	
2						100%	3.2	Visual/Gage (see 4.5.4)	
<u>Special</u>									
a					Stencil warning notice missing or illegible	100%	3.2	Visual	
<u>Major</u>									
101					Ignition cartridge torque	0.40%	3.2	Test	
102					Propellant charge damaged but not to the extent that propellant shall escape	100%	3.2	Visual/Gage (see 4.5.4)	
<b>NOTES</b>									

QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE	SHEET		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER	PARAGRAPH REFERENCE / INSPECTION METHOD
		2	2 OF						
4.4.2.5	Cartridge (continued)							15-12-345	NEXT HIGHEN ASSEMBLY
<u>Minor</u>									
201	Paint damage area in excess of 1/4 square inch					0.65%	3.2	Visual	
202	Marking incorrect or illegible					0.65%	3.2	Visual	
203	Pettman cement application improper					0.65%	3.2	Visual	
204	Poor workmanship					0.65%	3.5	Visual	
	<u>Proving Ground Test</u> <u>Production Ballistic Acceptance</u>			111/90			3.3	4.4.3.1/4.5.3	
<b>NOTE:</b>									

Replaces DRSMC-QA (D) Form 160, 1 Aug 83, which may not be used.

AMSMC Form 1570, 1 Feb 85

QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

**CLASSIFICATION OF DEFECTS & TESTS**

PARAGRAPH	TITLE	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	SHEET 1 OF 1		DRAWING NUMBER
				AQL OR 100%	REQUIREMENT PARAGRAPH	
4.4.2.6	Fiber Container (Unsealed)					15-12-352 NEXT HIGHEN ASSEMBLY 15-12-358
<u>CATEGORY</u>						PARAGRAPH REFERENCE / INSPECTION METHOD
<u>Critical</u>	None defined					
<u>Special</u>						
a	Propelling charge support assembly missing			100%	5.1	Visual
b	Support assembly position improper			100%	5.1	Visual
<u>Major</u>						
101	Tube support missing			0.40%	5.1	Visual
102	Cushion missing			0.40%	5.1	Visual
103	Packing stop missing			0.40%	5.1	Visual
<u>Minor</u>						
201	Round cannot be removed by hand			0.65%	5.1	Visual
202	Glue or asphalt on round			0.65%	5.1	Visual
<u>NOTES:</u>						

QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE	SHEET		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER
		1	OF					
CATEGORY								NEXT HIGHER ASSEMBLY PARAGRAPH REFERENCE / INSPECTION METHOD
4.4.2.7	Fiber Container (Sealed)		1					15-12-352/15-12-359
	None defined							
<u>Critical</u>								
<u>Major</u>								
101	Container damaged or cut through all asphalt impregnated layers	0.40%				5.1		Visual
102	Sealing strip not applied properly	0.40%				5.1		Visual
103	Metal end loose or distorted	0.40%				5.1		Visual
<u>Minor</u>								
201	Marking, as specified on Drawing 15-12-359 incorrect or illegible	0.65%				5.1		Visual
202	Contents loose	0.65%				5.1		Visual
<b>NOTES:</b>								



QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

**CLASSIFICATION OF DEFECTS & TESTS**

PARAGRAPH	TITLE	SHEET		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AOL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER	NEXT HIGHEN ASSEMBLY	PARAGRAPH REFERENCE /INSPECTION METHOD
		1	OF							
4.4.2.8	Metal Ammunition Container (Unsealed)	1	1					15-12-358		
<u>Critical</u>	None defined									
<u>Major</u>										
101	Any material containing condensate and surface moisture					0.40%	5.2			Visual
102	Spacer missing					0.40%	5.2			Visual
103	Cushion missing					0.40%	5.2			Visual
104	Incorrect number of assemblies					0.40%	5.2			Visual
<u>Minor</u>	None defined									
<u>NOTES:</u>										

QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE	SHEET		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER	NEXT HIGHER ASSEMBLY	PARAGRAPH REFERENCE / INSPECTION METHOD
		1	OF							
4.4.2.9	Metal Ammunition Container (Sealed)		1					15-12-358	9293440	
<u>Critical</u>	None defined									
<u>Major</u>	Air leakage test					100%	5.2			4.5.1
<u>Minor</u>	Marking incorrect or illegible Contents loose					0.65% 0.65%	5.4.2 5.2			Visual Manual
<b>NOTE:</b>										

Replaces DRSMC-QA (D) Form 160, 1 Aug 83, which may not be used.

