INCH-POUND

MIL-DTL-60584B (AR)
W/ AMENDMENT 3
18 August, 20011
SUPERSEDING
MIL-DTL-60584B(AR)
W/ AMENDMENT 2
30 March 2009

DETAIL SPECIFICATION

PROJECTILE, 155 MILLIMETER - SMOKE, WP, METAL PARTS ASSEMBLY, M110A2

This specification is approved for use by the U.S. Army ARDEC, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the manufacturing and assembly of the Projectile, 155MM, Smoke, WP, M110A2 Metal Parts. (See 6.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are needed to meet the requirements 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 assure the completeness of this list, document users are cautioned that they must meet all requirements cited in sections 3 and 4 of this specification, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to the Commander, U.S. Army ARDEC, ATTN: RDAR-QEM-A, Picatinny, NJ 07806-5000 or emailed to ardec-stdzn@pica.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.daps.dla.mil.

AMSC N/A FSC: 1320

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL SPECIFICATION

TT-C-490 - Chemical Conversion Coatings and Pretreatments for Ferrous Surfaces (Base for Organic Coatings)

DEPARTMENT OF DEFENSE STANDARDS

MIL-DTL-14824 – Projectile, HE, 155mm, M107 Metal Parts Assembly

MIL-STD-1168 - Ammunition Lot Numbering and Ammunition Data Card

MIL-STD-1916 - DOD Preferred Methods for Acceptance of Product

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

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

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

DTL10535925 - Projectile, HE, 155mm, M107 Metal Parts Assembly

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

9280357 - Body Magnetic Particle Standard for Projectile, 155MM, Smoke, WP, M110

10542945 - Projectile, 155MM, Smoke, WP, M110 Metal Parts

10542946 - Body Assembly

7548993 - Blank, Rotating Band

10542947 - Body

10542948 - Adapter

9280429 - Rotating Band Seat Tester.

(Copies of these drawings and specifications may be requested online at Drawing-Request@pica.army.mil or from U.S. Army ARDEC, ATTN: RDAR-EIS-PE, Picatinny Arsenal, NJ 07806-5000.)

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

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B 46.1 - Surface Texture (Surface Roughness Waviness, and Lay)

(Copies of ASME standards are available online from http://www.asme.org or from the American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990)

ASTM INTERNATIONAL (ASTM)

ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM E 8 - Standard Test Methods for Tension Testing of Metallic Materials
ASTM E 10 - Standard Test Method for Brinell Hardness of Metallic Materials
ASTM E 103 - Standard Test Method for Rapid Indentation Hardness Testing of Metallic Materials
ASTM E 1444 - Standard Practice for Magnetic Particle Testing

(Application for copies for ASTM publications should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. or online at http://www. http://www.astm.orgstm.org)

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 First article inspection. When specified (See 6.2) a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Materials, components and assemblies.

3.2.1 Adapter. The materials, components and assemblies shall comply with all requirements specified on Drawing 10542948.

3.2.2 Blank, rotating band. The materials, components and assemblies shall comply with all requirements specified on Drawing 7548993.

3.2.3 Body. The materials, components and assemblies shall comply with all requirements specified on Drawing 10542947.

3.2.4 Body asembly. The materials, components and assemblies shall comply with all requirements specified on Drawing 10542946.

3.2.5 Metal parts assembly (after paint). The materials, components and assemblies shall comply with all requirements specified on Drawing 10542945

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

3.4 Metal defects body and adapter. The body and adapter shall be free from all metal defects, in accordance with the visual defect standards (see 6.6) including cracks, splits, bursts, cold shuts, pipes, porosity, inclusions, folds, seams and other metal defects. In addition, the cavity shall be free of scale, fins, burrs, draw marks, laminations, imbedded foreign matter, and pits.

3.4.1 Nondestructive test. Projectiles shall be free of any discontinuities equal to or in excess of the Ultrasonic defect standards or as detected by magnetic particle inspection (see 6.3.1)

3.5 Banding.

3.5.1 Band seat. Prior to banding, the band seat shall be clean and free from oil, grease, dirt, rust or other foreign matter. Shot or sand-blasting shall not be permitted for cleaning the band seat after knurling.

3.5.2 Band blank. The rotating band blank shall be in the form of a solid ring, annealed if necessary to comply with the applicable drawing 7548993.

3.5.3 Rotating band strength and elongation. The applied band shall have a tensile strength of 30,000 lbs, per square inch (psi) minimum and the elongation shall be 25 percent of gage length, minimum (min).

3.5.4 Rotating band sidewall clearance.

3.5.4.1 Destructive. The rotating band shall be applied after final heat treatment of the body, by carefully pressing the band blank into the band seat so as to make contact with the sidewalls for a minimum of eight-tenths of the band seat depth. The bans shall be applied in such a manner as not to distort the body wall.

3.5.4.2 Visual. There shall be no gap at the forward or aft intersection of the body and band diameters after the rotating band has been machined to final dimension.

3.5.5 Rotating band diametrical clearance. The diametrical clearance between the rotating band and band seat shall not exceed .006 inch when the destructive method of testing is used or .009 when the nondestructive method of testing is used.

3.5.6 Rotating band seat contamination. The formation of scale between the band and the band seat shall be minimal in accordance with visual standards.

3.5.7 Protection of finished rotating band. The machined rotating band shall be protected from being nicked, burred or otherwise damaged in subsequent handling prior to shipment.

3.6 Air pressure test. Each assembly shall withstand an internal air pressure in accordance with requirements specified on drawing 10542946 without evidence of leakage.

3.7 Ballistic testing. The projectile assembly shall reveal no evidence of metal parts failure. Metal parts failure shall be:

a. Loss or breakup of metal parts components in flight.

b. Loss or fanning of the rotating band.

c. Shear of rotating band as evidenced by complete lack of engraving.

3.8 Workmanship.

3.8.1 Painting. Painting shall comply with the requirements of drawing 10542945 . All paint shall be dry to the touch before packing for shipment. Drying time prior to testing shall be in accordance with the applicable specification or drawing. Painting shall be complete, void free, and undamaged.

3.8.2 Surface finish. The requirements for surface finish are as detailed on the applicable drawing. The roughness comparison specimens prescribed by ASME B46.1 shall be used as a basis for surface roughness determinations, except in press fit area.

