INCH-POUND

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SUPERSEDING
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MILITARY SPECIFICATION

ARMOR PLATE, ALUMINUM ALLOY, 7039

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers 7039 wrought aluminum alloy armor plate. The nominal thickness of armor plate covered by this specification is 1/2 inch to 4 inches, inclusive (see 3.7 and 6.2).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS

FEDERAL

FED-STD-151B - Metals; Test Methods

MILITARY

MIL-STD-129 - Marking for Shipment and Storage

SPECIFICATIONS

FEDERAL

AMSTA-P-702-108 - Inspection of Aluminum Alloy Armor for Tank - Automotive Vehicles

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Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Research Laboratory, Materials Directorate, ATTN: AMSRL-MA-S, Watertown, MA 02172-0001 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC No. A6849 FSC 9535

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

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B557 - Tension Testing Wrought-Aluminum and Magnesium Alloy Products
ASTM G38 - Recommended Practices for Making and Using the C-Ring Stress-Corrosion Cracking Test Specimen
ASTM G47 - Determining Susceptibility to Stress Corrosion, Cracking of High-Strength Aluminum Alloy products.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI - H35.2 - Dimensional Tolerances For Aluminum Mill Products

(Application for copies should be addressed to the American National Standard Institute, Inc., 1430 Broadway, New York, NY 10018).

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.

2.3 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. Unless the contractor has furnished armor under this specification within a period of 37 months, the contractor shall submit samples with a test report to the contracting officer or his authorized representative for approval in accordance with 4.2.1. The first article ballistic test (see 4.4.1.4) may be waived at the discretion of the procuring activity if the manufacturer within 37 months has produced acceptable plate within thickness categories of table V to be supplied on the contract, provided also that no changes have been made in the processing manufacturer's techniques and other test conditions (see 6.2).

3.1.1 First time producer. First time producers wishing to qualify to this specification should follow the instructions of 6.8.

3.1.1.1 Change in mill processing. After an armor material has successfully complied with the requirements of this specification, any deliberate change in processing shall be drawn to the attention of the procuring activity. If the material processing is changed, the first article tests may be required by the procuring activity to assure compliance with the requirements of this specification.

3.2 Chemical composition. Chemical composition shall be within the limits shown in Table I. A certification of the chemical composition of the alloy shall be furnished with the ballistic test plates (see 6.2.2).

TABLE I. Chemical composition.

Element	Percent
Zinc	3.5 - 4.5
Magnesium	2.3 - 3.3
Manganese	0.10 - 0.40
Copper	.10 max
Iron	.40 max
Silicon	.30 max
Chromium	.15 - 0.25
Titanium	.10 max
Others, each	.05 max
Others, total	.15 max
Aluminum (by difference)	Remainder

3.3 Mechanical properties. Unless otherwise specified in the contract or order (see 6.2) the mechanical properties of the test specimen taken in the long-transverse direction shall meet the requirements of Table II when tested as specified in 4.6.2.

TABLE II. Mechanical properties.

Thickness, inch	Tensile strength min, psi	Yield strength 0.2% offset, min, psi	Elongation min, percent in 2 in.
Up to 1.500, incl	60,000	51,000	9
Over 1.500	57,000	48,000	8

3.3.1 If mechanical properties different from the values shown in Table II or any other properties are required other than those specified, in 3.3 and if the difference in properties are negotiated between the procuring activity and the supplier, the minimum acceptable ballistic requirements of Appendix A will apply.

3.4 Stress corrosion resistance. Unless otherwise specified in the contract or order (see 6.2) plate material 0.75 inch and over in ordered thickness shall be resistant to stress corrosion cracking. A minimum of 5 of the 9 specimens tested shall show no evidence of cracking at the end of 96 hours when tested as specified in 4.6.3 (see 6.5).

3.5 Heat treatment. Heat treatment shall be such as to meet the requirements of this specification (see 6.6).

3.6 Ballistic limit. The protection ballistic limit, BL(P), shall be as specified in the appendix A.

3.7 Dimensions. Dimensions shall be as specified in the contract or order (see 6.2).

3.7.1 Tolerances. Unless otherwise specified in the contract or order (see 6.2), the plates submitted for acceptance shall not vary from the specified dimensions by an amount greater than the tolerances shown in ANSI H35.2. Ballistic test plate tolerances shall be ± 1/2 inch.

3.7.1.1 Thickness. Thickness tolerances for production armor and ballistic test plates shall be a specified in table III.

TABLE III. Thickness tolerances.

Ordered Thickness, inches	Tolerance, inch	
	Minus	Plus 1/
0.500 to 0.625, incl	0.025	
0.626 to 0.875, incl	.030	
0.876 to 1.125, incl	.035	
1.126 to 1.375, incl	.040	
1.376 to 1.625, incl	.045	
1.626 to 1.875, incl	.052	
1.876 to 2.250, incl	.060	
2.251 to 2.750, incl	.075	
2.751 to 3.000, incl	.090	
3.001 to 4.000, incl	.110	

1/ The values for the plus column are derived from the full range of tolerances specified in Table 3.1 of ANSI H 35.2 less the value shown in the minus column. For example, the plus tolerance on a 2.0 inch thick by a 73 inches wide plate would be as follows:

Thickness tolerance (from ANSI H 35.2)	± 0.080"
Tolerance value shown in minus column	0.060"
Full tolerance less minus tolerance	0.160" - 0.060" + 0.100"
Derived plus tolerance	0.100"

3.7.1.2 Ballistic test plates. Tolerances shall be ± 1/2-inch on the length and width.

3.8 Marking for identification. Each plate shall be marked with the manufacturer's name or trade mark, number of this specification, the plate thickness in inches, the alloy designation, and the lot number or code relating to the lot number. The height of the characters shall be 3/8 of an inch or greater. Impression stamping shall not be used, unless permitted by the procuring activity.

