

INCH-POUND
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MIL-DTL-12235A (MR)

19 May 2009

SUPERSEDING

MIL-P-12235 (PA)

27 September 1952

w/AMENDMENT 1

8 November 1954

## DETAIL SPECIFICATION

PROJECTILE, PLATE-PROOFING (FOR IMPACT OR SHOCK TESTING) 37mm M1000, 57mm M1001, 75mm M1002, 90mm M1003, 105mm M1004, 20mm M1005, 57mm M1001A, and 75mm M1002A

This specification if approved for use within the Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

### 1. SCOPE

1.1 Scope. This specification covers plate-proofing projectiles made from steel and aluminum bar stock for use in impacting or shock-testing armor, armor weldments, and other armor structures (see 6.1).

1.2 Classification. The plate-proofing projectiles will be of the class and type specified in the contract or purchase order (see 6.2).

#### 1.2.1 Classes.

1.2.1.1 Class 1. Plate-proofing projectiles made from steel bar stock will be classified as Class 1.

Comments, suggestions, or questions on this document should be addressed to: Director, U.S. Army Research Laboratory, Weapons and Materials Research Directorate, Materials Applications Branch, Specifications and Standards Office, Attn: AMSRD-ARL-WM-MC, Aberdeen Proving Ground, MD 21005-5069 or emailed to <a href="mailto:rsquilla@arl.army.mil">rsquilla@arl.army.mil</a> . Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <a href="http://assist.daps.dla.mil/">http://assist.daps.dla.mil/</a> .
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AMSC N/A

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## MIL-DTL-12235A (MR)

1.2.1.2 Class 2. Plate-proofing projectiles made from aluminum bar stock will be classified as Class 2. The letter “A” will follow the type designation number to indicate that the projectile is made from aluminum. See Table I for a summary of Classes and Types.

1.2.2 Types.

1.2.2.1 Type I. Proofing-projectiles -37 mm designated M1000.

1.2.2.2 Type II. Proofing-projectiles -57 mm designated M1001.

1.2.2.3 Type III. Proofing-projectiles -75 mm designated M1002.

1.2.2.4 Type IV. Proofing-projectiles -90 mm designated M1003.

1.2.2.5 Type V. Proofing-projectiles -105 mm designated M1004.

1.2.2.6 Type VI. Proofing-projectiles - 20 mm designated M1005.

TABLE I. Proofing-projectile 's designations.

	<u>Type I</u>	<u>Type II</u>	<u>Type III</u>	<u>Type IV</u>	<u>Type V</u>	<u>Type VI</u>
<b>SIZE:</b>	<b>37 mm</b>	<b>57 mm</b>	<b>75 mm</b>	<b>90 mm</b>	<b>105 mm</b>	<b>20 mm</b>
<b>Class 1 (Steel)</b>	M1000	M1001	M1002	M1003	M1004	M1005
<b>Class 2 (Aluminum)</b>	N/A	M1001A	M1002A	N/A	N/A	N/A

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited 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 specified requirements of documents cited in sections 3, 4, or 5 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.

## MIL-DTL-12235A (MR)

## INTERNATIONAL STANDARDIZATION AGREEMENTS

- ISO 17025 - General requirements for the competence of testing and calibration laboratories (DoD Adopted).

(Copies of this document are available from <http://www.iso.ch> or from the International Organization for Standardization American National Standards Institute 11 West 42nd Street, 13th Floor New York, New York, United States, 10036.)

## FEDERAL SPECIFICATIONS

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

## DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-PRF-32033 - Lubricating Oil, General Purpose, Preservative (Water-Displacing, Low Temperature)

## DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-129 - Military Marking for Shipment and Storage  
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 from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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.

## American Society for Quality (ASQ)

- ASQC-A8402 - Quality Management and Quality Assurance - Vocabulary (DoD Adopted)

(Copies of this document are available from [www.asq.org](http://www.asq.org) or American Society for Quality, 600 Plankinton Avenue, Milwaukee, WI 53203.)

## ASME INTERNATIONAL

- ASME B46.1 - Surface Texture, (Surface Roughness, Waviness and Lay) (DoD Adopted)

(Copies of this document are available from [www.asme.org](http://www.asme.org) or ASME International, Three Park Avenue, New York, NY 10016-5990)

## MIL-DTL-12235A (MR)

## ASTM INTERNATIONAL

ASTM A751	-	Steel Products, Practices, and Terminology for Chemical Analysis of. (DoD Adopted)
ASTM B557	-	Standard Test Methods for Tension Testing Wrought and Cast Aluminum and Magnesium-Alloy Products (DoD adopted)
ASTM E18	-	Standard Test Methods for Rockwell Hardness of Metallic Materials
ASTM E381	-	Bars Steel Macroetch Testing, Billets, Blooms, and Forgings

(Copies of these documents are available from [www.astm.org](http://www.astm.org) or ASTM International, 100 Barr Harbor Drive, PO Box C700, 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 Materials. The materials and parts of the proofing-projectile shall meet all the requirements specified on the applicable drawings listed in Figures I -VIII. See Table II .

TABLE II. Proofing-projectile drawings.

<b>PROOFING-PROJECTILE</b>	<b>ARMY ORDNANCE DRAWINGS</b>	<b>CURRENT FIGURE</b>
M1000	75-2-414	FIGURE I
M1001	75-2-415	FIGURE II
M1001A	N/A	FIGURE III
M1002	75-2-416	FIGURE IV
M1002A	N/A	FIGURE V
M1003	75-18-57	FIGURE VI
M1004	75-4-184	FIGURE VII
M1005	7553662	FIGURE VIII

3.1.1 Steel proofing -projectiles. All steel proofing-projectiles shall be made from steel, in accordance with Table III.

3.1.1.1 Processing and composition.

## MIL-DTL-12235A (MR)

3.1.1.1.1 Processing. The composition and heat treatment, when required, shall be at the option of the contractor and shall be specified in the contract or purchase order (see 6.2) when the projectile body meets the hardness requirements of this specification.

3.1.1.1.2 Statement of analysis. The chemical analysis of steel shall be furnished with each lot of projectiles supplied.

3.1.1.2 Steel quality. The quality of the steel used in projectiles, as indicated by the results of macroetch test performed in accordance with 4.4.4.1, shall be as indicated in the contract or purchase order (see 6.2). Prior requirements indicated that the macrograph had to be equal to or better than that shown by macrographs A4, B5, and C8 of Appendix A and defects of the types shown by macrographs D3, D4, D5, D6, D7, or D8 of Appendix A. These macrographs were taken from the cancelled MIL-STD-1459 and they are offered as possible requirements. It is suggested that the ASTM Adjunct of ASTM E381; Plate I, Plate II, and Plate III be referenced in the contract or purchase order as possible accept / reject criteria.

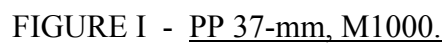
TABLE III. Proofing-projectile drawings.