3.8.3 Threads. Threads shall be full and undamaged for the entire minimum length or depth as specified on drawing 10542945.

3.8.4 Burr. No part shall have a burr which might interfere with the assembly or function of the round or which might be injurious to personnel handling the item.

3.8.5 Foreign matter. No part or assembly shall contain dirt, grease, chips, rust, corrosion or other foreign matter. Particular attention shall be given to the cavity of the metal parts to assure that no grit, scale or other foreign matter remains therein after final cleaning. The projectile cavity may contain light rust, in the form of discoloration or staining with no visual evidence of pitting, etching, flaking, or other surface damage, covering not more than 25 percent of the cavity surface.

4. VERIFICATION

TABLE I Requirement/Verification Cross Reference Matrix.

METHOD OF VERIFICATION
N/A - NOT APPLICABLE
1 - ANALYSIS
2 - DEMONSTRATION
3 - EXAMINATION
4 - TEST

CLASSES OF VERIFICATION
A - FIRST ARTICLE
B - ACCEPTANCE

SECTION 3 REQUIREMENTS		SECTION 4							
Para.	DISCRIPTION	VERIFICATION METHOD					VERIFICATION CLASS		VERIFICATION
		N/A	1	2	3	4	A	B	
3.1	First article inspection				X	X	X		4.2
3.2	Materials, components and assemblies	X							N /A
3.2.1	Adapter				X	X	X	X	4.3.3.1
3.2.2	Blank, rotating band.				X		X	X	4.3.3.2
3.2.3	Body				X		X	X	4.3.3.3, 4.4.1, 4.4.1.2
3.2.4	Body assembly.					X	X	X	4.3.3.4, 4.4.3
3.2.5	Metal parts assembly (after paint)				X	X	X	X	4.3.3.5, 4.4.5, 4.4.6
3.3	Ammunition lot numbering				X		X	X	4.3.3.5
3.4	Metal defects body and adapter				X		X	X	4.3.3.1, 4.3.3.3
3.4.1	Nondestructive test					X	X	X	4.3.3.4, 4.4.4
3.5	Banding				X		X	X	4.3.3.4
3.5.1	Band seat				X		X	X	4.3.3.4
3.5.2	Band blank				X		X	X	4.3.3.2
3.5.3	Rotating band strength and elongation					X	X	X	4.3.3.4, 4.4.2.3
3.5.4.1	Destructive				X	X	X	X	4.4.2.2, 4.3.3.4
3.5.4.2	Visual				X		X	X	4.3.3.4
3.5.5	Rotating band diametrical clearance					X	X	X	4.3.3.4, 4.4.2.1
3.5.6	Rotating band seat contamination				X		X	X	4.3.3.3
3.5.7	Protection of finished rotating band				X		X	X	4.3.3.5
3.6	Air pressure test					X	X	X	4.3.3.4
3.7	Ballistic testing					X	X	X	4.3.3.5, 4.4.6
3.8.	Workmanship				X		X	X	4.3.3.4

TABLE I Requirement/Verification Cross Reference Matrix – Continued

METHOD OF VERIFICATION N/A - NOT APPLICABLE 1 - ANALYSIS 2 - DEMONSTRATION 3 – EXAMINTION 4 - TEST		CLASSES OF VERIFICATION A - FIRST ARTICLE B - ACCEPTANCE							
SECTION 3 REQUIREMENTS		SECTION 4							
Para.	DISCRIPTION	VERIFICATION METHOD					VERIFICATION CLASS		VERIFICATION
		N/A	1	2	3	4	A	B	
3.8.1	Painting				X		X	X	4.3.3.5
3.8.2	Surface finish				X		X	X	4.3.3.3, 4.3.3.4
3.8.3	Threads				X		X	X	4.3.3.1, 4.3.3.3, 4.3.3.5
3.8.4	Burr				X		X	X	4.3.3.1 - 4.3.3.5
3.8.5	Foreign matter				X		X	X	4.3.3.1 - 4.3.3.5

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

a. First article inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 First article inspection.

4.2.1 First article quantity. A first article sample shall be submitted for evaluation in accordance with the provisions of 4.2.2 and Table II. The first article sample shall consist of the assemblies, components and test specimens listed below in the quantities indicated.

Part description	Drawing	Quantity
BLANK, ROTATING BAND	7548993	5
PROJECTILE MPTS ASSEMBLY	10542945	35
BODY ASSEMBLY	10542946	10
BODY	10542947	5
ADAPTER	10542948	5

4.2.2 First article rejection. If any sample fails to comply with the first article requirements, the sample shall be rejected.

TABLE II – First article inspection

PART	NUMBER OF SAMPLES	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
ADAPTER			
Dwg. 10542948			
Examination for characteristics	5	3.2.1	4.3.3.1
BLANK, ROTATING BAND			
Dwg. 7548993			
Examination for characteristics	5	3.2.2	4.3.3.2
BODY			
Dwg. 10542947			
Examination for characteristics	5	3.2.3	4.3.3.3
Mechanical properties	2	3.2.3	4.4.1

TABLE II - First article inspection - Continued

PART	NUMBER OF SAMPLES	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
BODY ASSEMBLY			
Dwg. 10542946			
Examination for characteristics	10	3.2.3	4.3.3.4
Band seating tightness	3	3.5.5	4.4.3.2
Rotating Band	5		
a) Side wall contact		3.5.4, 3.5.5	4.4.2.1, 4.4.2.2
b) Mechanical properties		3.5.3	4.4.2.4
Sectionalized joint	2	3.5.4	4.4.2.2
Metal Parts Assembly (after paint)			
Dwg. 10542945			
Examination for characteristics	35	3.2.5	4.3.3.5
Salt spray test	2	3.2.5	4.4.5
FUNCTIONAL TEST (PROVING GROUND)			
Dwg. 10542945			
Ballistic Testing			
a) Excess pressure	15	3.7	4.4.3.5, 4.4.6 – 4.4.6.1

4.3 Conformance inspection.

4.3.1 Lot formation. Lot formation shall be in accordance with lot formation requirement of MIL-STD-1916 paragraph "Formation and identification of lots or batches". In addition, inspection lots of projectiles shall contain bodies from not more than one forging manufacturer.

