

MIL-P-12235 (ORD)
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 SUPERSEDING
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MILITARY SPECIFICATION

PROJECTILES, PLATE-PROOFING (FOR IMPACT OR SHOCK TESTING) 37MM PP M1000, 57MM PP M1001, 75MM PP M1002, 90MM PP M1003, 105MM PP M1004

1. SCOPE AND CLASSIFICATION

1.1 Type.-- This specification covers plate-proofing projectiles made from steel bar stock for use in impacting or shock-testing armor, armor weldments, and other armor structures.

1.2 Classes.-- Plate-proofing projectiles shall be furnished in the following classes, as specified (see 6.1):

37-mm PP M1000
 57-mm PP M1001
 75-mm PP M1002
 90-mm PP M1003
 105-mm PP M1004

2. APPLICABLE SPECIFICATIONS, STANDARDS, DRAWINGS, AND PUBLICATIONS

2.1 The following specifications, standards, and drawings including all specifications and drawings listed or referenced thereon, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

QQ-M-151 - Metals; General Specification for Inspection of
 PA-PD-191 - Cleaning, Preparation and Painting of Metal
 Surfaces for Ammunition Items

MILITARY

MIL-M-11266 - Macroetch Test and Chart for Steel Bars, Billets
 and Blooms
 MIL-G-2550 - General Specification for Ammunition Except
 Small-Arms Ammunition

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection of
 Attributes
 MIL-STD-129 - Marking of Shipments

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DRAWINGS

ARMY ORDNANCE CORPS

75-2-414	-	Projectile, Plate-proofing; Shock 37 mm M1000
75-2-415	-	Projectile, Plate-proofing; Shock 57 mm M1001
75-2-416	-	Projectile, Plate-proofing; Shock 75 mm M1002
75-18-57	-	Projectile, Plate-proofing; Shock 90 mm M1003
75-4-184	-	Projectile, Plate-proofing; Shock 105mm M1004

(Copies of specifications, standards, and drawings required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer).

3. REQUIREMENTS

3.1 Materials. - The material and parts of the projectile shall meet all requirements specified on the applicable drawings listed on the applicable specifications.

3.2 Processing and composition. -

3.2.1 Processing. - The composition and heat treatment, when required, shall be at the option of the contractor when the projectile body meets the hardness requirements of this specification.

3.2.2 Statement of analysis. - The chemical analysis of the steel shall be furnished with each lot of projectiles supplied.

3.3 Steel quality. - The quality of the steel used in projectiles, as indicated by the results of macroetch test performed in accordance with 4.5.1, shall be equal to or better than that shown by macrographs A4, B5, and C6 of MIL-M-11266, with defects of the types shown by macrographs D3, D4, D5, D6, D7, or D8 of that specification as being cause for rejection.

3.4 Hardness. - The hardness of the finished projectile shall be within a range of 64 to 74 Rockwell B or an equivalent thereof, when tested as prescribed in paragraph 4.3. (see 6.2).

3.5 Rotating band. -

3.5.1 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.

3.5.2 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).

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

3.5.4 Clearance. - After seating of rotating band, the clearance between band and band seat shall not exceed .006 inch.

3.6 Cleaning prior to painting. - The projectile surface to be painted shall be cleaned by one of the methods specified in specification BA-PD-191. After cleaning, the surfaces shall not be recontaminated prior to painting and after painting shall meet the performance requirements of specification JAN-C-490.

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4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 Inspection (general).-- Inspection shall be as prescribed in specification MIL-G-2550 and QQ-M-151, when applicable.

4.2 Sampling.--

4.2.1 Lots.-- All projectiles in a lot shall be made of bar stock from a single heat of steel and shall have the same heat treatment when required.

4.2.2 Samples for test.-- Sampling for non-destructive tests shall be accomplished in accordance with Standard MIL-STD-105. The plan for double sampling at inspection level II shall be adhered to at AQL-4, of 4% unless otherwise specified by the contracting officer.

