

INCH-POUND

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2 July 2003
SUPERSEDING
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5 November 1984
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22 April 1977

DETAIL SPECIFICATION

CARTRIDGE, 40MM: practice, M781

Reactivated after 2 July 2003 and be used for new and existing designs and acquisitions

This specification is approved for use by the U.S. Army Armament Research, Development and Engineering Center, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the fabrication and manufacture of one type of cartridge designated as CARTRIDGE, 40mm: practice, M761.

1. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents in other section of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents

2.2.1 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 cited in the solicitation or contract (see 6.2)

Comments, suggestions, or questions on this document should be addressed to: Commander, U.S. Army TACOM-ARDEC, ATTN: AMSTA-AR-QAD, Picatinny Arsenal, New Jersey 07806-5000. Since contact information can change, you may want to verify the currency of this address information using the ASSIST online database at www.dodssp.daps.mil

AMSC N/A

FSC 1310

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SPECIFICATIONS

DEPARTMENT OF DEFENSE

- MIL-P-20444 - Primer, Percussion, M42 Parts for and Loading, Assembling and Packing
- MIL-A-70625 - Automated Acceptance Inspection Equipment Design, Testing and Approval, of

STANDARDS

MILITARY

- MIL-STD-1168 - Ammunition Lot Numbering and Ammunition Data Card
- MIL-STD-1916 - DoD Preferred Methods for Acceptance of Product
- MIL-STD-2073-1 - Standard Practice for Military Packaging

(Copies of these documents are available online at www.dodssp.daps.mil or <http://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094)

2.2.2 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 of these documents are those cited in the solicitation or contract (see 6.2).

DRAWINGS (see 6.5)

U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (ARDEC)

PRODUCT AND PACKING DRAWINGS

- 9322240 - Cartridge, 40mm, Practice, M781
- 9325894 - Packing and Marking for Box, Inner
- 9325896 - Packing and Marking for Box, Packing

INSPECTION EQUIPMENT DRAWINGS

- 8827889 - Gage, Receiver, Profile and Alignment, 40MM Cartridge
- 8827890 - Gage, Plug, Acceptance, Check
- 8827895 - Limit Check
- 12012006 - Barrel

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PUBLICATIONS

TM 9-1010-221-10 - Operator's Manual Grenade Launcher,
40 MM, M203

(Copies of these drawings may be requested by email from bhoracek@pica.army.mil or from U.S. Army TACOM-ARDEC, AMSTA-AR-QAA, Picatinny Arsenal, NJ 07806-5000. The Technical Manual is available from AMSTA-AR-QAC-C.)

CODE OF FEDERAL REGULATIONS

49 CFR-100-199 - Interstate Commerce Commission Rules
and Regulations for the Transportation
of Explosive and Other Dangerous
Article

(Copies of this document are available online at www.access.gpo.gov/nara/cfr or from the Superintendent of Documents, US Government Printing Office, Washington, DC 20315. Orders for the above publications, should cite 49 CFR 100-199).

2.3 Non-Government publications. The following document form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

ASTM B 117 - Standard Method of Salt Spray (Fog)
Testing.

(Copies may be requested online at www.astm.org or ordered from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959).

2.4 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.

1. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample of cartridges shall be subjected to first article inspection in accordance with 4.3.

3.2 Materials. Materials shall be in accordance with the applicable drawings and specifications.

3.3 Components and assemblies. The cartridge shall comply with all requirements specified on Drawing (Dwg.) 9322240, all associated drawings, and with all requirements in applicable specifications.

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3.4 Primer functioning. The primer shall function without evidence of squibbing or hangfire. Paragraph 6.6 of MIL-P-20444 contains definitions of functioning failures.

3.5 Production control check on .38 caliber case assembly. The primer shall function without evidence of squibbing, hangfire, or misfire.

