

INCH-POUND

MIL-PRF-71208 (AR)

9 April 2001

## PERFORMANCE SPECIFICATION

## CARTRIDGE, 5.56MM, ARMOR PIERCING, M995

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 Cartridge, 5.56mm, Armor Piercing, M995 (see 6.1).

## 2. 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 sections 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 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

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 TACOM-ARDEC, ATTN: AMSTA-AR-QAW-E, Picatinny Arsenal, New Jersey 07806-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSMC N/A

FSC 1305

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## SPECIFICATIONS

## DEPARTMENT OF DEFENSE

MIL-PRF-63460 Lubricant, Cleaner and Preservative for  
weapons and Weapon Systems (Metric)

## STANDARDS

## DEPARTMENT OF DEFENSE

MIL-STD-286	Propellants, Solid: Sampling, Examination and Testing
MIL-STD-636	Visual Inspection Standards for Small Arms Ammunition through Caliber .50
MIL-STD-650	Explosives: Sampling, Inspection and Testing
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1168	Ammunition lot Numbering and Ammunition Data Card
MIL-STD-1751	Safety and Performance Tests for Qualification of Explosives
MIL-STD-1916	DOD Preferred Methods for Acceptance of Product

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

## DRAWINGS (see 6.6)

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

## PRODUCT DRAWINGS

12590217 - Packing and Marking For Wirebound Box  
For PA108 Ammunition Container

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## INSPECTION EQUIPMENT DRAWINGS

7643674 - Classification of Cartridge Case Defects  
 Small Arms Ammunition  
 8648615 - Gage, Receiver, Profile and Alignment,  
 5.56mm Cartridge  
 10520006 - Ball, 3.94 Oz  
 10524139 - Pin, Firing, 5.56MM  
 11691287 - Link, Cartridge, Metallic Belt,  
 5.56mm, M27  
 LI-12956131 - Index of Inspection Equipment for  
 Cartridge, 5.56mm, Armor Piercing, M995

## INTERFACE DRAWING

12956131 - Cartridge, 5.56mm, Armor Piercing, M995

(Copies of other Government documents, drawings and publications required by contractors in connection with specific acquisition functions, should be obtained from U.S. Army ARDEC, Attn: AMSTA-AR-QAD, Picatinny Arsenal, NJ 07806-5000).

## PUBLICATIONS

## DEPARTMENT OF DEFENSE

ASPL - Army Propellant Surveillance Laboratory  
 for Propellant Stabilizer  
 SCATP-5.56MM - Ammunition Ballistic Acceptance  
 (Heavy Bullet) Test Methods Test Procedures for  
 5.56mm Cartridges  
 TB-700-2 - Department of Defense Explosives Hazard  
 Classification Procedures  
 ITOP 1-2-601 - LABORATORY Vibration Schedule  
 TOP 2-2-614 - Toxic Hazards Tests for Vehicles and  
 Other Equipment, 14 December 1984  
 ITOP 3-2-045 - TECOM Test Operating Procedure,  
 Automatic Weapons, Machine Guns, Hand  
 and Shoulder Weapons  
 ITOP 4-2-601 - Drop Tower Tests for Munitions  
 ITOP 4-2-602 - Rough Handling Tests  
 TOP 4-2-604 - Range Firing of Small Arms Ammunition,  
 12 August 1986  
 TOP 4-2-827 - Time of Flight and Ballistic  
 Coefficient, 27 May 1970

(Copies of the above Department of Defense Publications are available from Quality Engineering Directorate, ARDEC, Picatinny Arsenal, NJ 07806-5000, ATTN: AMSTA-AR-QAC-C.)

TM 60A-1-1-31 - General Information on EOD Disposal  
 Procedures

(Copies are available from EOD Division of FSAC, ARDEC, Picatinny

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Arsenal, NJ 07806-5000, ATTN: AMSTA-AR-FSX.)

DEPARTMENT OF INTERIOR

Bureau of Mines Report      Laboratory Equipment and Test  
Of Investigations 5624 -      Procedures for Evaluating  
                                         Explosibility of Dusts

(Copies of the above Department of Interior publication are available from The Department of Interior, U.S. Bureau of Mines, Pittsburgh Research Center Explosive Group, Cochrans Mill Rd., P.O. Box 18070. Pittsburgh, PA 15236).

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issue of documents not listed in the DODISS are the issues of the documents cited in the solicitation(see 6.2).

UNITED NATIONS

UN ST/SG/AC.10/11      -      Recommendations on the Transport  
                                         Of dangerous Goods, tests and  
                                         Criteria

(Copies of UN ST/SG/AC.10/11 are available from United Nations Publications, New York, NY 10017)

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.

3. REQUIREMENTS

3.1 Design verification. When specified in the contract (see 6.2), a sample of cartridges shall be subjected to design verification test inspection in accordance with the technical provisions specified herein (see 4.2).

3.2 First article. When specified in the contract (see 6.2), a sample shall be subjected to first article inspection in accordance with the technical provisions herein (see 4.3).

3.3 Product uniformity. The usage, storage and disposal processes involved with the M995 cartridge require a high degree of product uniformity. The contractor shall identify key characteristics of the design for which uniformity is deemed essential to meet performance requirements and determine how much variability is allowable. The variability of key characteristics shall conform to the baseline established for them during design verification.

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3.4 Interface requirements. Each cartridge shall accommodate the following inputs and interfaces.

3.4.1 Interface with link. The cartridge shall interface with the M27 link.

3.4.2 Physical characteristics. The cartridge shall be physically compatible with the dimensions listed on drawing 12956131. The cartridge shall interface with the weapon chamber.

3.4.3 External surface. External surface of the cartridge shall be marked legibly, and free of dent, fold, wrinkle, buckle, bulge, chips, dirt, grease, rust and foreign material. External surface shall be free of burrs, scratches and sharp edges, which may affect performance or result in personnel injury during handling.

3.4.4 Primer sensitivity. The energy imparted by a 3.94 plus or minus .02 ounce steel ball falling 12 inches shall initiate all primers. The energy imparted by a 3.94 plus or minus .02 ounce ball falling three inches shall not cause initiation of the primer.

3.5 Operating requirements. Each cartridge shall provide the following functional, operational, and performance capabilities.

3.5.1 Chamber pressure

3.5.1.1 Chamber pressure at 70 °F. The average chamber pressure of cartridges, conditioned at 70°F, shall not exceed 59,700 psi. Neither the chamber pressure of an individual cartridge nor the average chamber pressure plus three standard deviations of chamber pressure shall exceed 64,700 psi.

3.5.1.2 Chamber pressure at extreme temperatures. The average chamber pressure of cartridges at -65°F and at +125°F shall not vary from the average chamber pressure of cartridges at 70°F by more than 7,000 psi. The average chamber pressure of the cartridges conditioned at +125°F  $\pm$  2°F or at -65°F shall not exceed 64,700 psi.

3.5.2 Port pressure

3.5.2.1 Port pressure at 70°F. The mean port pressure minus three standard deviations shall not be less than 15,300 psi for cartridges conditioned to 70°  $\pm$  2° F.

3.5.2.2 Port pressure at extreme temperatures. The average port pressure of the cartridges at -65° F and at +125° F shall not vary by more than 2,000 psi from the average port pressure of

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the sample test cartridges conditioned at  $70^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ; and shall not be less than 14,600 psi.

### 3.5.3 Velocity

3.5.3.1 Velocity at  $70^{\circ}$ . The mean velocity of cartridges conditioned at  $70^{\circ}\text{F}$ , measured at 78 ft from the muzzle of the weapon, shall be within  $\pm 40$  fps of the velocity determined during design verification. The standard deviation of the velocities shall not exceed 40 fps.

3.5.3.2 Velocity at extreme temperature. The average velocity of cartridges at  $-65^{\circ}\text{F}$  and at  $125^{\circ}\text{F}$  shall not increase or decrease by more than 250 fps with respect to the average velocity of cartridges conditioned at  $70^{\circ}\text{F}$ .

3.5.4 Action time. The average action time plus five standard deviations of cartridges conditioned at  $70^{\circ}\text{F}$ ,  $-65^{\circ}\text{F}$  and  $+125^{\circ}\text{F}$  shall not exceed 3 milliseconds.

3.5.5 Cyclic rate. The cartridges shall function in the M4 carbine at an average cyclic rate between 700 and 970 rounds per minute (rpm), in the M16A2 Rifle between 700 and 900 rpm and in the M249 machine gun between 700 and 850 rpm when fired at  $70^{\circ} \pm 2^{\circ}\text{F}$ .

3.5.6 Noise level. The noise level of the cartridges at the gunner's ear position shall not exceed 164 decibels and the duration shall not exceed 20ms.

3.5.7 Bullet integrity. The bullet of the cartridge shall not burst or fragment in 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.

### 3.5.8 Penetration

3.5.8.1 3.5mm NATO plate. The bullet of the cartridge shall be capable of penetrating at 0 degrees obliquity a 3.5mm NATO plate at a minimum range of 600 meters at ambient temperature.

3.5.8.2 12mm Steel armor plate. The bullet of the cartridge shall be capable of penetrating at 0 degrees obliquity a 12mm steel armor plate at a minimum range of 100 meters.

3.5.8.3 1/2 inch aluminum plate. The bullet of the cartridge shall be capable of penetrating at 0 degrees obliquity a 1/2 inch aluminum armor plate at a range of 450 meters.

3.5.8.4 1/8 Rolled homogeneous plate. The bullet of the cartridge shall be capable of penetrating at 0 degrees obliquity

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a 1/8 inch rolled homogeneous (RHA) plate at a range of 550 meters.

3.5.8.5 Hollow concrete block. The bullet of the cartridge shall be capable of penetrating through both sides at 0 degrees obliquity a standard hollow concrete block at a range of 50 meters.

3.5.9 Range safety fan. The cartridge shall meet the range safety fan requirement (see 6.10).

3.5.10 Accuracy/dispersion.

3.5.10.1 Dispersion. Both the average standard deviation and the average horizontal standard deviation shall be no greater than 7.0 inches at 600 yards.

3.5.10.2 Accuracy in weapons. The cartridge shall meet the accuracy requirement when fired in the following weapons:

3.5.10.2.1 M16A2 rifle and M4 carbine. A series of 10 rounds fired from each M16A2 Rifle or M4 Carbine at a range of 100 yards shall be within the extreme spread and targeting area (heavy outline) specified in Figure 2 in Appendix D for the M16A2 Rifle and Figure 3 in Appendix D for the M4 carbine.

3.5.10.2.2 M249 dispersion and targeting. When fired at a target located 50 meters from the muzzle of an M249 machine gun, the following criteria shall be met.

3.5.10.2.2.1 Dispersion Nine out of ten rounds fired in a single burst shall realize a figure of merit H+L (height + length) not exceeding 13 inches. No keyholing shall be permitted.

3.5.10.2.2.2 Targeting The mean point of impact of nine rounds of a ten round burst shall be within a 20 centimeter by 20 centimeter square. The center of this square shall be  $5 \pm .25$  centimeters above the point of aim.

3.5.11 Vertical trajectory. The trajectory of the projectile shall match within  $\pm .75$  mil the M855 ball cartridge and the M856 tracer cartridge out to a range of 600 meters.

3.5.12 Bullet extraction. The force required to separate the bullet from the cartridge case shall not be less than 45 lbs.

3.5.13 Chemical compatibility. The cartridge shall maintain its function in the M4 carbine, M16A2 rifle and the M249 machine gun after exposure to commonly encountered chemicals in the field.



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3.5.14 Explosive ordnance disposal (EOD). When specified in the contract (see 6.2), the cartridge shall undergo an EOD disposal test during design verification by EOD personnel in accordance with EOD procedures prescribed by Army TM 60A-1-1-31.

3.6 Ownership and support requirements. Each cartridge shall possess the following life-cycle ownership characteristics.

3.6.1 Function and casualty.

3.6.1.1 Function and casualty for normal acceptance. The cartridge shall function without casualty at -65°F, ambient and +125°F in the M4 Carbine, M16A2 Rifle and the M249 Machine gun.

3.6.1.2 Function and casualty for design verification temperature extremes. The cartridge shall safely function (none of the following defects: vent hole missing or obstructed, bullet remaining in bore, complete circumferential rupture, partial circumferential rupture in the K and L section, detached material and uncontrolled fire of three rounds or greater) at -65°F and +155°F.