3.8.1 Ballistic test plates. In addition to the marking in 3.8 each ballistic test plate shall be marked with the letters PRE for first article test plates and ACC for acceptance test plates. This marking shall be impression stamped on the rolled surface within a 1/2-inch band at the edge of the test plate in letters not less than 3/8 inch high. Ballistic retest plates shall be marked "R1" and R2", respectively (see 50.2).

3.8.2 Preparation for shipment. Prior to shipment, examination shall be made to determine compliance with section 5.

3.9 Ballistic test plate information. A properly executed check list for armor data form MIL-46063 (figure 1) or equivalent, shall be mailed to the office of the testing activity and timed to arrive within one or two days of the ballistic test plate arrival (see 6.4).

3.10 Workmanship. Plate shall be uniform in quality and clean, smooth, and sufficiently free from buckles, blisters, hard spots, damaged ends, laminations, and other defects which may affect its use.

3.10.1 Surface and edge condition. Surface cracks, edge cracks, or edge laminations shall be cause for rejection.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Unless otherwise specified in the contract or order (see 6.2), ballistic test plates shall be forwarded to Commander, US Army Combat Systems Tests Activity, Aberdeen Proving Ground, ATTN: STECS-AS-MM, Aberdeen Proving Ground, MD 21005-5059, for ballistic testing.

4.2 Classification of inspection. Inspection shall be classified as follows:

a. First article inspection (see 4.2.1).
b. Acceptance of individual production lots (see 4.2.2).

4.2.1 First article inspection. First article inspection shall consist of the following:

a. Chemical analysis (see 3.2, 4.4.1.1 and 4.6.1).
b. Tension tests (see 3.3, 4.4.1.2 and 4.6.2).
c. Stress corrosion test (see 3.4, 4.4.1.3 and 4.6.3).
d. Ballistic tests (see 3.6, 4.4.1.4, 4.6.4 and appendix).
e. Dimensions (see 3.7 and 4.5.2).
f. Identification marking (see 3.8 and 4.5.1).
g. Workmanship (see 3.10 and 4.5.1).

4.2.2 Production lot acceptance inspection. Lot acceptance inspection shall consist of the following:

a. Chemical analysis (see 3.2, 4.4.2.1, 4.4.2.2 and 4.6.1).
b. Tension tests (see 3.3, 4.4.2.3 and 4.6.2).
c. Stress corrosion test (see 3.4, 4.4.2.4 and 4.6.3).
d. Ballistic tests (see 3.6, 4.4.2.5, 4.6.4 and appendix).
e. Dimensions (see 3.7 and 4.5.2).
f. Identification marking (see 3.8 and 4.5.1).
g. Workmanship (see 3.10 and 4.5.1).
h. Preparation for shipment (see 3.8.2 and section 5).

4.3 Lot. A lot shall consist of plates of the same ordered thickness which have been processed together to produce uniform properties from ingots whose chemical composition was certified as meeting the requirements of this specification. The weight of the finished plates in the lot shall not exceed 50,000 pounds.

4.4 Sampling.

4.4.1 For first article testing.

4.4.1.1 Chemical composition. Samples for chemical analysis shall be removed from the plate material being selected for the ballistic tests.

4.4.1.2 Mechanical properties. One tension test sample shall be removed from the same plate material that has been selected for the ballistic test.

4.4.1.3 Stress corrosion tests. The stress corrosion test samples shall be removed from the same plate that has been selected for the ballistic test.

4.4.1.4 Ballistic tests. Two plates 12 by 36, ± 1/2-inch of each ordered thickness shall be submitted for ballistic testing. The orientation of these plates with respect to the rolling direction shall be at the option of the manufacturer. The ballistic test may be waived at the discretion of the procuring activity (see 6.2) if the manufacturer within 37 months has produced acceptable plate within the range(s) shown on table V, provided also that the manufacturer's processing and test conditions are the same as for previously accepted plates (see 3.1).

4.4.2 For acceptance of production lots.

4.4.2.1 Chemical composition, ingot analysis. At least one sample shall be taken from the molten metal representing one group of ingots poured as a unit from the same source of molten metal. Complete ingot analysis records shall be available to the procuring activity at the producer's facility.

4.4.2.2 Chemical composition, finished product analysis. When sampling has not been made in accordance with 4.4.2.1, one sample shall be taken for each 4,000 pounds or less in each lot in accordance with Method 111 or 112 of Fed Std No. 151. Complete product analysis records shall be available to the procuring activity at the producer's facility.

4.4.2.3 Mechanical properties. From each lot, samples for tension tests shall be selected in accordance with Table IV. Each sample shall be selected from a different plate in the lot. Should a lot consist of only one plate, only one tension test sample shall be taken.

TABLE IV. Number of tension tests.

Lot size, pounds	Number of samples
To 8,000, incl	2
8,001 to 12,000, incl	3
12,001 to 20,000, incl	4
20,001 up	5

4.4.2.4 Stress corrosion tests. From each lot, one plate 12 inches by 12 inches (± 1 inch), by the ordered thickness, shall be selected for stress corrosion tests. At the discretion of the procuring activity, reduced sampling may be instituted (not every lot need by sampled) (see 4.8).

4.4.2.5 Ballistic testing. From each lot, one plate, 12 by 36, ± 1/2, from the ordered thickness shall be selected for ballistic testing. The orientation of these plates with respect to the rolling direction shall be at the option of the manufacturer. At the discretion of the procuring agency (see 6.2) the ballistic testing may be waived (see 4.8)

4.5 Examination.

4.5.1 Visual. Each plate shall be examined to determine compliance with the identification marking (see 3.8) and workmanship (see 3.10) requirements.

4.5.2 Dimensional. Plates within a lot shall be measured to determine compliance with the requirements for dimensions and tolerances (see 3.7) in accordance with the sampling procedures approved by the procuring activity.

4.6 Tests.

4.6.1 Chemical composition. Test samples shall be prepared and tested in accordance with method 111 or 112 of Fed. Test Method Std. No. 151 (see 6.3). In case of dispute, the analysis by method 111 shall be the basis for acceptance or rejection.