3.6 Functioning. The cartridge shall function satisfactorily at hot ($105^{\circ} \pm 5^{\circ}\text{F}$), ambient ($70^{\circ} \pm 5^{\circ}\text{F}$) and cold ($-5^{\circ} \pm 5^{\circ}\text{F}$) temperature and the projectile shall have a mean velocity of 247 plus or minus (\pm) 7 feet-per-second (f.p.s.) when measured 20 feet from the muzzle in accordance with (IAW) 4.5.4 and a standard deviation not exceeding 4.5 f.p.s (para 6.4). For both the hot and cold temperature phases, mean velocity and standard deviation shall be recorded for informational purposes only. At all temperatures the projectile shall produce a visible signature upon impact.

3.7 Ammunition lot numbering. Ammunition lot numbers shall be assigned in accordance with MIL-STD-1168.

3.8 Workmanship. All parts and assemblies shall be fabricated, loaded and assembled in a thorough and workmanlike manner. They shall be free of burrs, chips, sharp edges, cracks, dirt, grease, rust and other foreign matter. The cleaning method used shall not be injurious to any parts, nor shall the cleaning agents contaminate the parts. Exterior surface coatings shall be continuous; however a few light scratches not exposing base material may be permitted. All marking and stamping shall be neat and sharply defined.

4. VERIFICATION

TABLE I. Requirements/Verification cross-reference matrix

METHOD OF VERIFICATION	CLASSES OF VERIFICATION
N/A - Not applicable	A - First article
1 - Analysis	B - Conformance
2 - Demonstration	
3 - Examination	
4 - Test	

Section 3 Requirement	Verification Methods					Verification Class		Section 4 Verification Procedures
	NA	1	2	3	4	A	B	
3.1					X	X		4.3
3.2		X		X	X	X	X	4.4
3.3				X	X	X	X	4.3/4.4
3.4					X	X	X	4.5.2
3.5					X	X	X	4.5.3
3.6					X	X	X	4.3.2/4.5.4
3.7				X		X	X	4.5.8

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3.8			X		X		X	4.5.9
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4.1 Classification of verification. The verification requirements specified herein are classified as follows:

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

4.2 Verification conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in Table I.

4.3 First article inspection. When specified in the contract, a sample of 300 cartridges, 40mm, training, M781 shall be subjected to first article verification in accordance with Table II.

4.3.1 First article quantity. First article verification shall be performed in accordance with Table II.

4.3.2 First article rejection. If any item of the sample fails to comply with the first article requirements, the sample shall be rejected. During the functioning test, the first article shall be rejected if one or more of following occur:

- a. Any primer blow back in any phase (as evidenced by perforation of the cup or extrusion of the primer around firing pin causing difficulty in opening weapon).
- b. Mean velocity or standard deviation fails to meet the applicable requirement (ambient only, informational in hot and cold phase). Velocity measurements on projectiles, which separate or emit dye within 26 feet of the muzzle, shall not be included in the mean velocity and standard deviation calculations.
- c. One (1) or more squibs or hangfires in any temperature phase. Two (2) or more primer misfires in all temperature phases. If a cartridge fails to fire in the first attempt, it will be classified as a failure.
- d. No more than nine (9) projectile failures are permitted, including separations, dye emissions in flight, or failures to emit dye on impact.
- e. Any projectile sticks in the gun bore in any temperature phase or fails to attain a minimum velocity of 144 fps. A projectile for which a velocity measurement was not obtained due to low velocity shall be cause for rejection of the lot.

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- f. Three (3) or more primers show any evidence of gas leakage (discoloration of cartridge case base).
- g. One (1) or more cartridges cases cannot be automatically ejected clear of the launcher with a single forward slide of the barrel.

4.3.3 Weapon application for first article. The cartridges shall be fired using two (2) randomly selected (chosen by Government inspector) M203 barrels, two-hundred (200) cartridges on one (1) M203 barrel at ambient and one-hundred (100) cartridges on one (1) M203 barrel for both hot/cold temperatures.