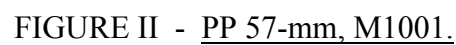
PROOFING-PROJECTILE	STEEL	ALUMINUM
M1000	Hot-Rolled, As-Rolled FS 1021	N/A
M1001	Hot-Rolled, As-Rolled FS 1021	N/A
M1001A	N/A	Alloy 1100 Temper 0
M1002	Hot-Rolled, As-Rolled FS 1021	N/A
M1002A	N/A	Alloy 1100 Temper 0
M1003	Hot-Rolled FS 1021	N/A
M1004	Cold Rolled FS 1021	N/A
M1005	Hot-Rolled FS 1009 to FS 1020	N/A

3.1.1.3 Hardness. The hardness of the finished steel projectiles shall be within a range of 64 to 74 Rockwell B (100 to 122 BHN), when tested as prescribed in paragraph 4.3.4.2 (See 6.3).

3.1.1.4 Rotating band.

3.1.1.4.1 Cleaning before assembly. Prior to banding, the band seats shall be clean and free from oil, grease, dirt, rust, and foreign material. Shot blasting or sand blasting shall not be used for cleaning band seats.





## MIL-DTL-12235A (MR)

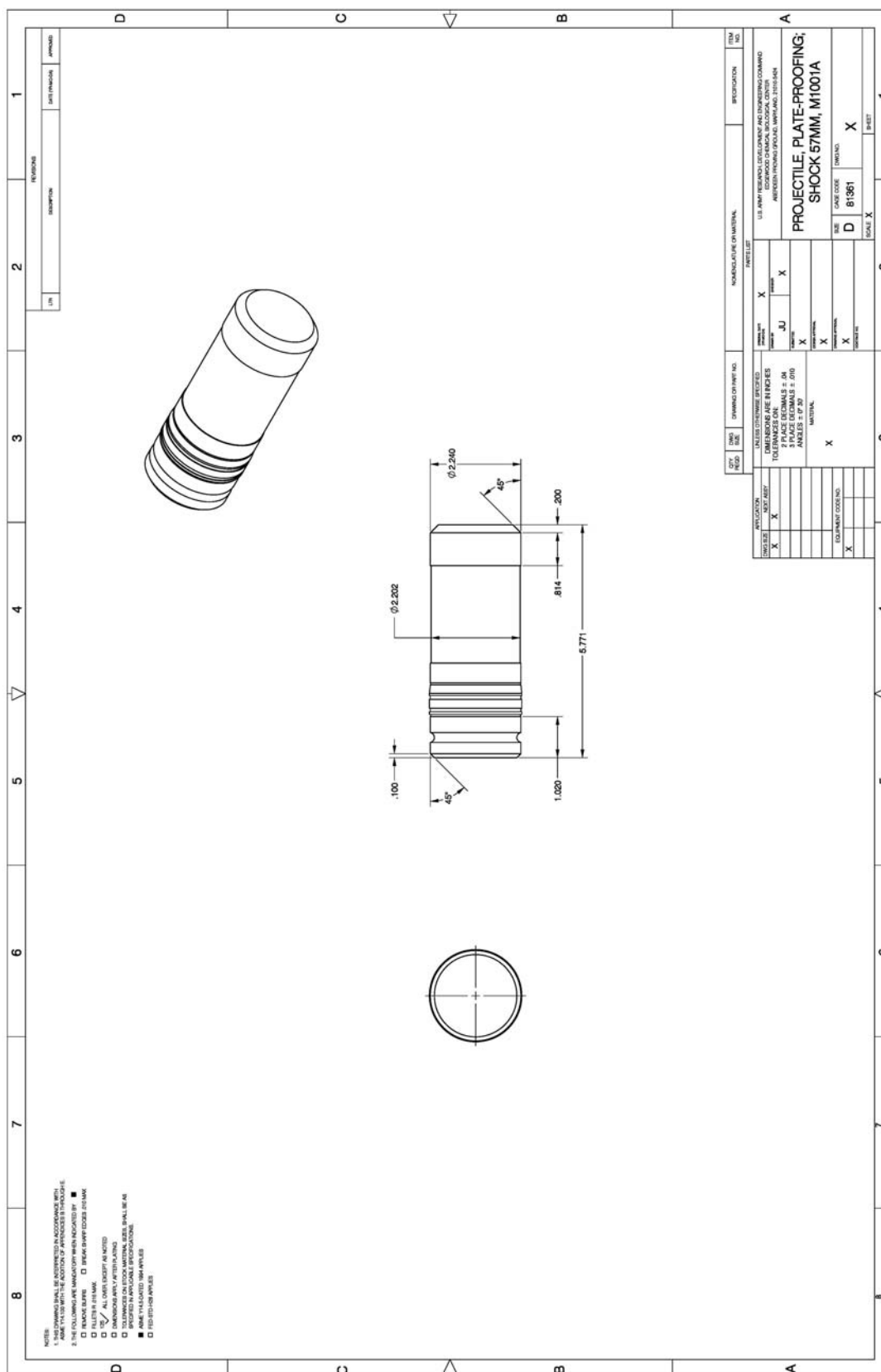
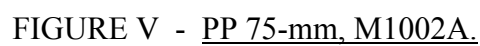


FIGURE III - PP 57-mm, M1001A





MIL-DTL-12235A (MR)

