MIL-C-63989A(AR)
5 October 1984
SUPERSEDING
MIL-C-63989(AR)
1 March 1984

MILITARY SPECIFICATION

CARTRIDGE, 5.56MM, BALL, M855

This specification is approved for use by the US 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 the M855 Ball cartridge for use in 5.56mm weapon systems with a "one in seven" (one revolution in seven inches) barrel twist.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-A-2550	-	Ammunition, General Specification for
MIL-I-45607	-	Inspection Equipment, Aquisition, Maintenance and Disposition of
MIL-A-48078	-	Ammunition, Standard Quality Assurance Provisions, General Specification for
MIL-C-70460	-	Cartridge, 5.56MM, Ball, (Heavy Bullet), Reference

FSC 1305

STANDARD

MILITARY

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-636	-	Visual Inspection Standards for Small Arms Ammunition Through Caliber .50
MIL-STD-644	-	Visual Inspection Standards and Inspection Procedures for Inspection of Packing
MIL-STD-1168	-	Lot Numbering of Ammunition

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.

DRAWINGS

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER (ARDC)

7643674	-	Classification of Cartridge Case Defects for Small Arms Ammunition
9342868	-	Cartridge, 5.56MM, Ball, M855
9342869	-	Bullet, Ball, 5.56MM
9349656	-	Slug
9349657	-	Jacket
9357841	-	Cartridge, 5.56MM, Ball, (Heavy Bullet) Reference
9378276	-	Case

INSPECTION EQUIPMENT

LI-9342868	-	Index of Inspection Equipment Lists for Cartridge, 5.56MM, Ball, M855

PACKAGING & MARKING

9345240	-	Pkg & Mkg; Crtgs, 5.56MM; Cartons; Box, Ammo, M2A1; Box, WRBND
9345243	-	Pkg & Mkg; Crtgs, 5.56MM; 10 Rd Clips; Cartons; Bandoleer, M8; Box, Ammo, M2A1; Box, WRBND

9354586	-	Pkg & Mkg; Crtgs, 5.56MM, Linked; SAW, M249 Ammo Mag; Box, Ammo, M2A1; Box, WRBND
9357711	-	Pkg & Mkg; Box, WRBND; Crtgs, 5.56MM, Ball, M855: Linked: Box, Ammo, M2A1
9357715	-	Pkg & Mkg: Crtgs, 5.56MM, Ball, M855; 10 Rd Clips; Cartons; Bandoleer, M3; Box Ammo, M2A1; Box WRBND
9378319	-	Pkg & Mkg: Crtgs, 5.56MM; Linked; SAW, M249 Ammo Mag: Box, Ammo, M2A1: Box WRBND

PUBLICATIONS

SCATP-5.56MM (Heavy Bullet)	-	Small Caliber Ammunition Test Procedures for 5.56mm (Heavy Bullet) Cartridges
ASTM-E92	-	Method of Test for Vickers Hardness of Metallic Materials

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

2.1.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Cartridge. The cartridge shall comply with all requirements specified on Drawing 9342868, all associated drawings and with all requirements specified in applicable specifications and standards.

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

3.3 Bullet extraction. The force required to extract the bullet from the cartridge case shall not be less than 45 pounds.

3.4 Residual stress. The cartridge case shall not split when subjected to a 1 percent mercurous nitrate solution for 15 minutes.

3.5 Waterproofness. The cartridge shall not release more than one bubble of air when subjected to a positive internal pressure of 7.5 pounds per square inch (psi) for 30 seconds.

3.6 Velocity. The average velocity of the cartridges, conditioned at 70° ± 2°F, shall be 3000 feet per second (fps) plus or minus 40 fps at 78 feet from the muzzle of the weapon. The standard deviation of the velocities shall not exceed 40 fps.

3.7 Chamber pressure. The average chamber pressure of the sample cartridges, conditioned at 70° ± 2°F shall not exceed 55,000 psi. Neither the chamber pressure of an individual sample test cartridge or the average chamber pressure plus three standard deviations of chamber pressure shall exceed 61,000 psi.