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TABLE II. First article inspection

Cartridge and Components

<u>Examination or Test</u>	<u>No. of Sample Units</u>	<u>Requirement Paragraph</u>	<u>Inspection Method</u>
Windshield (Dwg. 9322236) Examination for defects	25 (Note 1)	3.3	4.4.2.1
Case, Cartridge (Dwg. 9322230) Examination for defects	25 (Note 1)	3.3	4.4.2.2
Body Assembly (Dwg. 9310344) Examination for defects	25 (Note 1)	3.3	4.4.2.3
Salt Spray	5	3.3	4.4.2.3
Projectile Assembly (Dwg. 9310345) Examination for defects	25	3.3	4.4.2.4
.38 Caliber Case Assembly (Dwg. 9322238) Examination for defects	25	3.3	4.4.2.5
Cartridge Case Loading Assembly, M212 (Dwg. 9322239) Examination for defects	25	3.3	4.4.2.6
Cartridge, 40mm, Practice, M781 (Dwg. 9322240) Examination for defects	300	3.3	4.4.2.7
Functioning Test	300	3.6	4.5.4/4.3.3
Hot ($105^{\circ} \pm 5^{\circ}\text{F}$)	50	3.6	4.5.4.1/4.3.2
Ambient ($70^{\circ} \pm 5^{\circ}\text{F}$)	200	3.6	4.5.4.2/4.3.2
Cold ($-5^{\circ}\text{F} \pm 5^{\circ}\text{F}$)	50	3.6	4.5.4.3/4.3.2

Note 1 - Sample quantity to be prorated by the number of mold cavities.

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4.4 Conformance inspection

4.4.1 Inspection lot formation. Lot formation shall be in accordance with paragraph 4.2.2 of MIL-STD-1916. For the components identified below, each inspection lot of cartridges shall be produced with components from a single manufacturer and from individual lots manufactured under the same interfix:

- a. M212 cases
- b. Projectile body
- c. Windshield
- d. Primers and .38 cases
- e. M9 Propellant

4.4.2 Classification of characteristics

- a. Inspection sampling requirements for Major and Minor characteristics are as defined in MIL-STD-1916, Table I and Table II. Verification Level IV shall be used for all characteristics defined as Majors and Verification Level III for all Minor characteristics; Critical characteristics shall be addressed in accordance with paragraph 4.4 of MIL-STD-1916.
- b. Conformance inspection shall be performed in accordance with paragraphs 4.4.2.1 through 4.4.2.11, of Table III.

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TABLE III. Conformance inspection

CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
				9322236
4.4.2.1	Windshield			NEXT HIGHER ASSEMBLY
				9310345
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
<u>Critical</u>	None defined			
<u>Major</u>				
101	Outside diameter	Level IV	3.3	Gage
102	Diameter large cavity	Level IV	3.3	Gage
103	Large wall thickness	Level IV	3.3	Gage
104	Diameter between lobes (See Note 1)	Level IV	3.3	Gage
105	Runout of break-up diameter	Level IV	3.3	Gage
<u>Minor</u>				
201	Runout of Outside diameter with large cavity	Level III	3.3	Gage
202	Evidence of poor workmanship	Level III	3.8	Visual
Notes: 1 - Applicable only to part number 9322236-2.				

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TABLE III. Conformance inspection

CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER 9322230
4.4.2.2	Case, Cartridge, M212			NEXT HIGHER ASSEMBLY 9322239
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
<u>Critical</u>	None defined			
<u>Major</u>				
101	Total Length	Level IV	3.3	Gage
102	Second largest outside diameter	Level IV	3.3	Gage
103	Depth of cavity from rear of case	Level IV	3.3	Gage
104	Largest outside diameter	Level IV	3.3	Gage
105	Diameter flash hole	Level IV	3.3	Gage
106	True position of second largest inside diameter with second largest outside diameter	Level IV	3.3	Gage
107	True position of largest outside diameter with second largest outside diameter	Level IV	3.3	Gage
108	Width of groove lip (applicable only to alternate configuration with annular groove)	Level IV	3.3	Gage
<u>Minor</u>				
201	Thickness of flange	Level III	3.3	Gage
202	Depth of counterbore	Level III	3.3	Gage
203	Largest inside diameter, open end	Level III	3.3	Gage
204	Second largest inside diameter, open end	Level III	3.3	Gage
205	Evidence of poor workmanship	Level III	3.8	Visual
Notes:				

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TABLE III. Conformance inspection

CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER 9310344
4.4.2.3	Body Assembly			NEXT HIGHER ASSEMBLY 9310345
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
<u>Critical</u>	None defined			
<u>Major</u>				
101	Diameter forward of rotating bands	Level IV	3.3	Gage
102	Diameter rear of rotating bands	Level IV	3.3	Gage
103	Diameter of rotating bands	Level IV	3.3	Gage
104	Diameter between Rotating bands	Level IV	3.3	Gage
105	Diameter of cartridge case snap groove	Level IV	3.3	Gage
106	Salt spray (Note 1)	2 per 8-hr shift	3.3	4.5.7
107	Maximum diameter of windshield snap groove (see Note 2)	Level IV	3.3	Gage
<u>Minor</u>				
201	Distance from rear of body to rotating band	Level III	3.3	Gage
202	Evidence of poor workmanship	Level III	3.8	Visual

Notes:

1 - The production represented by the 8-hour shift sample shall be rejected if any white corrosion is visible to the unaided eye at normal reading distance in any location on the band surface of the body, but not including the edges, when salt spray tested in accordance with 4.5.7.

2 - Applicable only to p/n 9310344-2.

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TABLE III. Conformance inspection**CLASSIFICATION OF CHARACTERISTICS**

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
				9310345
4.4.2.4	Projectile Assembly (See Note 1)			NEXT HIGHER ASSEMBLY
				9322240
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
<u>Critical</u>	None defined			
<u>Major</u>				
101	Total weight of projectile incorrect (See Note 2)	Level IV	3.3	Balance
102	Windshield loose	Level IV	3.3	Manual-Visual
<u>Minor</u>				
201	Excessive Gap	Level III	3.3	Gage
202	Evidence of poor workmanship	Level III	3.8	Visual
Notes:				
1 - This table is only applicable to manual and automated assembly processes that allow for inspection of the projectile independently. For automated or manual processes that do not allow for inspection of the projectile assembly the inspection requirements defined here shall be performed on the final assembly (see 4.4.2.7). See Note 2 for Major 101 exception.				
2 - If inspection is to occur at final assembly as defined in Note 1, Major 101 shall not be inspected for. Total cartridge weight shall be inspected at final assembly in lieu of this requirement.				

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TABLE III. Conformance inspection**CLASSIFICATION OF CHARACTERISTICS**

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
				9322238
				NEXT HIGHER ASSEMBLY
				9322239
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
<u>Critical</u>				
1	Primer above flush	100%	3.3	Gage
2	Propellant weight, min (See Note 1)	100%	3.3	AAIE, 4.5.5 (See 6.6- 6.9)
<u>Major</u>				
101	Primer more than .003 below surface of case	Level IV	3.3	Gage
102	Propellant weight, max (See note 2)	100%	3.3	AAIE, 4.5.5
103	Production control check	4.5.3	3.5	4.5.3
<u>Minor</u>				
201	Total length	Level III	3.3	Gage
202	Evidence of poor workmanship	Level III	3.8	Visual
Notes:				
1 - Any assembly found with less than 75% of the assessed propellant load will be classified as critical defect.				
2 - Any assembly found to have a propellant load outside of drawing tolerance shall be classified as major defect with the exception of those having less than 75% of the assessed load for which note 1 applies.				

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TABLE III. Conformance inspection

CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
				9322239
				NEXT HIGHER ASSEMBLY
				9322240
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
<u>Critical</u>	None defined			
<u>Major</u>				
101	.38 Caliber case assembly above outer surface of case (see note 2)	Level IV	3.3	Gage
102	.38 Caliber case assembly more than .008 below outer surface of case (see note 2)	Level IV	3.3	Gage
<u>Minor</u>				
201	Lacquer missing	Level III	3.3	Visual
202	Marking misleading or unidentifiable	Level III	3.3	Visual
203	Evidence of poor workmanship	Level III	3.8	Visual
Notes:				
1 - This table is only applicable to manual and automated assembly processes that allow for inspection of the cartridge case loading assembly independently. For automated or manual processes that do not allow for inspection of the cartridge case loading assembly the inspection requirements defined here shall be performed on the final assembly (see 4.4.2.7).				
2 - When annular groove design is used (see Note 5 of Dwg. 9322230), outer surface refers to the outer ring.				