3.6.1.3 Function and casualty for design verification reliability The reliability shall be comparable with the M855 cartridge.

3.6.2 Safety.

3.6.2.1 Final hazard classification. The M995 cartridge shall comply with the following Hazard Classification.

DOD Hazard Class/Div: 1.4

DOD Hazard Compatibility Group: S

DOT Hazard Class: 1.4S

Net Explosive Weight: 0.001830 kgs.

3.6.2.2 Energetic material qualification. The energetic material shall be qualified by the Army Service Qualification Authority (see 6.9).

3.6.2.3 Energetic materials compatibility. All energetic materials (explosives, propellants and pyrotechnics) utilized shall be compatible with all combinations of directly contacting energetic and non-energetic materials. In addition, they shall be compatible with all combinations of materials that have the potential for contact in the system's life cycle (manufacturing environment and storage).

3.6.2.4 Energetic Materials Manufacture and Quality Assurance All energetic materials (explosives, propellants,



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etc.) utilized shall be manufactured in accordance with the requirements of the applicable U. S. Military or commercial specifications.

3.6.2.5 Propellant stability. All propellant shall be stable over a minimum time period of 20 years.

3.6.2.6 Pyrotechnic sensitivity. All pyrotechnic materials shall be insensitive to initiation during routine shipping, handling and storage.

3.6.2.7 Toxic fumes. The toxic fumes produced by the cartridge shall be comparable or less than those produced by firing similar quantities of 5.56mm, M855 ammunition. Personnel shall not be exposed to heavy metal levels in excess of the most stringent limits established by the occupational safety and Health Administration. The toxic fumes levels shall be within the acceptable levels established by the Surgeon General's Office.

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

3.6.4 Residual stress. The cartridge shall not have residual stresses that would cause it to crack or split.

3.7 Environmental requirements. Each cartridge shall operate without evidence of cracking, distortion, or damage that may impair its intended operation or loss of performance, under the following environmental conditions.

3.7.1 Waterproofness. The cartridge shall be waterproof to the extent that functioning is not adversely affected.

3.7.2 Sequential rough handling. The cartridge shall be capable of withstanding rough handling and transportation found in the operational environment.

3.7.3 Long term high temperature storage. The cartridge shall be safe to store and fire after being subjected to 28 days of continuous heating at 140°F. The reliability(see 6.6.2) of the cartridge shall not degrade and the cyclic rate shall not change by more than 15 percent.

3.7.4 Long term low temperature storage. The cartridge shall be safe to store and fire after being subjected to 28 days continuous cooling at -40°F. The reliability of the cartridge shall not degrade and the cyclic rate shall not change by more than 15 percent.

3.7.5 Thermal shock. The cartridge shall exhibit no evidence of corrosion and shall function after exposure to alternately high and low temperature extremes of 160°F to -70°F.

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3.7.6 Temperature and humidity. The cartridge shall be safe to fire and shall function after being subjected to a 10-day temperature/humidity cycle.

3.7.7 Corrosion. The cartridge shall be safe to store and fire after being subjected to a 5 percent salt spray (fog).

3.7.8 Hot chamber effects (cook off). A cartridge inserted into the chamber of the M249 machine gun following the firing of 200 cartridges in the weapon shall not fire (cook off). A cartridge inserted into the chamber of the M4 carbine or M16A2 rifle following the firing of 150 cartridges in that weapon shall not fire (cook off). In addition, the cartridge shall not deform to the extent that clearing of the weapons is made difficult.

3.7.9 Barrel erosion. The life of the M249 barrel shall not be less than 15,000 rounds.

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## 4. Verification

Table I. REQUIREMENTS/VERIFICATION CROSS REFERENCE MATRIX

## METHOD OF VERIFICATION

N/A - Not applicable

1 - Analysis

2 - Demonstration

3 - Examination

4 - Test

## CLASSES OF VERIFICATION

A - Design verification

B - First article inspection

C - Conformance inspection

Section 3 Requirement	Verification Methods					Verify. Class			Section 4 Verification Procedures
	NA	1	2	3	4	A	B	C	
3.1			X	X	X	X			4.2
3.2				X	X		X		4.3
3.3				X	X		X	X	4.2.4, 4.5.30
3.4.1					X	X	X	X	4.5.12
3.4.2				X	X	X	X	X	Table V
3.4.3					X	X	X	X	Table V
3.4.4					X	X	X	X	4.5.1
3.5.1					X	X	X	X	4.5.2
3.5.2					X	X	X	X	4.5.2
3.5.3					X	X	X	X	4.5.2
3.5.4					X	X	X	X	4.5.2
3.5.5					X	X			4.5.3
3.5.6					X	X			4.5.4
3.5.7					X	X	X	X	4.5.5
3.5.8.1					X	X	X	X	4.5.6, 4.5.6.1
3.5.8.2					X	X	X	X	4.5.6, 4.5.6.2
3.5.8.3					X	X			4.5.6, 4.5.6.3
3.5.8.4					X	X			4.5.6, 4.5.6.4
3.5.8.5					X	X			4.5.6, 4.5.6.5
3.5.9					X	X			4.5.7
3.5.10.1					X	X	X	X	4.5.8.1
3.5.10.2					X	X			4.5.8.2
3.5.11					X	X			4.5.9
3.5.12					X	X	X	X	4.5.10
3.5.13					X	X			4.5.11
3.5.14					X	X			4.5.12
3.6.1.1					X	X	X	X	4.5.12.1
3.6.1.2					X	X			4.5.12.2, 4.5.12.3
3.6.1.3					X	X			4.5.12.4
3.6.2.1					X	X			4.5.13
3.6.2.2					X	X			4.5.14
3.6.2.3				X		X			4.5.15
3.6.2.4			X			X	X	X	4.5.16
3.6.2.5					X	X			4.5.17
3.6.2.6					X	X			4.5.18
3.6.2.7					X	X			4.5.19
3.6.3				X				X	4.4.1.1
3.6.4					X	X	X	X	4.5.20
3.7.1					X	X	X	X	4.5.21
3.7.2					X	X			4.5.22
3.7.3					X	X			4.5.23
3.7.4					X	X			4.5.24
3.7.5					X	X			4.5.25
3.7.6					X	X			4.5.26
3.7.7					X	X			4.5.27
3.7.8					X	X			4.5.28
3.7.9					X	X			4.5.29

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4.1 Classification of verification. The inspection requirements specified herein are classified as follows:

- a. Design verification (see 4.2)
- b. First article inspection (see 4.3)
- c. Conformance inspection (see 4.4)

4.1.1 Verification conditions. Unless otherwise specified all verifications shall be performed in accordance with the test conditions specified in Table II.

4.2 Design verification.

4.2.1 Design verification quantity. The contractor shall submit a design verification sample of 90,000 cartridges as designated by the Contracting Officer for evaluation in accordance with the provisions of 4.2.2.

4.2.2 Verifications to be performed. See MIL-STD-1916 and Table I in this specification. Examination for critical characteristics shall be performed in accordance with Table II, V and MIL-STD-1916 paragraph 4.4 and 4.5. Examination for major and minor defects shall be performed in accordance with Table II and V. The sample to be examined shall be drawn in such a way that it is representative of the entire quantity submitted. Nonconforming cartridges shall be rejected and put aside for further examination.

4.2.3 Design verification rejection. If any item of the sample fails to comply with the design verification requirements, the sample shall be rejected.

4.2.4 Product uniformity. Ten sets of components, subassemblies and assemblies shall be subjected to a physical configuration audit (PCA) to establish product uniformity baseline for the key characteristics identified in 3.3.

4.2.5 Explosive ordnance disposal (EOD). The contractor shall provide the following M995 cartridge samples to the EOD Technology Division for EOD design verification tests, as specified in the contract (see 6.2).

- a. One sample cartridge and one cutaway cartridge with technical information (giving detailed operation and functioning descriptions).
- b. Three - 90 degree inert cutaway models.
- c. Six - inert models.

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TABLE II. Design verification  
 CLASSIFICATION OF CHARACTERISTICS

EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD
SAMPLE ACC-REJ			
Product uniformity		3.3	4.2.4
Interface		3.4	Table V
Examination for Defects		3.4.1, 3.4.2, 3.4.3,	Table V
Critical defects	100% 0-1		
Major Defects(101 to 104)	100% 0-1		
Major defects(105 to 121)	MIL-STD-1916, Level V		
Minor defects	MIL-STD-1916, level III		
Primer Sensitivity	600 <u>1/</u>	3.4.4	4.5.1
Residual Stress	50 0-1	3.6.4	4.5.20
Bullet extraction	50 0-1	3.5.12	4.5.10
Waterproof +70°F	120 <u>1/</u>	3.7.1	4.5.21
EPVAT (Electronic Chamber & Port Pressures, Velocity, Action Time, 3-test barrel)		3.5.1, 3.5.2 3.5.3, 3.5.4	4.5.2
-65°F	90 <u>1/</u>		
+70°F	90 <u>1/</u>		
+125°F	90 <u>1/</u>		
Dispersion +70°F			
1 Test barrel	180 <u>1/</u>	3.5.10.1	4.5.8.1
(3 wpns) M4	180 <u>1/</u>	3.5.10.2.1	4.5.8.2
(3 wpns) M16A2	180 <u>1/</u>	3.5.10.2.1	4.5.8.2
(3 wpns) M249	180 <u>1/</u>	3.5.10.2.2	4.5.8.2
Penetration			
3.5mm NATO plate	30 15-16	3.5.8.1	4.5.6
12mm Steel armor plate	30 0-1	3.5.8.2	4.5.6
1/2 inch aluminum plate	30 15-16	3.5.8.3	4.5.6
1/8 RHA plate	30 15-16	3.5.8.4	4.5.6
Hollow concrete block	30 15-16	3.5.8.5	4.5.6
Range safety fan(test barrel)	400	3.5.9	4.5.7
Function and casualty		3.6.1.1	4.5.12
(1 wpns) M4	800 <u>1/</u>		
(1 wpns) M16A2	800 <u>1/</u>		
(1 wpns) M249	800 <u>1/</u>		
Function and casualty(reliability)			
At ambient temperature		3.6.1.2	4.5.12
(3 wpns) M4	6,000 <u>1/</u>		
(3 wpns) M16A2	6,000 <u>1/</u>		
(3 wpns) M249	45,000 <u>1/</u>		

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TABLE II. Design verification  
 CLASSIFICATION OF CHARACTERISTICS

EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD
SAMPLE ACC-REJ			
Cyclic Rate		<u>3</u> / 3.5.5	4.5.3
Noise (1 wpn) M4	---	<u>1</u> / 3.5.6	4.5.4
(1 wpn) M16A2	---	<u>1</u> / 3.5.6	4.5.4
(1 wpn) m249	---	<u>1</u> / 3.5.6	4.5.4
Thermal shock (1 wpn) M16A2	200	<u>1</u> / 3.7.5	4.5.25
Barrel erosion (3 weapon) M249	45,000	<u>3</u> / 3.7.9	4.5.29
High-Low Temp Functioning		3.6.1.1	4.5.12
(3 wpns) +155°F M4	3,000	<u>1</u> /	
(3 wpns) +155°F M16A2	3,000	<u>1</u> /	
(3 wpns) +155°F M249	3,000	<u>1</u> /	
(3 wpns) -65°F M4	3,000	<u>1</u> /	
(3 wpns) -65°F M16A2	3,000	<u>1</u> /	
(3 wpns) -65°F M249	3,000	<u>1</u> /	
Chemical Compatibility		<u>1</u> / 3.5.13	4.5.11
(1 wpn) M16A2	390	<u>1</u> /	
Bullet Integrity		3.5.7	4.5.5
M4	<u>3</u> /, <u>4</u> /, <u>1</u> /		
M16A2	<u>3</u> /, <u>4</u> /, <u>1</u> /		
M249	<u>3</u> /, <u>4</u> /, <u>1</u> /		
Corrosion (Salt & Fog)		3.7.7	4.5.27
(1 wpn) M4	120	<u>1</u> /	
(1 wpn) M16A2	120	<u>1</u> /	
(1 wpn) M249	200	<u>1</u> /	
Hot chamber effects (cook off)			
(1 wpn) M4	---	<u>1</u> / 3.7.8	4.5.28
(1 wpn) M16A2	---	<u>1</u> / 3.7.8	4.5.28
(1 wpn) M249	---	<u>1</u> / 3.7.8	4.5.28
Temperature and Humidity Cycling		3.7.6	4.5.26
(1 wpn) M16A2	500	<u>1</u> /	
Long Term High Temperature			
Storage (28 day hot 140°F)		3.7.3	4.5.23
(1 wpn) M16A2	250	<u>1</u> /	
Long Term Low Temperature			

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TABLE II. Design verification  
 CLASSIFICATION OF CHARACTERISTICS

EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD
SAMPLE ACC-REJ			
Storage (28 day cold -40°F) (1 wpn) M16A2	250	<u>1</u> /	3.7.4 4.5.24
Sequential Rough Handling (-65°F, +160°F)		<u>2</u> /	3.7.2 4.5.22
Toxic Fumes			3.6.2.7 4.5.19
(1 wpn) M4	150	<u>5</u> /	
(1 wpn) M16A2	150	<u>5</u> /	
(1 wpn) M249	500	<u>5</u> /	
Explosive Ordnance Disposal		<u>1</u> /	3.5.14 4.2.5
Match/Time of flight	100	<u>1</u> /	3.5.11 4.5.9
Final Hazard Classification			3.6.2.1 4.5.13
Energetic Mat. Qualification			3.6.2.2 4.5.14
Energetic Mat. Compatibility			3.6.2.3 4.5.15
Energetic Mat. Manufacture and Quality Assurance			3.6.2.4 4.5.16
Propellant Stability			3.6.2.5 4.5.17
Pyrotechnic Sensitivity			3.6.2.6 4.5.18

## NOTES:

- 1/ The design represented by the sample is rejected if it fails to comply with the applicable requirements.
- 2/ If either M2A1 or M19A1 Ammunition box is used, then, water resistance and pop tests shall not be required.
- 3/ This test shall be conducted simultaneously with Function and Casualty.
- 4/ The 300 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.
  - d. Sixty rounds from the M4 Function and casualty test: 3 round burst mode.