AMSMC Form 1570, 1 Feb 85

QUALITY CONFORMANCE INSPECTION

MIL-C-70781 (AR)

**CLASSIFICATION OF DEFECTS & TESTS**

PARAGRAPH	TITLE	SHEET		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER	PARAGRAPH REFERENCE / INSPECTION METHOD
		1	1						
4.4.2.10	Packing Box (Sealed)							9293440/15-12-361	NEXT HIGHER ASSEMBLY
<u>Critical</u>	None defined								
<u>Major</u>	None defined								
<u>Minor</u>	Boards split or separated exposing containers					0.65%	5.3		Visual
201	Contents loose					0.65%	5.3		Manual
202	Marking, incorrect or illegible					0.65%	5.4		Visual
203									
<b>NOTES:</b>									

## MIL-C-70781 (AR)

4.4.3 Testing.

4.4.3.1 Proving ground test (see 3.3). The cartridges shall be observed for the following characteristics:

- a. Misfires, Major defect (see 3.3.1)
- b. Duds, Major defect (see 3.3.3)
- c. Short rounds, Critical defect (see 3.3.6)
- d. Premature burst, Critical defect (see 3.3.2)
- e. Metal parts separation, Critical defect (see 3.3.4)
- f. Range precision, Major defect (see 3.3.5) (70°F conditioned samples only).

Testing shall be as specified in 4.5.3.

4.4.3.1.1 Initial production test. Beginning with the first lot produced and continuing until three consecutive lots have complied with the acceptance criteria specified herein, 111 random sample cartridges shall be selected from each lot for this test. The lot shall be rejected if:

- a. One or more misfires occur
- b. Two or more duds occur
- c. One or more short rounds occur
- d. One or more premature bursts occur
- e. One or more metal parts separations occur
- f. Horizontal range standard deviation at charge 0, charge 2 or charge 4 is exceeded.

4.4.3.1.2 Production test. After three consecutive lots have complied with the criteria of 4.4.3.1.1, 90 random sample cartridges shall be selected from each lot for this test. The lot shall be rejected if:

## MIL-C-70781 (AR)

- a. One or more misfires occur
- b. Two or more duds occur
- c. One or more short rounds occur
- d. One or more premature bursts occur
- e. One or more metal parts separations occur
- f. Horizontal range standard deviation at charge 0 or charge 4 is exceeded.

4.4.4 Inspection equipment. The inspection equipment required to perform the examination and test prescribed herein is described in the "Paragraph Reference/Inspection Method" column in the tables starting with 4.4.2.1. The contractor shall submit for approval inspection equipment designs in accordance with the terms of the contract. See section 6 of MIL-A-48078.

4.5 Methods of inspection.

4.5.1 Container air leakage test. The shipping and storage containers shall be tested in accordance with Drawing 9246386.

4.5.2 Burster. Gently shake the cartridge in line with the longitudinal axis. Rattles indicate a loose burster.

4.5.3 Proving ground test. The test shall be performed at a Government Proving Ground in accordance with the applicable U.S. Army Test and Evaluation Command (USATECOM) Acceptance Test Procedure.

4.5.3.1 First article test. The cartridges for first article testing shall be separated into three equal groups; one group conditioned for 24 hours at  $+ 145^{\circ}\text{F} \pm 2.5^{\circ}\text{F}$ , one group conditioned for 24 hours at  $+ 70^{\circ}\text{F} \pm 2.5^{\circ}\text{F}$  and one group conditioned for 24 hours at  $-50^{\circ}\text{F} \pm 2.5^{\circ}\text{F}$ . Each group shall be separated into three equal subgroups; one subgroup tested at charge zero, one subgroup tested at charge two, and one subgroup tested at charge four.

4.5.3.2 Production test. The cartridges for production lot acceptance shall be conditioned at  $70^{\circ}\text{F} \pm 2.5^{\circ}\text{F}$ . The sample for the first three production lots (111) shall be separated into three equal groups; one group tested at charge zero, one group tested at charge two, and one group tested at charge four.