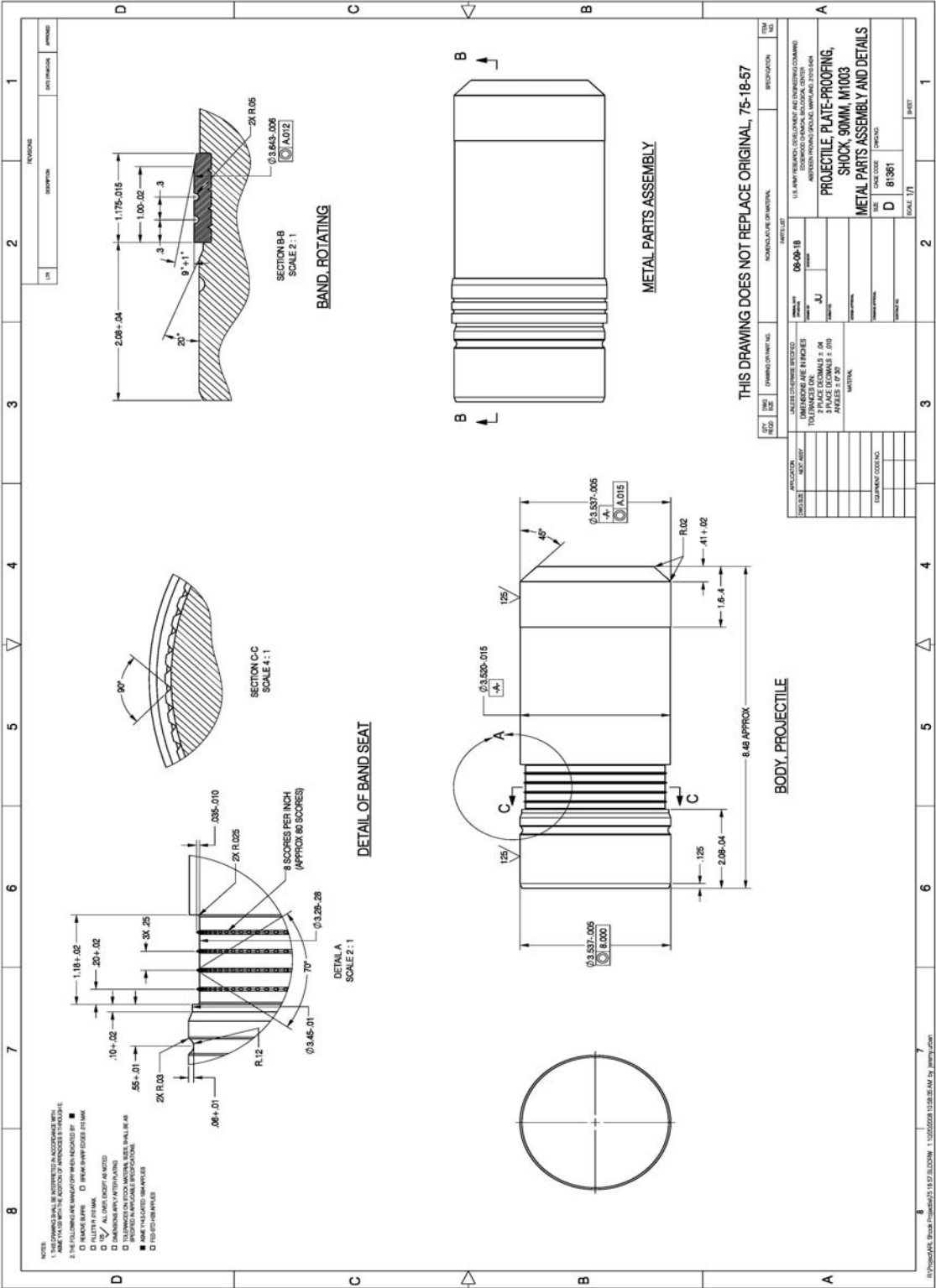


FIGURE VI - PP 90-mm, M1003.

MIL-DTL-12235A (MR)

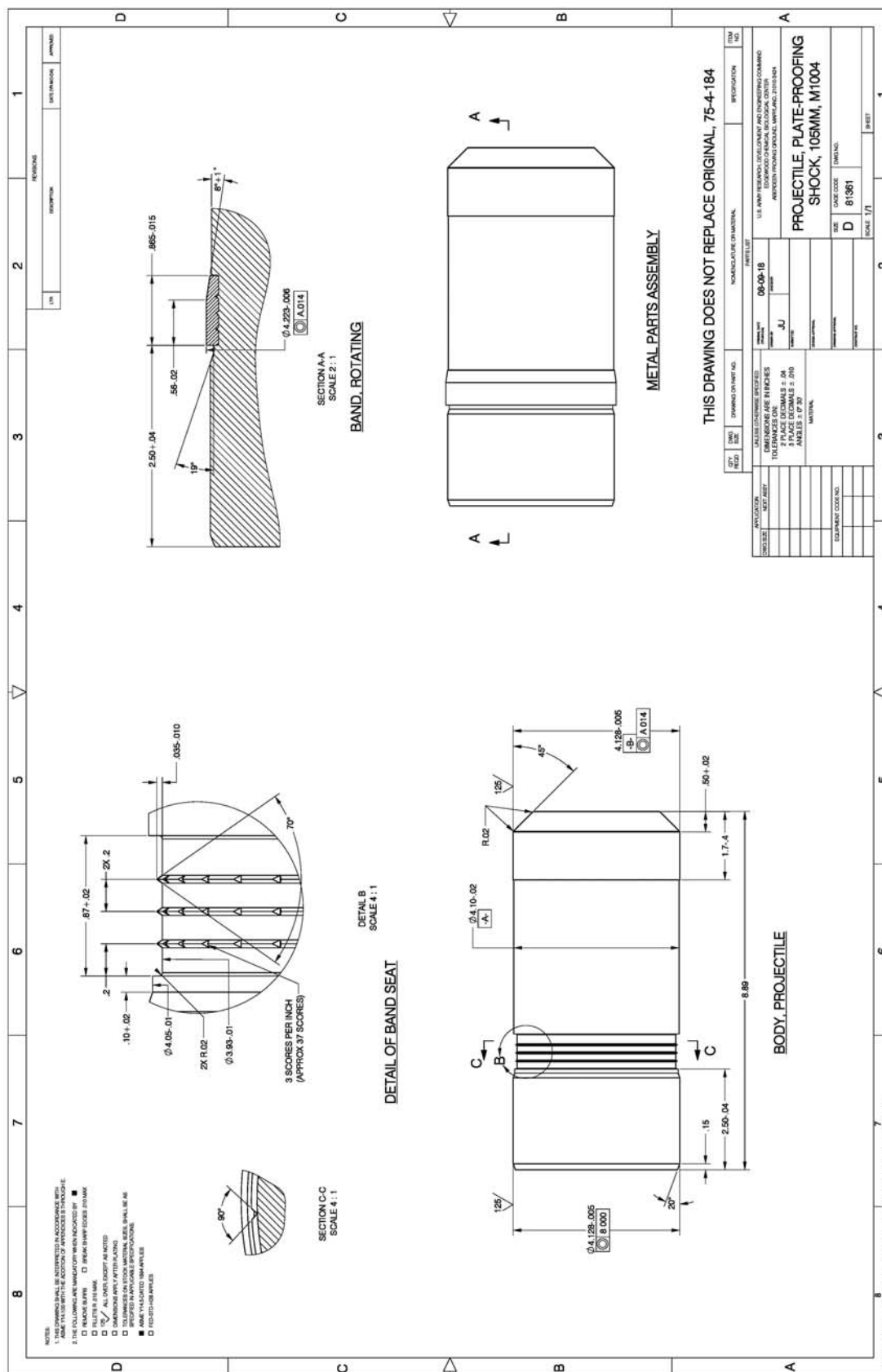


FIGURE VII - PP 105-mm, M1004.