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TABLE III. Conformance inspection**CLASSIFICATION OF CHARACTERISTICS**

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER 9322240
4.4.2.7	Cartridge, 40mm, Practice, M781 (see Note 1)	NEXT HIGHER ASSEMBLY		
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
<u>Critical</u>	None defined			
<u>Major</u>				
101	Projectile assembly loose	Level IV	3.3	Manual-Visual
102	Chamber gage (see Note 2)	100%	3.3	8827889, 8827890, 8827895/Note 4
103	Total weight (see Note 3)	Level IV	3.3	Balance
104	Functioning (Hot, Ambient, Cold) (see Note 5)	216	3.6	4.5.4
<u>Minor</u>				
201	Total length	Level III	3.3	Gage
202	Marking misleading or unidentifiable	Level III	3.3	Visual
203	Excessive Gap	Level III	3.3	Gage
204	Evidence of poor workmanship	Level III	3.8	Visual
Notes:				
1 - Additional inspection requirements of 4.4.2.4 and 4.4.2.6 shall apply to this assembly, if not previously satisfied by lower assembly level inspections. See 4.4.2.4 and 4.4.2.6 regarding applicability.				
2 - The contractor may elect to conduct 100% chamber gaging prior to complete cure of sealants but shall, after curing is complete, subject a sample of cartridges to chamber gaging. The Government must approve the cure time. The sample size shall be 315 with accept on zero and reject the lot on one failure.				
3 - Major 103 is only required if the projectile weight has not been inspected per 4.4.2.4. See note 1 and 4.4.2.4.				
4 - The contractor may elect to conduct chamber gaging with an approved chamber gage that is part of automatic assembly operation but shall, after curing, satisfy the requirements of Note 2 using the manual government design.				
5 - All functional test samples shall be pulled after complete cure of the sealant.				

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TABLE III. Conformance inspection

CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER 9325894
4.4.2.8	Unsealed fiber box			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
<u>Critical</u>	None defined			
<u>Major</u>				
101	Improper number of cartridges	Level IV	3.3	Visual
102	Separator missing	Level IV	3.3	Visual
<u>Minor</u>				
201	Evidence of poor workmanship	Level III	3.8	Visual
Notes:				

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TABLE III. Conformance inspection

CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
				9325894
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
4.4.2.9	Packing and Marking for Box, Inner (Prior to and after Sealing Bag)			NEXT HIGHER ASSEMBLY
<u>Critical</u>	None defined			
<u>Major</u>				
101	Container damaged	Level IV	3.3	Visual
102	Corners not blunted	Level IV	3.3	Visual
103	Heat seal test of packing seals (after sealing bag)	Note 1	3.3	4.5.6
104	Marking misleading or unidentifiable	Level IV	3.3	Visual
<u>Minor</u>				
201	Contents loose	Level III	3.3	Manual
202	Evidence of poor workmanship	Level III	3.8	Visual
Notes:				
1 - Sampling and rejection shall be in accordance with MIL-STD-2073-1.				

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TABLE III. Conformance inspection

CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER 9325896
4.4.2.10	Packing and Marking for Box, Packing (Before closing box)			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
<u>Critical</u>	None defined			
<u>Major</u>				
101	Marking of bag misleading or unidentifiable	Level IV	3.3	Visual
102	Bag torn or perforated	Level IV	3.3	Visual
103	Bag improperly sealed	Level IV	3.3	Visual
<u>Minor</u>				
201	Evidence of poor workmanship	Level III	3.8	Visual
Notes:				

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TABLE III. Conformance inspection

CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
				9325896
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
4.4.2.11	Packing and Marking for Box, Packing (After Sealing)			NEXT HIGHER ASSEMBLY
<u>Critical</u>	None defined			
<u>Major</u>				
101	Box damaged	Level IV	3.3	Visual
102	Metallic seal missing or improperly positioned	Level IV	3.3	Visual
103	Marking misleading or unidentifiable	Level IV	3.3	Visual
<u>Minor</u>				
201	Contents loose	Level III	3.3	Visual/Manual
202	Evidence of poor workmanship	Level III	3.8	Visual
Notes:				

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4.5 Methods of verification.