## MIL-C-70781 (AR)

After three consecutive lots have complied with the acceptance requirements, the production lot sample (90) shall be separated into two groups; one group tested at charge zero, and one group tested at charge four. All cartridges from the ballistic sample shall be radiographed prior to shipment to the ballistic test facility. Film from acceptable lots may be discarded. The cartridge shall be fired from a standard 60MM Lightweight Company Mortar System (LWCMS) mortar at an elevation of 45° from a hard mount (a solid base test fixture) within two minutes after removal from the conditioning chamber. The individual velocities, pressures, deflections, and ranges shall be recorded on the firing record. Observation shall be made for misfires and duds, and shall be recorded. Should a premature burst or metal parts separation occur, a photograph shall be taken of the evidence and attached to the firing record. The velocity and range standard deviations and arithmetic averages shall be calculated and recorded. Range probable error shall be calculated and recorded. Temperature of the day, weather and the time of firing shall also be recorded. Hawk radar shall be used to observe for metal parts separation, unobserved short rounds and unobserved duds. In these events, an analysis should be made of the radar data and should be noted on the firing record. This shall include a comparison of times of flight of the unobserved rounds with that of the normal rounds. Prints of the radar traces of these rounds, and prints of the preceding and succeeding rounds, shall be attached to the firing record. Data from ballistically acceptable lots may be discarded. A smear camera shall be used to photograph all test samples. The camera shall be positioned to pick up each round just outside the second velocity coil. Should an unobserved dud, short round or any other abnormal performance occur, a photo print of these rounds, and prints of all the other rounds in the particular charge zone, shall be attached to the firing record. Film from acceptable lots may be discarded.

4.5.3.3 Test validity. If for any reason the proving ground personnel considers that the test conditions have detrimentally affected the test results, the test results shall be declared invalid and a new test shall be performed on additional sample cartridges.

4.5.4. Damaged propelling charge. To ascertain that a damaged propelling charge is to be classed as critical or major, the following procedure shall be used:

## MIL-C-70781 (AR)

a. Place the damaged charge on a M27 fin, oriented such that the propellant would be resting against the damaged surface.

b. The fin-charge shall be hand-shaken vigorously three times.

c. Examination shall be made for propellant spillage - if any propellant is observed, the damaged propelling charge shall be classed as a critical defect; if no propellant is observed, the damaged propelling charge shall be classed as a major defect.

4.5.5. Radiographic examination. The ballistic sample cartridges (WP filled) shall be subjected to radiographic examination. The radiographic beam shall form a 90° angle with the longitudinal axis of the projectile. Examination of the radiograph shall be made to determine the presence of the burster pad in the burster casing, part missing or improperly assembled, as well as cracks, foreign material or similar defects. Radiographic equipment, operations and procedures shall be qualified in accordance with MIL-STD-453. In addition, the sensitivity of the radiographic technique shall be 2.0 percent, and the photographic density of the film used shall be no less than 1.25, as determined in accordance with 4.5.5.2. In the event an original radiograph leaves doubt as to its acceptability, the cartridge shall be re-radiographed at an angle 90° from that of the original exposure and in the same plane.

4.5.5.1 Sensitivity check of radiographic technique. The sensitivity of the radiographic technique shall be determined by the means of a penetrometer fabricated as specified herein. Location of the penetrometer hole shall be 4 1/4 inches measured from base shoulder of projectile body toward fuze nose threads. The projectile, with attached penetrometer, shall be positioned between the radiographic source and the radiographic film with the penetrometer facing the radiographic source. When radiographing a group of projectiles on a rotating ring, the penetrometer, taped to a projectile, may be used to represent the group when checking sensitivity. The sensitivity of the radiographic technique shall be considered satisfactory when the image of the penetrometer, including the holes, is sharply defined on the radiograph. The penetrometers shall be made of steel having an approximate specific gravity of 7.8. Penetrometer thickness shall be .020 plus or minus (+) .010 inches. Each penetrometer shall have a circular hole with a diameter twice that of the penetrometer thickness. For further details on construction of the penetrometers, see MIL-STD-453. Frequency of sensitivity check shall be no less than one in each fifty (50) radiographs.