4.3 Hardness test.-- A hardness test shall be made on one out of every ten finished projectiles. The test shall be made on the outside diameter approximately $\frac{1}{2}$ inch from the nose end of the plate-proofing projectile with any hardness-testing machine specified in QQ-M-151. If any sample projectile shows a hardness reading outside of the range specified in 3.4, the ten projectiles represented by that sample shall be subject to rejection, with the option of reworking and resubmitting for test.

4.4 Rotating-band tests.--

4.4.1 Seating test.--

4.4.1.1 Methods for FP projectiles other than 105-mm FP M1004.-- One band per 2,000 shell 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 near the rear (a minimum of six diametral measurements). These points of measurement 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 result will 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 .006 inch on any one diameter, either front or rear, the band shall be removed from ten additional shell from the group represented. If a clearance greater than .006 inch on any one diameter is indicated on any one of these additional shell, the entire group represented shall be rejected subject to rebanding and retest. When wavy band seat ribs or irregular band profile interferes 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.

4.4.1.2 Methods for 107-mm FP M1004.-- A hydraulic press having one moveable 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 .378 inch on a side each having a face radius of 2.11 inch shall be provided, one on the fixed and one on the moveable ram of the press and both on a common

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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 6.4). 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 application of the pressure. The difference in the two diametral readings will 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 .008 inch. The impression left by the indentors shall not be cause for rejection of the shot. This test shall be performed by the contractor on samples of sufficient size and frequency to assure him of adequate process control of band seating.

4.4.1.3 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 6.3).

4.4.2 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 rebanded and resubmitted for test.

4.5 Tests for soundness.-

4.5.1 Macro inspection.- One full cross-sectional sample shall be taken from each bar of stock and shall be macro-etched in accordance with MIL-W-11266 and examined for compliance with 3.3. If soundness of the macro-etched sample does not meet the requirements of 3.3, 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.

4.5.2 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.

5. PREPARATION FOR DELIVERY

5.1 Packing.-

5.1.1 Container.- The projectiles shall 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 shall be protected from coming into contact with another projectile by means of suitable partitions. The packing container shall be sufficiently rigid to permit storing in tiers of at least 10-foot height without damage to either container or contents. The gross weight of any container shall not exceed 70 pounds. The lot number shall be marked on each container.

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5.1.2 Data card.-- Data cards, 5 x 8 inches, made of commercial manila tag-board approximately 200 pounds room weight, shall be prepared for each lot of accepted projectiles to provide the information specified below. Quantities (approximately 8 per lot) and distribution of data cards shall be in accordance with instructions issued by the Office, Chief of Ordnance.

AMMUNITION DATA CARD

Kind	Lot No.
Part No.	Quantity in lot
Drawing No.*	Spec. No.#.
Manufactured by.	Date.
Contract No.	Order No.
Packedin a box
Remarks.	

* Includes revisions, amendments and AHR's

Certified to by inspector.

Note. Place here name of inspector, district, arsenal, and sub-district, when applicable.

5.2 Marking.-- The marking for shipment shall be in accordance with Standard MIL-STD-129.

6. NOTES

6.1 Ordering data.-- Procurement documents should specify the title, number, and date of this specification, and class required (see 1.2).

6.2 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.

6.3 Seating of band.-- The necessity for firmly seating the rotating band so that the gliding metal will be in contact with the projectile at all points cannot 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.

6.4 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:

6.4.1 Place shell on test fixtures and adjust guide so that the rotating band of the projectile is correctly located with respect to the indenter.

6.4.2 Step on treadle and allow load to act until needle of indicating dial which measures ram travel, comes to rest. Note reading.

6.4.3 Release treadle and allow indicating needle to return to zero.

6.4.4 Without disturbing the projectile, repeat step 6.4.2 and note reading.

6.4.5 Release treadle.

6.4.6 Take difference between the readings of step 6.4.2 and step 6.4.4. It is a function of the gap or clearance at the diameter and is called the indicated diametral clearance.

6.4.7 Repeat above steps 6.4.1 to 6.4.5 for other diameters of the shell.

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NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specification, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any right or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

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