3.8 Port pressure. The mean port pressure minus three standard deviations shall not be less than 13,000 psi for sample cartridges conditioned to 70° ± 2°F.

3.9 Penetration. The bullet of the sample cartridges shall demonstrate complete penetration of 10 gage (.135 inch) thickness AISI 1010 to 1020 steel plate target with hardness between RB 55 minimum and RB 70 maximum (NATO plate) positioned at 0 ± 5° obliquity and located 656 yards (600 meters) from the weapon. Additionally an aluminum witness plate (2024-T3 or equivalent nominally 0.020" thick) shall be located 6 inches behind the target to determine penetration. Testing shall be performed when the air temperature is between 30°F and 95°F. This test shall only be performed for the First Article test and for the first three production lots. If the requirements for penetration have been successfully met for the First Article and three (3) consecutive production lots this test may be discontinued.

3.10 Temperature stability. The action time, pressure and velocity of sample cartridges conditioned and fired at the temperature extreme specified below shall be in accordance with the following requirements.

a. Conditioned at 125° ± 2°F for not less than one hour and fired at that temperature.

b. Conditioned at -65° ± 2°F for not less than one hour and fired at that temperature.

3.10.1 Velocity. The average velocities shall not decrease by more than 250 fps with respect to the average velocity of the sample cartridges conditioned at 70 ± 2°F, any increase in velocity is acceptable.

3.10.2 Chamber pressure. The average chamber pressure shall not vary from the average chamber pressure of the sample test cartridges conditioned to 70° ± 2°F by more than 5,000 psi. Any decrease in chamber pressure is acceptable.

3.10.3 Port pressure. The average port pressure shall not vary by more than 2,000 psi from the average port pressure of the sample cartridges of the same lot conditioned at 70 ± 2°F, but not to be less than 12,000 psi.

3.10.4 Action time. The mean action time for these cartridges shall be as stated in paragraph 3.15.

3.11 Accuracy and matching (600 yards).

* 3.11.1 Accuracy. No individual target shall exhibit horizontal or vertical linear standard deviations greater than 7.8 inches at 600 yards.

3.11.2 Matching. The mean point of impact of the test cartridges at 600 yards shall not deviate above or below the mean point of impact of the reference cartridge in a vertical direction, by more than 10.8 inches. (Note: A reference round shall be in accordance with Dwg. 9357841 and shall have passed the testing criteria of MIL-C-70460).

3.12 Function and casualty. The cartridges shall function without casualty at ambient temperature and under the temperature conditions specified below in both the M249 machine gun and M16A2 rifle.

a. Conditioned at 125° ± 2°F for not less than one hour and fired at that temperature.

b. Conditioned at -65° ± 2°F for not less than one hour and fired at that temperature.

* 3.13 Fouling. The fouling accumulated in the M16A2 and M249 weapons during the firing of the sample cartridges shall not cause failure of either weapon to function.

3.14 Bullet integrity. The bullet of the cartridge shall not burst either in its passage through the barrel or in flight; neither shall the jacket of the bullet nor any part thereof strip from the other bullet components when the cartridge is fired.

3.15 Action time. The mean action time plus five standard deviations shall not exceed 3 milliseconds. Action time is defined as the sum of the primer ignition time, propellant burning time, and the time taken by the bullet to reach the gas port.

3.16 Barrel erosion. The average life per weapon barrel of three (3) barrels shall be not less than 10,000 rounds. The barrel life shall be considered as having ended when the average velocity of an individual burst in the test drops 200 ft/sec or more with respect to the average velocity of the initial burst of the test or when the bullets, from twenty percent or more of the cartridges show keyholing; whichever comes first. (Keyholing is defined as yaw exceeding 15^{o} at a range of one thousand (1000) inches.) The test shall be performed on the first article sample only.