4.5.1 Check test for deterioration of primers (See MIL-P-20444). If the total time between original acceptance of any lot and the assembly of that lot into the cartridge case exceeds two years, or if the primers have been subjected to adverse conditions, however brief, at any time since previous tests, the primer lot shall be subjected to and must satisfactorily pass the check test for deterioration specified in MIL-P-20444.

4.5.2 Primer functioning. Sampling shall be in accordance with paragraph 4.2.3.2.2 of MIL-P-20444, except that the sample size shall be eight hundred (800) primers from each lot. If one or more primers fail to comply with the applicable requirement, the lot shall be rejected. Primers not originally purchased to this requirement shall be tested for the requirement of paragraph 3.4. Each primer of the 800 samples shall be tested as specified in paragraph 4.3.2.2 of MIL-P-20444.

4.5.3 Production control check on .38 caliber case assembly. This is a test of the primer function after assembly to the .38 caliber case. The contractor at his own risk may conduct this test at higher levels of assembly but all requirements defined below remain unchanged. Five (5) .38 caliber loaded case assemblies shall be randomly selected from every two (2) hours of production from each primer assembly machine. The loaded .38 case assemblies produced by each primer assembly machine shall be kept segregated and identified. They shall not be used until this test has been performed. The loaded .38 cases shall be assembled to the M212 case IAW drawing 9322239 or as full M781 cartridges IAW drawing 9322240 (adhesive bond of the .38 cal case assembly to the M212 case assembly is optional). The final contractor chosen assembly shall be fired from an approved launcher placed on an approved mount. Alternatively, any other method approved by the procuring agency may be used for this test. Observation shall be made for primer function IAW paragraph 3.5. If any sample fails to comply with the applicable requirement, the two hours production of primer .38 caliber cases represented by the sample shall be rejected. This applies regardless to the level of assembly being tested. If .38 caliber cases are purchased with primers, the supplier must separate the cases by primer machine. The contractor will then select a sample from each primer machine and load them into M212 cartridges cases and fire them; acceptance criteria remains the same. The sample will be randomly selected using a verification level IV.

4.5.4 Functioning test. The Government inspector shall select two hundred and sixteen (216) cartridges from each lot for this test. The cartridges shall be fired using two (2) randomly selected (chosen by Government inspector) M203 barrels, one-hundred forty-four (144) cartridges on one (1) M203 barrel at ambient temperature and seventy-two (72) cartridges on one (1)

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M203 barrel for both hot/cold temperatures.

The cartridges to be tested shall be conditioned for a minimum of eight (8) hours at the temperatures defined in 4.5.4.1 through 4.5.4.3. The cartridges shall be taken from the conditioning chamber and fired within five (5) minutes after being removed from temperature conditioning. The firings shall occur in a M203 Grenade Launcher with a barrel in accordance with Dwg.12012006 placed on an approved mount to impact at 200 meters minimum from the launcher onto a six-inch thick loose gravel pad. The gravel used shall have ½ inch maximum stone size. Observation shall be made for the applicable projectile performance requirements. See paragraph 4.5.4.5 for additional requirements with respect to velocity measurements and M203 barrels.

4.5.4.1 Hot temperature ($105^{\circ} \pm 5^{\circ}\text{F}$). Thirty-six (36) samples shall be tested at this temperature.

4.5.4.2 Ambient temperature ($70^{\circ} \pm 5^{\circ}\text{F}$). One hundred and forty four (144) samples shall be tested at this temperature.

4.5.4.3 Cold temperature ($-5^{\circ} \pm 5^{\circ}\text{F}$). Thirty-six (36) samples shall be tested at this temperature.