MIL-DTL-12235A (MR)

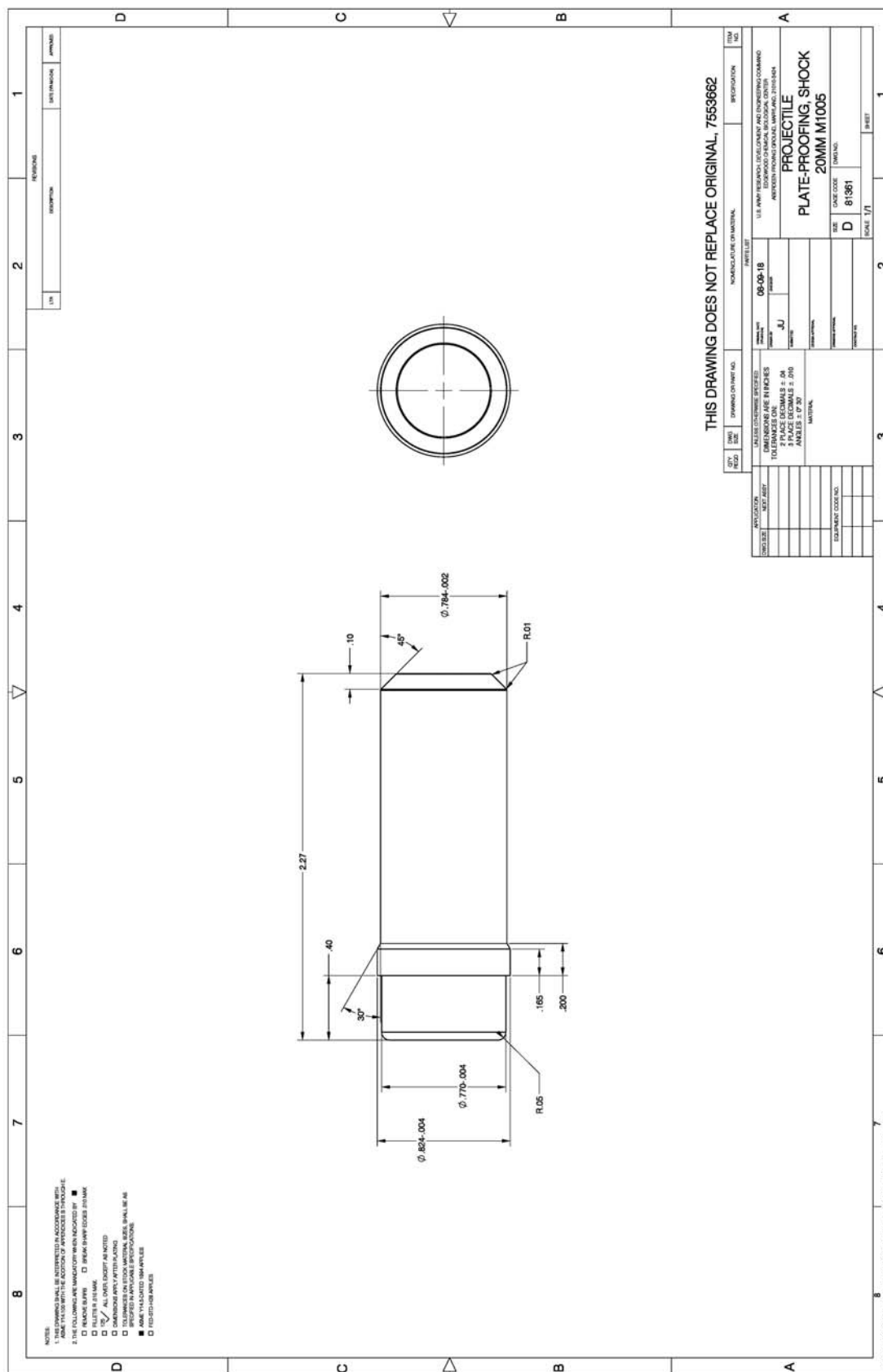


FIGURE VIII - PP 20-mm, M1005.

## MIL-DTL-12235A (MR)

3.1.1.4.2 Application. Rotating bands shall be applied cold and in the fully annealed condition. The band shall be in the form of a solid ring, carefully pressed into the band seat so as to fill it completely and to fit it tightly. The application shall be in such a manner as not to distort the body of the projectile (see 4.4.1).

3.1.1.4.3 Protection. The machined rotating band shall not be nicked, burred, or otherwise damaged.

3.1.1.4.4 Clearance. After seating of the rotating band, the clearance between band and band seat shall not exceed 0.006 inches.

3.1.1.5 Cleaning prior to painting. The projectile surface to be painted shall be cleaned by one of the methods specified in TT-C-490 unless otherwise specified in the contract or purchase order (see 6.2). After cleaning, the surfaces shall not be re-contaminated prior to painting and after painting shall meet the requirements specified in the contract or purchase order (see 6.2)

3.1.2 Aluminum proofing -projectiles. All aluminum proofing-projectiles shall be made from aluminum alloy 1100 Temper 0 in accordance with Table III.

3.1.2.1 Processing and composition.

3.1.2.1.1 Processing. The composition and heat treatment, when required, shall be at the option of the contractor and shall be specified in the contract or purchase order (see 6.2).

3.1.2.1.2 Statement of analysis. The chemical analysis of aluminum shall be furnished with each lot of projectiles supplied.

3.1.2.2 Aluminum quality. The quality of the aluminum used in projectiles shall be as indicated in the contract or purchase order (see 6.2).

3.1.2.3 Mechanical properties. Unless otherwise specified in the contract or order (see 6.2 and 6.3), the mechanical properties of the test specimen taken in the longitudinal direction shall meet the minimum mechanical properties listed in Table IV.

TABLE IV. Minimum mechanical properties.

Tensile Strength, Ksi	Yield Strength, 0.2% Offset, Ksi	Elongation percent
13.0	5.00	35

#### 4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as conformance inspection (see 4.2).

## MIL-DTL-12235A (MR)

4.2 Conformance inspection. The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified (see 6.2), the supplier shall utilize his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examination and tests shall be kept complete and available to the Government as specified in the contract or purchase order (see 6.2). The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2.1 Inspection terms and definitions. Reference shall be made to ASQC-A8402 to define the inspection terms used.

4.2.2 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed in accordance with ISO 17025.

4.3 Sampling.

4.3.1 Lot. A lot shall consist of all the projectiles made of bar stock from a single heat of steel or aluminum, as applicable, and shall have the same heat treatment.

4.3.2 Submittal of product. Unless otherwise specified in the contract or purchase order (see 6.2) the contractor shall submit the product in accordance with MIL-STD-1916.

4.3.3 Examination. Examination shall be performed for the requirements of 3.1.1.2, 3.1.1.3, 3.1.1.4, 3.1.1.5, 3.1.2.2, 3.1.2.3, 3.1.2.4, and 3.1.2.5 in accordance with MIL-STD-1916 with the specific acceptance level that is specified in the contract or purchase order (see 6.2). All nonconforming material shall be rejected.

4.3.4 Inspection testing. The following tests shall be performed in accordance with the provisions of 4.4 except as provided in ISO 9001.

4.3.4.1 Material composition. A sample shall be selected for chemical analysis from the bars used for manufacturing of the projectiles prior to machining or from sufficient parts prior to heat-treating to form a sample of at least 2 ounces. Failure to comply with the requirements of 3.1.1 or 3.2.1 shall be cause for rejection of the lot.

4.3.4.2 Quality. Each lot of material shall be inspected for quality as specified in the contract or purchase order (see 3.1.1.2, 3.1.2.2, and 6.2).

4.3.4.3 Hardness. A hardness test shall be made on one out of every ten finished projectiles unless otherwise specified in the contract or purchase order (see 6.2). The test shall be made on the outside diameter approximately 0.5 inches from the nose end of the plate-proofing projectile with any hardness testing machine approved by the Government. If any sample projectile shows a hardness reading outside of the range specified in 3.1.1.3, the ten projectiles represented by that sample shall be subject to rejection, with the option of reworking and resubmitting for test.