3.17 First article test. This specification contains technical provisions for first article examination and testing. Requirements for the submission of the first article sample by the contractor shall be as specified in the contract.

3.18 Workmanship. The requirements for workmanship shall be as specified on applicable drawings, referenced specifications and in accordance with the following:

a. Metal defects. The cartridge shall be free of metal defects which includes, but is not limited to: folds, wrinkles, scratches, scaly metal, dents, perforations, and other discontinuities.

b. Foreign matter. The cartridge shall be free of corrosion, stains, discolorations, dirt, and smears of lacquer.

c. Cleaning. Cleaning methods used shall not be injurious to any part, nor shall the parts be contaminated by any cleaning agent.

d. Contamination of explosive components. Extreme care shall be exercised to avoid contamination of primers and propellant by oil, grease, or other foreign matter.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsbility for inspection. In accordance with MIL-A-48078.

4.2 Inspection equipment. In accordance with MIL-A-48078 (Inspection equipment) and MIL-A-2550 (Test and measuring equipment).

4.3 Classification of inspections. The following types of inspection shall apply:

a. First Article Inspection

b. Quality Conformance Inspection

4.4 First article inspection.

4.4.1 First article sample. The sample shall be manufactured using the same materials, equipment, processes and procedures as will be used in regular production. All parts and materials shall be the same as used for regular production and shall be obtained from the same source of supply. The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with the provisions of 4.4.2. The first article sample shall consist of the following items in sample quantities indicated.

Part Description	Drawing	Quantity
Cartridge, 5.56MM, Ball, M855	9342868	45,000
Bullet, Ball, 5.56MM	9342869	25
Slug	9349656	25
Jacket	9349657	25

4.4.2 Inspections to be performed. First article components and assemblies may be subjected by the Government to any or all of the examinations and tests specified in Table I and to any or all of the requirements of the applicable drawings.

4.4.3 Rejection of first article sample. The first article sample shall be rejected if any of the criteria specified in 4.4.2 is not met. MIL-A-48078 (Rejection) shall apply.

TABLE I. First article inspection

CLASSIFICATION OF DEFECTS & TESTS

MIL-C-63989A(AR)

PARAGRAPH	TITLE		SHEET 1 OF 2		DRAWING NUMBER
	Cartridge, 5.56MM, Ball, M855 and Components				See Below
					NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
	Bullet, Ball, 5.56MM (Dwg. 9342869)				
	Examination for Defects	25	100%	3.2	4.5.6
	Slug (Dwg. 9349656)				
	Examination for Defects	25	100%	3.2	4.5.6
	Jacket (Dwg. 9349657)				
	Examination for Defects	25	100%	3.2	4.5.6
	Cartridge (Dwg. 9342868)				
	Examination for Defects	1/	100%	3.2	4.5.6

NOTES: 1/ From the 45,000 submitted cartridges a sample, selected in accordance with MIL-STD-105, Inspection Level II, shall be examined for defects.

SMC-OA (D) Form 160, 1 Aug 83 replaces edition of 1 Jul 77 which may be used until exhausted.

TABLE I. First article inspection

CLASSIFICATION OF DEFECTS & TESTS

MIL-C-63989A(AR)

PARAGRAPH	TITLE		SHEET 2 OF 2		DRAWING NUMBER
	Cartridge, 5.56MM, Ball, M855				9342868
					NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
*	Bullet extraction 1/	75	2-3	3.3	4.6
	Waterproofness	50 150	3-10 9-10	3.5	4.6
	Residual stress 1/	150	1-2	3.4	4.6
	Hardness (head)	10	0-1	3.1	4.6
*	Hardness (sidewall)	10 30	0-2 1-2	3.1	4.6
	BALLISTIC TESTS - See Table III			3.6 to 3.15	4.6
	Barrel errosion	30,000		3.16	4.6

NOTES: 1/ No retest permitted during First Article Test.