4.3.2 Body heat treatment or stress relief lots.

4.3.2.1 Heat treatment lots. A heat treatment lot of bodies shall consist of bodies from only one mill heat of steel that have been heat treated in the same time cycles, in one unchanged process. The maximum lot size shall be 2000 bodies. If a mill heat exceeds 2000 bodies, the mill heat shall be divided into any convenient number of heat treatment lots that would preclude the need for forming miscellaneous heat treatment lots.

4.3.2.2 Stress relieved lots. Stress relieved lots shall contain cold worked bodies from not more than one heat of steel that have been cold worked by the same process, utilizing the same tooling and equipment and stress relieved in the same furnace at the same temperature for the same length of time. The maximum lot size shall be 2000 bodies.

4.3.2.3 Miscellaneous lots. Small lots (such as bodies manufactured from abnormally small heats of steel or bodies that have become separated from previously delivered lots) may, at the discretion of the supplier, be grouped into miscellaneous heat treatment or stress relieved lots as the case may be. Such lots shall be identified by a miscellaneous lot code number and processed in accordance with either 4.3.2.1 or 4.3.2.2 as applicable. The maximum lot size shall be 2000 bodies.

4.3.2.4 Mechanical properties lots. The lots constituted per 4.3.2.1, 4.3.2.2 and 4.3.2.3 shall be the basis for selecting samples for mechanical properties tests. Bodies in each heat treatment or stress relieved lots shall be identified to that particular lot until satisfactory completion of mechanical properties tests.

4.3.2.5 Projectile lots. When it has been determined that bodies of a heat-treated, stress relieved or miscellaneous lot have complied with the mechanical properties requirement of the applicable drawing, they may be regrouped for assembly into projectile lots, to which will be assigned a projectile lot number. The projectile lot shall consist of projectile assemblies produced by one supplier under one contract in one unchanged process, in accordance with the same drawing, same drawing revision, same specification and same specification revision, under conditions of continuous production free from interruptions other than those due to the end of a shift, day, or workweek. The projectile lot thus constituted shall be the basis for the selection of samples for functional test hereinafter prescribed.

4.3.3 Conformance inspection by classification of characteristics. See paragraphs 4.3.3.1 through 4.3.3.5.

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.1	TITLE Adapter.	SHEET 1 OF 3		DRAWING NUMBER 10542948 / NEXT HIGHER ASSEMBLY 10542946
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical				
1	Diameter of press fit area	100%	3.2.1	AIE
Major				
101	Pitch diameter of external thread	Level IV	3.2.1	AIE
102	Major diameter of external thread, min.	Level IV	3.2.1	AIE
103	Length from rear face to basic diameter on rear taper	Level IV	3.2.1	AIE
104	Runout of forward taper to outside thread pitch diameter and shoulder	Level IV	3.2.1	AIE
105	Runout of projected pitch diameter of internal threads (2 places) to out- side thread pitch diameter, forward face and shoulder (see Note 1)	Level IV	3.2.1	AIE
106	Runout of press fit diameter at rear of fuze cavity to external thread pitch diameter and shoulder	Level IV	3.2.1	AIE
107	True position of diameter at rear of fuze cavity to press fit diameter	Level IV	3.2.1	AIE
108	Pitch diameter of internal thread	Level IV	3.2.1	AIE
109	Minor diameter of internal thread, max.	Level IV	3.2.1	AIE

Note 1. These inspections are not required when components are to be supplied as assemblies.

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.1 Cont.	TITLE Adapter	SHEET 2 OF 3		DRAWING NUMBER 10542948 / NEXT HIGHER ASSEMBLY 10542946
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Major				
110	Depth to bottom of fuze cavity	Level IV	3.2.1	AIE
111	Depth to bottom of counterbore at rear of fuze cavity	Level IV	3.2.1	AIE
112	Effective internal thread length, min	Level IV	3.2.1	AIE
113	Diameter of counterbore at rear of fuze cavity	Level IV	3.2.1	AIE
114	Length from front face to first basic diameter on taper	Level IV	3.2.1	AIE
115	Length from front face to second basic diameter on taper	Level IV	3.2.1	AIE
116	Metal defective	Level IV	3.4	Visual
117	Reverse taper in press fit area	Level IV	3.2.1	AIE
118	Surface finish of press fit area(note 2)	Level IV	3.2.1	Visual/Comparison blocks
119	Radius at start of press fit area improper, or incorrect form or not present for entire circumference	Level IV	3.2.1	AIE/Visual

Note 2. Surface finish of press fit area shall not be inspected until all manufacturing and gaging operations have been completed.

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.1 Cont.	TITLE Adapter	SHEET 3 OF 3		DRAWING NUMBER 10542948 / NEXT HIGHER ASSEMBLY 10542946
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Minor				
201	Diameter of undercut forward of external thread	Level II	3.2.1 3.2.1	AIE AIE
202	Diameter of rear face	Level II	3.2.1	AIE
203	Length from front face to shoulder	Level II	3.2.1	AIE
204	Length from rear face of shoulder to rear of external thread	Level II	3.2.1	AIE
205	Length, total	Level II	3.2.1	AIE
206	Width of undercut forward of external thread	Level II	3.2.1	AIE
207	Diameter of thread chamfer	Level II	3.2.1	AIE
208	Length of internal thread, max.	Level II	3.2.1	AIE
209	Width of notches (if applicable)	Level II	3.2.1	AIE
210	Depth of notches (if applicable)	Level II	3.2.1	AIE
211	Diameter of notches (if applicable)	Level II	3.2.1	AIE
212	Radii or chamfers missing or incorrect	Level II	3.4 / 3.2.1	Visual
213	Burr	Level II	3.8.4	Visual
214	Foreign material	Level II	3.8.5	Visual
215	Evidence of poor workmanship	Level II	3.8	Visual

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.2	TITLE Blank, Rotating Band	SHEET 1 OF 1		DRAWING NUMBER 7548993 / NEXT HIGHER ASSEMBLY 10542946
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical	None defined			
Major				
101	Inside diameter	Level IV	3.5	AIE
102	Width	Level IV	3.5	AIE
103	Thickness	Level IV	3.5	AIE
104	Band blank	Certification	3.5	Visual/ Examination
Minor				
201	Evidence of poor workmanship	Level II	3.8	Visual