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- e. Forty rounds from the M4 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 300 cartridges shall be tested in different M249, M4 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.

5/ The design represented by the sample shall be rejected if it does not get approval from the Surgeon General's office.

4.3 First article. When specified in the contract, a sample of the cartridges shall be subjected to First Article Verification in accordance with Table III.

4.3.1 First article quantity. First article verification shall be performed on the following.

<u>Name</u>	<u>Drawing</u>	<u>Quantity</u>
Cartridge, 5.56mm, Armor Piercing, M995	12956131	10,000

4.3.2 Inspections to be performed. The first article sample shall be subjected to all of the examinations and tests specified in Table III.

4.3.3 First article rejection. If any assembly, component or test specimen fails to comply with any of the applicable requirements, the first article sample shall be rejected.

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TABLE III. First article inspection  
CLASSIFICATION OF CHARACTERISTICS

EXAMINATION OR TEST	CONFORMANCE CRITERIA SAMPLE ACC-REJ		REQUIREMENT PARAGRAPH	INSPECTION METHOD
First article			3.2	4.3
Product uniformity			3.3	4.2.4 4.5.31
Interface			3.4	Table V
Examination for Defects			3.4.1, 3.4.2 3.4.3	Table V
Critical defects	100%	0-1		
Major defects (101 to 104)	100%	0-1		
Major defects (105 to 121)	MIL-STD-1916, Level V			
Minor defects	MIL-STD-1916, Level III			
Primer Sensitivity	600	<u>1</u> /	3.4.4	4.5.1
Residual Stress	50	0-1	3.6.4	4.5.20
Bullet extraction	25	0-1	3.5.12	4.5.10
Waterproof	50	<u>1</u> /	3.7.1	4.5.21
EPVAT (Electronic Chamber & Port Pressures, Velocity, Action Time)			3.5.1, 3.5.2 3.5.3, 3.5.4	4.5.2
-65°F	20	<u>1</u> /		
+70°F	20	<u>1</u> /		
+125°F	20	<u>1</u> /		
Dispersion	90	<u>1</u> /	3.5.10.1	4.5.8.1
M4 Function & Casualty			3.6.1	4.5.12
+70°F	400	<u>1</u> /		Table VI
-65°F	200	<u>1</u> /		Table VI
+125°F	200	<u>1</u> /		Table VI
M16A2 Function & Casualty			3.6.1	4.5.12
+70°F	400	<u>1</u> /		Table VI
-65°F	200	<u>1</u> /		Table VI
+125°F	200	<u>1</u> /		Table VI
M249 Function & Casualty			3.6.1	4.5.12
+70°F	400	<u>1</u> /		Table VI
-65°F	200	<u>1</u> /		Table VI
+125°F	200	<u>1</u> /		Table VI
Bullet Integrity			3.5.7	4.5.5
M4	<u>3</u> /, <u>4</u> /, <u>1</u> /			
M16A2	<u>3</u> /, <u>4</u> /, <u>1</u> /			
M249	<u>3</u> /, <u>4</u> /, <u>1</u> /			
Penetration				
3.5mm NATO plate	20	10-11	3.5.8.1	4.5.6
12mm armor plate	20	0-1	3.5.8.2	4.5.6
Energetic Mat. Manufacture and Quality Assurance			3.6.2.4	4.5.16

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## NOTES:

- 1/ The first article shall be rejected if it fails to comply with applicable requirement.
- 2/ The sample is divided equally among 3 weapons.
- 3/ Conducted simultaneously with function and casualty.
- 4/ The 300 round sample shall be composed of the following:
  - b. One hundred rounds from the M249 Function and Casualty test.
  - c. Sixty rounds from the M16A2 Function and Casualty test: 3 round burst mode.
  - d. Forty rounds from the M16A2 Function and Casualty test: Single shot mode.
  - e. Sixty rounds from the M4 Function and casualty test: 3 round burst mode.
  - f. Forty rounds from the M4 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 300 cartridges shall be tested in different M249, M4 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.

#### 4.4 Conformance verification.

4.4.1 Lot formation. The lot formation shall be in accordance with MIL-STD-1916

4.4.1.1 Lot identification. Visually verify that each lot of ammunition is identified as to type, caliber, model and lot number in accordance with MIL-STD-1168.

#### 4.4.2 Classifications of characteristics.

a. Reference the definitions of Critical, Major, and Minor characteristics in MIL-STD-1916.

b. Conformance examinations and tests are specified in Table IV.

c. Alternative conformance provisions. The contractor may use contractor proposed alternative conformance acceptance provisions in accordance with MIL-STD-1916 in lieu of the verification provisions of this specification. Prior to applying the alternative conformance provisions, the contractor shall submit the proposed alternative conformance provisions for Government approval (see 6.7).

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4.4.3 Variability of key characteristics. For each key characteristic, the contractor shall provide objective evidence to demonstrate, with 90 percent confidence that at least 99.7 percent of product meets its established baseline limits.

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TABLE IV. Conformance inspection

## CLASSIFICATION OF CHARACTERISTICS

EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD
	SAMPLE ACC-REJ		
Product uniformity		3.3	4.2.4
Interface		3.4	4.5.31 Table V
Examination for Defects		3.4.1, 3.4.2, 3.4.3	Table V
Critical defects	100% 0-1		
Major defects (101-104)	100% 0-1		
Major defects (105 to 121)	MIL-STD-1916 Level IV		
Minor defects	MIL-STD-1916 LEVEL II		
Primer Sensitivity <u>5</u> /		3.4.4	4.5.1
Residual Stress	50	3.6.4	4.5.20
Bullet extraction	25	3.5.12	4.5.10
Waterproof	50	3.7.1	4.5.21
EPVAT (Electronic Chamber & Port Pressure, Velocity, Action Time)		3.5.1, 3.5.2 3.5.3, 3.5.4 3.5.10	4.5.2
+70°F	20		
-65°F	20		
+125°F	20		
Dispersion	90	3.5.10.1	4.5.6
M4 Function & Casualty		3.6.1	4.5.12
+70°F <u>1</u> /	400		Table VI
-65°F <u>1</u> /	200		Table VI
+125°F <u>1</u> /	200		Table VI
M16A2 Function & Casualty		3.6.1	4.5.12
+70°F <u>1</u> /	400		Table VI
-65°F <u>1</u> /	200		Table VI
+125°F <u>1</u> /	200		Table VI
M249 Function & Casualty		3.6.1	4.5.12
+70°F <u>1</u> /	400		Table VI
-65°F <u>1</u> /	200		Table VI
+125°F <u>1</u> /	200		Table VI
Bullet Integrity		3.5.7	4.5.5
M4 <u>2/3</u> /			
M16A2 <u>2/3</u> /			
M249 <u>2/3</u> /			
Penetration			
3.5mm NATO plate	20 10-11	3.5.8.1	4.5.6
12mm armor plate	20 0-1	3.5.8.2	4.5.6

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TABLE IV. Conformance inspection

## CLASSIFICATION OF CHARACTERISTICS

Energetic Mat. Manufacture and  
Quality Assurance

3.6.2.4

4.5.16

## NOTES:

- 1/ The acceptance and retest numbers of Table VI shall be applied to the M249 results(all temperatures combined), the M16A2 results(all temperatures combined) and the M4 results(all temperatures combined) individually. All Function and Casualty defects observed in other ballistic tests shall be included in the defects count.
  - 2/ Divided equally between 2 weapons.
  - 3/ Conducted simultaneously with function and casualty.
  - 4/ The 300 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.
    - d. Sixty rounds from the M4 Function and casualty test: 3 round burst mode.
    - e. Forty rounds from the M4 Function and casualty test.: Single shot mode.
  - 5/ Fifty primers are tested at each height. If the average critical height plus 3 standard deviations is less than the all fire requirement or if the average critical height minus 2 standard deviations is less than the no fire requirement, a second test shall be run consisting of 100 primers at each height. Failure of the second sample to comply with the above criteria shall cause the lot to be rejected.
- 4.4.3 Test samples. Only cartridges having met the visual and dimensional requirements shall be used in the ballistic tests, and shall have been selected in such a manner that the sample is representative of the entire lot. The cartridges shall be thoroughly mixed before being divided into samples for the various tests.

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TABLE V. Cartridge inspection  
CLASSIFICATION OF CHARACTERISTICS

EXAMINATION OR TEST <u>1/</u>		CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD
SAMPLE ACC-REJ				
<u>Critical:</u>				
1.	Case split in I, L or M location (6)	100%	3.6.2	Gage
2.	Case split in S or J location with loss of powder (6)	100%	3.6.2	Gage
3.	Perforated case (7)	100%	3.6.2	Gage
4.	Low charge <u>2/</u>	100%	3.6.2	Gage
<u>Major:</u> <u>3/</u>				
101.	Primer missing (32)	100%	3.4.2	Visual/gage
102.	Primer cocked (33)	100%	3.4.2	Visual/gage
103.	Primer inverted (34)	100%	3.4.2	Visual/gage
104.	Case split in I,S or J location with no loss of powder	100%	3.4.2	Visual/gage
105.	Corroded or stained(if etched) case(2)	Level IV	3.4.3	Visual
106.	Round head (4)	Level IV	3.4.2	Visual
107.	Dented case (5)	Level IV	3.4.2	Visual
108.	Draw scratch in case(if applicable) (8)	Level IV	3.4.3	Visual
109.	Beveled underside of head (10)	Level IV	3.4.2	Visual
110.	Scaly metal on case(if applicable) (12)	Level IV	3.4.3	Visual
111.	No chamfer on head (rim) (13)	Level IV	3.4.3	Visual
112.	Loose primer (35)	Level IV	3.4.1	Visual/Manual
113.	Diameter of extractor groove, max, incorrect	Level IV	3.4.2	Gage
114.	Diameter of head, incorrect	Level IV	3.4.2	Gage
115.	Thickness of rim, incorrect	Level IV	3.4.2	Gage
116.	Length to shoulder datum, incorrect	Level IV	3.4.2	Gage
117.	Depth of primer, incorrect	Level IV	3.4.2	Gage
118.	Primer cup missing	Level IV	3.4.3	Visual
119.	Overall length, max, incorrect	Level IV	3.4.2	Gage
120.	Cartridge Identification Marking missing/incorrect	Level IV	3.4.3	Visual
121.	Profile and Alignment, incorrect	Level IV	3.4.2	8648615



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TABLE V. Cartridge inspection  
CLASSIFICATION OF CHARACTERISTICS

EXAMINATION OR TEST		CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD
SAMPLE ACC-REJ				
<u>Minor:</u>				
201.	Discolored, dirty, oily or smeared waterproofing (1) (if applicable)	Level II	3.4.3	Visual
202.	Dented case (5)	Level II	3.4.3	Visual
203.	Draw scratch in case (8)	Level II	3.4.3	Visual
204.	Scratch in case (9)	Level II	3.4.3	Visual
205.	Scaly metal on case (12)	Level II	3.4.3	Visual
206.	Fold, wrinkle, buckle or bulge in case (14, 15, 16, 17)	Level II	3.4.3	Visual
207.	Head stamp missing or illegible (18)	Level II	3.4.3	Visual
208.	Defective head (19)	Level II	3.4.3	Visual
209.	No waterproofing material (if applicable) (primer pocket joint) (37)	Level II	3.4.3	Visual
210.	Defective crimp (primer) (38)	Level II	3.4.3	Visual
211.	Diameter of extractor groove, min, incorrect	Level II	3.4.2	Gage
212.	External surface	Level II	3.4.3	Visual

## Notes for Table IV:

- 1/ Numbers in parenthesis after defect descriptions refer to visual standards in MIL-STD-636.
- 2/ Prior to design verification testing, the contractor shall establish the minimum charge required to preclude the possibility of a bullet in bore. Cartridges containing less than this minimum charge are critically defective.
- 3/ Level II or Level IV refer to verification level II or verification Level IV respectively of Table II Attributes sampling plans in MIL-STD-1916.