4.5 Quality conformance inspection.

4.5.1 Lot formation. In accordance with MIL-A-48078.

4.5.2 Lot submission. The product shall be submitted in accordance with MIL-STD-105.

4.5.3 Component parts. Unless otherwise specified, component lots shall be homogeneous and of a size convenient to the contractor and inspected, tested and accepted by the contractor. The cartridge lot may not contain:

a. Cartridge cases from more than one manufacturer.

b. Primers from more than one lot interfix number from one manufacturer.

c. Bullets from more than one interfix number from one manufacturer.

d. Propellant from more than two lots and more than one manufacturer.

4.5.4 Lot identification. Each lot of ammunition shall be identified as to type, caliber and model, as well as a lot number in accordance with MIL-STD-1168.

4.5.5 Inspections to be performed. Inspection shall be as specified in 4.5.6 (Examination for defects) and the Quality Conformance Testing Table (Table II).

4.5.6 Examination for defects.

a. Major and minor defects. Examination for major and minor defects shall be performed on a class basis or individual basis as specified, in accordance with Table II using applicable sampling plans and acceptance criteria of MIL-STD-105. The Acceptable Quality Level (AQL) shall be as specified in Table II. All non-conforming cartridges (or components) shall be rejected.

b. Critical defects. Unless otherwise specified, one hundred percent examination shall be performed for all critical defects. If a visual critical defect is found in a sample either just prior to a firing test or after a firing test (and the defect is not due to the firing), the lot shall be rejected. The lot shall then be rescreened and resubmitted for visual inspection of critical defects. If a critical defect is found during packing, the portion of the lot that has been packed or is in the process of being packed shall be rejected. In addition, the portion of the lot remaining to be packed shall be rejected. The lot shall then be rescreened and resubmitted for visual inspection of critical defects.

TABLE II. QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-C-63989A(AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9349657
4.5.6.1	Jacket				NEXT HIGHER ASSEMBLY 9349678
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical:	None defined.				
Major:	(Individual AQL's)				
101.	Diameter		1.50%	3.2	SMTE
102.	Base thickness		1.50%	3.2	SMTE
103.	Base thickness variation		1.50%	3.2	SMTE
104.	Wall thickness at chamfer		1.50%	3.2	SMTE
105.	Improper weight		1.50%	3.2	Balance
Minor:	(Individual AQL's)				
201.	Evidence of poor workmanship		2.50%	3.2	Visual

NOTES:

TABLE II. QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-C-63989A(AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9349656
4.5.6.2	Slug				NEXT HIGHER ASSEMBLY 9342869
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical:	None defined.				
Major:	(Individual AQL's)				
101.	Improper weight		1.50%	3.2	Balance
Minor:	(Individual AQL's)				
201.	Evidence of poor workmanship		2.50%	3.2	Visual

NOTES:

RSMC-0A (D) Form 160, 1 Aug 83 replaces edition of 1 Jul 77 which may be used until exhausted.

TABLE II. QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-C-63989A(AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9342869
4.5.6.3	Bullet, Ball, 5.56MM				NEXT HIGHER ASSEMBLY 9342868
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical:	None defined.				
Major:	(Individual AQL's)				
101.	Diameter of bourrelet		1.50%	3.2	SMTE
102.	Concentricity of boat-tail to bourrelet diameter		1.50%	3.2	SMTE
103.	Length of boat-tail		1.50%	3.2	SMTE
104.	Angle of boat-tail		1.50%	3.2	SMTE
105.	Length of bullet		1.50%	3.2	SMTE
106.	Distance from bullet tip to cannelure		1.50%	3.2	SMTE
107.	Concentricity of bullet tip to bourrelet diameter		1.50%	3.2	SMTE
108.	Distance from .090 diameter to .218 diameter		1.50%	3.2	SMTE
109.	Diameter of knurl		1.50%	3.2	SMTE
110.	Ogive radius		1.50%	3.2	SMTE
111.	Bullet tip, width		1.50%	3.2	SMTE
112.	Improper weight		1.50%	3.2	Balance
113.	Improper contact of slug to surface "x"		1.50%	3.2	Visual
114.	Damaged cannelure		1.50%	3.2	Visual
Minor:	(Individual AQL's)				
201.	Evidence of poor workmanship		2.50%	3.2	Visual