## MIL-DTL-12235A (MR)

4.3.5 Mechanical properties. The number of tension specimens that shall be tested shall be specified in the contract or purchase order (see 6.2) and shall meet the requirements when tested as specified in 4.4.5.

4.3.6 Inspection equipment. The examination and tests shall be made using equipment approved by the Government.

4.4 Test methods.

4.4.1 Material composition. Chemical analysis for conformance to the material composition requirements of 3.1.1 and 3.1.2 shall be conducted on the sample in accordance with ASTM A751.

4.4.2 Hardness. The test specimens shall be prepared and tested in accordance with ASTM E18 and shall be in compliance with the hardness requirement of 3.1.1.3.

4.4.3 Rotating band tests.

4.4.3.1 Seating test.

4.4.3.1.1 Methods for plate-proofing projectiles other than 20-mm M1005 and 105-mm M1004. One band per 2,000 shells from each banding machine (or where production is less than 2,000 per working shift, one band from each banding machine from each shift) shall be removed for examination of the seating. Prior to removal, the diameter of the finished band shall be measured on at least three diameters 60° apart and on at least two points along the length of the cylindrical portion, near the front and rear (a minimum of six diametral measurements). These points of measurements shall be marked on the bands as well as the orientation of the band on the shot. After removal, the thickness of the band shall be measured at each of the marked points (twelve measurements) and the diameter of the band seat shall be measured opposite those points. To the diameters of the band seat at each point, the corresponding sum of the two thicknesses of the band shall be added and the results subtracted from the corresponding exterior diameter of the band previously determined. The results shall indicate the total diametral clearance between the band and its seat. If the band is well seated, a negative clearance or interference may be indicated on some of the measurements or even on the average of all measurements. In case the indicated clearance thus determined is greater than 0.006 inches on any one diameter, either front or rear, the band shall be removed from ten additional shells from the group represented. If a clearance greater than 0.006 inches on any one diameter is indicated on any one of these additional shells, the entire group represented shall be rejected subject to re-banding and retest. When wavy band seat ribs or irregular band profiles interfere with ease of measurement, the manufacturer is authorized to machine the outside of the band in order to obtain an adequate cylindrical surface. The diameter of the machined band must exceed the bourrelet diameter.

4.4.3.1.2 Methods for plate-proofing projectiles for the 105-mm M1004. A hydraulic press having one movable ram, capable of exerting a total ram pressure of 12,000 pounds minimum, shall be used for this test. Two indentors (or anvils) of rectangular cross section 0.378 inches on a side each having a face radius of 2.11 inches shall be provided, one on the fixed and one on the

## MIL-DTL-12235A (MR)

movable ram of the press and both on a common center line. The press shall be fitted with indicators to show the pressure on the ram and the motion of the ram. The band seating shall be inspected between the indentors by measuring the travel of the indentors during application of pressure. Care must be taken not to take readings until after full pressure has been applied and the motion of the ram has ceased as shown by the dial indicator (see 6.5). Measurements shall be taken in two planes approximately ninety degrees apart. The pressures used (10,000 p.s.i.) shall be great enough to seat the band under the indentors, but not so great that permanent deformation of the shot occurs. The band seating shall be inspected by pressing the band between the indentors and measuring the diameter of the rotating band in each plane before and after applications of the pressure. The difference in the two diametral readings shall be the sum of the clearances under the band at two points in one plane. The average of the readings in the two planes shall not exceed 0.008 inches. The impression left by the indentors shall not be cause for rejection of the shot. This test shall be preformed by the contractor on samples of sufficient size and frequency to assure adequate process control of the band seating.

4.4.3.1.3 Character of seating. Each band removed in accordance with this paragraph shall be examined for character of seating as well as to determine whether corners of the band seats have been properly filled (see 6.4).

4.4.3.2 Retest. A retest may be made at the request of the contractor. If failure occurs in the retest, the group of projectiles represented by the samples may be re-banded and resubmitted for test.

#### 4.4.4 Tests for soundness.

4.4.4.1 Macro inspection. One full cross-sectional sample shall be taken from each bar stock and shall be macro-etched in accordance with ASTM E381 and examined for compliance with 3.1.1.2. If soundness of the macro-etched sample does not meet the requirements of 3.1.1.2 (or as specified in the contract or purchase order (see 6.2)), the bar shall be subject to rejection. Portions of the bar may be resubmitted for inspection under this test, provided the contractor can show to the satisfaction of the inspector that the part or parts containing injurious defects have been removed.

4.4.4.2 Visual inspection. After finish-machining, each projectile shall be inspected visually for cracks, piping, seams, porosity, and other injurious defects. All projectiles showing such defects shall be subject to rejection.

4.4.5 Mechanical properties. Tension test specimens shall be prepared and tested in accordance with ASTM B557 and shall be in compliance with the mechanical properties requirement of 3.1.2.3.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2 and 6.7). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory

## MIL-DTL-12235A (MR)

Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

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

6.1 Intended use. The plate-proofing projectiles covered by this specification are intended for use in impacting or shock-testing armor, armor weldments, and other armor structures.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. Caliber, type and millimeter required (see 1.2).
- c. Composition and heat treatment for steel projectiles (see 3.1.1.1.1).
- d. Quality of steel by indicating acceptable and rejectable micrographs (see 3.1.1.2, 4.3.4.2, 4.4.4.1, and 6.2).
- e. Cleaning method different than TT-C-490 (see 3.1.1.5).
- f. Surface requirements after painting (see 3.1.1.5).
- g. Composition and heat treatment for aluminum projectiles (see 3.1.2.1.1).
- h. Quality of aluminum projectiles (see 3.1.2.2, 4.3.4.2, and 6.2).
- i. If mechanical specimens are not tested in the longitudinal direction (see 3.1.2.3).
- j. Inspection facilities, if different (see 4.2).
- k. Inspection records (see 4.2).
- l. Inspection conditions (see 4.2.2).
- m. Submittal of product (see 4.3.2).
- n. Acceptance level (see 4.3.3).
- o. Number of hardness tests, if different (see 4.3.4.3).
- p. Number of tension specimens to be tested (see 4.3.5).
- q. Packaging requirements (see 5.1 and 6.7).
- r. Marking requirements (see 6.6).

6.3 Uniformity. It is essential that all projectiles procured under this specification give uniform results in order that a single standard will be used for the qualification and acceptance tests of armor plate, armor castings, and weldments thereof.

6.4 Seating of band. The necessity for firmly seating the rotating band so that the gilding metal will be in contact with the projectile at all points can not be over-emphasized. Air gaps of even a few thousandths of an inch result in differences in starting resistance when the band enters the rifling. This causes variations in the burning characteristics of the powder which in turn affects the muzzle velocity. It is essential that bands be fully and uniformly applied in order to obtain satisfactory results.

