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DETAIL SPECIFICATION

PROJECTILE, 155MM, HE, M107
LOADING, ASSEMBLING AND PACKING

Inactive for new design after 3 February 1997

This specification is approved for use by the U.S. Army Armament Research Development and Engineering Center (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 requirements, examinations and tests for the loading, assembling and packing of Projectile, 155MM, HE, M107 (see 6.1).

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

AMSC N/A FSC 1320

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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 sited 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 cited in the solicitation or contract.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-1168 - Ammunition lot numbering and ammunition data cards

MIL-STD-1916 - DoD preferred methods for acceptance of product

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

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

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

9362569 - PACKING & MARKING FOR PALLET, WOOD AMMO FOR PJCTL 155MM

9216352 - PROJECTILE, 155MM, HE, M107 (W/SUPPL CHG) LOADING, ASSEMBLY AND MARKING DIAGRAM

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12914619 - PACKING AND MARKING FOR 155MM PROJECTILE PALLET

13010426 - PROJECTILE, 155MM, HE, M107 LOADING, ASSEMBLY AND MARKING DIAGRAM

(Copies of these drawings may be requested online at Pica.drawing.request@conus.army.mil or from U.S. Army ARDEC, ATTN: AMSRD-AAR-AIS-TD, Picatinny, 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 these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL (ASTM)

ASTM E 1742 - Standard Practice for Radiographic Examination

(Copies of ASTM standards are available online at http://www.astm.org or from American Society for Testing and materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with table III (see 4.2).

3.2 Components and assemblies. The components and assemblies shall comply with all requirements specified on drawing (dwg) 9216352 or 13010426.

3.2.1 Projectile loading assembly (prior to loading explosive). The components and assemblies shall comply with all requirements specified on drawing (dwg) 9216352 or 13010426.

3.2.2 Projectile loading assembly (Before post cycle heating)(Radiographic acceptance requirements). The components and assemblies shall comply with all requirements specified on drawing (dwg) 9216352 or 13010426.

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3.2.3 Projectile loading assembly (prior to assembly of liner). The components and assemblies shall comply with all requirements specified on drawing (dwg) 9216352 or 13010426.

3.2.4 Projectile, 155MM, HE, M107 LAP (prior to assembly of supplementary charge, if applicable). The components and assemblies shall comply with all requirements specified on drawing (dwg) 9216352 or 13010426.

3.2.5 Projectile 155MM, HE, M107 LAP (prior to assembly of lifting plug). The components and assemblies shall comply with all requirements specified on drawing (dwg) 9216352 or 13010426

3.2.6 Projectile, 155MM, HE, M107 Loading Assembly and Marking Diagram. The components and assemblies shall comply with all requirements specified on drawing (dwg) 9216352 or 13010426.

3.2.7 Packing and marking for 155MM projectile (metal pallet). The components and assemblies shall comply with all requirements specified on drawing (dwg) 9216352 or 13010426.

3.2.8 Packing and Marking for Pallet, Ammunition, for Projectile 155MM (alternate wood pallet). The components and assemblies shall comply with all requirements specified on drawing (dwg) 9216352 or 13010426.

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

3.4 Loading of high explosive

3.4.1 Interior cavity metal defects. The body cavity shall be free of scale, fins, burrs, draw marks, laminations, embedded foreign matter, folds, pits and sharp edges, in accordance with visual standards (see 6.3).

3.4.2 Unsolidified pool of paint. There shall be no unsolidified pool of paint or blister in the projectile cavity prior to loading of the explosive. The interior surface of the projectile shall be dry when the high explosive is poured into the projectile.

3.4.3 Projectile cavity contamination. The interior cavity of the projectile prior to loading shall be free from foreign matter, chemical residue, oil and grease.

3.4.4 Interior coating. Projectile having the interior wall imperfectly coated, in accordance with visual standards (see 6.3) shall not be loaded.

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3.5 Radiographic inspection.

3.5.1 Metal parts defects. There shall be no cracks, pipes or thin wall sections in the projectile metal part. There shall be no evidence of gaps, as defined by visual x-ray standards, between the rotating band and its seat (see 6.3.)

3.5.2 Foreign material. There shall be no foreign material in the explosive charge.

3.5.3 Base separation. The maximum allowable base separation shall be 0.015 inch between the base of the projectile cavity and the explosive charge.

3.5.4 Porosity (see 6.17.)

3.5.4.1 Shrink porosity. Shrink porosity within the explosive charge shall not exceed the requirements specified in Table I.

3.5.4.2 Spherical porosity. Spherical voids greater than 1/8 inch in diameter shall be considered as cavities. Spherical pores less than 1/32 inch in diameter shall be disregarded. Visual x-ray image standards illustrating acceptable levels of spherical porosity shall be established for each line and process see (6.3.) Areas of spherical porosity not exceeding the standards shall be acceptable.

3.5.5 Projected cavities. Cavities within the explosive charge shall not exceed the requirements specified in Table I. Cavities having a maximum projected length of 1/32 inch shall be disregarded.

3.5.6 Piping (also known as core porosity). Piping within the explosive charge shall not exceed the requirements specified in Table I.

3.5.7 Cracked charges.

3.5.7.1 Width. The width of a transverse crack shall be measured within 1/8 inch of where it intersects the projectile body. If the width is not clearly measurable within 1/8 inch of the body intersection or it does not extend to within 1/8 inch of the body intersection, that transverse crack shall be considered to have met the width requirement of Table I. The plane of a transverse crack shall appear to intersect both projectile sidewalls, to include the base radius. Transverse cracks which meet the width requirement shall be counted for the sum requirement. All cracks, regardless of orientation, shall meet the width requirement.

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3.5.7.2 Sum. Not more than one transverse crack shall be permitted in Segment A and not more than two transverse cracks shall be permitted n Segment A, B and C combined. Cracks which appear to be joined at any point shall be considered as one crack. Transverse cracks on x-ray film or display appear as a group or cluster of lines or elements because the crack in the explosive is fragmented along various fracture lines. An apparent collection of such transverse elements that are joined together shall be considered as one crack. Separated transverse cracks apparently joined by a longitudinal crack, know as "Christmas tree" cracks, shall be counted as separate cracks.

3.5.8 Annular ring. An annular ring within the explosive charge shall not exceed the requirements specified in Table I.

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TABLE I. Radiographic defects size

Cast Defects		Segments (See figure 1)			
		A	B	C	D
Sum of projected areas of shrink porosity	(in^2)	5/16	5/8	5/8	-
Sum of projected areas of cavities, excluding pipes, cracks, annular rings and porosity.	(in^2)	*1/64	1/4	1/2	1/2
Projected length of any cavity excluding pipes, cracks, annular rings and porosity.	(in)	1/8	1/2	1/2	3/4
Piping cavities maximum projected area.	(in^2)	0	1/4	1/2	-
Piping cavities maximum projected width.	(in)	0	1/4	1/4	-
Cracks, maximum projected width.	(in)	1/32	1/32	1/16	-
Annular rings, maximum projected width.	(in)	0	0	1/4	-
Notes:					
* If the length of the largest cavity is 1/16 inch or less, the maximum total projected area may be 1/20 in^2.					
Piping cavitation is defined as cavitation located on or near the vertical center line of the projectile with the longitudinal axis three times or greater than the width.					
An Annular ring is defined as cavitation that takes the form of a ring or portion thereof around the periphery of the cast.					