NOTES:

TABLE II. QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE	SHEET	DRAWING NUMBER
4.5.6.4	Cartridge, 5.56mm, Ball: M855 (Inspection)	1 OF 3	9342868
			NEXT HIGHER ASSEMBLY: Not applicable

CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical:					
1.	Perforated Case (6)		100%	3.1	Visual
2.	Case split in K, L or M location (7)		100%	3.1	Visual
3.	Primer missing (32)		100%	3.1	Visual
4.	Primer cocked (33)		100%	3.1	Visual
5.	Primer inverted (34)		100%	3.1	Visual
6.	Weight min 1/		100%	3.1	Balance
Major:	(Group AQL - 0.25%)				
101.	Total length			3.1	Gage
102.	Case split in I, S, or J location (6)			3.1	Visual
103.	Corrosion or stain with etching (2)			3.1	Visual
104.	Chamfer missing on head (rim) (13)			3.1	Visual

1/ Each lightweight cartridge shall be disassembled and the propellant weighted. Any cartridge containing less than 13 grains of propellant shall be classed as a critical defect. Any cartridge containing 13 grains or more of propellant shall be classed as a major defect.

Numbers after defect descriptions refer to visual defect standards in MIL-STD-636 (NATO Caliber 7.62mm Section).

NOTES:

DRSMC-OA (D) Form 160, 1 Aug 83 replaces edition of 1 Jul 77 which may be used until exhausted.

TABLE II. QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE		SHEET 2 OF 3		DRAWING NUMBER 9342868
4.5.6.4	Cartridge, 5.56mm, Ball: M855 (Inspection)				NEXT HIGHER ASSEMBLY Not applicable
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
105.	Case mouth not crimped in cannelure (11)			3.1	Visual
106.	No evidence of mouth anneal (21)			3.1	Visual
107.	Draw scratch (8)			3.1	Visual
108.	Split bullet jacket (24)			3.1	Visual
109.	Loose bullet (25)			3.1	Visual
110.	Loose primer (35)			3.1	Visual
111.	Scaly metal (12)			3.1	Visual
112.	Profile and alignment			3.1	Gage
113.	Diameter of head			3.1	Gage
114.	Thickness of head			3.1	Gage
115.	Length to shoulder datum diameter			3.1	Gage
116.	Depth of primer			3.1	Gage
117.	Diameter of extractor groove, max			3.1	Gage
118.	Nato mark missing			3.1	Visual

NOTES: Numbers after defect descriptions refer to visual defect standards in MIL-STD-636 (NATO Caliber 7.62mm Section).

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE		SHEET	DRAWING NUMBER
4.5.6.4	Cartridge, 5.56mm, Ball: M855 (Inspection)		3 OF 3	9342868
				NEXT HIGHER ASSEMBLY: Not applicable

CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Minor:	(Group AQL - 1.50%)		1.50%		
201.	Discolored, dirty, oily, or smeared (1)			3.1	Visual
202.	Case dented (5)			3.1	Visual
203.	Scaly metal on case (12)			3.1	Visual
204.	Fold, wrinkle, buckle or bulge in case (14, 15, 16, 17)			3.1	Visual
				3.1	Visual
205.	Head stamp missing or illegible (18)			3.1	Visual
206.	Defective head (19)			3.1	Visual
207.	Defective mouth (20)			3.1	Visual
208.	Bullet dented (22)			3.1	Visual
209.	Bullet scratched (23)			3.1	Visual
210.	Scaly metal on bullet (27)			3.1	Visual
211.	Upset (crooked) point (28)			3.1	Visual
212.	Blunt point (30)			3.1	Visual
213.	Defective cannelure (31)			3.1	Visual
214.	Nicked or dented primer (36)			3.1	Visual
215.	No waterproofing material (primer pocket joint) (37)			3.1	Visual
				3.1	Visual
216.	Defective crimp (28)			3.1	Visual
217.	Scratch (case) (9)			3.1	Visual
218.	Missing or improper color of bullet tip			3.1	Visual
219.	Extractor groove diameter undersized			3.1	Gage

NOTES: Numbers after defect descriptions refer to visual defect standards in MIL-STD-636 (NATO Caliber 7.62mm Section).