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TABLE VI. Function and casualty defect classification and accept/reject criteria.

DEFECT	First Article & LOT ACCEPTANCE		Design Verification M16A2 AND M4 (Individually)		DESIGN VERIFICATION M249	
	Accept	Reject	Accept	Reject	Accept	Reject
1. Misfire 1/						
a. No vent hole, or obstruction in the vent area	0	1	0	1	0	1
b. Other	1	2	4	5	6	7
2. Bullet remaining in bore	0	1	0	1	0	1
3. Primer leaks:						
a. Perforation of firing pin indent in primer cup						
(1) M249/FN Minimi Machine Gun	0	1	0	1	0	1
(2) M16A2 Rifle	0	1	0	1	0	1
b. Escape of gas through primer cup (excluding 3a above)	1	2	4	5	6	7
c. Escape of gas around primer cup						
(1) Total number allowed	12	13	59	60	120	121
(2) More than 50 percent of periphery	5	6	9	10	14	15
d. Blown primer - Primer separates from casehead and primer pocket is grossly distorted.	0	1	0	1	0	1
e. Dropped primer - Primer falls out of pocket upon retraction of bolt.	0	1	1	2	1	2
f. Loose primer - Primer remains in pocket, but is physically loose.	0	1	1	2	1	2

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TABLE VI. Function and casualty defect classification and accept/reject criteria. (continued)

DEFECT	First Article & Lot Acceptance		Design Verification M16A2 and M4 (Individually)		Design Verification M249	
	ACCEPT	REJECT	Accept	Reject	Accept	Reject
4. Case casualties						
a. Longitudinal split 2/						
(1) Neck and shoulder (I or S)	6	7	20	21	25	26
(2) Body (J)	4	5	10	11	15	16
(3) Body (K)	0	1	1	2	1	2
(4) To head (L)	0	1	1	2	1	2
(5) Through head (M)	0	1	1	2	1	2
b. Circumferential rupture 2/						
(1) Partial, shoulder or body (J and S)	1	2	3	4	4	5
(2) Partial, body (K)	0	1	0	1	0	1
(3) Partial, head (L)	0	1	0	1	0	1
(4) Complete	0	1	0	1	0	1
5. Failure to extract	0	1	1	2	1	2
6. Weapon stoppage 3/	0	1	1	2	1	2
7. Detached Material	0	1	1	2	1	2
8. Uncontrolled fire						
3 rounds or greater 4/	0	1	0	1	0	1
2 rounds or less 5/	0	1	1	1	0	1

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**NOTES:**

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

3. 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. Uncontrolled fire of 3 rounds or greater occurs when 3 or more rounds are fired in excess of that expected to be fired. For example, if in single shot mode, one trigger pull produces 4 or more rounds to fire, or in three round burst mode, one trigger pull causes 6 or more rounds to fire.

5. Uncontrolled fire of 2 rounds or less occurs when 1 or 2 rounds are fired in excess of that expected to be fired. For example, if in single shot mode, one trigger pull produces 2 or 3 rounds to fire, or if in three round burst mode, one trigger pull produces 4 or 5 rounds to fire.

#### 4.5 Methods of verification.

4.5.1 Primer sensitivity. Test in accordance with the SCATP-5.56mm(Heavy Bullet), Chapter 18, utilizing the ball and firing pin identified on drawings 10520006 and 10524139 respectively.

4.5.2 Chamber pressure, port pressure, velocity and action time. The test samples shall be conditioned at the test temperatures,  $\pm 2^{\circ}\text{F}$  for at least two hours. The test shall be conducted in accordance with SCATP-5.56mm(Heavy Bullet), Section 7.

4.5.3 Cyclic rate. The cyclic rate shall be measured using a recorder capable of measuring to an accuracy of at least  $\pm 2$  percent. Cyclic rates shall be measured during Function and Casualty testing.

4.5.4 Noise. The Noise test shall be conducted in accordance with Appendix C.

4.5.5 Bullet integrity. Test in accordance with SCATP-5.56mm (Heavy Bullet), Section 6. All irregular perforations shall be measured. All irregular perforations greater than 1/10 inch shall be classed as defects.

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4.5.6 Penetration. The penetration test shall be performed in general accordance with SCATP-5.56mm(Heavy Bullet), Section 13 and the following materials when applicable.

4.5.6.1 The NATO plate shall be mild steel, 3.5mm nominal (10 gauge) thickness defined SAE(Society of Automotive Engineers)1010 or SAE1020. The Rockwell hardness shall be a minimum of B55 and a maximum of B70. The penetration test for the 3.5mm NATO plate shall only be performed when the temperature is above 20°F. The cartridge shall penetrate the 3.5mm NATO plate a minimum of 50 percent of the time.

4.5.6.2 12mm Steel armor plate The Brinel hardness of the plate shall be a minimum of 300.

4.5.6.3 ½ inch aluminum plate. The Aluminum used shall be a 5,000 series aluminum.

4.5.6.4 1/8 Rolled homogeneous plate. The plate used shall be a 1/8 inch rolled homogeneous(RHA) plate.

4.5.6.5 Hollow concrete block. The material used shall be a standard hollow concrete block. The block shall be checked for penetration through both sides.

4.5.7 Range safety fan. The range safety fan test shall be performed in accordance with Appendix E.

4.5.8 Accuracy/dispersion.

4.5.8.1 Dispersion The test shall be conducted in accordance with SCATP-5.56mm(Heavy bullet), Section 3.

4.5.8.2 Accuracy in weapons. The test shall be conducted in accordance with Appendix D.

4.5.9 Vertical trajectory. One hundred cartridges shall be tested in accordance with the procedures in TOPs 4-2-604 and 4-2-827. The test cartridges shall be fired from three 5.56mm accuracy barrels at an elevation of 15°. A radar system shall be positioned adjacent to the mount with the antenna aligned to the line of flight. The radar shall be capable of tracking the rounds for a minimum of 5 seconds. Data shall be recorded a minimum of every 25 meters. The test shall be repeated with standard M855 and M856 cartridges. Ballistic results of all 100 shots for each cartridge type shall be averaged and analyzed to determine the trajectory match with the service round at a range out to 600 meters. To be acceptable, the difference between the vertical trajectory of the M995 cartridge and the M856 and M856 cartridges shall be no more than .75 mil over the entire range.

4.5.10 Bullet extraction. The cartridge shall be tested in accordance with SCATP-5.56mm(heavy Bullet), Section 5. The rate

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of travel of the test machine head shall be from 3 inches to 6 inches per minute.

4.5.11 Chemical compatibility. Test in accordance with Appendix B for cartridges consisting of other than a brass case and a copper jacketed bullet. A brass case and a copper jacketed bullet does not require any testing for verification.

4.5.12 Function and casualty.

4.5.12.1 Function and casualty for first article and lot acceptance. Function and casualty tests shall be conducted in general accordance with SCATP-5.56mm(Heavy Bullet, Section 10.

4.5.12.2 Function and casualty high temperature design verification test for system. Three weapons of each type(M4, M16A2 and M249) and 1,000 rounds for each weapon shall be placed in a climatic-chamber facility and conditioned to 155°F for a minimum of four hours. The weapons shall be fired in 100 round cycles. A minimum two hour dwell time shall be observed between each cycle to allow the weapon to return to the conditioned temperature. Velocity and, cyclic rate of fire shall be measured.

4.5.12.3 Function and casualty low temperature design verification test for system. Three weapons of each type(M4, M16A2 and M249) and 1,000 rounds for each weapon shall be placed in a climatic-chamber facility and conditioned to -65°F for a minimum of four hours. The weapons shall be fired in 100 round cycles. A minimum two hour dwell time shall be observed between each cycle to allow the weapon to return to the conditioned temperature. Velocity and cyclic rate of fire shall be measured.

4.5.12.4 Function and casualty and reliability design verification.

a. The Reliability, Function and Casualty test shall be performed in general accordance with ITOP 3-2-045, paragraph 4.3.2, and Sections 4 and 10 of SCATP-5.56mm(Heavy Bullet). Three M16A2 rifles, three M4 carbines, and three M249 machine guns shall be used to support this subtest. Prior to testing, each weapon shall be cleaned, inspected, and lubricated (CIL) with cleaner, lubricant, preservative (CLP) (MIL-PRF-63460).

b. M16A2 Rifle and M4 Carbine.

(1) Three each M16A2 rifles and M4 carbines shall each fire 2040 rounds of M995 AP ammunition in 120-round cycles. The weapons shall be lubricated at 600-round intervals and CIL at 1200-round intervals.

(2) The firings shall be accomplished in 17 cycles using 30-round magazines and fired in accordance with the

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following:

## FIRING CYCLE FOR M16A2 RIFLE AND M4 CARBINE

## Magazine

<u>No.</u>	<u>Firing Operation</u>
1	Three-round burst every 5 to 8 seconds
2	Three-round burst every 2 to 5 seconds
3	Semiautomatic - 10 to 30 shots per minute (spm)
4	Semiautomatic - 10 to 30 spm

(3) Four 30-round magazines for each weapon shall be numbered and used in rotation. The magazines shall be fully loaded for each use. Cyclic rate-of-fire for the weapons shall be measured during the second magazine of each cycle of the test. The cyclic rate-of-fire shall be measured on the fourth burst.

(4) The barrels of the weapons shall be forced air-cooled after each cycle.

(5) One weapon shall be designated for function and casualty testing prior to the test. The first and last 120 cartridges (240 rounds total) fired from this weapon shall be visually inspected for defects listed in Table VI and Drawing No. 7643674, Classification of Defects for Small Arms Ammunition.

## c. M249 Machine gun.

(1) The test shall consist of firing 45,000 rounds of linked ammunition from three weapons in 200-round cycles. The cartridges shall be linked using the M27 link (Drawing 11691287). 15,000 rounds shall be fired in each of three weapons. Prior to testing, the barrels assigned to each weapon shall be pneumatically gauged.

(2) The weapons shall be cleaned, inspected and lubricated at 4000-round intervals and shall be relubricated at 2000-round intervals.

(3) For this subtest, the M249 SAW shall be fired from the bipod. The test firings shall be accomplished in 75 cycles using 200-round belts of test ammunition per barrel per cycle. The weapons shall be fired in bursts of 5 to 7 rounds at a rate of approximately 85 rpm. The barrels of the weapons shall be forced air-cooled after every 200 rounds fired. Weapon cyclic rate-of-fire shall be measured prior to the initiation of the test and at every 2000-round interval and shall consist of a 20-round belt of M995 AP ammunition fired in one continuous burst.

(4) Muzzle velocity and yaw shall be measured prior to testing, at every 4000-round interval, and at the completion of testing and shall consist of a 20-round belt of M995 AP



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ammunition fired in one continuous burst. Muzzle velocity shall be measured using muzzle velocity radar equipment. Yaw shall be measured using a paper target located 25 meters from the muzzle of the weapon.

(5) One weapon shall be designated for function and casualty testing prior to the test. The first and last 100 cartridges (200 rounds total) fired from this weapon shall be visually inspected for ammunition defects listed in Table VI and Drawing No. 7643674.

