

MIL-A-46063F  
 8 December 1985  
 SUPERSEDING  
 MIL-A-46063E  
 10 MARCH 1977

## 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 specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

#### STANDARDS

##### FEDERAL

Fed. Test Method Std. No. 151 - Metals; Test Methods

##### MILITARY

MIL-STD-129 - Marking for Shipment and Storage

#### SPECIFICATIONS

##### MILITARY

AAA-PFE-1 - Acceptance Test Procedure for Aluminum Alloy Armor - Plate, Forged, Extruded

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: Director, U.S. Army Laboratory Command, Materials Technology Laboratory ATTN: SLCMT-MRS-ES, Watertown, MA 02172-0001 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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MIL-A-46063F

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

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS

- B 557 - Tension Testing Wrought-Aluminum and Magnesium Alloy Products
- G 38 - Recommended Practices for Making and Using the C-Ring Stress-Corrosion Cracking Test Specimen
- G 47 - 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) STANDARDS

- 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 specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede 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).

## MIL-A-46063F

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.

## MIL-A-46063F

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  $\pm 1/2$  inch.

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

Table III. Thickness tolerances

Ordered Thickness, inches	Tolerance, inch	
	Minus	Plus <u>1/</u>
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)	$\pm 0.080$ "
Tolerance value shown in minus column	0.060"
Full tolerance less minus tolerance	$0.160" - 0.060" + 0.100"$
Derived plus tolerance	0.100"

3.7.1.1 Ballistic Test Plates. Tolerances shall be  $\pm 1/2$ -inch on the length and width.

## MIL-A-46063F

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 supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

MIL-A-46063F

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 4.5.3 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.

## MIL-A-46063F

4.4.1.4 Ballistic tests. Two plates 12 by 36,  $\pm 1/2$ -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 ( $\pm 1$  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 be sampled) (see 4.8).

4.4.2.5 Ballistic testing. From each lot, one plate, 12 by 36,  $\pm 1/2$ , 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.

## MIL-A-46063F

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).



MIL-A-46063F

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 - 1.555	20mm FSP	0
1.501 - 3.000	Cal. .50 APM2	0
3.001 - 4.000	14.5mm API, BS41	0

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. Test Method Std. No. 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.

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.

## MIL-A-46063F

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

6.1 Intended use. The armor specified herein is for military vehicles.

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 Data requirements. When this specification is used in an acquisition which incorporate a DD Form 1423, Contract Data Requirements List (CDRL) the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n) (2) are invoked and the DD Form 1432 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

<u>Paragraph No.</u>	<u>Data Requirement Title</u>	<u>Applicable DID No.</u>
3.1	Report, First Article Test	UDI-T-23790
3.2	Certification Data Report	UDI-T-23264
3.9	Ballistic Data Record for Non-ferrous Armor Material	DI-T-1919

(Copies of DID's required by contractors in connection with specific acquisition functions should be obtained from the naval publications and Forms Center or as directed by the contracting officer).

## MIL-A-46063F

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 Combat System Test Activity, ATT: AMSTE-TO-0, Aberdeen Proving Ground, MD 21005-5005.

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 CSTA, ATTN: AMSTE-TO-0, APG, MD 210055005 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:

<u>To go from</u> <u>English</u>	<u>Multiply by</u>	<u>To get</u> <u>Metric SI unit</u>
inch	0.0254	metre (m)
foot	0.3048	metre (m)

## MIL-A-46063F

<u>To go from</u> <u>English</u>	<u>Multiply by</u>	<u>To get</u> <u>Metric SI unit</u>
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 actually initiates the request for procurement and maintains the records of the procurement.

#### Custodians:

Army -- MR  
Air Force -- 20

#### Preparing activity

Army -- MR  
Project No. 9535-0402

#### Review activities:

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

#### User activities:

Navy -- SH

(WP# ID-6924A/DISC-0043A. FOR AMMRC USE ONLY).