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.3	TITLE Body	SHEET 1 OF 4		DRAWING NUMBER 10542947 / NEXT HIGHER ASSEMBLY 10542946
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical				
1	Non-destructive test for metal defective	100%	3.4.1	4.4.4 - 4.4.4.2
Major				
101	Pitch diameter	Level IV	3.2.3	AIE
102	Minor diameter, max.	Level IV	3.2.3	AIE
103	Diameter of rotating band seat	Level IV	3.2.3	AIE
104	Effective thread length	Level IV	3.2.3	AIE
105	Depth from front face to bottom of base counterbore	Level IV	3.2.3	AIE
106	Length from front face to first basic diameter	Level IV	3.2.3	AIE
107	Length from front face to second basic diameter	Level IV	3.2.3	AIE
108	Length from bottom of base counterbore to first inside diameter	Level IV	3.2.3	AIE
109	Length from bottom of base counterbore to second inside diameter	Level IV	3.2.3	AIE

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.3 Cont.	TITLE Body	SHEET 2 OF 4		DRAWING NUMBER 10542947 / NEXT HIGHER ASSEMBLY 10542946
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Major				
110	True position of base counter bore with pitch diameter and forward face	Level IV	3.2.3	AIE
111	Length from front of boattail to rear of rotating band seat	Level IV	3.2.3	AIE
112	Location of rotating band seat	Level IV	3.2.3	AIE
113	Thickness of wall, min. at blend area	Level IV	3.2.3	AIE
114	Variation in wall thickness to rear of bourrelet	Level IV	3.2.3	AIE
115	Variation in wall thickness forward of bourrelet	Level IV	3.2.3	AIE
116	Width of rotating band seat	Level IV	3.2.3	AIE
117	Length, total	Level IV	3.2.3	AIE
118	Length from front face to rear of bourrelet	Level IV	3.2.3	AIE
119	Diameter of base counter bore	Level IV	3.2.3	AIE
120	Distance from bottom of base counter bore to basic diameter on taper of counter bore	Level IV	3.2.3	AIE
121	Diameter of nose counter bore	Level IV	3.2.3	AIE
122	Diameter of rear face	Level IV	3.2.3	AIE

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.3 Cont.	TITLE Body	SHEET 3 OF 4		DRAWING NUMBER 10542947 / NEXT HIGHER ASSEMBLY 10542946
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
123	Outside diameter of body (2 places) at rear of rotating band undercut and blend area	Level IV	3.2.3	AIE
124	Runout of rear face with body	Level IV	3.2.3	AIE
125	Runout of boattail with body	Level IV	3.2.3	AIE
126	Runout of ogive with body	Level IV	3.2.3	AIE
127	Runout of projected pitch diameter of threads (2 places) with body and forward face	Level IV	3.2.3	AIE
128	Runout of bourrelet with body	Level IV	3.2.3	AIE
129	Diameter of bourrelet, min	Level IV	3.2.3	AIE
130	Mechanical properties	4.4.1	3.2.3	4.4.1
131	Foreign matter on band seat	Level IV	3.5.1, 3.5.6	Visual
132	Scoring or knurling missing from rotating band seat	Level IV	3.2.3	Visual
133	Weight (excluding lifting plug and grommet)	Level IV	3.2.4	AIE

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.3 Cont.	TITLE Body	SHEET 4 OF 4		DRAWING NUMBER 10542947 / NEXT HIGHER ASSEMBLY 10542946
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Minor				
201	Depth of nose thread counter bore	Level II	3.2.3	AIE
202	Radii or chamfers missing or incorrect	Level II	3.2.3	Visual
203	Surface finish improper	Level II	3.8.2	Visual
204	Evidence of shot or sand blasting on rotating band seat	Level II	3.2.3	Visual
205	Burr	Level II	3.8.4	Visual
206	Foreign matter (except as otherwise classified)	Level II	3.8.5	Visual
207	Metal defective	Level II	3.4	Visual standards
208	Evidence of poor workmanship	Level II	3.8	Visual

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.4	TITLE Body Assembly	SHEET 1 OF 3		DRAWING NUMBER 10542946 / NEXT HIGHER ASSEMBLY 10542945
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical				
1	Air pressure test	100%	3.6	4.4.3.1
Major				
101	Runout of projected pitch diameter (2 places) with body and forward face	Level IV	3.2.4	AIE
102	Runout of adapter with body	Level IV	3.2.4	AIE
103	Runout of rotating band with body	Level IV	3.2.4	AIE
104	True position of base counter bore with press fit surface	Level IV	3.2.4	AIE
105	Diameter of rotating band	Level IV	3.2.4	AIE
106	Diameter of rotating band groove	Level IV	3.2.4	AIE
107	Diameter of rotating band relief groove	Level IV	3.2.4	AIE
108	Length from rear of rotating band to start of angle	Level IV	3.2.4	AIE
109	Angle at front of rotating band	Level IV	3.2.4	AIE
110	Angle at rear of rotating band relief groove	Level IV	3.2.4	AIE
111	Width of rotating band	Level IV	3.2.4	AIE

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.4 Cont.	TITLE Body Assembly	SHEET 2 OF 3		DRAWING NUMBER 10542946 / NEXT HIGHER ASSEMBLY 10542945
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Major				
112	Width of rotating band groove	Level IV	3.2.4	AIE
113	Width of rotating band, rear of angle	Level IV	3.2.4	AIE
114	Width of rotating band relief groove	Level IV	3.2.4	AIE
115	Location of rotating band.	Level IV	3.2.4	AIE
116	Length total (max.)	Level IV	3.2.4	AIE
117	Rotating band mechanical properties	4.4.2.3	3.5.3	4.4.2.3
118	Rotating band side wall contact	4.4.2.2	3.5.4.1	4.4.2.2
119	Band seating tightness	4.4.2.1.2	3.2.4/ 3.5.5	4.4.2.1
120	Sectionalized joint	4.4.3.2	3.2.4	4.4.3.2
121	Adaptor not seated for 360 degrees	Level IV	3.2.4	Visual
122	Air pressure stamp missing (indicating failure to pass test) see note 1	100%	3.2.4	Visual
123	Non-destructive test stamp missing (indicating failure to pass test) see note 1	100%	3.2.4	Visual
124	Any gap between the finish machined rotating band and the body	100%	3.5.4.2	Visual/ Dedicated illumination

Note 1. Any part found without the required test stamp shall be tested to determine if the part fails the critical test. If the part fails the test it shall be treated as a Critical Nonconformance. If the part passes the critical test it shall be treated as a Major Nonconformance.