4.6.2 Mechanical properties. Tension test specimens shall be prepared and tested in accordance with ASTM B 557. Test specimens shall be taken in the long transverse direction.

4.6.3 Stress corrosion. Short transverse stress corrosion test specimens shall be prepared and tested in accordance with the procedure outlined in ASTM G 38 and G 47. The specimens shall be stressed 35 ksi. Nine specimens shall be tested per sample per lot. A maximum delay of 3 hours between stressing and initiation of stress corrosion test is permitted.

4.6.3.1 Report of results. The report shall include the following:

a. The producer and lot number.
b. Specification and contract number.
c. "Stress-corrosion test passed" or "stress-corrosion test failed" in accordance with results of the test.

4.6.4 Ballistic testing. Ballistic testing shall be in accordance with appendix A. Test plate thickness, as measured by the ballistic testing agency, shall be used in conjunction with Table V and Appendix A to determine the test projectile and the required V_{50} protection ballistic limit respectively. A minimum of four thickness measurements, at least 2-inches from any edge, are to be taken at random locations in the area to be impacted. A calibrated deep throat micrometer or a calibrated ultrasonic measuring device, is to be used and the individual measurements are to be read to the nearest 0.001-inch, will be reported as the actual thickness of the plate. This thickness will be used to determine the minimum ballistic limit, BL(P), requirement from the appropriate table in the appendix. When necessary, interpolation between two consecutive thicknesses in the table will be performed to determine the minimum required BL(P).

4.7. Rejection and retest. Unless otherwise specified in the contract or order (see 6.2) and except as specified in 4.7.2 and 4.7.3, rejection and retest shall be conducted in accordance with the general section of FED-STD-151 (see 6.2).

4.7.1 Rejection of first article plates. Failure of the first article test plates to meet the requirements of 4.2.1, indicates failure of the product and process.

TABLE V. Acceptance ballistic test plates.

Ordered thickness, inches	Projectile	Angle of Obliquity in degrees
0.500 - 0.749	Cal. .30 APM2	30
0.750 - 0.950	Cal. .50 FSP	0
0.951 - 1.500	Cal. .30 APM2	0
0.951 - 1.500	20mm FSP	0
1.501 - 3.000	Cal. .50 APM2	0
3.001 - 4.000	14.5mm API, BS41	0

4.7.1.1 Retest of first article samples. Resubmission and retest of first article samples shall not be made until the manufacturer has made necessary corrections in the processing of the material to the satisfaction of the procuring activity.

4.7.2 Stress corrosion. If the manufacturer so desires, a retest shall be performed using 13 specimens. A minimum of seven specimens shall be uncracked upon examination at the end of 96 hours of exposure. If the retest also fails, the manufacturer may elect to resubmit the lot after retreatment of the entire lot. After retreatment, the lot must pass the requirements outlined in 4.6.2., 4.6.3 and 4.6.4.

4.7.3 Ballistic. Rejection and retest of ballistic test plates shall be in accordance with the Appendix A, 50.2.

4.8 Reduced testing. At the discretion of the procuring activity, (see 6.2) the amount of testing may be reduced provided the results on consecutive lots indicate that a uniform product meeting the testing requirement is being produced, and providing the manufacturer agrees to maintain the same manufacturing procedures. Reduced testing shall be in accordance with U.S. Army TACOM's Quality Assurance Pamphlet AMSTA-P-702-108, Section 11, Sampling Plans.

5. PACKAGING

5.1 Preservation and packaging. Unless otherwise specified in the contract or order, preservation and packaging shall be level C (see 6.2).

5.1.1 Level C. Cleaning, drying, preservation and packaging shall be in accordance with manufacturer's commercial practice.

5.2 Packing. Unless otherwise specified in the contract or order, packing shall be level C (see 6.2).

5.2.1 Level C. Packing shall be in accordance with commercial practice adequate to insure acceptance and safe delivery by the carrier for the mode of transportation employed.

5.3 Marking. In addition to any special marking for shipment required by the contract or order, (see 6.2) shipments shall be marked in accordance with the requirements of MIL-STD-129.

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 armor specified herein is for military vehicles.

6.1.1 The intent of this paragraph is to establish the interchange of extruded armor for flat rolled armor plate in limited applications where the use of extrusion technology may allow for the reduction of manufacturing costs of military vehicles.

6.1.1.1 The nominal size covered by this modification is one half inch to two inches (1/2" - 2") thickness by widths up to 28 inches.

6.1.1.2 If the producer chooses to interchange extruded armor plate for rolled armor plate, then all requirements of paragraph 3 shall be met.

6.1.1.3 Exceptions to paragraph 4 (Quality Assurance Provisions). All requirements of paragraph 4 shall be met with the following exceptions:

6.1.1.3.1 Stress corrosion tests (4.4.2.4). The size of test plate shall be understood to be the extruded width x 12 inch x thickness.

6.1.1.3.2 Ballistic testing (4.4.2.5). The size of the test plate shall be understood to be the determined by the producer after contact with the testing activity to determine the number and size of test samples.

6.1.1.3.3 Marking (5.3). In addition to the requirements of 5.3, the shipment shall be marked "Extrusion Interchange".

6.2 Ordering data. Acquisition documents shall specify the following:

6.2.1 Acquisition requirements.

a. Title, number, and date of this specification.
b. Special mechanical property and ballistic requirements if required (see 3.3).
c. When a different stress corrosion requirement is desired (see 3.4).
d. Dimensions required (see 3.7).
e. Destination of test plates (see 4.1.1).
f. Rejection and retest requirements if other than in 4.7.
g. Preparation for shipment, if other than in 5.1 and 5.2.
h. Additional marking, if required (see 5.3).
i. Whether first article ballistic testing is waived (see 3.1).
j. Whether acceptance test sampling may be reduced (see 4.8.)
k. Whether acceptance ballistic tests are waived (see 4.8).
l. Sampling procedures approved by procuring agency (see 4.5.2).