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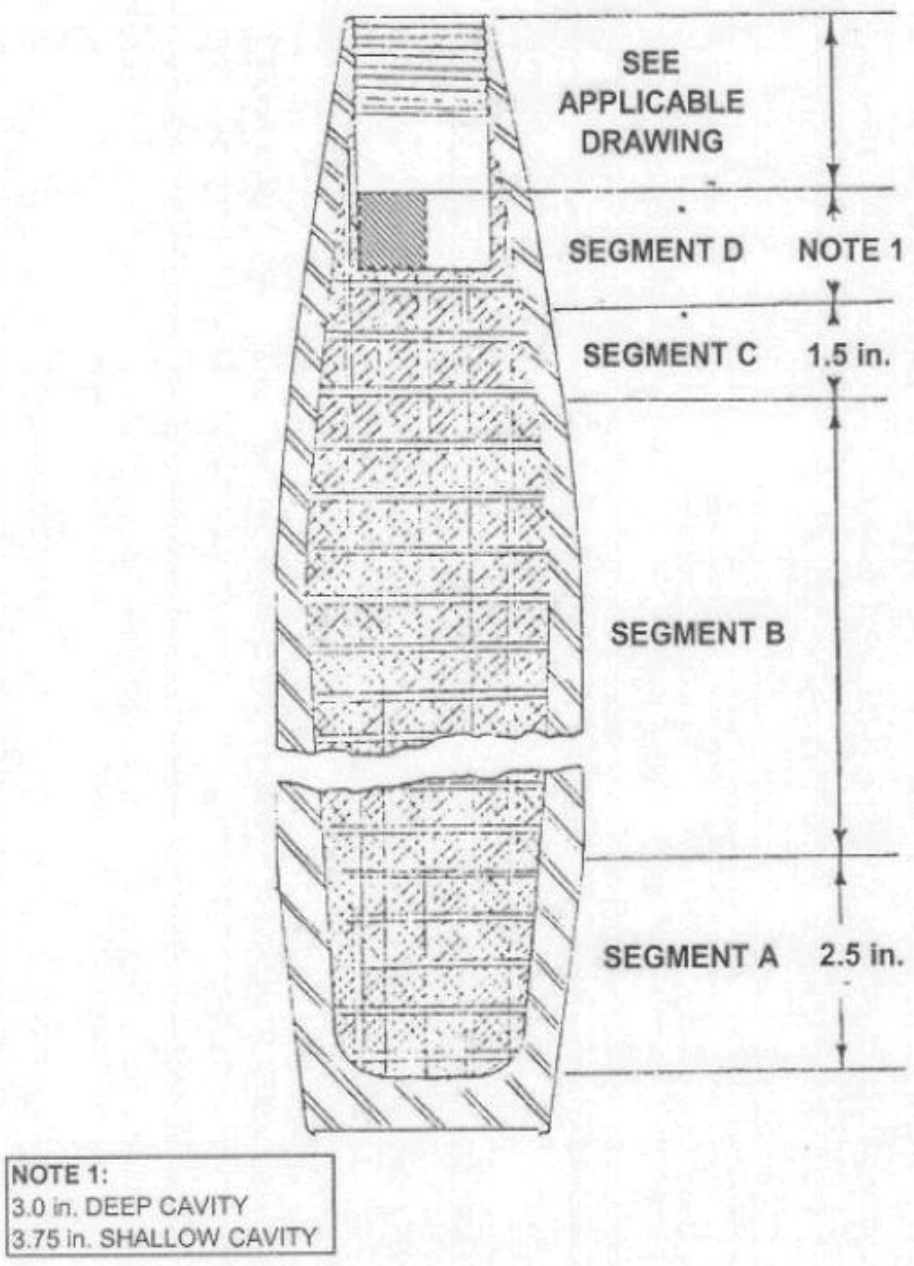

FIGURE 1. Projectile, 155MM, M107, HE charge segments

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3.6 Mating thread surfaces. The mating surfaces of threads shall be free of caked explosive and free of foreign material. If a chemical cleaner is required, acetone or methylene chloride shall be used. Care should be taken to prevent the chemical cleaner from coming into contact with the charge and becoming entrapped in the projectile.

3.7 Fuze well surface cavitation. Cavities formed due to chipped or broken explosive from the sidewalls of the fuze well shall not extend in aggregate around more than 1/4 of the circumference. The maximum dimension of any visible cavity in the faced surface of the charge shall not exceed 1/4 inch in any direction and the total area of all cavities shall not exceed 80 percent of the surface area. (Cavities having a maximum dimension of 1/32 inch or less shall be disregarded in this computation as shall voids within the applicable region of the fuze well prescribed by 9216352 or 13010426.)

3.8 Base separation saw samples. The maximum allowable base separation shall be .015 inch when inspected after sectioning.

3.9 Fuze well (before assembly of the liner). The fuze well shall be free from any loose explosive or any foreign matter prior to assembly of the liner. Chemical cleaner shall not contact the charge or become entrapped in the projectile.

3.10 Fuze well (after assembly of the liner). The fuze well shall be free from any loose explosive or any foreign matter after assembly of the liner.

3.11 Exterior surfaces explosive contamination. There shall be no explosive on the exterior surface of the projectile.

3.12 Ballistic testing. There shall be no premature burst or indication of metal parts separation or failure in the gun bore or in flight when fired at a pressure of 41000 plus 3000 pounds per square inch (PSI).

3.13 Workmanship. The requirements of workmanship are as follows:

a. Cleaning. If required the cleaning method shall not be injurious to any of the parts nor shall the parts be contaminated by the cleaning agent.

b. Painting. Painting shall comply with the requirements of the applicable drawing. All paint shall be dry to the touch before testing and packing for shipment. Drying time prior to testing shall be in accordance with the applicable specification.

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c. Foreign matter. No part or assembly shall contain dirt, grease, chips, rust, corrosion or other foreign matter.

3.13.1 Rotating band. The land surfaces of the rotating band shall comply with the following:

a. There shall be no raised brass.

b. There shall be no paint or foreign matter on the outer diameter.

c. Nicks, gouges, scratches and other depressions on the lands not exceeding 0.025 inches in depth are acceptable.

d. Nicks, gouges, scratches and other depressions on the lands with depths greater than 0.025 and less than or equal to 0.050 inches are acceptable unless damage extends longitudinally across more than half of the land width.

e. There shall be no "washboard" or striated area that extends longitudinally across more than half of the land width if the depth exceeds 0.025 inches at any point.

f. There shall be no nicks, gouges, scratches or other depressions on the lands with depths greater than 0.050 inches.