MIL-A-46063F

CHECK LIST FOR DATA ON									
	Contract No.								
PRIME CONTRACTOR	Contract No.								
MFG.	for Ballistic Test:								
Address	Firing Date:								
MFG. Record No. & Date	Firing Record No.								
Shipping Date:	MIL-A- REV. ____ Amend. ____								
Shipped To:	Type of Furnance:								
PURPOSE: ____ Acceptance ____ Development ____ 1st Art.	Cast or Heat No.								
SAMPLE: ____ Primary ____ Retest	End Item:								
Represents _____ Lbs.	Material for use on (Specific Vehicle)								
<b>TEST ITEM IDENTIFICATION</b>									
Serial Code or Plate No.	Representing Lot No.	Ordered Thick (in.)	Size (L x W)	Alloy No. & Temper					
<b>CHEMICAL ANALYSIS OF SUBMITTED FIRST ARTICLE</b>									
ZN	MG	MR	CU	FE	SI	CR	TI	OTHER	REMAINDER - AL
/	/	/	/	/	/	/	/	/	/
<b>CHEMICAL COMPOSITION OF PRODUCTION LOTS(S):</b>					CONFORMS TO SPECIFICATION REQUIREMENTS <input type="checkbox"/>				
<b>MECHANICAL PROPERTIES</b>									
UTS - PSI	YS (.20 OFFSET) PSI	ELONG. 2°		ACT. HARD: TYPE					
Stress Corrosion Test				Date:			Signature of Supplier's Representative		
				Date:			Signature of Govt. Representative		
<b>BALLISTIC TEST RECORD</b>									
Test	Projectile	Obl. (Degree)	Act. Thks. (in.)	Reqd. Vel. (fps)	Act. Vel. (fps)	Excess Vel. (fps)	Results Passed/Failed	AMCS Nos.	
Lot _____ Met (failed to meet) the ballistic requirements of _____ Specification								TECOM or TRMS No.	
DATE		<b>PROOF FACILITY SIGNATURES</b>							
		CHIEF, ARMOR BRANCH					TEST DIRECTOR		

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

## MIL-A-46063F

## 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 acquisition 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.

## MIL-A-46063F

## 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  $72 \pm 15^{\circ}\text{F}$  ( $22 \pm 8^{\circ}\text{C}$ ).

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  $\pm 10$  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.

## MIL-A-46063F

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.



## MIL-A-46063F

## APPENDIX A

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 for this test start at ordered thickness  
0.500 inch.

\*\*Specification requirements for this test end at ordered thickness  
0.749 inch.

## MIL-A-46063F

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 for this test start at order thickness  
0.750 inch.

\*\*Specification requirements for this test end at ordered thickness  
0.950 inch.

## MIL-A-46063F

## APPENDIX A

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
0.900	1156	1.080	1482	1.260	1892
.905	1164	1.085	1492	1.265	1905
.910	1172	1.090	1502	1.270	1918
.915	1180	1.095	1513	1.275	1931
.920	1189	1.100	1523	1.280	1944
.925	1197	1.105	1533	1.285	1957
.930	1205	1.110	1544	1.290	1970
.935	1214	1.115	1554	1.295	1983
.940	1222	1.120	1565	1.300	1997
.945	1231	1.125	1576	1.305	2010
* .950	1239	1.130	1587	1.310	2024
.955	1248	1.135	1597	1.315	2038
.960	1256	1.140	1608	1.320	2051
.965	1265	1.145	1619	1.325	2065
.970	1274	1.150	1630	1.330	2079
.975	1283	1.155	1641	1.335	2093
.980	1292	1.160	1653	1.340	2107
.985	1301	1.165	1664	1.345	2121
.990	1310	1.170	1675	1.350	2135
.995	1319	1.175	1687	1.355	2150
1.000	1328	1.180	1698	1.360	2164
1.005	1337	1.185	1710	1.365	2179
1.010	1346	1.190	1721	1.370	2193
1.015	1355	1.195	1733	1.375	2208
1.020	1365	1.200	1745	1.380	2223
1.025	1374	1.205	1757	1.385	2238
1.030	1384	1.210	1769	1.390	2253
1.035	1393	1.215	1781	1.395	2368
1.040	1403	1.220	1793	1.400	2283
1.045	1413	1.225	1805	1.405	2299
1.050	1422	1.230	1817	1.410	2314
1.055	1432	1.235	1829	1.415	2329
1.060	1442	1.240	1842	1.420	2345
1.065	1452	1.245	1854	1.425	2361
1.070	1462	1.250	1867	1.430	2377
1.075	1472	1.255	1879	1.435	2392