6.2.2 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data

are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Para.	DID Number	DID Title	Suggested Tailoring
3.1	DI-FORG-80962	First Article Forging Report	---
3.2	DI-MISC-80678	Certification/Data Report	---
3.9	DI-MISC-80073	Armor Materials Test Reports	---

(Copies of data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DOD 5010.12L, Vol. 11, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094 or as directed by the contracting officer.)

6.3 Chemical analysis. Suggested ASTM Methods that can be used for chemical analysis E-34, E-227 and E-607.

6.4 Form MIL-46063. Form MIL-46063 replaces TAC Form 3983A for reporting data to this specification. Form MIL-46063 may be reproduced and used for submittal of data required (see figure 1 and 6.2.2).

6.5 Stress corrosion. It should be noted that a structure built from plate meeting the requirements prescribed herein should have susceptibility to stress corrosion minimized by proper attention to design and fabrication characteristics. The stress corrosion susceptibility of plate meeting the requirements of this specification will represent a hazard, especially in the short transverse direction. Exposed short transverse sections should be considered carefully in design and protected by special fabrication practices to guard against cracking.

6.6 Mechanical properties to ballistic requirements. The minimum mechanical properties specified (see 3.3) may not assure aluminum armor plate meeting the specified ballistic requirements (see 3.6).

6.7 Stress corrosion test. The manufacturer may, at his own risk, ship material prior to the completion of the stress corrosion test.

6.8 Potential suppliers. Potential suppliers who have not previously supplied armor plate to MIL-A-46063 and wish to have their material ballistically tested, may do so at their own expense. It is recommended that inquiries for such testing be directed to Commander, US Army CSTA, ATT: STECS-LI-A, Aberdeen Proving Ground, MD 21005-5059.

6.9 New contracts sponsored by government agencies. At the time that a new contract is initiated for the production of combat vehicles, the contractor's supplier is to estimate for the contractor the number, size and delivery schedule of the ballistic test plates which are to be submitted for

first article acceptance testing. A lead time of 60 days after the contract has been signed is to be allowed prior to shipment of the first ballistic test plate(s) to APG to insure that all administrative functions for the establishment of a new CSTA project have been completed in preparation for the test. The contracting government agency is to initiate the new project through a letter to Commander, US Army TECOM, ATTN: AMSTE-TA-O, Aberdeen Proving Ground, MD 21005-5005 requesting a cost estimate for the ballistic testing of the applicable number and sizes of plates. In the case of increases in scope of existing projects, similar correspondence is needed.

6.10 Metric units. When metric dimensions are required, units for inch, foot, foot-pounds feet per second, and pounds per square inch may be converted to the metric equivalent by multiplying them by the following conversion factors:

To go from English	Multiply by	To get Metric SI unit
inch	0.0254	metre (m)
foot	0.3048	metre (m)
foot-lb	1.3558	joule (J)
feet/sec	0.3048	metre per second (m/s)
pounds/sq. inch	0.00689	mega pascal (mpa)

NOTE: Conversion factors can be obtained from ASTM E380 entitled "Metric Practice Guide".

6.11 Definitions.

6.11.1 Manufacturer. The manufacturer is defined as the company producing the aluminum alloy plate or forging.

6.11.2 Contracting Officer. The term "contracting officer" means the person executing a contract on behalf of the Government and any other officer or civilian employee who is properly designated contracting officer; and the term includes, except as otherwise provided, the authorized representative of a contracting officer acting within the limits of his authority.

6.11.3 Procuring activity. The term "procuring activity" is that activity of the Government which acutually initiates the request for procurement and maintains the records of the procurement.

6.12 Subject term (key word) listing.

Armor plate	0.30 caliber AP, M2 projectile
Armor	0.50 caliber AP, M2 projectile
Aluminum	0.50 caliber FSP
7039	14.5mm API, BS41
Ballistic limit	20mm FSP

Custodians:
Army - MR
Air Force - 11

Review activities:
Army - AT, AR, TE
Navy - AS
Air Force - 84, 99
DLA - IS

User activities:
Navy - SH

Preparing activity
Army - MR

Project 9535-0548

(WP# ID-6924A/DISC-0067A. FOR MTL USE ONLY).

CHECK LIST FOR DATA ON

	Contract No.
PRIME CONTRACTOR	Contract No. for Ballistic Test:
MFG.	Firing Date:
Address	Firing Record No.
MFG. Record No. & Date	MIL-A- REV.___ Amend.___
Shipping Date:	Type of Furnance:
Shipped To:	Cast or Heat No.
PURPOSE: ___Acceptance ___Development ___1st Art.	End Item:
SAMPLE: ___Primary ___Retest	Material for use on(Specific Vehicle)
Represents Lbs.	

TEST ITEM IDENTIFICATION

Serial Code or Plate No.	Representing Lot No.	Ordered Thick (in.)	Size (L x W)	Alloy No. & Temper

CHEMICAL ANALYSIS OF SUBMITTED FIRST ARTICLE

ZN	MG	MN	CU	FE	SI	CR	TI	OTHER	REMAINDER - AL

CHEMICAL COMPOSITION OF PRODUCTION LOTS(S): CONFORMS TO SPECIFICATION REQUIREMENTS ☐

MECHANICAL PROPERTIES

UTS - PSI	YS (.2% OFFSET) PSI	ELONG. 2"	ACT. HARD: TYPE	

Stress Corrosion Test	Date:	Signature of Supplier's Representative
	Date:	Signature of Govt. Representative

BALLISTIC TEST RECORD

Test	Projectile	Obl. (Degree)	Act. Thks. (in.)	Reqd. Vel. (fps)	Act. Vel. (fps)	Excess Vel. (fps)	Results Passed/Failed	AMCMS Nos.

Lot Specification Met (failed to meet) the ballistic requirements of

TECOM or TRMS No.