TABLE II. QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.5.6.5	Cartridge, 5.56mm, Ball: M855 (Testing)				9342868
					NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
*	Bullet extraction	25 75	0-3 2-3	3.3	4.6
	Waterproofness	50 150	3-10 9-10	3.5	4.6
	Residual stress	50 150	0-2 1-2	3.4	4.6
	Hardness (head)	10	0-1	3.1	4.6
*	Hardness (sidewall)	10 30	0-2 1-2	3.4	4.6
	BALLISTIC TESTS (see Table III)			3.6 to 3.15	4.6

NOTES:

4.5.7 Ballistic testing. The ballistic tests are specified in TABLE III. Firing defects are specified in TABLE IV. Tests shall be conducted as specified in paragraph 4.12.

4.5.7.1 Ballistic test samples. The quantities for the various ballistic tests are as specified in TABLE III. Only cartridges that have been previously submitted to and passed the requirements of the critical inspections specified in para 4.5.6.b. shall be used for the ballistic tests. To assure a random sample for each test the sample cartridges from the lot shall be combined and intermixed prior to being divided into samples for the various test.

TABLE III

Ballistic test samples

TEST	Ambient	temperatures (°F) 70°±2°	-65°±5°	+125°±2°	Requirement Para.
Action Time 1/		20	20	20	3.15 & 3.10
Velocity 1/		20	20	20	3.6 & 3.10
Chamber press 1/		20	20	20	3.7 & 3.10
Port press 1/		20	20	20	3.8 & 3.10
M249 Function & Casualty 2/, 3/	400		200	200	3.12
M16A2 Function & Casualty 2/, 3/	400		200	200	3.12
Accuracy at 600 yards 8/	90				3.11.1
Matching 7/	30				3.11.2
Fouling 4/	800		400	400	3.13
Penetration 6/	50				3.9
Bullet integrity 5/	200				3.14
Barrel erosion	30,000				3.16

NOTE 1/ Failure of the cartridges in any sample to comply with the applicable requirements shall be cause for rejection of the lot subject to testing of a second sample consisting of double the quantity of cartridges used in the first test for the temperature or temperatures at which the failure occurred. The lot shall be rejected if the cartridges in the second sample fail

to comply with the applicable requirements. Action time, chamber pressure and port pressure tests shall be conducted simultaneously with velocity.

NOTE 2/ See Table IV for defect classification and accept/reject criteria. The individual results of the M249 machine gun and M16A2 rifle shall be compared to the accept/reject criteria for the specified defects stated.

NOTE 3/ Function and casualty testing shall be conducted with both the M249 machine gun and the M16A2 rifle. The M249 shall utilize 200 round magazines; the M16A2 shall utilize 20 round magazines.

NOTE 4/ The sample for this test shall be the sample specified for the Function and Casualty test for each respective weapon, i.e. 800 rounds for the M249 and 800 rounds for the M16A2.

NOTE 5/ The two hundred round sample shall be composed of the following:

a. One hundred rounds from the M249 Function and Casualty test.

b. Sixty rounds from the M16A2 Function and Casualty test: 3-round burst mode.

c. Forty rounds from the M16A2 Function and Casualty test: Single shot mode.

Failure of four or more bullets (from the total sample) to comply with the applicable requirements shall be cause for rejection of the lot. If more than one but less than four bullets fail in the first test, a second sample of 200 cartridges shall be tested in different M249 and M16A2 weapons than were used in the first test. The lot shall be rejected if in the combined first and second sample, four or more bullets fail to comply with the applicable requirements.