## MIL-A-46063F

Table IX. Minimum Required Ballistic Limits - 20mm Fragment  
Simulating Projectiles at 0° Obliquity (Continued)

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
1.440	2408	1.480	2540	1.520	2679
1.455	2424	1.485	2557	1.525	2697
1.450	2441	1.490	2574	1.530	2715
1.455	2457	1.495	2591	1.535	2733
1.460	2473	*1.500	2609	1.540	2751
1.465	2490	1.505	2625	1.545	2761
1.470	2507	1.510	2643	1.550	2788
1.475	2523	1.515	2661		
1.480	2540	1.535	2733		
1.485	2557	1.540	2751		
1.490	2594	1.545	2769		

\*Specification requirements for this test start at ordered thickness  
0.951 inch.

\*\*Specification requirements for this test end at ordered thickness  
1.500 inches.

Note: Tabulated values on either side of the specification requirements are  
for interpolation of BL(P) requirements on undersize or oversize plates.

## MIL-A-46063F

## APPENDIX A

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
0.900	1920	1.075	2136	1.250	2332
0.905	1927	1.800	2141	1.255	2337
0.910	1933	1.085	2147	1.260	2343
0.915	1939	1.090	2153	1.265	2348
0.920	1946	1.095	2159	1.270	2353
0.925	1952	1.100	2165	1.275	2359
0.930	1959	1.105	2171	1.280	2364
0.935	1965	1.110	2176	1.285	2369
0.940	1971	1.115	2182	1.290	2375
0.945	1978	1.120	2188	1.295	2380
*0.950	1984	1.125	2193	1.300	2385
0.955	1990	1.130	2199	1.305	2390
0.960	1997	1.135	2205	1.310	2395
0.965	2003	1.140	2210	1.315	2401
0.970	2009	1.145	2216	1.320	2406
0.975	2015	1.150	2222	1.325	2411
0.980	2021	1.155	2227	1.330	2416
0.985	2028	1.160	2233	1.335	2422
0.990	2034	1.165	2239	1.340	2427
0.995	2040	1.170	2244	1.345	2432
1.000	2046	1.175	2250	1.350	2437
1.005	2052	1.180	2255	1.355	2442
1.010	2058	1.185	2261	1.360	2447
1.015	2064	1.190	2266	1.365	2452
1.020	2070	1.195	2272	1.370	2458
1.025	2076	1.200	2277	1.375	2463
1.030	2082	1.205	2283	1.380	2468
1.035	2088	1.210	2288	1.385	2473
1.040	2094	1.215	2294	1.390	2478
1.045	2100	1.220	2299	1.395	2483
1.050	2106	1.225	2305	1.400	2488
1.055	2112	1.230	2310	1.405	2493
1.060	2118	1.235	2316	1.410	2498
1.065	2124	1.240	2321	1.415	2503
1.070	2130	1.245	2326	1.420	2508

## MIL-A-46063F

## APPENDIX A

Table X. Minimum Required Ballistic Limits - Caliber .30  
AP M2 Projectiles at 0° Obliquity (Continued)

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
1.425	2513	1.475	2563	1.525	2612
1.430	2518	1.480	2568	1.530	2616
1.435	2523	1.485	2573	1.535	2621
1.440	2528	1.490	2577	1.540	2626
1.445	2533	1.495	2582	1.545	2631
1.450	2538	** 1.500	2587	1.550	2635
1.455	2543	1.505	2592		
1.460	2548	1.510	2597		
1.465	2553	1.515	2602		
1.470	2558	1.520	2607		

\* Specification requirements begin for this ordered thickness.