3.14 Inspection lot formation. Lot formation shall be in accordance with MIL-STD-1916.

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4. VERIFICATION

TABLE II. Requirement/verification cross reference matrix

Methods of Verification N/A – Not Applicable 1 – Analysis 2 – Demonstration 3 – Examination 4 – Test							Classes of Verification A- Design Verification B- First Article C- Acceptance			
Section 3 Requirements	Description	Verification Method					Verification Class			Section 4 Verification
		N/A	1	2	3	4	A	B	C	
3.1	First Article				X	X		X	X	4.2
3.2	Components and assemblies				X	X		X	X	4.3.2.1 thru 4.3.2.7 or 4.3.2.8 as applicable
3.2.1	Projectile loading assembly (prior to loading explosive)				X	X		X	X	4.3.2.1
3.2.2	Projectile loading assembly (Before post cycle heating)(Radiographic acceptance requirements)				X	X		X	X	4.3.2.2
3.2.3	Projectile loading assembly (prior to assembly of liner)				X	X		X	X	4.3.2.3
3.2.4	Projectile, 155MM, HE, M107 LAP (prior to assembly of supplementary charge, if applicable)				X	X		X	X	4.3.2.4
3.2.5	Projectile 155MM, HE, M107 LAP (prior to assembly of lifting plug)				X	X		X	X	4.3.2.5
3.2.6	Projectile, 155MM, HE, M107 Loading Assembly and Marking Diagram				X	X		X	X	4.3.2.6
3.2.7	Packing and marking for 155MM projectile (metal pallet)				X	X		X	X	4.3.2.7 as applicable

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TABLE II. Requirement/Verification Cross Reference Matrix- Continued

3.2.8	Packing and Marking for Pallet, Ammunition, for Projectile 155MM (alternate wood pallet)				X	X		X	X	4.3.2.8 as applicable
3.3	Ammunition lot numbering				X			X	X	4.3.2.7/ 4.3.2.8
3.4.1	Interior cavity metal defects				X			X	X	4.3.2.1
3.4.2	Unsolidified pool of paint.				X			X	X	4.3.2.1
3.4.3	Projectile cavity contamination				X			X	X	4.3.2.1
3.4.4	Interior coating				X			X	X	4.3.2.1
3.5.1	Metal parts defects				X			X	X	4.3.2.2/4.5.1
3.5.2	Foreign material				X			X	X	4.3.2.2/4.5.1
3.5.3	Base separation				X			X	X	4.3.2.2/4.5.1
3.5.4.1	Shrink porosity				X			X	X	4.3.2.2/4.5.1
3.5.4.2	Spherical porosity				X			X	X	4.3.2.2/4.5.1
3.5.5	Projected cavities				X			X	X	4.3.2.2/4.5.1
3.5.6	Piping				X			X	X	4.3.2.2/4.5.1
3.5.7.1	Width				X			X	X	4.3.2.2/4.5.1
3.5.7.2	Sum				X			X	X	4.3.2.2/4.5.1
3.5.8	Annular ring				X			X	X	4.3.2.2/4.5.1
3.6	Mating surfaces				X			X	X	4.3.2.3
3.7	Fuze well surface cavitation				X			X	X	4.3.2.2
3.8	Base separation saw samples				X			X	X	4.3.2.3/4.5.2
3.9	Fuze well (before)				X			X	X	4.3.2.3
3.10	Fuze well (after assembly of the liner)				X			X	X	4.3.2.4
3.11	Exterior surfaces explosive contamination				X			X	X	4.3.2.4/4.3.2 .6
3.12	Ballistic testing					X		X	X	4.3.2.6/4.5.3
3.13	Workmanship				X			X	X	4.3.2.1 thru 4.3.2.7 or 4.3.2.8
3.13.1	Rotating Band				X			X	X	4.3.2.6
3.14	Inspection lot formation		X						X	4.3.1

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4.1 Classification of inspections. 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. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with Table III.

4.2.1 First article quantity. First article verification shall be performed on the quantity of items as indicated in table III.

4.2.2 Inspections to be performed. The first article verification shall be performed in accordance with Table III.

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

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TABLE III. First article inspection

	Number of FAT Samples	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Projectile, 155mm, HE, M107 Loading, Assembly and Marking (Dwg 9216352 or 13010426)			
Examination for defects Note 1 (Except Proving Ground Test)	16	3.2	4.3.2.1 to 4.3.2.7 or 4.3.2.8 (as applicable)
Proving Ground Test	15 or 32	3.12	4.5.3
Base separation test	8	3.8	4.5.2

Note 1. The examination for defects in paragraph 4.3.2 are for dimensional and visual inspections and in many cases must be witnessed during assembly.

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4.3 Conformance inspection.

4.3.1 Lot formation. Lot formation shall be in accordance with lot formation requirement of MIL-STD-1916. In addition, each inspection lot of the projectile 155MM HE M107 shall contain:

a. Explosive of one type from one lot interfix number from one manufacturer.

b. Projectile metal parts of one lot interfix number from one manufacturer.

c. Loaded projectiles of one weight zone.

d. Supplementary charge of one lot interfix number from one manufacturer (if applicable).

4.3.2 Classification of characteristics.

a. Sampling requirements. Inspection sampling requirements for critical, major and minor characteristics are defined in MIL-STD-1916. Unless specified otherwise, Inspection Level IV shall be used for all characteristics defined as Majors and Inspection Level II for all Minor characteristics; Critical characteristics shall be addressed in accordance with MIL-STD-1916.

b. Conformance inspection. Conformance inspection shall be performed in accordance with paragraph 4.3.2.1 through 4.3.2.8. For all conformance inspections the same sample specimen may be used for all non-destructive examinations or tests.

c. Alternative Inspections. Alternative conformance inspections may be submitted and approved in accordance with MIL-STD-1916.

d. Tool control. Dimensions marked tool control shall 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 there is an established correlation between the tool dimensions and the component dimensions prior to the start of production. There shall be adequate surveillance to assure that the drawing requirements are being met throughout the life of the tool.