## MIL-DTL-12235A (MR)

6.5 Hydraulic press. The Detroit testing Machine, Model RB-1, has been found suitable for the test specified in this specification. The test is performed as follows:

- a) Place shell on test fixture and adjust glide so that the rotating band of the projectile is correctly located with respect to the indentor.
- b) Step on treadle and allow load to act until needle of indicating dial which measures ram travel, comes to rest. Note reading.
- c) Release treadle and allow indicating needle to return to zero.
- d) Without disturbing the projectile, repeat step (b) and note reading.
- e) Release treadle.
- f) Take difference between the readings of step (b) and (d). It is a function of the gap or clearance at the diameter and is called the indicated diametral clearance.
- g) Repeat above steps (a) to (e) for other diameters of the shell.

6.6 Marking. Suggested wording to be included in the contract or purchase order “Marking for shipment and storage shall be in accordance with MIL-STD-129” (see 6.2).

6.7 Packing container. Suggested wording to be included in the contract or purchase order (see 6.2): The projectiles should be packed in commercial-type containers so constructed as to insure acceptance by common or other carrier for safe transportation, at the lowest rate, to the point of delivery. Each projectile should be protected from coming into contact with another projectile by means of suitable partitions. The packing container should be sufficiently rigid to permit storing in tiers of at least 10-foot height without damage to either container or contents. The lot number should be marked on each container.

6.8 Subject term (key word) listing.

Aluminum  
Armor  
Ballistic  
Body armor  
Steel  
Weldment

6.9 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.

## MIL-DTL-12235A (MR)

**APPENDIX A**

## MACROGRAPH STANDARDS

## A.1 SCOPE

A.1.1 Scope. This appendix provides the macrographs for accepting and rejecting steel projectiles used in plate-proofing testing. This appendix is not a mandatory part of this specification. The macrographs contained herein are intended for use if specified in the contract or purchase order for the plate-proofing projectiles(see A.6.2).

A.1.2 Applicability. The macrographs specified in this appendix are not required unless they are specifically specified in the contract or purchase order for the plate-proofing projectiles (see A.6.2). The content of this appendix was taken from specification, MIL-STD-1459 (MU).

## A.2 APPLICABLE DOCUMENTS N/A

## A.3 REQUIREMENTS

A.3.1 Acceptable defects. See Figure A-1 (A4 - Center defects), Figure A-2 (B5 - Subsurface defects), and Figure A-3 (C8 - Ring defects).

A.3.2 Unacceptable defects. Miscellaneous defects; inclusions, flakes and bursts. See Figure A-4 (D3), Figure A-5 (D4), Figure A-6 (D5), Figure A-7 (D6), Figure A-8 (D7), and Figure A-9 (D8).

## A.4 VERIFICATION N/A

## A.5 PACKAGING N/A

## A.6 NOTES

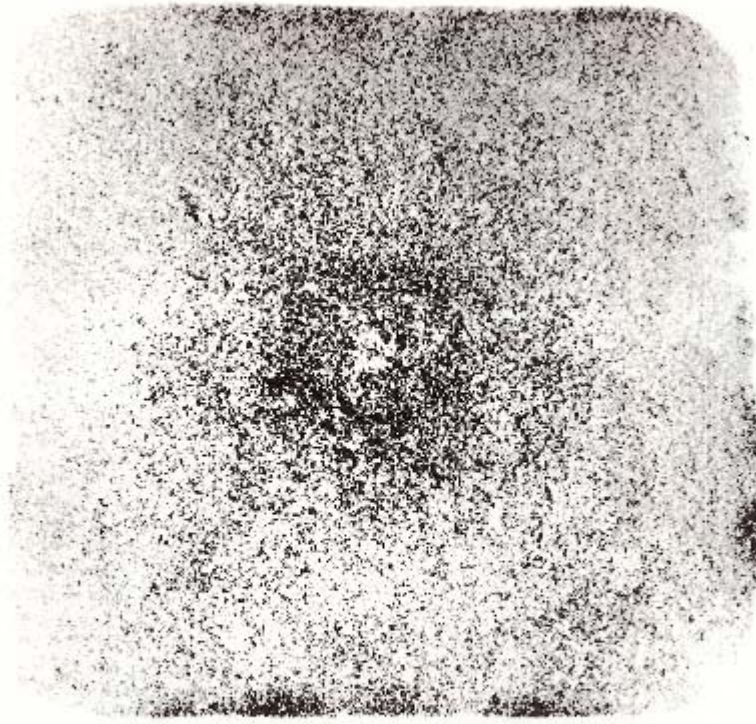
A.6.1 Intended use. The macrographs listed in this appendix are to be used by the Procuring Activity as guidelines for determining the quality of the steel projectiles as indicated by the results of macroetch test performed in accordance with this specification (see 4.5.1).

A.6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Specify which, if any, macrographs in Figures A-1 to A-9 are to be used for accepting or rejecting the steel projectiles (see A.1.1 and A.1.2).

MIL-DTL-12235A (MR)

**APPENDIX A**

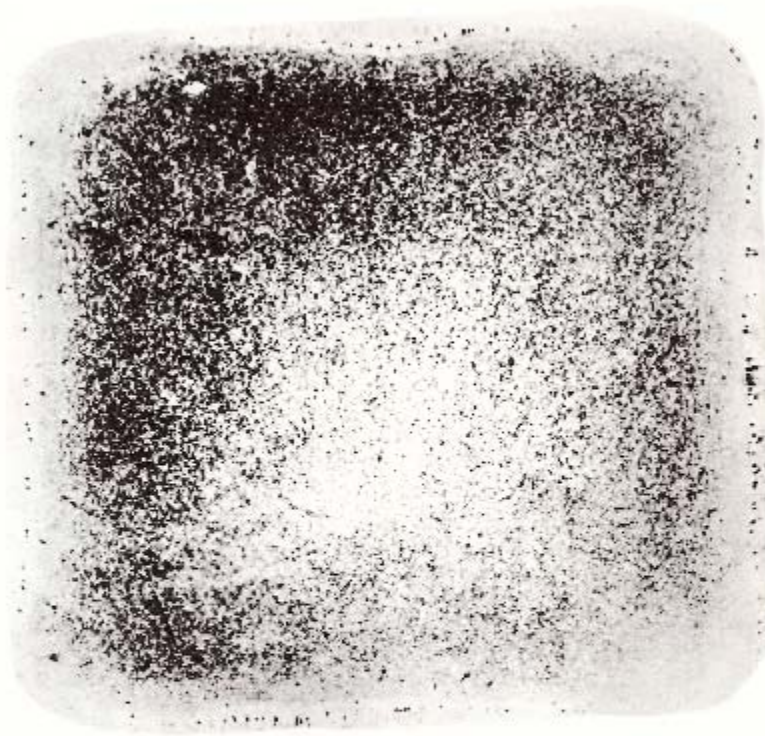


**A4**

FIGURE A-1. Macrograph A4

MIL-DTL-12235A (MR)

**APPENDIX A**



**B5**

FIGURE A-2. Macrograph B5

MIL-DTL-12235A (MR)