(6) There shall be no stoppages due to the interface between the cartridge and the M27 link.

4.5.13 Final hazard classification. Compliance with the FHC requirements specified in paragraph 3.6.2.1 shall be validated during the Performance Verification Test (PVT). PVT tests shall be in accordance with TB-700-2, Department of Defense Ammunition and Explosives Hazard Classification Procedures. The following UN test series, as defined in TB 700-2, shall be used:

6(a) for single package test, 6(b) for stack test, 6(c) for external fire test, 4(a) for thermal stability and 4(b)(ii) for 12 meter drop test.

4.5.14 Energetic material qualification. If the selected energetic material is not currently qualified for military use, qualification tests shall be conducted in accordance with the test procedures listed below:

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Test procedures/energetic materials

<u>Test</u>	<u>Reference Document</u>	<u>Test Procedure Description</u>
Friction Sensitivity (Apparatus & Comparison Values)	TB 700-2	Para 5.4.b
Impact Sensitivity (Apparatus & Comparison Values)	TB 700-2	Para 5-4.a
Electrostatic Sensitivity (Apparatus & Comparison Values)	MIL-STD-1751	Chap. 5.2.3, 5.4.7 or 5.5.4
Auto ignition Temperature	MIL-STD-1751	Chap. 5.3.9
Explosion Temperature (5 sec.)	MIL-STD-650	Method 506.1
Explosibility of Dusts	BOM Rpt. 5624 Page 12	Minimum Explosive Concentration
Gap Test for Solids and Liquids	TB 700-2	Para 5-3.a
Small Scale Burn Test	TB 700-2	Para 5-4.d
Thermal Stability @75°C	TB 700-2	Para 5-4.c
Cap Sensitivity Test	TB-700-2	Para 5-6.a

4.5.15 Energetic material compatibility. Compatibility tests shall be conducted in accordance with Method 504.1.1 of MIL-STD-650 or Method 408.1.1 of MIL-STD-286. Compatibility is demonstrated when results reflect negligible reactivity.

4.5.16 Energetic materials manufacture and quality assurance. The contractor shall certify that all energetic materials comply with the applicable military or commercial specifications.

4.5.17 Propellant stability.

4.5.17.1 Stability analysis Propellant stabilizer analysis shall be conducted in accordance with the Army propellant Surveillance Laboratory (ASPL) test methods for the specific propellant stabilizer (see 6.11). Propellant with stabilizer values of 0.30% or less shall not be used.

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4.5.17.2 Moisture and Total Volatiles The test shall be performed two times using the oven method listed in MIL-STD- 286, section 101.2.2. Propellant that does not meet manufacturing specifications for moisture and total volatiles shall not be used.

4.5.18 Pyrotechnic sensitivity. Pyrotechnic sensitivity tests shall be conducted in accordance with the test procedures listed below. Acceptable sensitivity is demonstrated when results comply with the requirements listed below.

<u>Test</u>	<u>Reference Document</u>	<u>Requirement</u>
ERL Impact (Type 12, 2.5 kilogram weight)	MIL-STD-1751	50 percent Initiation at 20cm. (min)
Friction Pendulum/ Steel Shoe	MIL-STD-1751	Burn with no detonation (max. reaction)
Friction Pendulum/ Fiber Shoe	MIL-STD-1751	Burn with no detonation (max. reaction)
Electrostatic Discharge at 0.030 Joule	MIL-STD-1751	0 reactions in 20 tests
Differential Thermal Analysis	MIL-STD-1751	200°C (min)

4.5.19 Toxic fumes. The toxic fume test shall be conducted in general accordance with TOP 2-2-614 paragraph 5.1. Each M4 carbine, M16A2 rifle and M249 machine gun shall be cleaned and lubricated prior to testing. The weapon to be fired shall be placed in a test fixture enclosed in a sealed toxic fumes chamber. All firing shall be done remotely. Five valid trials shall be obtained from each type of weapon. Each trial shall consist of 30 rounds of ammunition fired in 3 round bursts for the M4 carbine and the M16A2 rifle. Each trial for the M249 machine gun shall consist of 100 rounds fired in 10 round bursts. Toxic fumes levels shall be recorded during and after the firing of the weapon until the concentrations have declined to an acceptable level. The emission of carbon monoxide(CO), ammonia(NH<sub>3</sub>), sulfur dioxide(SO<sub>2</sub>), and nitrous oxides(NO<sub>x</sub>) shall be measured for each trial fired. The test chamber shall be cleaned of spent brass and vacuumed between trials. Testing shall be repeated using standard ammunition for comparison. The results of the toxic fume test shall be approved by the Surgeon General.

#### 4.5.20 Residual stress.

4.5.20.1 Cartridges with brass cases. Test in accordance with SCATP-5.56mm(Heavy Bullet), Section 12. Prior to testing, all lubricants and coatings shall be removed from the cartridge case using solvents or cleaning techniques appropriate to the particular lubricant or coating being used.

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4.5.20.2 Cartridges with polyethylene cases. Test in accordance with Appendix A.

4.5.20.3 Cartridges with cases of other materials. Test in accordance with procedures appropriate to the material(s) used to manufacture the cartridge.

4.5.21 Waterproofness. Verification for the waterproof requirement shall be performed by either of the following methods:

4.5.21.1 Waterproofness (Bubble test). The bubble test shall be conducted in accordance with the SCATP-5.56MM (Heavy Bullet), section 17. The cartridge shall not release more than one bubble of air when subjected to a positive internal pressure 7.5 pounds per square inch psi for 30 seconds minimum.

4.5.21.2 Waterproofness (Firing test). A sample of 50 cartridges shall be submerged for 24 hours in water at  $70^{\circ} \pm 2^{\circ}\text{F}$  in a horizontal position to a depth such that there is a minimum of one inch of water above the highest point of the cartridge. The cartridges shall then be removed from the water, wiped dry and placed in a temperature controlled room or chamber at  $70^{\circ} \pm 2^{\circ}\text{F}$  for a minimum of two hours. The velocity test shall then be conducted in accordance with the SCATP-5.56MM (Heavy Bullet). The average velocity of the 50 cartridges shall be compared to the average velocity obtained from the velocity test of 4.5.2. The difference shall be less than 50 fps.

4.5.22 Sequential rough handling.

4.5.22.1 General. Prior to the start of the sequential rough handling tests, cartridges shall be packaged in a 5.56m cartridge container. A total of 1600 M995 AP rounds shall be packaged in accordance with drawing 12590217. Should another packaging configuration be used then the quantity of rounds tested and the test method shall be determined by the procuring activity. The sequential ruggedness testing consists of the following tests in order of occurrence: transportation-vibration (secured-cargo vibration), 7 foot packaged drop, loose-cargo vibration, and 5 foot individual drop. A sample of 400 test cartridges shall be withdrawn after each phase and fired from the M249 machinegun for function and casualty in accordance with SCATP-5.56MM (heavy Bullet). The mean round between stoppage (MRBS) shall be determined by combining the rounds from all of the phases of the sequential rough handling test. A MRBS shall be determined for both rounds fired at high temperature and rounds fired at low temperature.

4.5.22.2 Transportation-vibration phase (secured-cargo). Testing shall be in accordance with ITOP 1-2-601. One Wire-bound wooden wraparound box (1600 test cartridges) shall be temperature-conditioned at  $160^{\circ}\text{F} \pm 3^{\circ}\text{F}$  for a minimum of 16 hours

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or until complete temperature soak prior to being subjected to secured-cargo vibration. A like number of cartridges shall be temperature conditioned at  $-62^{\circ}\text{F} \pm 3^{\circ}\text{F}$  for a minimum of 16 hours prior to being subjected to secured-cargo vibration. The cartridges shall be reconditioned for a minimum of 16 hours between axes of vibration, except when two axes of vibration are conducted sequentially within the same day. When the latter occurs, the cartridges shall be moved directly from one test orientation to the next. The time the cartridges are out of temperature for movement between the conditioning chamber and the test cell, as well as during the test setup, shall be regained in conditioning at a 1: 1 ratio prior to the start of testing. The conditioning and vibration chamber temperatures shall be maintained within  $\pm 3^{\circ}\text{F}$  of the required test temperature. The 5.56-mm cartridges shall be subjected to the secured-cargo vibration simulation in each of their three major orthogonal axes (vertical, transverse, and longitudinal). The vibration schedules used shall represent the secured-cargo transportation modes for a typical field/mission transport scenario over secondary and cross-country road surfaces as described in ITOP 1-2-601, Appendix B, Table B-1.

The first vibration schedule shall represent the vibration environment on the cargo bed of a composite of tactical vehicles consisting of the M127 12-ton semi trailer, M813 and M814 5-ton trucks, M36 2-1/2-ton truck, Commercial Utility Cargo Vehicle (CUCV) M1008 1-1/4-ton truck, the High-Mobility Multipurpose Wheeled Vehicle (HMMWV) M998 1-1/4-ton truck, and the Heavy Expanded Mobility Tactical Truck (HEMTT) M985 10-ton truck. This test shall represent 800 kilometers(km) of secured-cargo transport per axis.

The second vibration schedule shall represent the off-road conditions on the cargo bed of the 1/4-ton M416 and the 1-1/2-ton M105A2 two-wheeled trailer. The composite two wheeled trailer vibration environment shall simulate 25km of secured-cargo transport per axis.

The third vibration schedule shall represent the environment on the cargo bed of the M548 tracked vehicle. This M548 tracked vehicle vibration environment represents 25km of the transport per axis.

At the completion of each axis of vibration, the exterior surfaces of all containers shall be visually inspected for damage. For the final inspection (after all axes of all vibration), the SSCs shall be opened and the cartridges shall be visually inspected. Four hundred cartridges (one plastic ammunition magazine from each metal PA108 inner container) from each temperature shall be removed from the test sequence and subjected to function and casualty testing in accordance with SCATP-5.56MM(heavy Bullet).

4.5.22.3 Seven foot packaged drop test. The 7 foot packaged drop test shall be conducted in general accordance with ITOP 4-2-602, Appendix A.

Twelve hundred test cartridges and 400 hundred dummy

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cartridges or an equivalent simulated dummy load shall be temperature-conditioned to  $160^{\circ}\text{F} \pm 3^{\circ}\text{F}$  and a like number of cartridges temperature-conditioned to  $-62^{\circ}\text{F} \pm 3^{\circ}\text{F}$  for a minimum of 16 hours or complete temperature soak prior to being drop tested. The cartridges shall be packaged in the 5.56mm packaging configuration (one per temperature).

At the completion of the preconditioning period, each container shall be subjected to two drops, one in each of the following impact orientations: (1) bottom down, (2) one side down. The drops shall be made from a quick-release hook attached to an overhead hoist at the prevailing outside air temperature. The test items shall be allowed to fall freely onto an armor plate, 3 inches thick, supported by 18 inches of crushed stone.

The containers shall be visually inspected after each drop for any damage. The containers shall then be opened and the 5.56mm cartridges shall be inspected for damage. Four hundred cartridges shall be removed from each temperature phase and shall be subjected to function and casualty testing in accordance with SCATP-5.56MM(heavy Bullet). The remaining 800 test cartridges from each temperature environment shall be repacked in their respective containers and prepared for the loose-cargo (packaged) vibration test.

4.5.22.4 Loose-cargo (packaged) vibration. Testing shall be conducted in general accordance with ITOP 4-2-602.

The laboratory test shall represent 120km of loose-cargo transport during off-road transport. The table shall be operated, shafts in phase, in a circular motion with a constant displacement of 1 inch, double amplitude (DA), at a speed of 300 rpm, thus producing a table acceleration of 1.3 gravitational accelerations (g's). The packaged ammunition shall be tested for 15 minutes in each of two orientations: transverse and longitudinal. For the longitudinal axis, the packaged ammunition shall be placed on the table with the longitudinal axis of the test cartridges parallel to the transverse axis of the table surface. For the transverse axis, the packaged ammunition shall be placed on the table with the longitudinal axis of the cartridges parallel to the longitudinal axis of the table surface.

A wooden or hard solid retaining fence section shall be placed around the perimeter of a section of the bed of the package tester to prevent the ammunition containers from falling off the table and shall be positioned so that free space of approximately 1 inch exists on all sides of the SSCs. The loose cargo vibration testing shall be conducted at each of two temperatures:  $160^{\circ}\text{F} \pm 3^{\circ}\text{F}$  and  $-62^{\circ}\text{F} \pm 3^{\circ}\text{F}$ . Eight hundred test cartridges and 800 dummy cartridges or an equivalent dummy load for each temperature environment shall be conditioned for a minimum of 16 hours or until a complete temperature soak prior to loose-cargo testing.