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.1	**TITLE** Projectile loading assembly (prior to loading explosive)	**SHEET** 1 **OF** 1	**DRAWING NUMBER** 9216352 or 13010426
			NEXT HIGHER ASSEMBLY

CLASSIFICATION	**EXAMINATION OR TEST**	**CONFORMANCE CRITERIA**	**REQUIREMENT PARAGRAPH**	**INSPECTION METHOD REFERENCE**
Critical				
1	Foreign matter in charge cavity	100%	3.4.3	Visual/ Inspection light
Major				
101	Interior protective coating with bare spot	100%	3.4.4	Visual Standard/ Inspection light
102	Pool of paint in bottom of cavity	100%	3.4.2	Visual
103	Metal defects in cavity	100%	3.4.1	Visual/ Inspection light
Minor				
201	Evidence of poor workmanship	Level II	3.13	Visual

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.2	**TITLE** Projectile loading assembly (Before post cycle heating) (Radiographic acceptance requirements)	**SHEET** 1 **OF** 3	**DRAWING NUMBER** 9216352 or 13010426
			NEXT HIGHER ASSEMBLY

CLASSIFICATION	**EXAMINATION OR TEST**	**CONFORMANCE CRITERIA**	**REQUIREMENT PARAGRAPH**	**INSPECTION METHOD REFERENCE**
Critical				
1	Base separation in excess of that permitted (see 6.16.1)	Note 1,2	3.5.3	4.5.1
2	Cavities, other than piping, cracks or annular rings in Segment A with a total area in excess of 1/16 square inch or length in excess of 1/4 inch (see 6.16.2)	Note 1,2	3.5.5	4.5.1
3	Annular rings in Segment A or B with a width in excess of 1/32 inch (see 6.16.3)	Note 1,2	3.5.8	4.5.1
4	Piping cavities in Segment A exceeding 1/16 square inch in total area or 1/8 inch in width (see 6.16.4)	Note 1,2	3.5.6	4.5.1
5	Cracks in Segment A in excess of the requirements of Table I (see 6.16.5)	Note 1,2	3.5.7.1	4.5.1

Note 1. 100% inspection by level II or better certified reader with a 1 in 10 review by a Level III certified non destructive test inspector.
Note 2. Any projectile that has any of the critical defects listed above shall be classed defective and removed from the lot.

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.2	**TITLE** Projectile loading assembly (Before post cycle heating) (Radiographic acceptance requirements)	**SHEET** 2 **OF** 3		**DRAWING NUMBER** 9216352 or 13010426 **NEXT HIGHER ASSEMBLY**
CLASSIFICATION	**EXAMINATION OR TEST**	**CONFORMANCE CRITERIA**	**REQUIREMENT PARAGRAPH**	**INSPECTION METHOD REFERENCE**
Critical				
6	Cast defects in Segment B in excess of twice the requirements of Table I (see 6.16.6)	Note 1,2	3.5.4 through 3.5.8	4.5.1
7	Metal parts defects, except rotating band gaps, in excess of that permitted (see 6.11 and 6.16.7)	Note 1,2	3.5.1	4.5.1
8	Foreign material in the explosive cast (see 6.16.8)	Note 1,2	3.5.2	4.5.1

Note 1. 100% inspection by Level II or better certified reader with a 1 in 10 review by a Level III certified non destructive test inspector.

Note 2. Any projectile that has any of the defects listed above shall be classed defective and removed from the lot.

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.2	**TITLE** Projectile loading assembly (Before post cycle heating) (Radiographic acceptance requirements)	**SHEET** 3 **OF** 3		**DRAWING NUMBER** 9216352 or 13010426 **NEXT HIGHER ASSEMBLY**
CLASSIFICATION	**EXAMINATION OR TEST**	**CONFORMANCE CRITERIA**	**REQUIREMENT PARAGRAPH**	**INSPECTION METHOD REFERENCE**
Major				
101	Cast defects in Segments A (except cracks,) B, C or D in excess of the requirements of table 1	Note 1,2	3.5.4 through 3.5.8	4.5.1
102	Porous areas in excess of that permitted	Note 1,2	3.5.4	4.5.1
103	Cracks in Segment A in excess of that permitted	Note 1,2	3.5.7.2	4.5.1
104	Rotating band gaps in excess of that permitted	Note 1,2	3.5.1	4.5.1
Minor				
201	Cracks in Segments A, B and C combined in excess of that permitted	Note 1,2	3.5.7.2	4.5.1

Note 1. 100% inspection by Level II or better certified reader with a 1 in 10 review by a Level III certified non destructive test inspector.

Note 2. Any projectile that has any of the defects listed above shall be classed defective and removed from the lot.

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.3	TITLE Projectile loading assembly (prior to assembly of liner)	SHEET 1 OF 1	DRAWING NUMBER 9216352 or 13010426
			NEXT HIGHER ASSEMBLY

CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical				
1	Base separation, destructive test see(6.16.9)	4.4.1	3.8	4.5.2
Major				
101	Fuze well surface cavitation excessive	Level IV	3.7	Visual/ Dedicated Illumination(DI)
102	Loose explosive in fuze well	Level IV	3.9	Visual/DI
103	Foreign material in fuze well	Level IV	3.9	Visual/DI
104	Depth of fuze well.	Level IV	3.2	AIE
105	Diameter of fuze well max.	Level IV	3.2	AIE
106	Projectile threads not clean prior to application of adhesive	Level IV	3.2	Visual/DI
107	Caked explosive on mating surfaces of threads	100%	3.6	AIE
108	Application of adhesive incomplete or incorrect	Level IV	3.2	Visual
Minor				
201	Evidence of poor workmanship	Level II	3.13	Visual

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.4	TITLE Projectile, 155MM, HE, M107 LAP (prior to assembly of supplementary charge, if applicable)	SHEET 1 OF 1	DRAWING NUMBER 9216352 or 13010426
			NEXT HIGHER ASSEMBLY

CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical	None defined			
Major				
101	Depth to bottom of liner min.	Level IV	3.2	AIE
102	True position of inside diameter of liner with minor diameter of internal thread and end face of projectile body	Level IV	3.2	AIE
103	Inside diameter of liner after swaging	Level IV	3.2	AIE
104	Torque of liner (witnessed during application of assembly torque)	Level IV	3.2	AIE/Visual
105	Swage missing or incomplete	100%	3.2	Visual
106	Presence of caked explosive on exterior of shell body, and forward face	100%	3.11	Visual
Minor				
201	Liner damaged	Level II	3.2	Visual
202	Foreign material in liner cavity including explosive	Level II	3.10	Visual
203	Evidence of poor workmanship	Level II	3.13	Visual

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.5	**TITLE** Projectile 155MM, HE, M107 LAP (prior to assembly of lifting plug)	**SHEET** 1 **OF** 1	**DRAWING NUMBER** 9216352 or 13010426
			NEXT HIGHER ASSEMBLY

CLASSIFICATION	**EXAMINATION OR TEST**	**CONFORMANCE CRITERIA**	**REQUIREMENT PARAGRAPH**	**INSPECTION METHOD REFERENCE**
Critical				
1	Supplementary charge pad or supplementary charge missing, if applicable (see 6.16.11)	100%	3.2	AIE
Major				
101	Lifting plug gasket missing	Level IV	3.2	Visual/ Inspection light
102	Supplementary charge inverted	Level IV	3.2	Visual
Minor				
201	Supplementary charge not removable by hand (if applicable)	Level II	3.2	Manual
202	Supplementary charge damaged (if applicable)	Level II	3.2	Visual
203	Foreign matter on threads including explosive or exudates	Level II	3.6	Visual
204	O-ring lubricant missing from front face of projectile	Level II	3.2	Visual
205	Spacer missing	Level II	3.2	Visual
206	Evidence of poor workmanship	Level II	3.13	Visual