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.4 Cont.	TITLE Body Assembly	SHEET 3 OF 3		DRAWING NUMBER 10542946 / NEXT HIGHER ASSEMBLY 10542945
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Minor				
201	Depth of undercut forward of rotating band(if applicable)	Level II	3.2.4	AIE
202	Width of undercut forward of rotating band(if applicable)	Level II	3.2.4	AIE
203	Radii or chamfers missing or incorrect	Level II	3.2.4	Visual
204	Surface finish improper	Level II	3.8.2	Visual
205	Notches incorrect (if applicable)	Level II	3.2.4	AIE
206	Burr	Level II	3.8.4	Visual
207	Foreign matter	Level II	3.8.5	Visual
208	Evidence of poor workmanship	Level II	3.8	Visual

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.5	TITLE Metal Parts Assembly (after Paint)	SHEET 1 OF 2		DRAWING NUMBER 10542945 NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical				
1	Ballistic test excess pressure	4.4.6.1	3.7	4.4.6 / 4.4.6.1
Major				
101	Diameter of bourrelets, max.	100%	3.2.5	AIE
102	Salt spray	TT-C-490	3.2.5	4.4.5
103	Rotating band damaged	Level IV	3.2.5	Visual
104	Thread damaged	Level IV	3.2.5 / 3.8.3	Visual
105	VCI paper missing or improperly inserted.	Level IV	3.2.5 3.2.5	Visual Visual
106	Protective finish incomplete or damaged	Level IV	3.2.5	Visual
Minor				
201	Marking missing, incorrect, or illegible	Level II	3.2.5	Visual
202	Paint on threads	Level II	3.2.5	Visual
203	Paint on front face or threads	Level II	3.2.5	Visual
204	Paint on rotating band surfaces	Level II	3.2.5	Visual
205	Paint not dry	Level II	3.2.5	Visual/Examination
206	Corrosive preventive compound inadequate or excessive	Level II	3.2.5	Visual

Conformance inspection by classification of characteristic

PARAGRAPH 4.3.3.5 Cont.	TITLE Metal Parts Assembly (after Paint)	SHEET 2 OF 2		DRAWING NUMBER 10542945 NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Minor				
207	Burr	Level II	3.8.4	Visual
208	Foreign matter	Level II	3.8.5	Visual
209	Grommet missing or loose	Level II	3.2.5	Visual
210	Lifting plug missing	Level II	3.2.5	Visual
211	Evidence of poor workmanship	Level II	3.8	Visual

4.4. Testing. Testing is described in the First Article Table, Quality Conformance, and herein.

4.4.1 Mechanical properties.

4.4.1.1 Hardness test projectile body.

4.4.1.1.1 Hardness test samples from heat treatment lots. In order to determine uniformity of heat treatment, each body forging in the heat treatment lot (as defined in 4.3.2.1) shall be subjected to a hardness test with a Brinnel hardness tester. (See 4.4.1.1.4)

4.4.1.1.2 Hardness test samples from stress relieved lots. Twenty-five cold shaped bodies from the first batch of each stress relieved lot (as defined in 4.3.2.2) processed through the stress relief furnace and 5 bodies from each one hour's production thereafter for the balance of the stress relieved lot shall be subjected to a hardness test to assess uniformity of the product. (See 4.4.1.1.4)

4.4.1.1.3 Hardness test samples from miscellaneous lots. Miscellaneous heat treatment lots shall be subject to a hardness test in accordance with 4.4.1.1.1. Miscellaneous stress relieved lots shall be subject to a hardness test in accordance with 4.4.1.1.2.

4.4.1.1.4 Hardness test. The hardness test shall be conducted in accordance with ASTM E 103 and the following:

a. The surface of the body in the area designated by the drawing to be hardness tested shall be prepared by machining a flat to a sufficient depth, .015 inch minimum, to remove scale and get below the decarburization zone. The preparation process to be used shall require Government approval. Manual grinding shall not be used. The surface preparation requirement may be eliminated if the following conditions are met:

(1) Lab results confirm that current production process produces a decarburized zone of .003 inches maximum in the test area. Samples, or photo-micrographs, of high and low hardness shall be available for review and approval. Samples may be the same as for 4.4.1.2 below.

(2) A controlled atmosphere is maintained in the austenitizing furnace.

(3) Depth of decarburization shall be verified for the first heat treat lot.

b. Hardness tester periodic verification shall be performed using Brinell test standards manufactured in accordance with ASTM E 10 in lieu of production samples.

c. One hardness reading shall be taken.

d. The hardness tester shall use a standard 10mm Brinell ball. The body shall be securely supported so that no rocking or shifting of the body will occur during the test. The tester shall apply a pre load followed by application of the full load. The pre load shall not exceed 10 percent of the major load of 3000kg. The amount of penetration of the indenture (10mm ball) during that time period when the major load is applied including the dwell time at the end of the load application shall be automatically measured. The tester shall be provided with a means to compensate for any flexing of the test item that may occur during application of the major load. The hardness number will be displayed at the conclusion of the test.

e. All hardness test measurements shall be automatically recorded.

4.4.1.2 Tension test projectile body.

4.4.1.2.1 Tension test samples from heat treatment lots. Two projectile body forgings, one of the hardest and one of the softest as determined by 4.4.1.1.1., shall be subjected to this test. Failure of any tension test specimen to comply with the yield strength or elongation requirements of drawing 10542947 shall be cause for rejection of the lot. The entire lot may be reheat treated and retested; or a new set of bodies may be selected and tested from a segment of the heat treat lot having a tighter hardness range than the heat treatment lot as originally sampled. If an acceptable hardness range can be established for this heat treatment lot, bodies falling within this range will be accepted. All other bodies shall be rejected. Rejected bodies may be reheat treated and retested.