**APPENDIX A**

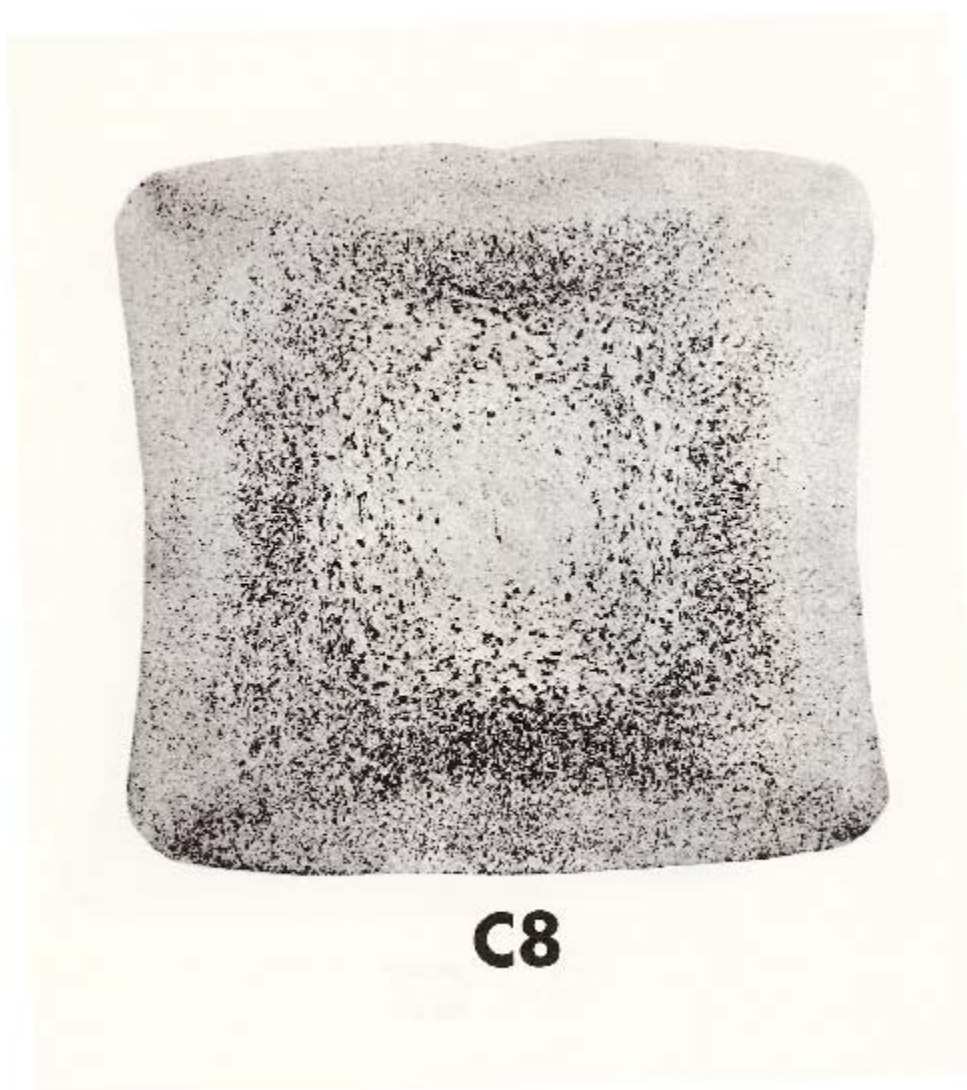
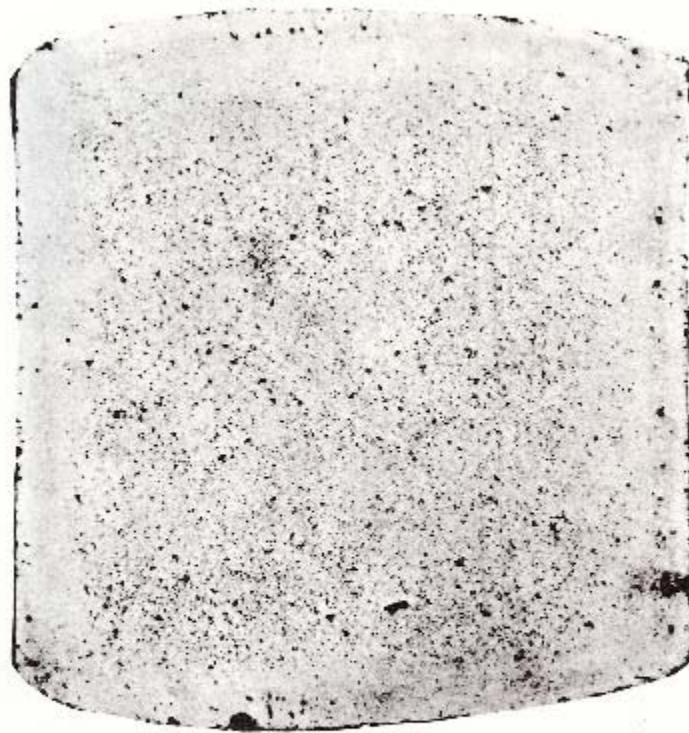


FIGURE A-3. Macrograph C8

MIL-DTL-12235A (MR)

**APPENDIX A**



**D3**

FIGURE A-4. Macrograph D3

MIL-DTL-12235A (MR)

**APPENDIX A**



FIGURE A-5. Macrograph D4

MIL-DTL-12235A (MR)

**APPENDIX A**



FIGURE A-6. Macrograph D5

MIL-DTL-12235A (MR)