The containers shall be visually inspected after all vibration for any damage. The containers shall then be opened and the 5.56 mm cartridges shall be inspected for damage. Four



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hundred cartridges shall be removed from each temperature phase and subjected to function and casualty testing in accordance with SCATP-5.56mm (heavy Bullet). The remaining 400 test cartridges from each temperature environment shall be prepared for the five foot unpackaged drop test.

4.5.22.5 Five foot unpackaged drop. Testing shall be conducted in general accordance with ITOP 4-2-602, paragraph 5.1.

At the completion of the reconditioning period, a random sample of 120 unlinked M995 AP test cartridges from each temperature environment shall be removed from their respective SSCs and subjected to the individual bare cartridge drops. The drop procedure, equipment, and impact surface shall be the same previously described for the 7 foot drop test. twenty cartridges from each temperature environment shall be dropped once in one of the following orientations: (1) nose down; (2) base down; (3) 45 nose down, (4) 45 base down; and (5) side down. In addition, 20 cartridges from each temperature environment shall be dropped once in each of the five orientations (multiple drops for each cartridge).

The cartridges shall be visually examined after each drop. The cartridges shall then be linked together and fired from the M249 machinegun for function and casualty testing in accordance with SCATP-5.56MM (heavy Bullet).

4.5.22.6 Forty foot packaged drop. The forty foot drop test shall be conducted in general accordance with ITOP 4-2-601. A minimum of three fully loaded containers shall be temperature conditioned for a minimum of 16 hours or until complete temperature soak at each of the following temperatures  $-62^{\circ}\text{F} \pm 3^{\circ}\text{F}$ , ambient and  $160^{\circ}\text{F} \pm 3^{\circ}\text{F}$ . One container for each temperature.

Each container shall be subjected to a single 40ft drop in the normal shipping orientation. The drop shall be made from a quick-release hook attached to an overhead hoist and shall be made at the prevailing outside air temperature. The container shall be allowed to fall freely onto the impact surface. The container and test ammunition shall be visually inspected for damage and a determination made of suitability for safe handling and disposal. The criteria for acceptance shall be that the rounds are deemed safe to handle and dispose of following the test.

4.5.23 Long term high temperature storage. The cartridges shall be subjected to a 28 day continuous heating test. Two hundred fifty cartridges shall be placed in a climatic-chamber and conditioned to  $140^{\circ}\text{F}$  for 28 days. The cartridges are then inspected for any visual signs of deterioration. The cartridges are stored under standard ambient room temperature ( $70^{\circ}\text{F}$ ) for 48 hours. After that period, the ammunition shall be fired from an M16A2 rifle in the 3 round burst mode. The cyclic rate of fire shall be compared to the cyclic rate of fire obtained during the function and casualty test. The cyclic rate shall be within 15 percent of the rate obtained during function and casualty.



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Failure of the rounds to safely function (none of the following defects: vent hole missing or obstructed, bullet remaining in bore, complete circumferential rupture, partial circumferential rupture in the K and L section, detached material and uncontrolled fire of three rounds or greater shall be cause for rejection.

4.5.24 Long term low temperature storage. The cartridges shall be subjected to a 28 day continuous cooling test. Two hundred fifty cartridges shall be placed in a climatic-chamber and conditioned to -40°F for 28 days. The cartridges are then inspected for any visual signs of deterioration. The cartridges are stored under standard ambient room temperature (70°F) for 48 hours. After that period, the ammunition shall be fired from an M16A2 rifle in the 3 round burst mode. The cyclic rate of fire shall be compared to the cyclic rate of fire obtained during the function and casualty test. The cyclic rate shall be within 15 percent of the rate obtained during function and casualty. Failure of the rounds to safely function (none of the following defects: vent hole missing or obstructed, bullet remaining in bore, complete circumferential rupture, partial circumferential rupture in the K and L section, detached material and uncontrolled fire of three rounds or greater shall be cause for rejection.

4.5.25 Thermal shock test. The thermal shock test shall be conducted in general accordance with MIL-STD-810, test method 503.3. Six hundred test cartridges shall be subjected to thermal shock. The test samples shall be placed inside an environmental chamber set at -70°F for initiation of thermal shock test sequence. At the completion of the first 4 hour cycle, the cartridges shall be transferred to a high temperature chamber set at 160°F for a 4 hour cycle. This process shall be repeated until 6 cycles (48 hours of exposure) are completed. The cartridges shall be visually inspected for any signs of deterioration. The cartridges shall then be stored under standard room temperature 70°F for 48 hours. At the conclusion of the 48 hours storage, the sample cartridges shall be visually inspected for evidence of corrosion. The test cartridges shall then be function fired from an M16A2 rifle in the 3 round burst mode. Two hundred cartridges shall be fired from each of three M16A2 rifles. The cyclic rate of fire shall be compared to the cyclic rate of fire obtained during the function and casualty test. The cyclic rate shall be within 15 percent of the rate obtained during function and casualty.

4.5.26 Temperature/humidity test. Two hundred test cartridges are placed in the temperature-humidity chamber on a stainless steel, wire mesh rack. The chamber temperature and relative humidity (RH) are raised to 120°F and 30 ± 10 percent RH over a two hour period. This temperature-humidity environment is maintained for 24 hours, following which the chamber temperature is decreased to 70°F and RH is increased to 50 ± 10

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percent, over a two hour duration. This temperature-humidity environment is maintained for 24 hours, following which the RH is raised to  $95 \pm 10$  percent over a one hour period while maintaining a chamber temperature of  $70^{\circ}\text{F}$ . The cartridges are then exposed to ten cycles(240 hours) of the temperature-humidity conditions given below:

Storage Schedule for 24-hour Humidity Test Cycle

<u>Phase</u>	<u>Temperature °F</u>	<u>Relative Humidity</u>	<u>Duration Hour</u>
I	Gradually increase to $105 \pm 3^{\circ}$ and	$90 \pm 5$	2
II	Maintain at $105 \pm 3^{\circ}$ and....	$90 \pm 5$	16
III	Gradually decrease to from $105^{\circ}$ to $70 \pm 2^{\circ}$ and increase to $105^{\circ}$	$95 \pm 5$	2
IV	Maintained at $105 \pm 3^{\circ}$ and....	$95 \pm 5$	4

After the third, fifth, eighth, and tenth cycles of the test, 50-round samples each of the ammunition are withdrawn from the chamber and visually inspected for any evidence of deterioration or corrosion. The cartridges shall then be fired from an M16A2 rifle set in the 3 round burst mode. The cyclic rate of fire shall be compared to the cyclic rate of fire obtained during the function and casualty test. The cyclic rate shall be within 15 percent of the rate obtained during function and casualty. Failure of the rounds to safely function (none of the following defects: vent hole missing or obstructed, bullet remaining in bore, complete circumferential rupture, partial circumferential rupture in the K and L section, detached material and uncontrolled fire of three rounds or greater shall be cause for rejection.

4.5.27 Corrosion. The sample shall be subjected to the salt-fog test outlined in Method 509 of MIL-STD-810. After 48 hours of exposure to the 5 percent mixture, the sample shall be examined and its condition documented. Two hundred rounds shall then be loaded into links and fired from the M249 machinegun. One hundred twenty rounds shall be loaded into both the M4 carbine and the M16A2 rifle and fired in accordance with the firing sequence listed below. Failure of the rounds to safely function (none of the following defects: vent hole missing or obstructed, bullet remaining in bore, complete circumferential rupture, partial circumferential rupture in the K and L section (Dwg. 7643674), detached material and uncontrolled fire of three rounds or greater shall be cause for rejection.

FIRING CYCLE FOR M16A2 RIFLE AND M4 CARBINE

<u>Magazine No.</u>	<u>Firing Operation</u>
1	Three-round burst every 5 to 8 seconds
2	Three-round burst every 2 to 5 seconds

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- 3 Semiautomatic - 10 to 30 shots per minute (spm)
- 4 Semiautomatic - 10 to 30 spm

4.5.28 Hot chamber effects (cook off). Cookoff testing shall be conducted in general accordance with paragraph 4.2 of ITOP 3-2-045. The barrel of each weapon shall be instrumented to measure barrel temperatures in accordance with paragraph 4.2.1b of ITOP 3-2-045. The weapon cyclic rate of fire, function performance, time to cookoff, ambient range temperature, and barrel temperature shall be measured for each trial. The following procedure shall be followed for the individual weapons:

4.5.28.1 M4 and M16A2 Five weapons of each type shall be used for this test. 150 rounds shall be fired in each weapon at the rate of 30 rounds every 10 seconds.

4.5.28.2 M249 Five weapons shall be used for this test. 200 rounds shall be fired in each weapon. The weapon shall be mounted in a test stand and fired using link ammunition at a rate of 85 rounds per minute.

4.5.29 Barrel erosion. The test shall be conducted in accordance with section 4 of SCATP-5.56mm (Heavy Bullet) with the exception that the test shall be conducted for 15,000 rounds. Firing in any barrel shall be terminated when either the velocity drops 200 ft/sec or more or when the bullets from twenty percent or more of the cartridges in any burst show yaw exceeding 15° at 83 feet from the muzzle.

4.5.30 Variability of key characteristics. For each key characteristic, the contractor shall provide objective evidence to demonstrate, with an eighty percent confidence, that at least 95 percent of the product meets its established baseline limits.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DOD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. 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

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nature that may be helpful, but is not mandatory.)

#### 6.1 Intended use.

a. The M995 Armor Piercing Cartridge is intended for use in the M4 carbine, M16A2 rifle and the M249 machinegun. The armor piercing cartridges procured to this specification are military unique because there is no commercial market for armor piercing cartridges.

6.2 Acquisition requirements. Acquisition documents should 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 design verification sample when required (see 3.1).

d. Requirements for submission of first article sample when required (see 3.2)

e. Provision for submission of Inspection Equipment Designs and test equipment.

f. Provisions for submission of acceptance inspection results for each lot of ammunition presented to the Government.

g. Packaging requirements. See 5.1 and applicable contract requirements. Packaging drawing 12590217 has been qualified for the required hazard classification and is one method of packaging that may be used.

h. EOD test when required (see 3.5.15).

i. Information needed to satisfy the requirements for qualification of energetic materials by the Army Service Qualification Authority, see 6.10. This information can be obtained in the desktop guide titled Explosive Hazard Classification Requirements for Performance Specifications that is available from AMSTA-AR-QAW-S.

J. Requirements for submission of ammunition data cards in accordance with MIL-STD-1168.

6.3 Contractor acceptance inspection equipment (AIE). Provisions concerning the contractor's AIE used to verify the requirements of this specification should be specified in the contract.

6.4 EOD qualification. Qualification for EOD by the Army

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requires the contractor to demonstrate that the design is capable of being rendered safe and disposed of in all field environments. This task, addressed in the contract, requires samples to be tested to EOD procedures, design information and test data. Point of contact for further information on EOD qualification can be obtained from Commander, US Army TACOM-ARDEC, ATTN: AMSTA-AR-FSX, Picatinny Arsenal, NJ 07806-5000.

6.5 Drawings. Drawings listed in Section 2 of this specification under the heading U.S. 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 is now under cognizance of ARDEC.

#### 6.6 Definitions.

6.6.1 Interfix. A commodity made to one unchanged design which encompasses unchanged drawing(s), material(s) and specification(s), manufactured by a specific manufacturing process by a single manufacturer at a single location.

6.6.2 Reliability. For the purpose of this specification, the following measure of reliability should be used.

$$\text{reliability} = 1 - \frac{\text{number of stoppages (ammunition related)}}{\text{number of rounds fired}}$$

6.6.3 Keyholing Keyholing is defined as any projectile yaw exceeding 15 degrees.

6.6.4 Action time 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.

6.7 Submission of alternative conformance provisions. All contractor proposed alternative conformance provisions should be submitted to the Government for evaluation/approval as directed by the contracting activity.

6.8 Inspections to be performed. Lot testing requirements, if necessary, for explosive materials unique to the cartridge should be provided by the ARDEC Safety Office through the contracting agency prior to contract award.