4.4.1.2.2 Tension test samples from stress relieved lots. Two projectiles bodies from each stress relieved lot (as defined by 4.3.2.2.) shall be selected at random and subjected to this test. Failure of any tension test specimen to comply with the yield strength or elongation requirements of drawing 10542947 shall be cause for rejection of the lot.

4.4.1.2.3 Tension test samples from miscellaneous lots. Samples for tension test of miscellaneous heat treatment or stress relieved lots shall be selected in accordance with 4.4.1.2.1 or 4.4.1.2.2, as applicable. Failure of any tension test specimen to comply with the yield strength or elongation requirements of drawing 10542947 shall be cause for rejection of the lot. Double the number of samples shall be selected for miscellaneous lots.

4.4.1.2.4 Tension test. From the samples provided by 4.4.1.2.1, 4.4.1.2.2 or 4.4.1.2.3 two tension test specimens conforming to the largest obtainable round type specimen as prescribed by ASTM E 8, shall be taken from opposite sides of the body at mid wall, in such a manner that the center of the gage length of the mechanical test bar will fall in line coincident with the center of the rotating band seat. The number of

specimens and their location are not defined and shall not be a restriction from testing additional specimens at other locations if necessary to determine that the mechanical properties of the projectile body meet drawing 10542947 requirements. The criteria for performing the tests shall be as prescribed by ASTM E 8.

4.4.2. Banding.

4.4.2.1 Rotating band tightness.

4.4.2.1.1 Tightness (nondestructive method). When the nondestructive method of testing is employed, five body and band assemblies from each 1-hour production or fraction thereof per banding machine in operation shall be subjected to this test. Failure of one or more bands to comply with 3.5.5 shall be cause for rejection of the assemblies represented by the failing sample. The samples shall be tested in accordance with rotating band seat tester drawing 9280429.

4.4.2.1.2 Tightness (destructive method). One body and band assembly from each production shift or fraction thereof shall be subjected to this test to determine compliance with 3.5.5. Failure to comply shall be cause for rejection of the assemblies represented by the failing sample. The body and band assembly selected should not be processed through the band machining line, although each band should have a light surface cut to true up the surface prior to measuring. The diameter of each band shall be measured on three (3) locations, 60 degrees apart, on the points along the cylindrical portion of their length, near the front and rear edges. This comprises six (6) diametrical measurements per band. These points of measurement shall be marked on the bands and on the projectile body adjacent thereto in such a manner as to permit proper body and band orientation after removal. The bands shall be carefully removed so as to keep deformation to a minimum. After removal, the thickness of the band shall be measured at each of the marked points (a total of 12 measurements) and the diameter of the band seat corresponding to these points shall also be measured. Add to each of the diameters of the band seat the sum of the corresponding two (2) thicknesses of the band; the results obtained shall then be subtracted from the previously determined diameters over the band. The six (6) results shall be totaled and the sum thus obtained will be divided by six (6) to determine the average diametrical clearance.

4.4.2.2 Side wall contact. One body and band assembly shall be selected from each production shift or fraction thereof from each banding machine in operation and subjected to this test to determine compliance with 3.5.4.1 Failure to comply shall be cause for rejection of the assemblies represented by the sample. The samples shall be sectioned by cutting through two planes normal to the longitudinal axis one-half inch forward and rear of rotating band. The cylindrical portion containing the rotating band shall be sectioned approximately in half through a plane parallel to its longitudinal axis. One of the two parts shall be used for establishment of mechanical properties of the band; the other part shall be sectioned into two parts, thus exposing four surfaces, each of

which reveals a view of the band as swaged into the band seat. The exposed surfaces shall be subjected to a light grinding operation to remove metal smear effects of saw cuts prior to measurements for depth of side wall contact to determine compliance with requirements of 3.5.4.1.

4.4.2.3 Tension test rotating band. Following the examination for depth of side wall contact as described in 4.4.2.2, the rotating band shall be removed from one of two segments from the sample provided by 4.4.2.2 and carefully flattened without hammering so as to hold additional cold working to a minimum. The specimen blank shall be machined so that all serration marks from the band seat are removed. A test specimen having two centimeter gage length and a one centimeter gage width, and grip ends of sufficient length to accommodate the tensile machine shall be removed from the blank band. The specimen shall be tested in accordance with the procedure prescribed by ASTM E 8.

4.4.3 Brazed joint.

4.4.3.1 Air pressure test. Each metal parts assembly shall be subjected to this test to determine compliance with requirements of the drawing 10542946. Failure of any assembly to comply shall be cause for rejection of the assembly. This test will be performed using equipment capable of performing the test accurately and consistently. The equipment shall be calibrated prior to start of each day's operation and after each four (4) hours continuous operation. The assembly shall be submerged in water in such a manner that the nose adapter joint is covered, and observation can be made for full 360 degrees of adapter joint. Observation shall be made for air bubbles rising to the surface of the water or bubbles leaving the vicinity of the adapter joint. In performing the test the pressure will be applied until the required minimum pressure is reached, after which the pressure will be held for a minimum length of time specified on the applicable drawing. After acceptance stamp letter "A" as indicated on the assembly drawing.

4.4.3.2 Sectionalized joint. Two body assemblies, prior to painting, shall be selected from each lot of body assemblies and subjected to this test to determine compliance with the requirements of the drawing 10542946. Failure to comply shall be cause for rejection of the lot. The samples provided shall be sectionalized by removing a portion of the body at least one inch to the rear of the brazed area. The section (containing the brazed joint) shall be cut into two (2) segments. From each segment, the portion of the body shall be peeled from the adapter. After peeling, the brazed area of each segment of the adapter and the mating pieces of the body shall be visually examined to determine compliance with the applicable drawing.

4.4.4 Non-destructive test for metal defects. Each projectile body shall be inspected for metal defects by either magnetic particle inspection or by ultrasonic test.