NOTE 6/ Accept/reject, retest criteria for this test is 50-2-5/100-4-5.

NOTE 7/ One of the 30-round targets from the Accuracy test shall be used as the sample for this test.

* NOTE 8/ The ninety round sample for this test shall be three thirty-round targets. One round is permitted only to miss one of the three targets. Two or more misses out of three valid targets shall result in rejection of the lot. See SCATP-5.56mm (Heavy Bullet) for definition of "valid target".

4.5.7.2 Function and casualty defects in ballistic tests. For any ballistic test except function and casualty, where the occurrence of a firing defect prevents the obtaining of a valid result for the characteristic being tested the following shall apply:

a. The defect shall be recorded under the appropriate function and casualty defect category and included in the defect count for determining acceptance or rejection in accordance with Table II.

b. The particular test for which the round was fired shall not be penalized.

c. A replacement round shall be fired to obtain the data for the characteristic being tested.

4.5.7.3 Accept - reject criteria for function and casualty tests. The lot shall be rejected when function and casualty defects (at all temperatures combined) plus the firing defects observed in all other ballistic tests exceed the first sample number listed in Table IV. The lot is then eligible for a retest provided that the defects observed do not equal or exceed the reject number in Table IV. If this reject number is equalled or exceeded the lot is automatically rejected with no provisions for retesting.

Therefore, if the number of defects found in the above tests exceeds the acceptance number for the first sample, but is less than the reject number for the first sample, a second sample, consisting of double the quantities specified under function and casualty test, shall be fired in both the M16A2 and M249 weapons. This procedure shall apply regardless of the weapon or weapons in which the firing defects occurred in the first test. If any firing tests for either weapon exceed the cumulative acceptance number, the lot shall be rejected. If, in testing a second sample, defects other than those for which the second sample is being tested should occur to the extent that they exceed the acceptance number for the cumulative sample, the lot shall be rejected.

TABLE IV

Function and casualty defect classification and accept/reject criteria for individual M249 and M16A2 test results (all temperatures combined)

DEFECT	FIRST SAMPLE ACCEPT	FIRST SAMPLE REJECT	CUMULATIVE ACCEPTANCE NO.
1. Misfire 1/			
a. No vent hole, or obstruction in the vent area 2/	0	1	-
b. Other	1	3	2
2. Bullet remaining in bore 2/	0	1	-
3. Primer leaks:			
a. Perforation of firing pin indent in primer cup			
(1) M249 Machine gun	0	See 3/	1
(2) M16A2 Rifle	0	See 3/	1
b. Escape of gas through primer cup (excluding 3a. above)	1	3	2
c. Escape of gas around primer cup			
(1) 50% or more than 50% of periphery	3	7	9
(2) Less than 50% of periphery	5	9	13
d. Blown primer - Primer separates from casehead and primer pocket is grossly distorted. 2/	0	1	-
e. Dropped primer - Primer falls out of pocket upon retraction of bolt.	0	2	1

f. Loose primer - Primer remains in pocket but is physically loose	0	2	2
4. Case casualties			
a. Longitudinal split 4/			
(1) Neck and shoulder (I or S)	5	9	13
(2) Body (J)	3	7	9
(3) Body (K)	0	2	1
(4) To head (L)	0	2	1
(5) Through head (M)	0	2	1
b. Circumferential rupture 4/			
(1) Partial, shoulder or body (J and S)	1	3	2
(2) Patial, body (K) 2/	0	1	-
(3) Partial, head (L) 2/	0	1	-
(4) Complete 2/	0	1	-
5. Failure to extract	0	2	1
6. Weapon stoppage 5/	0	2	1

1/ Each cartridge that misfires shall be disassembled and examined for presence of vent hole in primer pocket, or any obstruction in the vent hole area of the primer pocket that can be assignable as the cause for misfire. If the vent hole is missing or obstructed, the lot shall be rejected with no second sample permitted.