4.5.4.4 Rejection. Unless otherwise specified, the allowable number of failures is the total of all failures at all temperature phases. The lot shall be rejected if one or more of following occur:

- a. Any primer blow back in any phase (as evidenced by perforation of the cup or extrusion of primer around firing pin causing difficulty in opening weapon).
- b. Mean velocity or standard deviation fails to meet the applicable requirement (ambient only, informational in hot and cold phase). Velocity measurements on projectiles, which separate or emit dye within 26 feet of the muzzle, shall not be included in the mean velocity and standard deviation calculations.
- c. One (1) or more squibs or hangfires in any temperature phases. Two (2) or more primer misfires in all temperature phases. If a cartridge fails to fire in the first attempt, it will be classified as a failure.
- d. More than seven (7) projectile failures occur, including separations, dye emissions in flight, or failure to emit dye on impact.
- e. Any projectile sticks in the gun bore in any

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temperature phase or fails to attain a minimum velocity of 144 fps. A projectile on which a velocity measurement was not obtained due to the low velocity shall be cause for rejection of the lot.

- f. Three (3) or more primers show any evidence of gas leakage (discoloration of cartridge case base).
- g. One (1) or more cartridge cases cannot be automatically ejected clear of the launcher with a single forward slide of the barrel.

4.5.4.5 Velocity Measurement. The velocity shall be measured at twenty (20) feet from the muzzle of the launcher, using two sets of screens, each set of screens having an electronic counter. One set of screens shall be placed 14 and 26 feet from the launcher and the other set 15 and 25 feet from the launcher.

Note: To insure that the chronographs are read properly, the ratio of the two times shall not differ from 1.200 by more than plus or minus 0.005. If the ratio differs from 1.200 by more than plus or minus 0.005, the velocity results for that round shall be recorded but excluded from the calculation of mean velocity and standard deviation (no more than eight (8) rounds in a sample of 144 or eleven (11) rounds in a sample of 200 may be excluded). If the applicable number of improper ratios is exceeded, additional rounds must be fired. Observation shall be made and results recorded for functioning, mean velocity and standard deviation. The average of all rounds fired per sample (except above noted improper ratio(s)) shall meet the requirements of 3.6.

4.5.4.6 M203 Barrel for Test. The barrels that are used for testing shall comply with Dwg.12012006 except the average readings of the land diameter when measured with a two (2) or three (3) element gage at a distance of 2.5 inches from the chamber end of the barrel and 0.25 inches from the muzzle end of the barrel shall not exceed 1.611 inches. If the barrel land diameter exceeds 1.611, that barrel shall be retired from service. Routine maintenance, cleaning, and lubrication shall be performed in accordance with TM 9-1010-221-10 every 250 rounds or at the end of each days firing. It is advisable that the propellant charge weight be assessed using the same M203 barrel that will be used for the functioning test.

4.5.5 Inspection equipment. The inspection equipment required to perform the examination and tests prescribed herein is described in the Inspection Method Column in the tables starting with paragraph 4.4.2.1. Any automated acceptance inspection equipment (AAIE) prove-out shall be performed as following and in accordance with MIL-A-70625:

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4.5.5.1 Redundant inspection equipment. The contractor may elect to use redundant inspection equipment in lieu of using a single piece of equipment with a very low error rate. Where redundant equipment is used, the inspection system error rate is defined as the error rates of the two pieces of equipment multiplied together.

4.5.5.2 Automated acceptance inspection equipment. Equipment for which no, or minimal, human involvement is required in the acceptance determination. This would include equipment-employing probes/sensors/transducers that are automatically manipulated to perform measuring and detection functions. If readout is provided, the equipment will be categorized as automated even if operator interpretation is needed in the accept/reject decision.

4.5.6 Heat seal test of packing seal. This test shall be performed in accordance with specification MIL-STD-2073-1.

4.5.7 Salt spray. This test shall be conducted in accordance with ASTM B 117 for 48 hours using 5 % salt solution.

4.5.8 Ammunition lot numbering. Visually verify that an ammunition lot number has been assigned to each lot as described in MIL-STD-1168.

4.5.9 Workmanship. Visually verify that all parts and assemblies meet requirements of paragraph 3.8.

5. PACKAGING

For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DOD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. This specification covers the component parts and loading, assembling and packing for Cartridge, 40MM, Practice, M781.