DATE	PROOF FACILITY SIGNATURES	
	CHIEF, ARMOR BRANCH	TEST DIRECTOR

Figure 1. MIL-46063 Form - Check List for Armor Data (Replaces TAC Form 3983A)

APPENDIX A

ARMOR PLATE, ALUMINUM ALLOY, 7039

A-10 SCOPE. This appendix covers the minimum ballistic limits for acceptable requirements of aluminum alloy armor plate, 7039 when tested in accordance with the provisions of this specification.

A-20 APPLICABLE DOCUMENTS

A20.1 The following document forms a part of this appendix:

Proving Ground Acceptance Test Procedure No. AAA-PFE-1, 25 June 1979, for Aluminum Alloy Armor - Plate, Forged, Extruded.

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acqusition functions should be obtained from the contracting activity or as directed by the contracting officer).

A-30 DEFINITIONS

A-30.1 Fair impact. A fair impact is an impact resulting from the striking of the test plate by a projectile in normal flight (no yawing or tumbling) and separated from another impact or the edge of the plate, hole, crack or spalled area by an undisturbed area of at least two calibers.

A-30.2 Witness plate. A witness plate is normally a 0.014 inch thick sheet of 5052 H36 aluminum alloy (or a 0.020 inch thick sheet of 2024-T-3 aluminum alloy) placed six inches behind and parallel to the test plates or other ballistic sample.

A-30.3 Complete penetration, protection, CP(P). A complete penetration is a penetration in which the projectile or one or more fragments of the projectile or plate passes beyond the back of the test plate and perforates the witness sheet. In addition, any backspall which is dislodged off the back of the plate by a fragment-simulating projectile impact and which hits the witness sheet will be considered to be complete penetration whether or not the witness sheet is perforated.

A-30.4 Partial penetration, protection, PP(P). A partial penetration is any fair impact that is not a complete penetration.

A30.5 Gap. A gap is the difference in fps between the high partial penetration velocity and the low complete penetration velocity used to compute the ballistic limit when the high partial penetration velocity is lower than the low complete penetration velocity.

A-40 REQUIREMENTS

A-40.1 Resistance to penetration. The minimum required ballistic limit shall be in accordance with the values shown in tables VII through XII.

A-50 TESTS

A-50.1 Ballistic tests. Testing shall be in accordance with Proving Ground Acceptance Test Procedure AAA-PFE-1, 25 June 1979, for Aluminum Alloy Armor - Plate, Forged, Extruded, except that nothing in this procedure shall be construed to supersede or invalidate the requirements of this specification.

A-50.1.1 Temperature Conditioning. Prior to the test, the test item(s) will be temperature conditioned at least eight hours. Thermostatic control will be such that the average temperature of the item during the test shall be 72 ± 15°F (22 ± 8°C).

A-50.1.2 Protection ballistic limit, BL(P).

A-50.1.2.1 Normal circumstances. The BL(P) shall consist of an equal number of fair impact complete and partial penetration velocities attained by the up-and-down firing method. All BL(P)'s shall be computed using the highest partial penetration velocities and the lowest complete penetration velocities. Firing shall continue until either a 4-round BL(P) having a maximum velocity spread of 60 fps or a 6-round BL(P) having a maximum velocity spread of 90 fps has been attained, whichever comes first in the normal sequence of firing. If both occur simultaneously, the 6-round BL(P) will be reported.

A-50.1.2.2 Large zone of mixed results. In the event that the zone of mixed results (difference between the high partial penetration velocity and the low complete penetration velocity, the PP(P) velocity being higher than the low CP(P) velocity) exceeds 90 fps, the firing data will be compared with the specification minimum ballistic requirements. If the lowest complete penetration velocity is equal to or above the minimum specified ballistic limit velocity for the plate thickness, the ballistic limit will be computed on the basis of 4- or 6-rounds using the smallest possible velocity spread. If the lowest complete penetration velocity is below the minimum allowable ballistic limit velocity, then testing will continue until a 10-round ballistic limit has been attained using the smallest possible velocity spread. Ten-round ballistic limits will be reported as such on the armor data form MIL-46063.

A-50.1.2.3 Reduction of large velocity gap in borderline cases. If the ballistic limit, which has been determined, is within ± 10 fps from the minimum allowable ballistic limit and a gap exists which is greater than 25 fps, then another round, or rounds, will be fired to reduce the gap to 25 fps or less. The ballistic limit will then be recomputed using the above criteria. The recomputed BL(P) will be reported as the BL(P) of the plate (in borderline cases, a reduction of the gap between the high partial penetration velocity and the low complete velocity should result in a better evaluation of the BL(P).

A-50.2 Rejection and retest of ballistic plates.

A-50.2.1 First article tests (rejection). Unless otherwise specified in the contract or order, failure of any of the first article test plates to meet the minimum ballistic requirements shown in the appendix of this specification indicates failure of the product and process.

A-50.2.2 First article (retests). Submission of ballistic retest plates shall not be made until the manufacturer has made the necessary corrections in the processing of the material to the satisfaction of the procuring activity. Two retest plates shall be submitted for first article testing, and both tests must pass; otherwise, the armor material shall be rejected.

A-50.2.3 Acceptance tests (rejection). Unless otherwise specified in the contract or order, failure of a test plate to meet the ballistic requirements indicates failure of the lot; however, the final decision will depend on the outcome of retests, if submitted.

A-50.2.4 Acceptance tests (retests). If a test plate representing a lot fails to meet the ballistic requirement, the manufacturer, upon notification of the failure may submit at his own expense two additional test plates from the same lot for ballistic retest. If either of these plates fail the ballistic test, the lot shall be rejected. The manufacturer may elect to resubmit the lot after retreatment of the entire lot by submitting two additional test plates. If either of these plates fail, the lot shall be permanently rejected.

A-50.3 Disposition of ballistic test plates.

A-50.3.1 First article test plates. Upon request of the applicant within 15 days after ballistic testing, first article plates will be returned "as is" to the applicant, at his expense, unless the plates were destroyed in testing.