6.9 Energetic material qualification information. Qualification of energetic materials by the Army Service Qualification Authority requires the contractor to demonstrate that the energetic material meets the requirements of MIL-STD-1751 or STANAG 4170. This task is addressed in the statement of work in the contract. Points of contact for the Army Service

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Qualification Authority can be obtained from AMSTA-AR-QAW-S.

6.10 Range safety fan. The contractor needs to develop the range safety fan for the cartridge (see appendix E).

6.11 Propellant stability Methods for the propellant stabilizer analysis can be obtained from AMSTA-AR-WEE.

6.12 Subject term (key word) listing.

Bullet  
Function and Casualty testing  
Small Arms  
Penetration

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APPENDIX A

Residual Stress Test Procedure

A10.0 SCOPE

A10.1 Scope. This appendix gives test procedure for performing the residual stress test.

A20.0 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

A30.0 PURPOSE

A30.1 Purpose. The residual stress test is performed to determine if the residual stress in polyethylene cases is great enough to cause splits or cracks in service or during long term storage.

A40.0 EQUIPMENT

A40.1 Material. Detergent, Nonylphenoxy Poly, (Ethyleneoxy) Ethanol is required for this test.

A40.2 Test samples. Test samples shall consist of complete sets of the quantity of parts specified with the exception of propellant and primer (inert cartridge). Process the components on the production line and assemble to meet all final assembly dimensional requirements.

A40.3 Safety requirements. Heat resistant gloves shall be worn when handling heated test samples and trays.

A50.0 TEST PROCEDURES

A50.1 Test procedures. The following test procedure shall be followed:

a. Immerse the test samples in the detergent. Seal the detergent coated samples in a polyethylene bag to minimize evaporation and place them in an aluminum tray. Place the tray with the sealed bags of test samples in an oven set at  $160^{\circ}\text{F} \pm 5^{\circ}\text{F}$  for seven days.

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b. After seven days, remove the tray from the oven and cool for one hour. Rinse the inert test samples in running water to remove the detergent. Dry with clean rags or paper towels. Coat the surfaces with machinist's dye and wipe with rags or towels, removing all excess dye from the surfaces.

c. Examine the surfaces for cracks, splits and crazing using a 7-power eye loop or magnifying glass.



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APPENDIX BChemical Compatibility Test Procedure

## B10.0 SCOPE

B10.1 Scope. This appendix gives test procedures for performing the Chemical Compatibility Test.

## B20.0 APPLICABLE DOCUMENTS

## SPECIFICATOINS

## DEPARTMENT OF DEFENCE

MIL-PRF-372	Cleaning Compound, Solvent
MIL-PRF-680	Degreasing Solvent
MIL-DTL-12468	Decontaminating Agent
MIL-DTL-14107	Lubricating Oil, Weapons, Low Temperature
MIL-L-46000	Lubricant, Semi-Fluid (Automatic Weapons)
MIL-D-50030	Decontaminating Agent, DS2
MIL-PRF-63460	Lubricant, Cleaner and Preservative for Weapons and Weapons Systems (CLP)
MIL-DTL-83133	Turbine Fuel, Aviation, Kerosene Types

## FEDERAL

P-C-111	Carbon Removing Compound
A-A-59104	Insect Repellent

## NON-GOVERNMENT PUBLICATIONS

ASTM D1141	Standard Specification for Substitute Ocean Water
ASTM D4126	Standard Specification for Vapor Degreasing Grade

## B30.0 PURPOSE

B30.1 Purpose. To determine the durability of cartridges

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when brought into contact with various lubricants, cleaners and solvents used or available for use, in weapon and military vehicle maintenance.

## B40.0 EQUIPMENT

B40.1 Weapons. Weapons shall conform to the dimensions shown on the applicable drawings.

B40.2 Chemicals. The chemicals to be used are the following:

- a. Cleaning compound, solvent MIL-PRF-372
- b. Insect repellent, A-A-59104
- c. Dry-cleaning solvent (SD-1), MIL-PRF-680 (Type I)
- d. Lubricant, semi-fluid (automatic weapons), MIL-L-46000C
- e. Standard specification for vapor degreasing grade, ASTM D4126
- f. Lubricating oil, weapons, low temperature, MIL-D-14107C
- g. Carbon removing compound, P-C-111 (Type II)
- h. Lubricant (CLP), MIL-PRF-63460
- i. Decontaminating agent, MIL-DTL-12468
- j. Decontaminating Agent, DS2 MIL-D-50030
- k. Turbine fuel, aviation, kerosene types, MIL-DTL-83133
- l. Standard specification for substitute ocean water ASTM D1141
- m. Water, deionized or distilled

## B50.0 TEST PROCEDURES

B50.1 Pre-firing. The following procedure shall be followed:

- a. 30 cartridges shall be immersed in each assigned chemical for one hour at a depth of one inch above the case rim with the cartridge laid horizontally to the chemical. After one hour, the cartridges are removed, set base down in a storage rack and allowed to drain naturally for 24 hours.

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APPENDIX B (Continued)

b. After the 24-hour dripping period, the cartridges shall be wiped of the assigned chemical, and inspected for abnormalities.

B50.2 Firing. The following procedure shall be followed:

a. One hundred twenty rounds of control ammunition (M855 cartridges that were not exposed to any chemicals) shall be fired in an M16A2 rifle. The 30 test sample cartridges from each required chemical as designated in section 3 shall then be loaded into a 30 round magazine and fired in an M16A2 rifle in the 3 round burst mode. If functioning problems are encountered with any of the test conditions, The weapon shall be inspected, cleaned and an additional 120 rounds fired.

B50.3 Criteria. The criteria shall be considered met if no safety problems are observed, and if there is not more than one stoppage in any 30 round group.

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APPENDIX C

Noise Level Test Procedure

C10.0 SCOPE

C10.1 Scope. This appendix gives test procedures for performing the Noise Level Test.

C20.0 APPLICABLE DOCUMENTS

TOP 1-2-608                      Sound Level Measurements

(Copies of the above Department of Defense Publications are available from Quality Engineering Directorate, ARDEC, Picatinny Arsenal, NJ 07806-5000, ATTN: AMSTA-AR-QAC-C.)

C30.0 PURPOSE

C30.1 Purpose. To determine the impulse noise levels produced by test ammunition when fired from various service weapons.

C40.0 EQUIPMENT

C40.1 Weapons. Weapons shall conform to the dimensions shown on the applicable drawings.

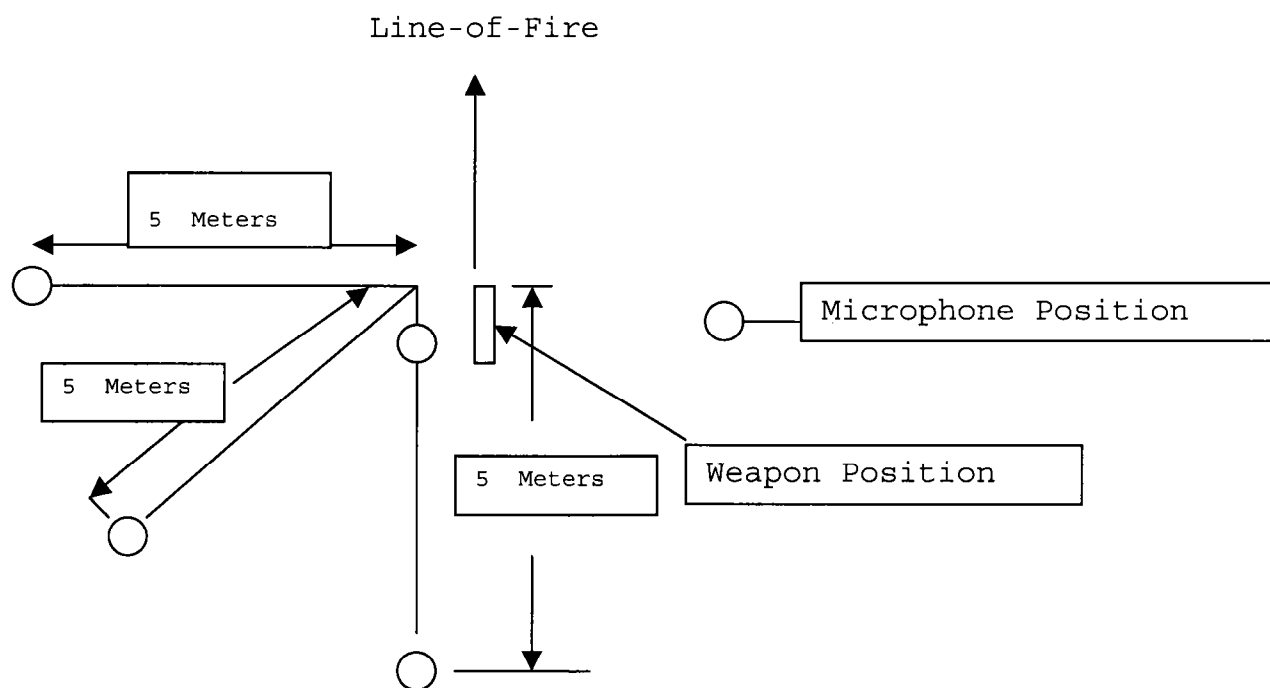
C50.0 TEST PROCEDURES

C50.1 Pre-firing (preparation for test). The Noise test shall be conducted in accordance with TOP 1-2-608 paragraph 4.2. Testing shall be conducted in an area free of any sound-reflecting surfaces within 49 feet.

C50.2 M4 Carbine, M16A2 Rifle and M249 Machinegun. Testing shall be conducted from one weapon of each type. For all test firings, the shooter shall fire from the prone position from the shoulder. Three microphones shall be placed as shown in Figure 1 and simultaneous analysis of impulse noise levels shall be made at the three locations. In addition, evaluation of the impulse noise levels shall be made at the shooter's ear (left ear, weapon fired right-handed). With the exception of the shooter's ear position, all distances are from the weapon's muzzle. Five single shots of test ammunition and five rounds of standard M55 Ball ammunition shall be fired single shot.

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APPENDIX C (Continued)



**Figure 1. Microphone Locations for the Noise Test**

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Appendix DAccuracy/Dispersion Test Procedures

## D10.0 SCOPE

D10.1 SCOPE. This Appendix gives test procedures for performing the accuracy test in the M4 carbine, M16A2 rifle and the M249 machinegun.

D20.0 APPLICABLE DOCUMENTS This section is not applicable to this appendix.

## D30.0 PURPOSE

D30.1 Purpose. To determine the accuracy of the ammunition when fired in various weapons.

## D40.0 EQUIPMENT

D40.1 Weapons. Weapons shall conform to the dimensions shown on the applicable drawings.

## D50.0 TEST PROCEDURES

D50.1 Dispersion and targeting in the M249 machinegun. This test shall be performed from a hard mount. Three weapons shall be used and six ten round targets shall be fired from each weapon. Ballistic zeroing shall be realized by adjusting the front sight. The rear sight shall be adjusted to the nominal position in both elevation and windage and set at the 300m range setting. Five warming shots shall be fired prior to performing this test. Ten rounds of test ammunition shall be fired in a burst at a target located 54.7 yards from the muzzle. The target shall be examined after firing to determine compliance with the requirement. The most unfavorable impact shall be deleted for the measurement of the extreme horizontal and vertical distances of the remaining nine shots. The same unfavorable impact shall be deleted when evaluating compliance with the targeting requirement.