4.4.4.1 Magnetic particle inspection. The procedures for performing this test shall be in accordance with ASTM E 1444 and use the wet fluorescent method with indirect magnetization by either the continuous method or the residual method. The suspension shall be applied to the entire body, inside and outside. The body shall be inspected after inducing a circular magnetic field and again after inducing a longitudinal magnetic field. The magnetic particle standard per Dwg. 9280357 shall be utilized to establish inspection sensitivity. Any body which fails to comply with the requirements of 3.4.1 shall be rejected. After draining, the body shall be thoroughly inspected in a darkened area under the ultra-violet light which will produce adequate fluorescence of the magnetic particles. The solids content of the suspension shall be maintained at a level recommended by the manufacturer. The suspension shall be checked at the start of each day's production and at intervals of not over 4 hours continuous operation. When performing the test for solids content of suspension, if it is determined that it does not comply, all assemblies that have been accepted since the last satisfactory test shall be retested after the suspension has been brought to the proper level. After acceptance, the body assembly shall be demagnetized and cleaned. Bodies which comply shall be stamped with the letter "M" as specified on drawing 10542947.

4.4.4.2 Ultrasonic test. Heat treated bodies, prior to band seat machining and threading, shall be inspected 100 percent utilizing the ultrasonic inspection test equipment, techniques and procedures as specified in MIL-DTL-14824 paragraph title "Ultrasonic Inspection." The ultrasonic standard specified in MIL-DTL-14824 paragraph title "Ultrasonic Inspection" shall be modified, as necessary, to conform to the form of the M110 projectile at the point of ultrasonic inspection. This modification shall maintain the standard notch sizes in all area of the projectile body.

4.4.5 Salt spray. After qualification in accordance with TT-C-490 or commercial equivalent as approved by the contracting officer, two(2) salt spray samples shall be taken each week, one during the first 30 minutes of production and a second at any other time. Failure to comply with the requirements of the applicable drawing shall be cause for taking the corrective action prescribed in TT-C-490.

4.4.5.1 Salt spray testing. Salt spray testing shall be accomplished on production projectiles or sectioned projectiles that were acceptable at the time of painting and were sectioned subsequent to painting. If sectioned projectiles are used, sectioning shall be accomplished to allow testing of all major areas of the projectiles on an alternating basis. The salt spray test shall be performed utilizing the equipment and procedures specified by ASTM B117 and TT-C-490 or commercial equivalent as approved by the procuring contracting officer, with the exception that test samples shall be selected in accordance with 4.4.5.

4.4.6 Proving ground ballistic test sampling procedures. Normal sampling will be conducted until two (2) consecutive lots have been accepted. Reduced sampling shall then be instituted. Any failure, while on reduced sampling, mandates return to normal sampling. Sample sizes for normal and reduced sampling shall be as follows:

	NORMAL	REDUCED
a. Excess pressure	10	8

4.4.6.1 Proving ground excess pressure ballistic test. The following test shall be conducted using cannon tubes having 25 percent minimum remaining life based upon current gun tube condemnation criteria. Photographic equipment shall be positioned near the muzzle of the weapon to record the condition of the projectile as it exits the tube. All photographs shall be examined for any noncompliance with the applicable requirements of 3.7. Each projectile submitted for this test shall be inert loaded, dummy fuzed and conditioned at 70 + / -5 degrees F for 24 hr. The projectile will be fired from a 39 caliber howitzer gun tube with acceptable tube life remaining after adjusting the weight of an M203 series propelling charge to yield a chamber pressure of 41,000 + 3000 PSI.

5. Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material 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 or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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

6.1 Intended use. The projectile covered by this specification is intended for use on the PROJECTILE, 155MM, SMOKE, WP, M110. Specifications covered by this standard are intended for use in acquisition to obtain military-unique items.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number and date of this specification.

b. For acquisition purposes, the contract or order should specify packaging requirements. The projectiles should be palletized and marked in accordance with drawing 9362569 and be ordered by the applicable stock number.

c. Requirements for submission of first article sample.

d. Government furnished equipment.

e. Requirements for submittal of Acceptance Inspection Equipment (see 6.3).

f. Requirements for Certification of nondestructive test (NDT) personnel.(see 6.4)

g. Establishment of visual defect standards (see 6.6).

h. Submission of ballistic test data and ammunition data cards (see 6.7).

i. Provisions for critical characteristic controls (see 6.10).

6.3 Submission of inspection procedures and equipment designs for approval. Submit equipment designs, as required, to Commander, ARDEC, ATTN.: AMSRD-AAR-QEM-A, Picatinny Arsenal, NJ 07806-5000.

6.3.1 Nondestructive test standards. Nondestructive test standards must be approved by the technical engineering agency.

6.4 Personnel qualification and certification for non-destructive testing (NDT). Personnel performing the ultrasonic and magnetic particle testing should be qualified and certified in accordance with recommended practice NAS 410 and procedures approved by ARDEC. Minimum qualification levels should be as follows:

Level III: Review and approval of NDT procedures, equipment and personnel certification plus the following;

Level II: Set-up, calibration, modification of NDT equipment and procedures plus the following;

Level I: Operation of NDT equipment.

6.5 Visual examination qualification. When compliance with the applicable requirement is in doubt as a result of visual examination the characteristic may be measured or gagged to determine acceptability.

6.6 Visual standards. Visual standards will be established at contractors plant in compliance with 3.4. All visual standards for defects will be established for each contract after the first months production or whenever requested by the procuring contracting agency. These standards will be approved by a technical Government agency.

6.7 Submission of ballistic test data and ammunition data cards. In addition to the normal distribution of records for items procured by the Department of the Army, one copy of all ballistic test data and ammunition data cards should be forwarded to

Commander, RDECOM-ARDEC, ATTN: AMSRD-AAR-QEM-A, and AMSRD-AAR-AEM-C, Picatinny Arsenal, NJ 07806-5000, and AMSMC-QAD-I Army Master Depository, Rock Island, IL 61299-6000P.

6.7.1 Range and deflection. Range and deflection are not technical requirements of this specification. They are mandatory performance requirements that are achieved by design and are affected by variability in the manufacturing process that may not be completely controlled by the present TDP.

6.8 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), Frankfort Arsenal, Rock Island Arsenal or Picatinny Arsenal drawings, Technical data originally prepared by these activities is now under the cognizance of ARDEC.