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.6	TITLE Projectile, 155MM, HE, M107 Loading Assembly and Marking Diagram	SHEET 1 OF 2	DRAWING NUMBER 9216352 or 13010426
			NEXT HIGHER ASSEMBLY

CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical				
1	Projectile zone weight incorrect	100%	3.2	AIE/Balance
2	Zone weight stenciling or punch marks incorrect	100%	3.2	Visual/Manual
3	Ballistic test	4.4.2	3.12	4.5.3
Major				
101	Diameter of bourrelet, max. (applies if bourrelet has been retouched)	100%	3.2	AIE
102	Torque test failure of lifting plug	Level IV	3.2	AIE
103	Rotating band damaged	Level IV	3.13.1	Visual
104	Explosive on exterior of projectile	Level IV	3.11	Visual
105	Lifting plug gasket missing	Level IV	3.2	Visual
Minor				
201	Rotating band cover missing, damaged or improperly Assembled	Level II	3.2	Visual

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.6	**TITLE** Projectile, 155MM, HE, M107 Loading Assembly and Marking Diagram	**SHEET** 2 **OF** 2		**DRAWING NUMBER** 9216352 or 13010426
				NEXT HIGHER ASSEMBLY
CLASSIFICATION	**EXAMINATION OR TEST**	**CONFORMANCE CRITERIA**	**REQUIREMENT PARAGRAPH**	**INSPECTION METHOD REFERENCE**
Minor continued				
203	Protective coating with total damaged area in excess of 1/4 inch^2	Level II	3.2	Visual
204	Marking misleading or unidentifiable (except for zones), including incorrect color code or lot number	Level II	3.2	Visual
205	Evidence of poor workmanship	Level II	3.13	Visual

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.7	**TITLE** Packing and marking for 155MM projectile (metal pallet)	**SHEET** 1 **OF** 1	**DRAWING NUMBER** 12914619
			NEXT HIGHER ASSEMBLY

CLASSIFICATION	**EXAMINATION OR TEST**	**CONFORMANCE CRITERIA**	**REQUIREMENT PARAGRAPH**	**INSPECTION METHOD REFERENCE**
Critical	None Defined			
Major				
101	Improperly assembled or parts missing	Level IV	3.2	Visual
102	Spacers loose or damaged	Level IV	3.2	Visual
103	Rods not properly engaged in cover or base	Level IV	3.2	Visual
104	Lifting plug of projectile missing or damaged	Level IV	3.2	Visual
105	Improper torque on nut at top of rod	Level IV	3.2	AIE
106	Cotter pin not properly engaged	Level IV	3.2	Visual/Manual
107	Projectile of different zones on the same pallet	Level IV	3.2	Visual
Minor				
201	Any marking missing incorrect or unidentifiable	Level II	3.2	Visual
202	Number of projectile assemblies incorrect	Level II	3.2	Visual
203	Evidence of poor workmanship	Level II	3.13	Visual

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Conformance inspection by classification of characteristics

PARAGRAPH 4.3.2.8	TITLE Packing and Marking for Pallet, Ammunition, for Projectile 155MM (alternate wood pallet)	SHEET 1 OF 1	DRAWING NUMBER 9362569 / NEXT HIGHER ASSEMBLY

CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
Critical	None defined			
Major				
101	Pallet cover damaged or improperly assembled	Level IV	3.2	Visual
102	DOD symbol missing or unidentifiable	Level IV	3.2	Visual
103	Projectile of different zones on the same pallet	Level IV	3.2	Visual
104	Lifting plug of projectile missing or damaged	Level IV	3.2	Visual
105	Strapping or wire missing or loose	Level IV	3.2	Visual/Manual
Minor				
201	Number of projectile assemblies incorrect	Level II	3.2	Visual
202	Marking misleading or unidentifiable	Level II	3.2	Visual
203	Strapping or wire improperly engaged	Level II	3.2	Visual
204	Evidence of poor workmanship	Level II	3.13	Visual

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4.4 Testing.

4.4.1 Base separation destructive test. Eight (8) projectiles with the largest base separations accepted by x-ray shall be selected for test per post cycle heat treatment lot. If insufficient samples are available with base separation, sufficient samples shall be randomly selected from those projectiles to be included in the post cycle heat treatment lot. The samples shall be placed in the coldest area of the post cycle chamber. If any sample projectile when tested has base separation in excess of the applicable requirement, the post cycle heat treatment lot it represents shall be rejected. The test shall be performed as specified in 4.5.2 (see 6.19.9). Sectioning of samples shall cease after one excessive gap is detected. Rejected post cycle lots may be recycled and retested with government permission, but not more than three total cycles may be conducted and cycle times shall be increased by nine (9) hours during recycles. Samples remaining unsectioned from the prior test shall be included in the recycle base separation sample.

4.4.2 Proving ground. The test shall be conducted in accordance with 4.5.3.. If any projectile fails to comply with the applicable requirement the lot shall be rejected.

4.4.2.1 First article and initial production lot samples. Beginning with the first article and first lot produced and continuing until three consecutive lots have complied with all the acceptance criteria contained herein, 15 sample projectiles shall be selected at random from each lot for this test. If any critical defect occurs, the lot shall be rejected.

4.4.2.2 Production lot samples. After three consecutive lots have complied with 4.4.2.1, 5 sample projectiles shall be selected at random for this test. If any critical defect occurs, the lot shall be rejected. In the event that any lot fails to meet all the requirements of this paragraph, successive lots must meet the provisions of 4.4.2.1 requirements specified therein.

4.4.2.2.1 Optional Production lot sampling and first article. The following test plan may be utilized when specified by the government procuring agency. Beginning with the first article lot, 32 sample projectiles shall be randomly selected from each lot for this lot acceptance testing. If any sample projectile fails to comply with the applicable requirements, the lot represented by that sample shall be rejected. After five consecutive production lots have complied with the applicable requirements, ballistic testing shall be discontinued until a first article test is required. Testing shall resume if a 180 calender day production stoppage occurs or a First Article Test is conducted, unless waived by the government.

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4.4.2.3 Test validity. If for any reason the proving ground considers that the test conditions have detrimentally affected the test results, the test shall be considered invalid and a new test shall be performed with additional samples.