A-50.3.2 Acceptance test plates. Acceptance test plates that comply with the requirements of this specification are considered as part of the lot they represent, and ownership of the test plates passes to the Government with the acceptance of that lot. Acceptance test plates that fail to comply with the requirements of this specification are considered as part of the lot they represent and remain the property of the producer just as the rejectable lot does. The failed plates will be returned, upon request, as in A-50.3.1.

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TABLE VII. Minimum Required Ballistic Limits - Caliber .30 AP M2 Projectile at 30° Obliquity.

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
0.475	1378	0.580	1604	0.685	1804
.480	1390	.585	1614	.690	1813
.485	1401	.590	1624	.695	1822
.490	1413	.595	1634	.700	1831
.495	1424	.600	1644	.705	1839
* .500	1435	.605	1654	.710	1848
.505	1446	.610	1664	.715	1857
.510	1457	.615	1674	.720	1866
.515	1468	.620	1683	.725	1874
.520	1479	.625	1693	.730	1883
.525	1490	.630	1702	.735	1891
.530	1501	.635	1712	.740	1900
.535	1511	.640	1721	.745	1909
.540	1522	.645	1730	** .749	1915
.545	1533	.650	1739	.750	1917
.550	1543	.655	1748	.755	1926
.555	1554	.660	1758	.760	1934
.560	1564	.665	1767	.765	1942
.565	1574	.670	1776	.770	1950
.570	1584	.675	1786	.775	1959
.575	1594	.680	1795	-	-

*Specification requirements begin for this ordered thickness.

**Specification requirements end for this ordered thickness.

APPENDIX A

TABLE VIII. Minimum Required Ballistic Limits - Caliber .50 Fragment Simulating Projectiles at 0° Obliquity

	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps		Thickness, in.	Required BL(P), fps
	0.700	1666	0.790	2012		0.880	2427
	.705	1683	.795	2033		.885	2452
	.710	1701	.800	2054		.890	2478
	.715	1719	.805	2076		.895	2504
	.720	1737	.810	2097		.900	2530
	.725	1755	.815	2119		.905	2556
	.730	1774	.820	2142		.910	2583
	.735	1793	.825	2164		.915	2610
	.740	1811	.830	2187		.920	2637
	.745	1831	.835	2210		.925	2665
*	.750	1850	.840	2233		.930	2693
	.755	1869	.845	2256		.935	2721
	.760	1889	.850	2280		.940	2749
	.765	1909	.855	2304		.945	2778
	.770	1929	.860	2328	**	.950	2807
	.775	1949	.865	2352		.955	2836
	.780	1970	.870	2377		.960	2866
	.785	1991	.875	2402		.965	2895
						.970	2926
						.975	2956
						.980	2987
						.985	3018
						.990	3049
						.995	3081
						1.000	3113

* Specification requirements begin for this ordered thickness.

** Specification requirements end for this ordered thickness.

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TABLE IX. Minimum Required Ballistic Limits - 20 mm Fragment Simulating Projectiles at 0° Obliquity.

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
0.940	1225	1.140	1618	1.340	2126
0.945	1234	1.145	1629	1.345	2141
* 0.951	1242	1.150	1640	1.350	2155
0.955	1251	1.155	1652	1.355	2170
0.960	1260	1.160	1663	1.360	2185
0.965	1269	1.165	1675	1.365	2199
0.970	1278	1.170	1686	1.370	2214
0.975	1287	1.175	1698	1.375	2229
0.980	1296	1.180	1709	1.380	2244
0.985	1305	1.185	1721	1.385	2260
0.990	1314	1.190	1733	1.390	2275
0.995	1323	1.195	1745	1.395	2290
1.000	1332	1.200	1757	1.400	2306
1.005	1342	1.205	1769	1.405	2321
1.010	1351	1.210	1781	1.410	2337
1.015	1361	1.215	1793	1.415	2353
1.020	1370	1.220	1806	1.420	2369
1.025	1380	1.225	1818	1.425	2385
1.030	1389	1.230	1831	1.430	2401
1.035	1399	1.235	1843	1.435	2417
1.040	1409	1.240	1856	1.440	2434
1.045	1419	1.245	1869	1.445	2450
1.050	1429	1.250	1881	1.450	2467
1.055	1439	1.255	1894	1.455	2483
1.060	1449	1.260	1907	1.460	2500
1.065	1459	1.265	1920	1.465	2517
1.070	1469	1.270	1933	1.470	2534
1.075	1479	1.275	1947	1.475	2551
1.080	1489	1.280	1960	1.480	2568
1.085	1500	1.285	1973	1.485	2585
1.090	1510	1.290	1987	1.490	2603
1.095	1521	1.295	2000	1.495	2620
1.100	1531	1.300	2014	** 1.500	2638
1.105	1542	1.305	2028	1.505	2656
1.110	1552	1.310	2041	1.510	2673
1.115	1563	1.315	2055	1.515	2691
1.120	1574	1.320	2069	1.520	2709
1.125	1585	1.325	2083	1.525	2728
1.130	1596	1.330	2098	1.530	2746
1.135	1607	1.335	2112		

* Specification Requirements begin for this Ordered Thickness.
** Specification Requirements end for this ordered Thickness.

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TABLE X. Minimum Required Ballistic Limits - Caliber .30 AP M2 Projectiles at 0° Obliquity.