6.9 Process notes. The following notes are provided for information only:

6.9.1 Hot forged heat treat method. Prior to finish machining, projectile bodies manufactured from forgings should be subjected to heat treatment to attain the required mechanical properties. The heat treatment should consist of heating above the critical temperature, followed by an oil quench. After quenching, the body forgings should be tempered without delay at a temperature suitable to produce required mechanical properties. After removal from the tempering furnace, the body forgings should be slowly cooled in air (forced air permitted) to a temperature of not more than 700 degree F, after which cooling may be accelerated by water spray. The contractor should submit, for information only, the heat treatment procedure to the technical agency.

6.9.2 Cold shaping and hot cup – cold draw methods. Cold working should be so accomplished as to produce in the bodies the mechanical properties specified. The bodies should be stress relieved at a temperature of 700 degree F, minimum, following the final forming operation during which time plastic flow takes place. A 30 minute minimum soak time at or above minimum temperature should be established, which will produce mechanical properties specified on the applicable drawing.

6.9.3 Rotating band application. The rotating band should be applied after final heat treatment of the body, by pressing the band blank into the band seat so as to make contact with the side walls for a minimum of eight-tenths of the band seat depth. The band should be applied in such manner as not to distort the body wall. Distortion should

be considered deformation outside of the dimensional limits specified on the applicable drawing.

6.9.4 Rotating band application.(hot band). The bands may be applied either hot or cold, but if applied hot, the bands should not be heated above 1600 degree F to prepare them for application to the body. The bands should be heated uniformly by a process which will prevent undue oxidation (loose scale) and be applied in a manner that will hold the formation of scale between the band and the band seat to a minimum.

6.10 Critical characteristic controls. All production contracts should contain requirements for handling critical defects. As part of all proposals, suppliers should be asked to describe policies, procedures and controls for all operations associated with safety characteristics, how they are documented and maintained under the supplier's integrated management system.

6.11 Critical characteristics. Critical characteristics 1 in 4.3.3.1 and 1 in 4.3.3.3 are so classified because the conditions are likely to cause failure to seal the WP loader or the burster, and allow WP leakage or cause premature projectile burst. Critical characteristic 1 in 4.3.3.3 are so classified because the conditions are likely to cause premature fracture of the projectile when fired. Critical characteristics 1 in 4.3.3.5 is so classified because it demonstrates premature projectile fracture when fired. In the case of inbore function, it is possible that the muzzle brake can deflect burning WP and projectile body fragments toward adjacent weapon crews.

6.12. Rotating band alternative inspection. The contractor and the government may agree upon band swaging process controls which have been shown to produce acceptable rotating bands. The manufacturing procedure, the inspection plan for controlling the process and any requirements on the rotating band should be a part of the AIE submittal prior to implementing into production. Once agreed upon these controls should not be changed without prior government approval. The contractor may submit a non-destructive test procedure including calibration standard and non-destructive test equipment (see 6.15.4). The inspection of the rotating should cover the aft end of the band if the entire band cannot be inspected. This alternative method may be implemented, with government approval once the following conditions have been met: Two body assemblies (one sample) as provided under 4.4.2 should be randomly selected from each 4-hour production or fraction thereof from each banding machine in operation to determine compliance with the requirements of 3.5.3, 3.5.4.1 and 3.5.5 failure to comply may be cause for rejection of the assemblies represented by the sample. A banding machine is considered qualified after 40 consecutive samples have been found acceptable.

6.12.1 Alternative inspection sampling. One body assembly from each 1-hour production or a fraction thereof per banding machine in operation should be subject to this test. While the alternative test procedure is in place the original inspection criteria of 4.4.2 should not be followed. Failure of one or more bands to comply with the agreed

upon criteria may be caused for the rejection of the assemblies represented by the samples.

6.12.1.1 Alternative inspection testing. The samples provided by 6.15.1 should be tested following the outline of 6.15. The samples may instead be tested in accordance with drawing No. 9280429.

6.12.1.2 Alternative inspection test failure. In the event of a non destructive testing failure or a failure to meet the visual gap requirement of 3.5.4.2, rotating band swaging should immediately cease on the banding machine which produced the failure. The part in question should be destructively tested per 4.4.2.1.2 to verify the gap. All bands since the last inspection should be non-destructively tested for acceptance. An investigation into the cause of the failure should be launched. Once determined and addressed swaging should resume with the first 10 bands being inspected. If all ten samples are acceptable inspection may return to post qualification sampling.

6.12.2 Process changes. If the process changes for any reason the new process should be re-qualified before the sampling of paragraph 6.15.1 may continue.

6.12.3 Submission of rotating band swaging procedures. The procedures for applying the rotating band and for maintaining, controlling and monitoring the rotating band application should be submitted to: Commander, ARDEC, ATTN:RDAR-QEM-A, Picatinny Arsenal, New Jersey 07806-5000 for review and concurrence.

6.12.4 Rotating band mechanical properties. In the case of the non-destructive test, the requirements of paragraph 3.5.3 should not be tested for. However, these requirements should instead be applied to the incoming band blanks and tested prior to swaging.

6.13 Classification of Characteristics. Conformance examinations and tests are specified in the following Classification of Characteristics paragraphs. When cited herein, attributes sampling inspection should be conducted in accordance with MIL-STD-1916, using the inspection levels cited in the Classification of Characteristic paragraphs. Definitions of Critical and Major should be as defined in MIL-STD-1916. Acceptance criteria should be in accordance with MIL-STD-1916. Alternative conformance inspections may be submitted and approved in accordance with MIL-STD-1916. Dimensions marked tool control should be gaged at the beginning of production and whenever tooling is replaced. Where destruction of components is necessary to inspect these dimensions, measurements of the tool may be substituted provided that the contractor has established correlation between the tool dimensions and the component dimensions prior to the start of production.

6.14 Definitions

a. Acceptance Inspection Equipment (AIE). Any measuring device that is traceable to the national or international standard used to assure conformance of material to the contract requirements.

6.15 Amendment notation. The margins of this specification are marked with bars to indicate modifications generated by this amendment. This was done as a convenience only and the government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

6.16. Subject term (key word) listing.

Banding
Rotating band

Custodian:	Preparing Activity:
Army – AR	Army – AR
	(Project 1320-2011-006)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.daps.dla.mil.