## MIL-C-70781 (AR)

4.5.5.2 Check of photographic density of film. The photographic density of the film shall be determined on the film in the region of the maximum equivalent thickness to be radiographed. Film density shall be checked each hour of operation, or fraction thereof, for each film processor. Greater frequency shall be required for any period during which difficulty is encountered in establishing the required densities. To judge densities, it is recommended that standards be used. Comparison of the film with standards may be made visually; however, the use of a densitometer is recommended.

4.5.5.3 Personnel qualification and certification. Personnel performing the radiographic examination in accordance with paragraph 4.5.5 shall meet the qualification and certification requirements defined in MIL-STD-410 as follows:

4.5.5.3.1 Set up and calibration. Level II.

4.5.5.3.2 Operator. Level I.

4.5.5.3.3 Documentation. The contractor will prepare and submit for approval, in accordance with data item description DI-S-3628 and the DD Form 1423, his detailed procedures for qualification and certification of personnel performing the non-destructive testing procedures required herein.

## 5. PACKAGING

### 5.1 Unit packaging.

5.1.1 Level A. The filled and cleaned cartridge shall be preserved in accordance with (Dwg.) 15-12-352. Eight each cartridges shall be packed together in a container in accordance with (Dwg.) 15-12-358. The container shall have a maximum air leakage rate of .40 atmospheric cubic centimeters per second when 3.0 pounds per square inch gage (psig) minimum external vacuum is applied when tested as specified in 4.5.1. Cartridges shall be oriented in a fuze end up configuration.

5.1.2 Level B. Same as level A.

5.1.3 Level C. Same as level A.



## MIL-C-70781 (AR)

5.2 Packing.

5.2.1 Level A. Two each metal ammunition containers, having eight M722 cartridges per container, shall be packed together in a fuze end up configuration in accordance with the packing requirements for the M720 cartridge shown on (Dwg.) 9293440.

5.2.2. Level B. Same as level A.

5.2.3 Level C. Same as level A.

5.3 Marking.

5.3.1 Level A. The spirally wound, fiber ammunition container shall be marked in accordance with (Dwg.) 15-12-359. Each metal ammunition container shall be marked in accordance with (Dwg.) 15-12-358. Each wood shipping container shall be marked in accordance with (Dwg.) 15-12-361.

5.3.2 Level B. Same as level A.

5.3.3 Level C. Same as level A.

## 6. NOTES

6.1 Intended use. This item is intended for use with 60mm mortars.

6.2. Ordering data. See MIL-A-48078.

6.3. Submission of test data. One copy of proving ground ballistic acceptance test data (i.e., firing record) shall be forwarded to each of the following:

Commander  
U.S. Army Armament Research, Development and  
Engineering Center  
ATTN: AMSMC-QAT-B (D), Bldg #62  
Picatinny Arsenal, NJ 07806-5000

6.4 Submission of inspection equipment designs for approval. See para 6.2.3 of MIL-A-48078. Submit designs as required to:

Commander, U.S. Army Armament, Munitions and  
Chemical Command  
ATTN: AMSMC-QAT-I (D), Bldg. #62  
Picatinny Arsenal, NJ 07806-5000

This address will be specified on the Contract Data Requirements List, DD Form 1423 in the contract. Unless otherwise specified, data item DI-R 1714 will apply.

MIL-C-70781 (AR)

6.5 Drawings. Drawings listed in Section 2 of this specification under the headings U.S. Army Armament Research, Development and Engineering Center (ARDEC) may also include drawings prepared by, and identified as Edgewood Arsenal, Frankford Arsenal, Rock Island Arsenal, Picatinny Arsenal or ARRADCOM drawings. Technical data originally prepared by these activities is now under the cognizance of ARDEC.

6.6 Subject term (key word) listing.

Burster  
White phosphorous (WP)

Custodian:  
Army-AR

Preparing activity:  
Army-AR

(Project 1310-A451)

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

MIL-C-70781 (AR)

2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

VENDOR

USER

MANUFACTURER

OTHER (Specify): \_\_\_\_\_

b. ADDRESS (Street, City, State, ZIP Code)

## 5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

## 6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)

DD FORM 1426  
82 MAR

PREVIOUS EDITION IS OBSOLETE.

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)