\*\* Specification requirements end for this ordered thickness.

Note: Tabulated values on either side of the specification requirements are for interpolation of BL(P) requirements on undersize or oversize plates.

## MIL-A-46063F

## APPENDIX A

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
1.450	1887	1.635	2028	1.820	2160
1.455	1891	1.640	2032	1.825	2163
1.460	1895	1.645	2036	1.830	2167
1.465	1899	1.650	2039	1.835	2171
1.470	1903	1.655	2043	1.840	2174
1.475	1907	1.660	2046	1.845	2177
1.480	1911	1.665	2050	1.850	2181
1.485	1915	1.670	2054	1.855	2185
1.490	1919	1.675	2057	1.860	2188
1.495	1923	1.680	2060	1.865	2192
* 1.501	1927	1.685	2064	1.870	2195
1.505	1931	1.690	2068	1.875	2199
1.510	1934	1.695	2072	1.880	2202
1.515	1938	1.700	2075	1.885	2207
1.520	1942	1.705	2079	1.890	2209
1.525	1996	1.710	2082	1.895	2213
1.530	1950	1.715	2086	1.900	2216
1.535	1953	1.720	2089	1.905	2220
1.540	1957	1.725	2093	1.910	2223
1.545	1961	1.730	2096	1.915	2226
1.550	1964	1.735	2100	1.920	2230
1.555	1968	1.740	2103	1.925	2233
1.560	1972	1.745	2107	1.930	2237
1.565	1976	1.750	2111	1.935	2240
1.570	1979	1.755	2114	1.940	2244
1.575	1983	1.760	2118	1.945	2247
1.580	1987	1.765	2121	1.950	2250
1.585	1991	1.770	2125	1.955	2253
1.590	1994	1.775	2129	1.960	2257
1.595	1998	1.780	2132	1.965	2260
1.600	2002	1.785	2136	1.970	2263
1.605	2006	1.790	2139	1.975	2266
1.610	2009	1.795	2142	1.980	2270
1.615	2013	1.800	2146	1.985	2273
1.620	2017	1.805	2149	1.990	2276
1.625	2021	1.810	2153	1.995	2279
1.630	2024	1.815	2156	2.000	2282

## MIL-A-46063F

## APPENDIX A.

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

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
2.005	2285	2.195	2406	2.385	2522
2.010	2288	2.200	2409	2.390	2525
2.015	2291	2.205	2412	2.395	2528
2.020	2295	2.210	2416	2.400	2531
2.025	2298	2.215	2419	2.405	2534
2.030	2301	2.220	2422	2.410	2537
2.035	2304	2.225	2425	2.415	2539
2.040	2308	2.230	2428	2.420	2542
2.045	2311	2.235	2431	2.425	2545
2.050	2314	2.240	2434	2.430	2548
2.055	2317	2.245	2437	2.435	2551
2.060	2321	2.250	2440	2.440	2554
2.065	2324	2.255	2443	2.445	2556
2.070	2327	2.260	2446	2.450	2559
2.075	2330	2.265	2449	2.455	2562
2.080	2333	2.270	2452	2.460	2565
2.085	2337	2.275	2456	2.465	2568
2.090	2340	2.280	2459	2.470	2570
2.095	2343	2.285	2462	2.475	2573
2.100	2346	2.290	2465	2.480	2576
2.105	2349	2.295	2468	2.485	2579
2.110	2353	2.300	2471	2.490	2582
2.115	2356	2.305	2474	2.495	2585
2.120	2359	2.310	2477	2.500	2587
2.125	2362	2.315	2480	2.505	2590
2.130	2365	2.320	2483	2.510	2593
2.135	2369	2.325	2486	2.515	2596
2.140	2372	2.330	2489	2.520	2599
2.145	2375	2.335	2492	2.525	2602
2.150	2378	2.340	2495	2.530	2605
2.155	2381	2.345	2498	2.535	2608
2.160	2384	2.350	2501	2.540	2611
2.165	2387	2.355	2504	2.545	2614
2.170	2391	2.360	2507	2.550	2617
2.175	2394	2.365	2510	2.555	2620
2.180	2397	2.370	2513	2.560	2623
1.185	2400	2.375	2516	2.565	2626
2.190	2403	2.380	2519	2.570	2629