**APPENDIX A**

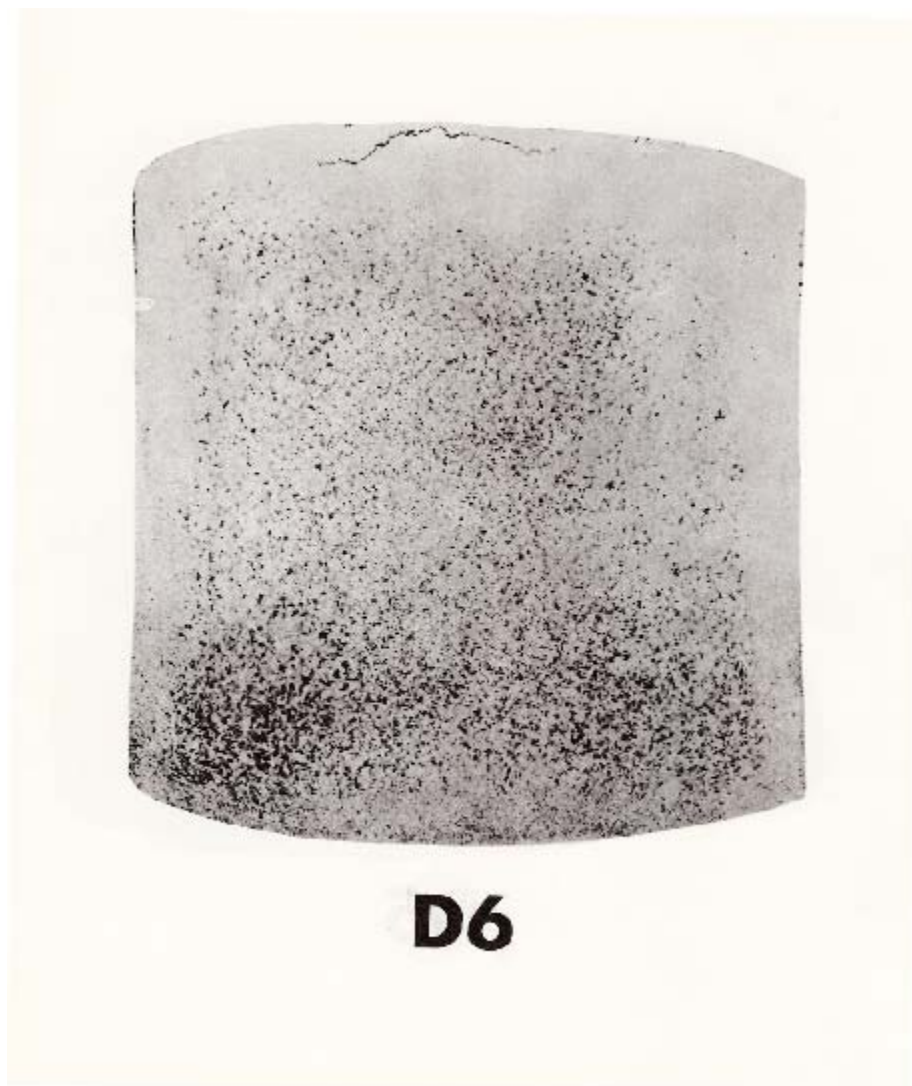
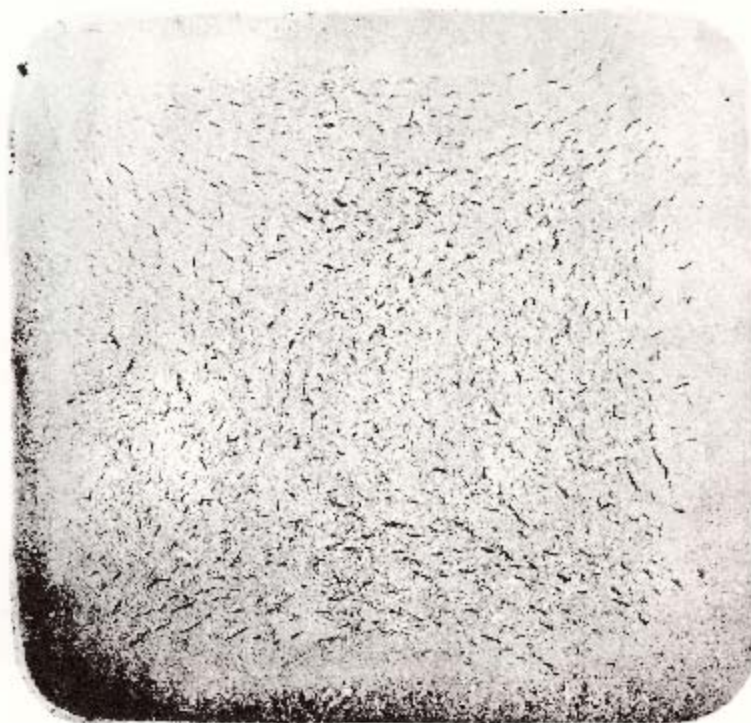


FIGURE A-7. Macrograph D6

MIL-DTL-12235A (MR)

**APPENDIX A**



**D7**

FIGURE A-8. Macrograph D7

MIL-DTL-12235A (MR)

**APPENDIX A**

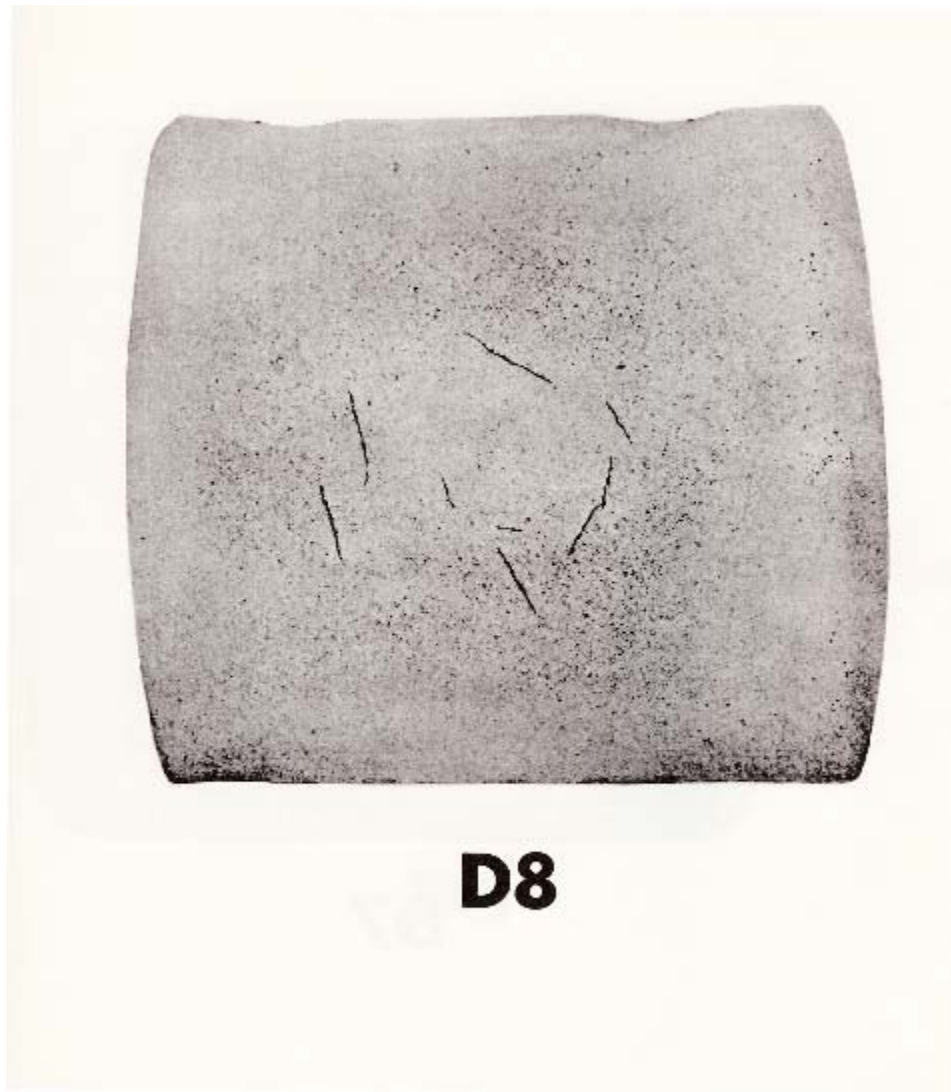


FIGURE A-9. Macrograph D8

MIL-DTL-12235A (MR)

CONCLUDING MATERIAL

Custodian:  
Army – MR

Preparing activity:  
Army – MR

Review activities:  
Army – AR, AV

(Project 1310-2008-005)

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 <http://assist.daps.dla.mil/>.