4.5 Method of inspection.

4.5.1 Radiographic examination

4.5.1.1 Determination of projectile explosive cast defects. The radiographic beam shall be located in a plane which is perpendicular to the longitudinal axis of the projectile and tangent to the base at its internal cavity. The outline of the explosive charge shall be clearly defined at all points. Examination of the radiographic image shall be made to determine compliance with applicable requirements. No images of lead masks, containers, fixtures, identifying marks, or other extraneous features shall project into the region of explosive under inspection, with the exception of specified Image Quality Indicators (IQIs) and radiation screening required to produce readable images in the thinner areas of the shell. Such screening shall be free of any radiographically observable features in the projected area under inspection. Radiographic equipment, operations and procedures shall be qualified in accordance with ASTM E1742 (see 6.4). In addition, the sensitivity of the radiographic technique shall be 2.0 percent and the minimum photographic density of the film used shall be no less than 1.5 at every point within the projected area of explosive, including the base, with the maximum density no greater than that to permit adequate inspection over the entire area. All defect-like features in the area of interest on a radiographic image shall be treated as defects unless positively identified as extraneous artifacts or metal parts irregularities. In the event an original radiographic image leaves doubt as to a shell's acceptability because of difficulty in evaluating the size, location, or classification of a defect, the projectile shall be rotated 90 degrees about its longitudinal axis from the original exposure, and additional radiographic images taken for clarification. Acceptability in all cases shall be judged on the basis of the image with the largest projection, except in the case where a re-radiograph reveals multiple superimposed cavities, each of which individually complies with the requirements. All additional radiographic images of a projectile for defect conditions will be identified on the image as retakes and stored; traceable to the original.

4.5.1.2 Check of sensitivity of radiographic technique. The sensitivity of radiographic technique shall be determined by means of Image Quality Indicators (IQI's), fabricated as specified herein. The three IQI's shall be placed on the radiographic source side of a projectile so that the 2T holes

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are at the point shown in Figure 2. When radiographing the

frequency of the sensitivity check shall be no less than one in each fifty radiographic images, and on a rotating ring, the IQI's shall be used at one station for each complete rotation of the ring. The sensitivity of the radiographic technique shall be considered satisfactory when the image of the IQI's, including the 2T holes, are perceptible in accordance with ASTM E 1742. The IQI's shall be made of steel having an approximate specific gravity of 7.8. The IQI's shall be located as shown on Figure 2. For further details on construction of the IQI's see ASTM E1742.

4.5.1.3 Check of photographic density of film. The photographic density of the film shall be determined on the film in the region of minimum film density within the projected area of the explosive charge. Film density shall be checked each hour of operation or fraction thereof, for each film processor. Greater frequency shall be required for any period during which difficulty is encountered in establishing the required densities. Photographic densities shall be measured with a diffuse density, photoelectric densitometer providing direct display of numerical density units. Accuracy of densitometer shall be maintained by calibrating with a photographic step tablet each hour immediately prior to measurement on the radiographic film. Calibration shall be made at a step tablet density level within .5D of that being measured on the radiographic film. Each point of density measurement on the radiographs shall be identified by a circumscribed circle (made with a suitable pen or pencil) of no more than 1/4 inch in diameter. All photographic step tablets used in normal operation shall be checked for accuracy monthly by calibrating the densitometer with a reference photographic step tablet calibrated by National Institute of Standards and Technology (NIST) or approved by the Government (see 6.4.1). The reference tablet shall be kept available, but shall be protected from wear and damage and shall not be used in daily operations. Any photographic step tablet having severe surface damage or showing a deviation from previous calibrations by .05D or more shall be replaced with a new, unused step tablet.

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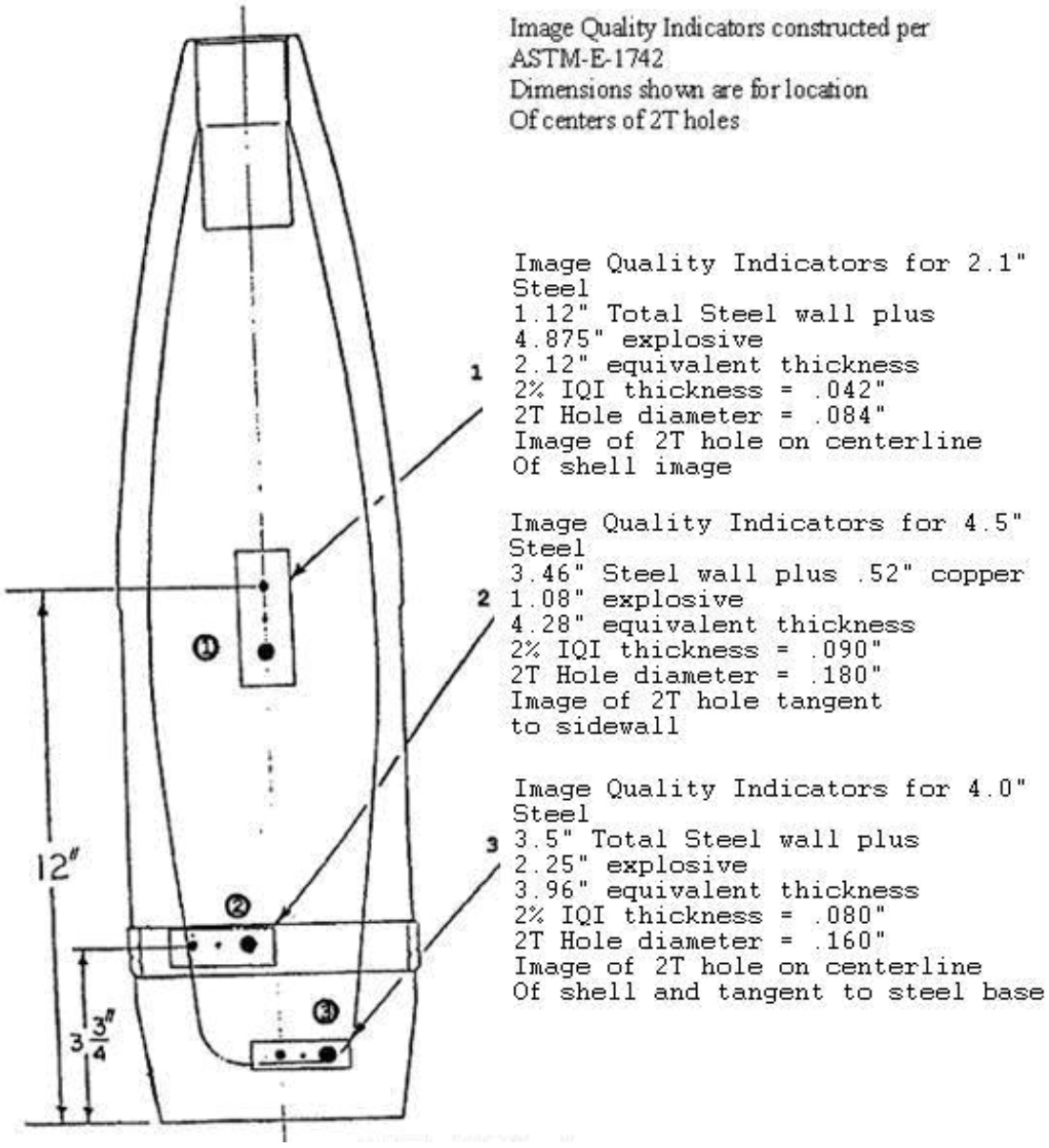

FIGURE 2. Projectile, 155MM, M107, Image Quality Indicators

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4.5.1.4 Review of radiographic sensitivity and techniques (see 6.4). The sensitivity of the radiographic technique shall be reviewed by submitting at least one radiographic image of the projectile containing the IQI and a copy of radiographic procedures prior to the start of initial production. These radiographic images shall be taken and processed using the same techniques as will be used in production. In addition one radiographic image of the IQI projectile and a sample of each type of rejectable defect shall be submitted for review once a month for the first three months of each contract and every three months thereafter. After qualification of the radiographic technique no changes to developing process, film, manufacturer or type radiographic source or exposure time shall be made without first submitting additional sample radiographic images of the IQI projectile for approval.