D50.2 Targeting and accuracy in the M16A2 Rifle. This test shall be performed using a firing stand simulating shoulder firing and targets in accordance with Figure 2. Three brand new weapons shall be used and six ten round targets shall be fired from each weapon. the front and rear sights are set as follows: The normal rear sight peep (sight rotated fully rearward) shall be used with the rear sight set centrally in the slot for windage within plus or minus five (5) clicks. The top edge of the front sight post flange shall be flush to .030 inch below the bottom surface of the front sight

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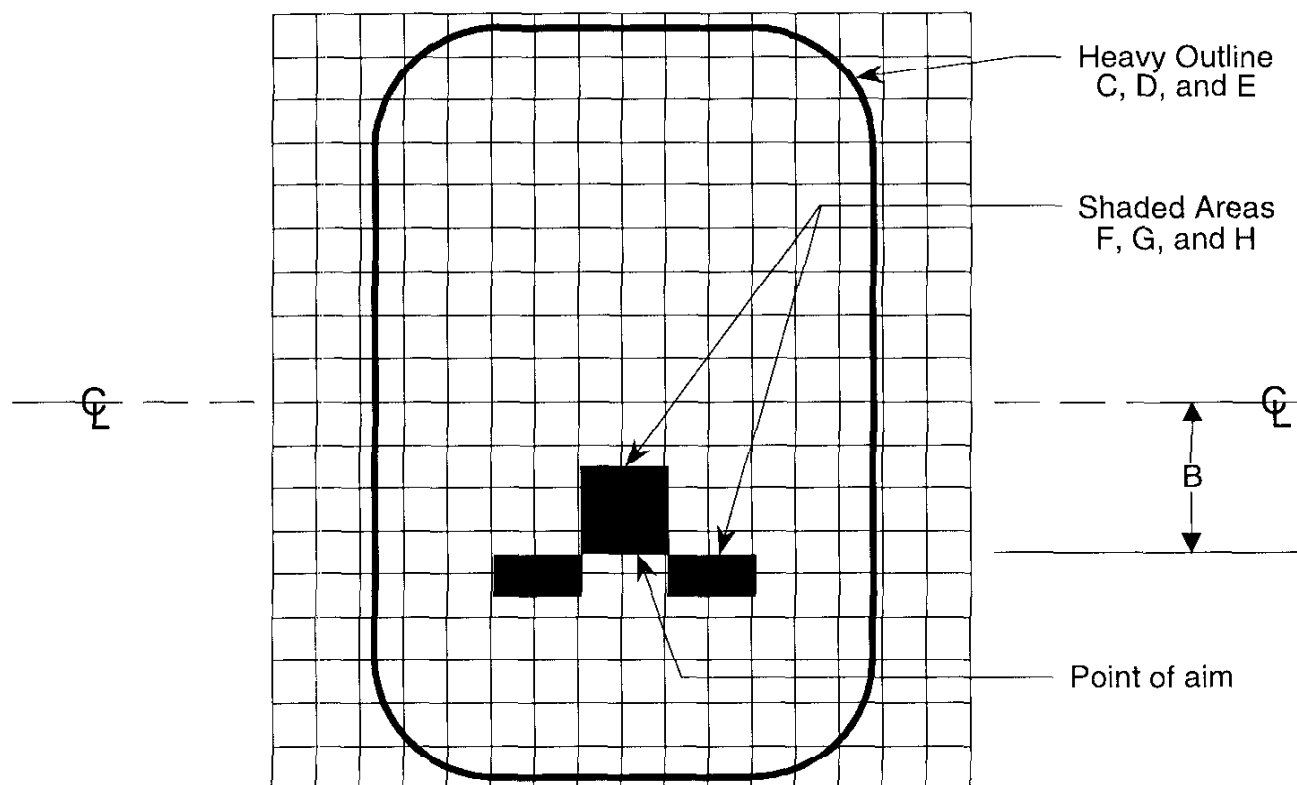
APPENDIX D (Continued)

slot. The selector lever shall be set on "SEMI" and the firing sights shall be aligned on the point of aim specified in Figure 2. Ten rounds shall be fired. The target shall then be checked to determine that the targeting and accuracy requirements have been met. Targets with evidence of a flyer or keyholing shall be cause for repeating the test.

D50.3 Targeting and accuracy in the M4 Carbine. This test shall be performed using a firing stand simulating shoulder firing and targets in accordance with Figure 3. Three brand new weapons shall be used and six ten round targets shall be fired from each weapon. the front and rear sights are set as follows: The normal rear sight peep (sight rotated fully rearward) shall be used with the rear sight set centrally in the slot for windage within plus or minus five (5) clicks. The top edge of the front sight post flange shall be flush to .030 inch below the bottom surface of the front sight slot. The selector lever shall be set on "SEMI" and the firing sights shall be aligned on the point of aim specified in Figure 3. Ten rounds shall be fired. The target shall then be checked to determine that the targeting and accuracy requirements have been met. Targets with evidence of a flyer or keyholing shall be cause for repeating the test.

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## APPENDIX D



- A - 10 shot group extreme spread
- B - Vertical distance from target centerline to point of aim
- C - Height of heavy outline
- D - Width of heavy outline
- E - Radius of corners of heavy outline
- F - Width of shaded areas
- G - Height of upper shaded area
- H - Heights of lower shaded areas
- I - Grid dimensions

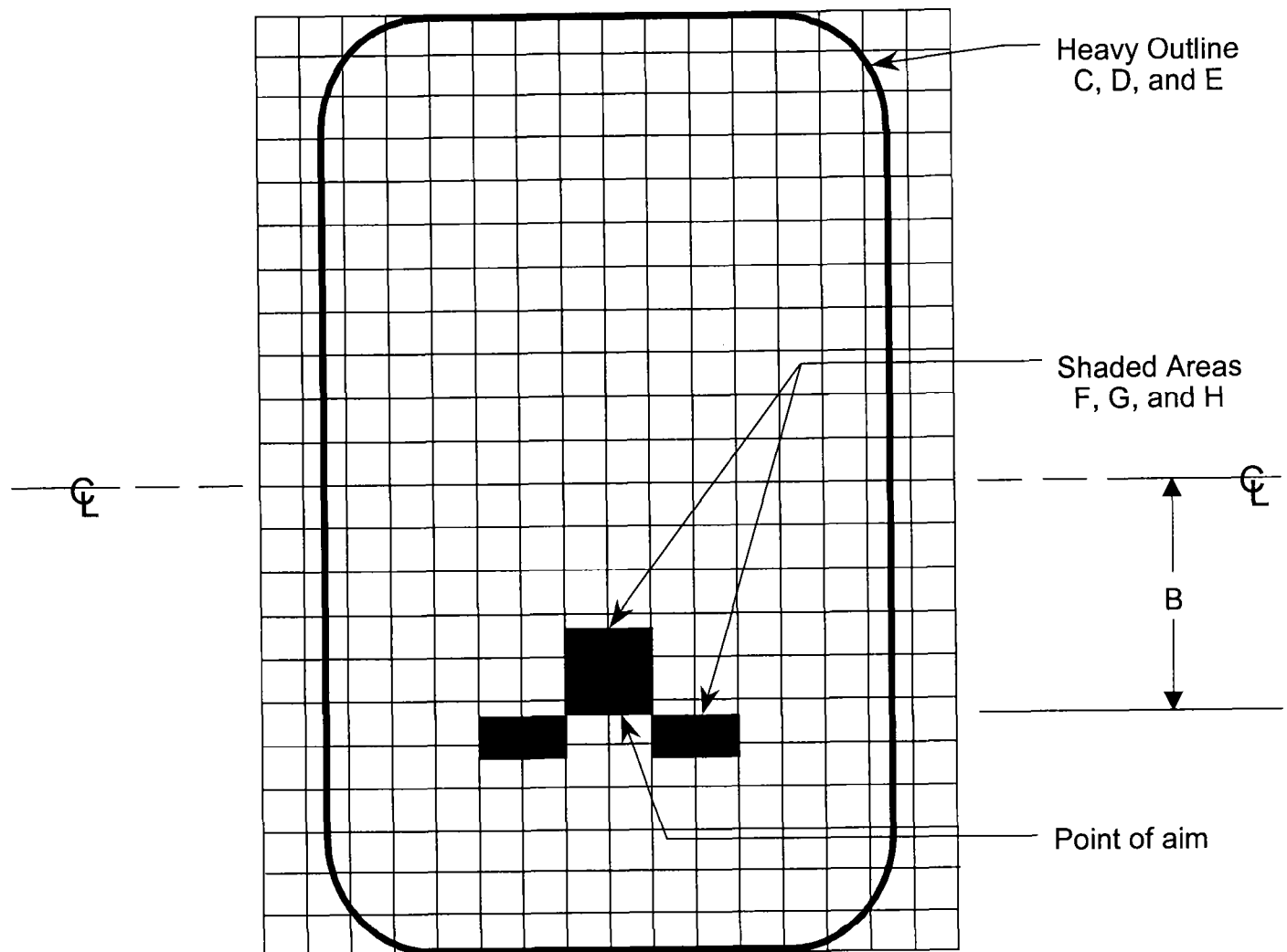
Target Diagram For		Dimensions in Inches								
		Group	P.O.A.	Heavy Outline			Shaded Areas			Grid
Meters	Yards	A	B	C	D	E	F	G	H	I
91.4	100	5.0	3.5	17.6	11.6	2.8	2.0	2.0	1.0	1.0

FIGURE 2. Targeting and accuracy diagram for M16A2 Rifle



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## APPENDIX D



- A - 10 shot group extreme spread  
 B - Vertical distance from target centerline to point of aim  
 C - Height of heavy outline  
 D - Width of heavy outline  
 E - Radius of corners of heavy outline  
 F - Width of shaded areas  
 G - Height of upper shaded area  
 H - Heights of lower shaded areas  
 I - Grid dimensions

Target Diagram For		Dimensions in Inches								
		Group	P.O.A.	Heavy Outline			Shaded Areas			Grid
Meters	Yards	A	B	C	D	E	F	G	H	I
91.4	100	5.6	5.2	22.0	13.2	2.9	2.0	2.0	1.0	1.0

FIGURE 3 Targeting and accuracy diagram for M4 Carbine

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Appendix ESurface Danger Zones Test Procedures

## E10.0 SCOPE

E10.1 SCOPE. This appendix gives test procedures for determining the surface danger zone for the 5.56-mm, M995 AP ammunition.

E20.0 APPLICABLE DOCUMENTS This section is not applicable to this appendix.

## E30.0 PURPOSE

E30.1 Purpose. This test is performed to determine the surface danger zone limits of the M995 AP ammunition.

## E40.0 EQUIPMENT

## E50.0 TEST PROCEDURES

E50.1 Test Procedures The following procedure shall be used:

a. Testing shall be conducted using a 5.56mm accuracy test barrel. Test firings shall be conducted against armor plate and sand at the 109.4 yard range. The impact angles and number of data points for each media are shown in the test matrix below:

Surface danger zone  
test matrix

Impact Media		Impact Angle, deg				
		3	5	10	15	20
Armor Plate	Data Points	-	75	50	75	50
Sand	Data Points	25	50	50	25	50

b. The 5.56mm accuracy barrel shall be installed on a V-block recoil mechanism mounted to a Frankford Rest. The center of the accuracy barrel shall be aligned along the established LOF. A variable angle test table shall be positioned 109.4 yards from the muzzle of the accuracy barrel (measurement made from muzzle to the trunnion of the table), perpendicular to the LOF. A Rolled Homogeneous Armor (RHA) plate shall be tack welded to the table with the center of the plate passing through the LOF and the trunnion. All positions shall be surveyed and the height of the accuracy barrel to the center of the trunnion of the variable table shall be measured to within 1 inch.

c. A Ricochet Radar head or equivalent shall be used to measure the impact and exit velocities as well as the ricochet angles of the projectiles. The radar head shall be positioned appropriately to allow for maximum coverage of the

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Appendix E

expected ricochet cone. positioned appropriately to allow for maximum coverage of the An IR detector shall be used to trigger the radar head.

d. All rounds shall be fired single shot from the accuracy barrel. An electronic theodolite shall be used to locate the impacts on the plate in relation to the radar position. A reflector shall be positioned on the impact point, and, with the theodolite aligned to the impact point, a laser range finder (LRF) shall be used to determine the position of the impact relative to the radar head.

e. The drag and trajectory results, minimum impact and exit velocity, the elevation and azimuth exit angle results shall be determined.

f. Testing shall be repeated using sand. The sand shall be Unimin's Accusand 20/30, unless otherwise specified. The moisture level and density of the sand shall be determined at the beginning of each day's firings.

Custodian:  
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Preparing activity:  
Army-AR

(Project: 1305-0227)

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

<b>I RECOMMEND A CHANGE:</b>		<b>1. DOCUMENT NUMBER</b> MIL-PRF-71208	<b>2. DOCUMENT DATE (YYYYMMDD)</b> 010409
<b>3. DOCUMENT TITLE</b> CARTRIDGE, 5.56MM, ARMOR PIERCING, M995			
<b>4. NATURE OF CHANGE</b> <i>(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)</i>			
<b>5. REASON FOR RECOMMENDATION</b>			
<b>6. SUBMITTER</b>			
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<b>c. ADDRESS</b> <i>(Include ZIP Code)</i> ATTN: AMSTA-AR-QAW-E, B-12 PICATINNY ARSENAL, NJ 07806-5000		<b>IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:</b> Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703) 767-6888 DSN 427-6888	