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6.2 Acquisition requirements. Acquisition documents must 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 2.2.1)
- c. Requirements for submission of first article sample
- d. Requirement for submission of inspection equipment designs (see 6.3).
- e. Applicable national stock number.
- f. Packaging requirements, if other than specified in Section 5.
- g. Serialization requirements, if applicable.
- h. Certificate of conformance for each lot or shipment of product, if applicable.
- i. Government Furnished Material or equipment.

6.3 Submission of inspection equipment designs for approval.

Submit equipment designs as required to Commander, ARDEC, ATTN: AMSTA-AR-QAC-C, Picatinny Arsenal, NJ 07806-5000. Request letter of submittal should state contractor, contract number, specification number, item nomenclature and classification of defects or test paragraph.

Inspection equipment, inspection method and the frequency of inspection should be submitted for approval to ARDEC, ATTN: AMSTA-AR-QAC-C, Picatinny Arsenal, NJ 07806-5000.

The contractor should submit for approval inspection equipment designs in accordance with terms of the contract. If contractor is to use their own M203 Grenade Launcher, the contractor should provide inspection gage/procedures on how M203 Grenade Launcher will be maintained.

6.4 Standard deviation should be calculated from the following formula:

$$S = \sqrt{\frac{\sum (X - \bar{X})^2}{n-1}}$$

where: X = each individual value

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$$\bar{X} = \frac{\sum X}{n} = \text{sample arithmetic mean}$$

n = sample size

$\sum (X - \bar{X})^2$ = the sum of the squares of the differences between the sample mean and each individual value.

6.4.1 For a faster and easier method of arriving at the standard deviation formula, the following alternate method may be used:

$$S = \sqrt{\frac{n \sum X^2 - (\sum X)^2}{n(n-1)}}$$

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

6.6 System reliability. The contractor should provide, for each defect identified as critical, a manufacturing and inspection system that assures no more than one in a million contain the defect. This should be assured by controlling the maximum defect rate produced and the error rate of the inspection equipment such that the product of the two terms when multiplied together is less than one in a million.

6.7 Maximum defect rate produced. The maximum defect rate produced should be defined as the largest defect rate expected for the characteristic of concern on a monthly or lot basis. The contractor should establish the maximum defect rate, however, it may not exceed one percent without approval of the procuring contracting officer. Once established, the contractor should monitor the defect rate to assure it does not exceed the maximum rate allotted. If the established maximum defect rate is exceeded, the production of that feature should be terminated until the cause is determined and corrected. Additionally, all product for that period of time should be rejected and reinspected.

6.8 Maximum error rate of the inspection system. The error rate of the inspection equipment should be defined as the expected ratio of the number of defective parts accepted to the number of defective parts inspected by the equipment. The

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contractor, to meet the system requirement as defined in 4.5.5.1, defines the maximum error rate allowed. However, it may not exceed 1/500 without approval of the procuring contracting officer. Based on the maximum error rate defined for the equipment, the contractor should develop a demonstration test procedure to demonstrate the error rate of the equipment. The test should be performed using defective parts or reject standards. No part or standard should be accepted during the test. If a part or standard is accepted, the cause for failure should be isolated and corrected and the test rerun. Unless otherwise specified in the detailed item specification, the minimum number of test samples to be run should be equal to 0.7 divided by the error rate (e.g. If the required error rate is 1/1000, the sample size would be 0.7 divided by (1/1000) = 700).

6.9 Periodic verification. Periodic verification of the system error rate should be performed.

6.10 Key words. Yellow-Orange smoke, Primer, Propellant, Muzzle velocity.

6.11 Revisions/Amendments History. The following is a record of changes incorporated into this document

ECP	Description	Date Approved
R0Q2009	Update/Include Inspection and Accept/Rejection criteria for First Article	07/11/2001
R0Q2018	Update chamber gage requirements	02/15/2001
R0S2031	Remove Alternate Projectile #9381594 and its components from TDPL	08/17/2000
R0S2033	<ul style="list-style-type: none"> • Clarify primer functioning requirement • Move production control check characteristics from the table for the M212 case to the table for the .38 case assembly • Allow production control check to be performed using M212 case or M781 cartridge 	06/14/2001

6.12 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.

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