## MIL-A-46063F

## APPENDIX A

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

Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps	Thickness, in.	Required BL(P), fps
2.575	2632	2.720	2714	2.865	2893
2.580	2635	2.725	2717	2.870	2796
2.585	2638	2.730	2720	2.875	2799
2.590	2641	2.735	2722	2.880	2801
2.595	2644	2.740	2725	2.885	2804
2.600	2647	2.745	2728	2.890	2807
2.605	2650	2.750	2731	2.895	2809
2.610	2652	2.755	2733	2.900	2812
2.615	2655	2.760	2736	2.905	2815
2.620	2658	2.765	2739	2.910	2817
2.625	2661	2.770	2742	2.915	2820
2.630	2664	2.775	2744	2.920	2823
2.635	2667	2.780	2747	2.925	2825
2.640	2669	2.785	2750	2.930	2828
2.645	2672	2.790	2753	2.935	2831
2.650	2675	2.795	2755	2.940	2833
2.655	2678	2.800	2758	2.945	2836
2.660	2681	2.805	2761	2.950	2839
2.665	2684	2.810	2764	2.955	2841
2.670	2686	2.815	2766	2.960	2844
2.675	2689	2.820	2769	2.965	2847
2.680	2692	2.825	2772	2.970	2849
2.685	2695	2.830	2774	2.975	2852
2.690	2697	2.835	2777	2.980	2855
2.695	2700	2.840	2780	2.985	2857
2.700	2703	2.845	2783	2.990	2860
2.705	2706	2.850	2785	2.995	2863
2.710	2709	2.855	2788	** 3.000	2865
2.715	2711	2.860	2791		

\*Specification requirements begin for this ordered thickness 1.501 inches.

\*\*Specification requirements end at ordered thickness 3.000 inches.

## MIL-A-46063F

## APPENDIX A

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
<u>1/</u> 3.000	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

## MIL-A-46063F

## APPENDIX A

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	<sup>2/</sup> 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		

<sup>1/</sup> Specification requirements for this test start at ordered thickness 3.001 inches."

<sup>2/</sup> Specification requirements for this test end at ordered thickness 4.000."

**STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL***(See Instructions - Reverse Side)*

<b>1. DOCUMENT NUMBER</b>		<b>2. DOCUMENT TITLE</b>	
<b>3a. NAME OF SUBMITTING ORGANIZATION</b>		<b>4. TYPE OF ORGANIZATION (Mark one)</b>	
<b>b. ADDRESS (Street, City, State, ZIP Code)</b>		<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____	
<b>5. PROBLEM AREAS</b>			
<b>a. Paragraph Number and Wording:</b>          <b>b. Recommended Wording:</b>          <b>c. Reason/Rationale for Recommendation:</b>          			
<b>6. REMARKS</b>			
<b>7a. NAME OF SUBMITTER (Last, First, MI) - Optional</b>		<b>b. WORK TELEPHONE NUMBER (Include Area Code) - Optional</b>	
<b>c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional</b>		<b>8. DATE OF SUBMISSION (YYMMDD)</b>	