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
0.940	1997	1.140	2252	1.340	2481
0.945	2004	1.145	2258	1.345	2487
* 0.951	2010	1.150	2264	1.350	2492
0.955	2017	1.155	2270	1.355	2498
0.960	2024	1.160	2276	1.360	2503
0.965	2030	1.165	2282	1.365	2508
0.970	2037	1.170	2288	1.370	2514
0.975	2044	1.175	2294	1.375	2519
0.980	2050	1.180	2299	1.380	2525
0.985	2057	1.185	2305	1.385	2530
0.990	2063	1.190	2311	1.390	2535
0.995	2070	1.195	2317	1.395	2541
1.000	2077	1.200	2323	1.400	2546
1.005	2083	1.205	2329	1.405	2551
1.010	2090	1.210	2335	1.410	2557
1.015	2096	1.215	2340	1.415	2562
1.020	2102	1.220	2346	1.420	2567
1.025	2109	1.225	2352	1.425	2573
1.030	2115	1.230	2358	1.430	2578
1.035	2122	1.235	2363	1.435	2583
1.040	2128	1.240	2369	1.440	2588
1.045	2134	1.245	2375	1.445	2594
1.050	2141	1.250	2381	1.450	2599
1.055	2147	1.255	2386	1.455	2604
1.060	2153	1.260	2392	1.460	2609
1.065	2160	1.265	2398	1.465	2615
1.070	2166	1.270	2403	1.470	2620
1.075	2172	1.275	2409	1.475	2625
1.080	2178	1.280	2415	1.480	2630
1.085	2185	1.285	2420	1.485	2635
1.090	2191	1.290	2426	1.490	2640
1.095	2197	1.295	2431	1.495	2646
1.100	2203	1.300	2437	** 1.500	2651
1.105	2209	1.305	2443	1.505	2656
1.110	2215	1.310	2448	1.510	2561
1.115	2222	1.315	2454	1.515	2666
1.120	2228	1.320	2459	1.520	2671
1.125	2234	1.325	2465	1.525	2676
1.130	2240	1.330	2470	1.530	2681
1.135	2246	1.335	2476		

* Specification Requirements begin for this Ordered Thickness.
** Specification Requirements end for this ordered Thickness.

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TABLE XI. Minimum Required Ballistic Limits - Caliber .50 AP M2 Projectiles at 0° Obliquity.

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
1.500	1955	1.695	2118	1.895	2274
* 1.501	1956	1.700	2122	1.900	2278
1.505	1959	1.705	2126	1.905	2281
1.510	1964	1.710	2130	1.910	2285
1.515	1968	1.715	2134	1.915	2289
1.520	1972	1.720	2138	1.920	2293
1.525	1976	1.725	2142	1.925	2296
1.530	1981	1.730	2146	1.930	2300
1.535	1985	1.735	2150	1.935	2304
1.540	1989	1.740	2154	1.940	2307
1.545	1994	1.745	2158	1.945	2311
1.550	1998	1.750	2162	1.950	2315
1.555	2002	1.755	2166	1.955	2319
1.560	2006	1.760	2170	1.960	2322
1.565	2011	1.765	2174	1.965	2326
1.570	2015	1.770	2178	1.970	2330
1.575	2019	1.775	2182	1.975	2333
1.580	2023	1.780	2186	1.980	2337
1.585	2028	1.785	2190	1.985	2341
1.590	2032	1.790	2193	1.990	2344
1.595	2036	1.795	2197	1.995	2348
1.600	2040	1.800	2201	2.000	2352
1.605	2044	1.805	2205	2.005	2355
1.610	2049	1.810	2209	2.010	2359
1.615	2053	1.815	2213	2.015	2363
1.620	2057	1.820	2217	2.020	2366
1.625	2061	1.825	2221	2.025	2370
1.630	2065	1.830	2224	2.030	2373
1.635	2069	1.835	2228	2.035	2377
1.640	2073	1.840	2232	2.040	2381
1.645	2077	1.845	2236	2.045	2384
1.650	2082	1.850	2240	2.050	2388
1.655	2086	1.855	2244	2.055	2391
1.660	2090	1.860	2247	2.060	2395
1.665	2094	1.865	2251	2.065	2398
1.670	2098	1.870	2255	2.070	2402
1.675	2102	1.875	2259	2.075	2406
1.680	2106	1.880	2263	2.080	2409
1.685	2110	1.885	2266	2.085	2413
1.690	2114	1.890	2270	2.090	2416

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TABLE XI. Minimum Required Ballistic Limits - Caliber .50 AP M2 Projectiles at 0o Obliquity. (Continued)

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
2.095	2420	2.295	2558	2.495	2689
2.100	2423	2.300	2561	2.500	2692
2.105	2427	2.305	2564	2.505	2695
2.110	2430	2.310	2568	2.510	2698
2.115	2434	2.315	2571	2.515	2701
2.120	2437	2.320	2574	2.520	2705
2.125	2441	2.325	2578	2.525	2708
2.130	2444	2.330	2581	2.530	2711
2.135	2448	2.335	2584	2.535	2714
2.140	2451	2.340	2588	2.540	2717
2.145	2455	2.345	2591	2.545	2720
2.150	2458	2.350	2594	2.550	2724
2.155	2462	2.355	2598	2.555	2727
2.160	2465	2.360	2601	2.560	2730
2.165	2469	2.365	2604	2.565	2733
2.170	2472	2.370	2608	2.570	2736
2.175	2476	2.375	2611	2.575	2739
2.180	2479	2.380	2614	2.580	2742
2.185	2483	2.385	2617	2.585	2746
2.190	2486	2.390	2621	2.590	2749
2.195	2490	2.395	2624	2.595	2752
2.200	2493	2.400	2627	2.600	2755
2.205	2497	2.405	2630	2.605	2758
2.210	2500	2.410	2634	2.610	2761
2.215	2503	2.415	2637	2.615	2764
2.220	2507	2.420	2640	2.620	2767
2.225	2510	2.425	2643	2.625	2770
2.230	2514	2.430	2647	2.630	2774
2.235	2517	2.435	2650	2.635	2777
2.240	2520	2.440	2653	2.640	2780
2.245	2524	2.445	2656	2.645	2783
2.250	2527	2.450	2660	2.650	2786
2.255	2531	2.455	2663	2.655	2789
2.260	2534	2.460	2666	2.660	2792
2.265	2537	2.465	2669	2.665	2795
2.270	2541	2.470	2673	2.670	2798
2.275	2544	2.475	2676	2.675	2801
2.280	2548	2.480	2679	2.680	2804
2.285	2551	2.485	2682	2.685	2807
2.290	2554	2.490	2685	2.690	2811