2/ No second sample permitted. Lot shall be rejected.

3/ If one or more defects are found in the first sample, a second sample shall be fired in the weapon(s) in which the defect occurred. The second sample shall consist of double the quantity of cartridges specified under function and casualty of Table II for such weapon(s). Prior to the testing of the second sample, the firing pin of the specific weapon(s) in which the defect originally occurred shall be replaced with a new firing pin. If an additional primer perforation is found in the second sample, the lot shall be rejected.

4/ For location of defects indicated by letters in parentheses, see Drawing C7643674.

5/ All stoppages attributable to the ammunition, with the exception of misfire, complete rupture or failure to extract, observed in all tests shall be included.

4.5.8 Packaging, packing and marking inspection. During or immediately prior to the packaging operation, 100% examination of the cartridges shall be performed to ascertain that the cartridge type conforms to the drawing. Occurrence of a high pressure test, dummy or blank cartridge shall be classed as a critical defect. Occurrence of any type other than those listed shall be classed as a major defect. All nonconforming cartridges shall be rejected. Inspection for packaging, packing and marking shall be in accordance with MIL-STD-644 as applicable to the drawing.

4.5.9 Inspection equipment. The examinations and tests shall be made using the equipment prescribed in Equipment Lists on LI-9342868. Unless otherwise specified, acquisition, maintenance and disposition of inspection equipment shall be in accordance with MIL-I-45607.

4.6 Methods of inspection.

The following tests shall be conducted in accordance with the test procedure document; SCATP-5.56MM (Heavy Bullet):

Barrel erosion
Bullet extraction
Waterproof
Residual Stress
EPVAT
    Chamber pressure
    Port pressure
    Velocity
    Action time
Temperature stability
Function and casualty
Fouling
Bullet integrity
Accuracy
Matching
Penetration

4.6.1 Hardness testing. The bullets shall be extracted, the propellant removed and the primers extracted. Each cartridge case of the sample shall be prepared and placed on the appropriate test fixture for testing in accordance with ASTM Method E 92.

4.6.1.1 Case sidewall. The average of the hardness values of the sample cases for each prescribed point along the sidewall exterior surface shall be computed and recorded in accordance with the drawing requirements.

4.6.1.2 Case head. The individual hardness value for each prescribed point on the head section of each sample case shall be recorded. Any value failing to meet the drawing requirement at a prescribed point(s) shall be cause for measurement of hardness at the corresponding point(s) on the opposite side of the primer pocket of the same head section from which the initial value was obtained. The higher of the two measurements shall be recorded as the value of record for determination of conformance to drawing requirements.

5. PACKAGING

5.1 Packing, level A (worldwide shipment). The cartridges shall be packed in accordance with drawing 9345240-1, 9345243, 9354586, 9357711, 9357715 or 9378317.

5.2 Marking and labeling. Packing boxes shall be marked and labeled in accordance with applicable drawing cited in 5.1.

6. NOTES

6.1 Intended use. The component covered by this specification are intended for use in the Cartridge, 5.56mm, Ball, M855.

6.2 Ordering data. See MIL-A-48078.

6.3 Submission of inspection equipment for design approvals. See MIL-A-48078. Submit designs as required to Commander, ARDC, ATTN: AMSMC-QAF-I(D), Dover, NJ 07801-5001.

* 6.4 Hazard notice. The cartridge described herein and some of its components are flammable and explosive and consequently present hazards in manufacture, handling, storage and shipment. The contractor should recognize these hazards and take appropriate measures to prevent fire, explosion, adverse environment, rough handling, corrosive atmosphere, and electrically inducted incidents. Such measures shall include the employment of an effective safety program that addresses the inherent hazards associated with the cartridge.

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

* 6.6 Changes from previous issues. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-C-63989A	CARTRIDGE, 5.56MM, BALL, M855

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

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)*

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