4.5.2 Base separation destructive test. This test shall be conducted after post cycle heat treatment is completed. The temperature of the sample projectiles (metal parts and explosive) shall 70±9 degrees F when sectioned and tested for base separation. To section the projectile cut parallel to the base approximately 4 inches up from the base to the center of the projectile axis, next cut through the base toward the nose perpendicular to aforementioned cut so as to remove a wedge of steel to expose explosive and metal parts interface. Nose drop the projectile with a lifting plug assembled 1.5 inches onto steel plate of inch minimum thickness and measure for base separation with a .5 inch wide feeler gage. Sectioning of saw samples shall cease after one excessive gap is detected.

4.5.3 Ballistic safety test. The sample projectiles shall be assembled with PD fuzes and fired from a M185 or M199 series cannon with 25% minimum tube life remaining. Projectile test temperature shall be 70+/-5 deg F. The propellant shall be an M203 series charge adjusted to produce PIMP pressure of 41,000 + 3000 PSI. Camera and radar coverage shall be provided to observe for projectile failure from the gun muzzle to the target area. Muzzle velocity and chamber pressure shall be recorded for information. Visual observation shall be made to assure that the projectile impacts in the target area.

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 of 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

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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 item covered by this specification is intended for use on the 155MM, Howitzer.

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 dwg 12914619 or alternative 9362569 and be ordered by the applicable stock number.

c. Requirements for submission of first article sample.

d. Establishment of visual defect standards (see 6.3).

e. Submission of contractor Radiographic procedures (see 6.4).

f. Provisions for notification of metal parts defects (see 6.4.3).

g. Provisions for Certification of nondestructive test (NDT) personnel (see 6.5).

h. Qualification of post cyclic heat ovens (see 6.6).

i. Submission of contractor acceptance inspection equipment (AIE)(see 6.7).

j. Submission of ballistic test data and ammunition data cards (see 6.8).

k. Provisions for critical characteristic controls (see 6.9).

j. Proving ground safety test sampling plan (see 4.4.2).

6.3 Visual and X-ray image standards. Visual and X-ray image standards consistent with those used for metal parts acceptance will be established at or provided to the contractor's plant in compliance with 3.4.2, 3.4.4, 3.5.1 and 3.5.4.2. ARDEC Quality and Radiographic personnel will approve visual and X-ray standards.

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6.4 Radiographic procedures. Submit radiographic procedures, standards and sample radiographic images to: Commander, ARDEC, ATTN: AMSRD-AAR-QEM-A, Picatinny, New Jersey 07806-5000.

6.4.1 Radiographic image density calibration. Densitometers used to perform radiographic image density measurements (4.5.1.3) should be verified in accordance with ASTM E-1079, Standard Practice for Calibration of Transmission Densitometers.

6.4.2 Radiographic film. Only a film type and vendor that has been approved by the Government should be used for radiographing this projectile. The final choice of film type must be determined for the particular radiographic facility to be used and should be based on achieving adequate sensitivity for both the IQI standard and inspected projectiles. A substitute item should not be used before prior testing and approval by the Government

6.4.2.1 Non-film methods of radiographic inspection. No non-film methods of radiographic inspection should be employed without prior review and approval by ARDEC. Qualification should be in accordance with ASTM E-1411 (Standard Practice for Qualification of Radioscopic Systems) and an approved Qualification Plan. System performance and implementation should comply with ASTM E-1255 (Standard Practice for Radioscopy). Qualification should include a demonstration that the specific non-film system proposed for production inspection detects or discloses all types and sizes of defects requiring radiographic examination.

6.4.3 Metal parts defects. The procuring activity will be notified of any projectile rejected for metal parts defects found upon inspection of the radiographic images. The rejected projectile will be held pending disposition by the procuring activity.

6.5 Certification of nondestructive test (NDT) personnel. All personnel operating or calibrating NDT equipment should be qualified and certified in accordance with NAS-410 “Certification and Qualification of Nondestructive Test Personnel”. Application for copies should be addressed to the Aerospace Industries Association of America, Inc, (AIA/NAS), 1000 Wilson Blvd, Suite 1700 Arlington, VA 22209. Qualification to other standards must be submitted to and approved by Commander, ARDEC, ATTN: AMSRD-AAR-QEM-A, Picatinny, NJ 07806-5000.

6.6 Qualification of post cyclic heat chambers. The chambers should be qualified for the number of projectiles and their location (stacking) in the chamber. The least efficient heat transfer area of the oven should be determined by

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thermocouples placed on projectiles within the chamber. An instrumented projectile (projectile with a thermo couple placed in the center both radially and axially of the explosive cast) should be placed in the least efficient area of the chamber and the required cycle times should be established based on these readings. The contractor should provide a qualification report. The report should contain a schematic of the chamber with projectile layout with supporting data confirming the location of least efficient area, a layout of chamber temperature distribution, a graph of the instrumented projectile results and a process control plan. Forward results to Commander, ARDEC, ATTN: AMSTA-AR-QAA-R, Picatinny, New Jersey 07806-5000.

6.7 Submission of contractor acceptance inspection equipment (AIE) designs for approval. Submit copies of designs as required to: Commander, U.S. Army ARDEC, ATTN: AMSRD-AAR-QEM-A, Picatinny, NJ 07806-5000. This address will be specified on the Contract Data Requirements List, DD Form 1423 in the contract.

6.8 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, ARDEC, ATTN: AMSRD-AAR-AEM-C and AMSRD-AAR-QEM-A, Picatinny, NJ 07806-5000.

6.8.1 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.

6.9 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.

6.10 Drawings. Drawings listed in Section 2 of this specification under the heading U.S. Army Armaments, 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.

6.11 Protection of the rotating band. Care should be exercised at all times so that the rotating band of each projectile will not be nicked or burred.

6.12 Mating surfaces explosive contamination. If a

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chemical cleaner is required, acetone or methylene chloride should be used. Care should be taken to prevent the chemical cleaner from coming into contact with the charge and becoming entrapped in the projectile.

6.13 Clean explosive scrap. Clean explosive scrap produced in regular operations may be remelted and reused provided that it complies with the requirements for the grade of high explosive specified, except for form. Scrap from Composition B risers, floor sweepings, ventilation and suction apparatus (other than from drilling operations specifically controlled to prevent contamination of explosive) should not be used (see 6.13.1).