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TABLE XI. Minimum Required Ballistic Limits - Caliber .50 AP M2 Projectiles at 0o Obliquity. (Continued)

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
2.695	2814	2.810	2883	2.925	2951
2.700	2817	2.815	2886	2.930	2954
2.705	2820	2.820	2889	2.935	2957
2.710	2823	2.825	2892	2.940	2960
2.715	2826	2.830	2895	2.945	2963
2.720	2829	2.835	2898	2.950	2965
2.725	2832	2.840	2901	2.955	2968
2.730	2835	2.845	2904	2.960	2971
2.735	2838	2.850	2907	2.965	2974
2.740	2841	2.855	2910	2.970	2977
2.745	2844	2.860	2913	2.975	2980
2.750	2847	2.865	2916	2.980	2983
2.755	2850	2.870	2919	2.985	2986
2.760	2853	2.875	2922	2.990	2989
2.765	2856	2.880	2925	2.995	2991
2.770	2859	2.885	2927	** 3.000	2994
2.775	2862	2.890	2930	3.005	2997
2.780	2865	2.895	2933	3.010	3000
2.785	2868	2.900	2936	3.015	3003
2.790	2871	2.905	2939	3.020	3006
2.795	2874	2.910	2942	3.025	3009
2.800	2877	2.915	2945	3.030	3012
2.805	2880	2.920	2948		

* Specification Requirements begin for this Ordered Thickness.
** Specification Requirements end for this Ordered Thickness.

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TABLE XII. Minimum Required Ballistic Limits - Caliber 14.5mm API, BS41 Projectile at 0° Obliquity.

	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
	2.950	2615	3.135	2739	3.320	2857
	2.955	2619	3.140	2742	3.325	2860
	2.960	2622	3.145	2746	3.330	2864
	2.965	2626	3.150	2749	3.335	2867
	2.970	2629	3.155	2752	3.340	2870
	2.975	2633	3.160	2755	3.345	2873
	2.980	2636	3.165	2759	3.350	2876
	2.985	2640	3.170	2762	3.355	2879
	2.990	2643	3.175	2765	3.360	2882
	2.995	2647	3.180	2769	3.365	2885
*	3.001	2650	3.185	2772	3.370	2888
	3.005	2653	3.190	2775	3.375	2891
	3.010	2656	3.195	2779	3.380	2895
	3.015	2660	3.200	2782	3.385	2898
	3.020	2663	3.205	2785	3.390	2901
	3.025	2666	3.210	2788	3.395	2904
	3.030	2670	3.215	2791	3.400	2907
	3.035	2673	3.220	2795	3.405	2910
	3.040	2676	3.225	2798	3.410	2913
	3.045	2680	3.230	2801	3.415	2916
	3.050	2683	3.235	2804	3.420	2920
	3.055	2686	3.240	2808	3.425	2923
	3.060	2689	3.245	2811	3.430	2926
	3.065	2693	3.250	2814	3.435	2929
	3.070	2696	3.255	2817	3.440	2932
	3.075	2699	3.260	2820	3.445	2935
	3.080	2703	3.265	2823	3.450	2938
	3.085	2706	3.270	2826	3.455	2941
	3.090	2709	3.275	2829	3.460	2944
	3.095	2713	3.280	2833	3.465	2948
	3.100	2716	3.285	2836	3.470	2950
	3.105	2719	3.290	2839	3.475	2953
	3.110	2722	3.295	2842	3.480	2956
	3.115	2726	3.300	2845	3.485	2959
	3.120	2729	3.305	2848	3.490	2962
	3.125	2732	3.310	2851	3.495	2965
	3.130	2736	3.315	2854	3.500	2968

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TABLE XII. Minimum Required Ballistic Limits - Caliber 14.5mm API, BS41 Projectile at 0° Obliquity. (Continued)

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
3.505	2971	3.690	3081	3.875	3185
3.510	2974	3.695	3084	3.880	3187
3.515	2978	3.700	3087	3.885	3190
3.520	2980	3.705	3090	3.890	3193
3.525	2983	3.710	3093	3.895	3195
3.530	2986	3.715	3096	3.900	3198
3.535	2989	3.720	3099	3.905	3200
3.540	2992	3.725	3102	3.910	3203
3.545	2995	3.730	3104	3.915	3206
3.550	2998	3.735	3107	3.920	3208
3.555	3001	3.740	3110	3.925	3211
3.560	3004	3.745	3113	3.930	3214
3.565	3007	3.750	3116	3.935	3216
3.570	3010	3.755	3119	3.940	3219
3.575	3013	3.760	3122	3.945	3222
3.580	3016	3.765	3125	3.950	3224
3.585	3019	3.770	3127	3.955	3226
3.590	3022	3.775	3130	3.960	3229
3.595	3025	3.780	3133	3.965	3232
3.600	3028	3.785	3136	3.970	3234
3.605	3031	3.790	3138	3.975	3237
3.610	3034	3.795	3141	3.980	3240
3.615	3037	3.800	3144	3.985	3242
3.620	3040	3.805	3147	3.990	3245
3.625	3043	3.810	3150	3.995	3248
3.630	3046	3.815	3152	** 4.000	3250
3.635	3049	3.820	3155	4.005	3252
3.640	3052	3.825	3158	4.010	3255
3.645	3055	3.830	3160	4.015	3257
3.650	3058	3.835	3163	4.020	3260
3.655	3061	3.840	3166	4.025	3262
3.660	3064	3.845	3168	4.030	3265
3.665	3067	3.850	3171	4.035	3267
3.670	3070	3.855	3174	4.040	3270
3.675	3073	3.860	3177	4.045	3272
3.680	3075	3.865	3179	4.050	3275
3.685	3078	3.870	3182		

* Specification requirements begin for this test at ordered thickness.
** Specification requirements end for this test at ordered thickness.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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