6.13.1 Clean explosive scrap. Clean explosive scrap is defined as scrap formed in kettles, risers and loading machines used in the pouring and cooling operations. Only TNT riser scrap is defined as clean.

6.13.1.1 Processing aid material for high explosive charge. Only qualified process aid materials are permitted with Composition B, MIL-C-401. Before adding materials, the Comp B temperature should be above 194 degrees Fahrenheit to provide satisfactory emulsion. The following material has been found acceptable as a wax dispersant when added to molten Comp B:

Lecithin, MIL-L-3061, in quantity of 0.10% - 0.02% by weight added.

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

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

6.16 Critical classification notes

6.16.1 Base Separation, X-Ray. Base separation is the most serious explosive defect since it is exposed to the maximum loading during gun firing. The explosive loading can cause premature functioning either through adiabatic heating of entrapped air or by impact of the explosive with the projectile base across the gap. Although critical defects are defined as those “likely” to cause safety failures and the data available indicates that premature functioning is not likely for gaps up to .030 inches, experience with projectile loading and x-ray inspection indicates that a base separation of greater than .015 inches must be classified as critical to maintain acceptably low escape rates for larger gaps.

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6.16.2 Cavities. Cavities in the bottom segment of the explosive cast over the sizes described are likely to cause premature functioning through adiabatic heating of entrapped air from loading during gun firing.

6.16.3 Annular Rings. Annular ring cavities in the bottom segments of the explosive cast over the width described are likely to cause premature functioning either through adiabatic heating of entrapped air or through explosive impact across the gap from loading during gun firing.

6.16.4 Piping Cavities. Piping cavities in the bottom segment of the explosive cast over the sizes described are likely to cause premature functioning through explosive collapse and impact across the void from loading during gun firing.

6.16.5 Cracks. Cracks in the bottom segment of the explosive cast over the width described are likely to cause premature functioning either through adiabatic heating of entrapped air or through explosive impact across the gap from loading during gun firing.

6.16.6 Explosive Cast Defects in Segment B. Explosive cast defects in Segment B in excess of twice the requirements are likely to cause premature functioning either through adiabatic heating of entrapped air, or through explosive impact across the voids

6.16.7 Metal Parts Defects. Metal parts defects, except rotating band gaps, large enough to be detected by x-ray examination of the explosive loaded projectile are likely to cause premature functioning from break-up of the projectile in the gun during firing.

6.16.8 Foreign Material, X-Ray. Foreign material in the explosive cast, detected by x-ray, is considered likely to cause a premature function because the effect of its infinite variety cannot be evaluated in advance of its occurrence.

6.16.9 Base Separation. Base separation in excess of .015 inches detected by physical measurement of sectioned sample projectiles is classified as critical because it indicates a problem with x-ray detection of base separation and/or the presence of a loose explosive cast, either of which represents a likely safety problem.

6.16.10 Foreign Matter in the Charge Cavity. Foreign material in the charge cavity, detected by visual inspection prior to explosive filling, is considered likely to cause a premature function because its infinite variety cannot be evaluated in advance of its occurrence.

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6.16.11 Supplementary Charge or pad Missing. When fired, a loose supplementary charge can impact the base of the fuze well with sufficient force to function the pressed TNT charge and the cast explosive projectile fill while in the gun tube. A missing supplementary charge can cause a safety failure if the fuze booster cup threads fail.

6.16.12 Projectile Zone Weight or Marking Incorrect. Incorrect projectile zone weight or zone weight marking can cause projectile impact short or long of the anticipated target area resulting in unacceptable collateral damage during combat operations in urban environments.

6.16.13 Ballistic Safety Test. Any premature projectile function or metal parts separation in the gun or in flight is likely to cause injury or death for the troops firing or supported by the howitzer.

6.17 Porosity.

6.17.1 Shrink porosity. Also known as core or sponge porosity, shrink porosity occurs during the cooling and solidification of the explosive cast, usually down the central axis of the cast, and radiating outward. Pores are often clustered and appear flattened or elongated.

6.17.2 Spherical porosity. Also known as gas porosity, the areas of spherical pores may occur anywhere throughout the explosive cast. Common causes are entrapped or entrained air induced during the melt pouring process. The X-ray image standards (see 6.3) for acceptable areas of spherical porosity should illustrate porous areas where the pores are generally spaced a minimum of two diameters apart in Segment A and the bottom half of segment B, and one diameter apart elsewhere in the cast. Sample loaded projectiles, sectioned to expose the porous areas, may be used to confirm pore spacing when setting standards. Pore spacing through and across an area of spherical porosity is usually equal.

6.18 Classification of Characteristics. Conformance examinations and tests are specified in the following Classification of Characteristics paragraphs. The contractor's quality program or detailed inspection system should provide assurance of compliance of all characteristics with the applicable drawing and specification requirements utilizing as a minimum the conformance criteria specified. 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, Major and Minor should be as defined in MIL-STD-1916. Acceptance criteria should be in accordance with MIL-STD-

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1916. Alternative conformance inspections may be submitted and approved in accordance with MIL-STD-1916.

6.19 Inspection equipment. The inspection equipment required to perform the inspections specified herein is identified in the "Inspection Method Reference" column of the Classification of Characteristics listings starting with 4.3.2.1. Contractor inspection equipment designs should be submitted for Government approval as specified in the contract. Designs which provide variable measurements instead of attribute data are preferred in order to facilitate the use of statistical process control.

6.20 Qualification of post-cyclic heat chambers. The chambers should be qualified for the number of projectiles and their location (stacking) in the chamber. The least efficient heat transfer area of the oven should be determined by thermocouples placed on projectiles within the chamber. An instrumented projectile (projectile with a thermocouple placed in the center both radially and axially of the explosive cast) should be placed in the least efficient area of the chamber and the required cycle time should be established based on these readings. The contractor should provide a qualification report. The report should contain a schematic of the chamber with the projectile layout with the supporting data confirming the least efficient are, a layout of chamber temperature distribution, a graph of the instrumented projectile results and a process plan. Forward results to Commander, ARDEC, ATTN: AMSRD-AAR-QEM-A, Picatinny, NJ, 07806-5000.

6.21 Packaging Drawings. If the contractor chooses to build to the current approved TDP (9362569 and 12914619) the Government will waive the testing required to meet the First Article performance test requirements of the packaging specification; except for Performance Oriented Packaging (POP) testing which is still required to transport hazardous materials in accordance with Code of Federal Regulations (CFR), Title 49. Unless otherwise noted, the custodian of the following drawings is the U.S. Army Tank-Automated Command- Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ 07806-5000;

6.22 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

6.23 Subject term (key word) listing.
Base separation
Loading of High Explosive
Radiographic Inspection

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Army – AR

Preparing Activity:
Army – AR
(Project 1320-2007-001)

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