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6 January 1984
SUPERSEDING
MIL-A-46027F(MR)
10 June 1976

MILITARY SPECIFICATION

ARMOR PLATE, ALUMINUM ALLOY, WELDABLE 5083 AND 5456

This specification is approved for use by the Army Materials and Mechanics Research Center, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers 5083 and 5456 wrought aluminum alloy armor plate which is weldable and has ballistic properties meeting the requirements of this specification. The nominal thickness of armor plate covered by this specification is one-quarter to three inches, inclusive.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), the following specifications, standards and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

AAA-PFE-1 - Aluminum Alloy Armor - Plate, Forged, Extruded

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Director, US Army Materials and Mechanics Research Center, ATTN: DRXMR-SMS, Watertown, MA 02172 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

/ FSC 9535 /

STANDARDS

FEDERAL

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

MILITARY

MIL-STD-129 - Marking for Shipment and Storage

(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 documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

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

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS

ASTM B 557 - Tension Testing Wrought and Cast Aluminum and Magnesium-Alloy Products

ASTM 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, Pennsylvania 19103.)

(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, the text of this specification shall take precedence.

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 to the contracting officer or his authorized representative for approval in accordance with 4.2.1. The first article ballistic test (see 4.4.1.3) may be waived at the discretion of the procuring activity if the

manufacturer within 37 months has produced acceptable plate within plus and minus 0.250 inch of the thickness (or thicknesses) to be supplied on the contract, provided also that no changes have been made in the processing techniques and other test conditions.

3.1.1 First time producer. First time producers wishing to qualify to this specification should follow the instructions of 6.4.

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 again 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 conformance of the chemical composition of the alloy shall be furnished with the ballistic test plates.

3.3 Mechanical properties. Unless otherwise specified in the contract or order, the mechanical properties of the test specimen taken in the longitudinal direction shall meet the requirements of table II.

3.3.1 If mechanical property requirements differ from those contained in table II or additional properties are specified other than those mentioned in 3.3, the ballistic requirements shall be negotiated between the procuring activity and the supplier.

3.4 Ballistic limit. The protection ballistic limit, BL(P), shall be as specified in appendix A. No ballistic limit shall be specified for plate thickness of 0.250 to 0.499 inch inclusive.

3.5 Stress corrosion resistance. When stress corrosion testing is specified in the contract or order (see 6.2), plate 0.750 inch and over in thickness shall be resistant to stress corrosion cracking, with a minimum of 5 of the 9 specimens showing no evidence of cracking at the end of 96 hours.

3.6 Thermal processing. After final strain hardening performed during plate fabrication, any thermal processing exceeding 200°F (93°C) excluding fabrication by welding will necessitate reverification for conformance to 3.3, 3.4 and 3.5.

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, the plates submitted for acceptance shall not vary from the specified dimensions by an amount greater than the tolerances shown in ANSI H35.2. Similarly, the thickness tolerance shall be as specified in table III.

TABLE I. Chemical composition, percent[1/]

Alloy	Silicon max.	Iron max.	Copper max.	Manganese	Magnesium	Chromium	Zinc max.	Titanium max.	Other, max. Each	Other, max. Total[2/]	Aluminum
5083	0.40	0.40	0.10	0.40-1.0	4.0-4.9	0.05-0.25	0.25	0.15	0.05	0.15	Rem.
5456	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.20	0.05	0.15	Rem.

1/ Except for "Aluminum" and "others", analysis normally is made for elements for which specific limits are shown.

2/ The sum of those "others" metallic elements 0.010 percent or more each, expressed to the second decimal before determining the sum.

TABLE II. Mechanical Properties[1/]

Thickness, inches	Tensile Strength Ksi	Yield Strength, 0.2% Offset Ksi	Elongation percent
0.250 to 0.499, incl.	45.0	35.0	8
0.500 to 2.000, incl.	45.0	37.0	8
2.001 to 3.000, incl.	44.0	35.0	9

1/ See 6.3.

2/ The gage length shall be 1.400 inch for plates having a nominal thickness of 0.500 inch.

TABLE III. Thickness Tolerances

Ordered Thickness, inches	Tolerance, inch minus	Tolerance, inch plus[1/]
0.250 to 0.499, incl.	0.020	-
0.500 to 0.875, incl.	0.030	-
0.876 to 1.125, incl.	0.035	-
1.126 to 1.375, incl.	0.040	-
1.376 to 3.000, incl.	0.045	-

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 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"
Full tolerance less minus tolerance	0.160 - 0.045 = 0.115"
Derived plus tolerance	0.115"
Tabulated minus tolerance	0.045"

3.8 Marking for identification. Each plate shall be marked adjacent to one plate edge with the manufacturer's name or trademark, the basic number of this specification, the plate thickness in inches, the alloy designation and the lot number or code relating to the lot number (see 4.3). 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 markings 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 edge in letters 3/8 inch high or greater. Ballistic retest plates shall be marked "R1" and "R2" respectively (see A-50.2).

3.9 Ballistic test plate information. A properly executed check list for Armor Data, MIL46027 (figure 1) or equivalent, shall be submitted with each ballistic test plate (see 6.5).

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.

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 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 the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.1.1 Unless otherwise specified in the contract or order, ballistic test plates shall be forwarded to Commander, U.S. Army Aberdeen Proving Ground, ATTN: STEAP-MT-A, Aberdeen Proving Ground, MD 21005, for ballistic testing (see 6.2).

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

(a) First article inspection (see 4.2.1).
(b) Acceptance (production).

4.2.1 First article inspection. First article inspection, except as otherwise indicated in this specification, shall utilize the same requirements and test methods as the production acceptance inspection shown in 4.6.

4.3 Lot. A lot shall consist of all plate of the same alloy and ordered thickness which have been processed together by the same mill practice. The weight of the finished plate in the lot shall not exceed 50,000 pounds and shall be submitted for inspection as a unit.

4.4 Sampling.

4.4.1 Sampling for first article testing.

4.4.1.1 For chemical composition. Samples for chemical analysis shall be removed from each plate selected for ballistic testing and shall meet the requirements when tested as specified in 4.6.1.

4.4.1.2 For mechanical properties. One tension test specimen shall be removed from each plate that has been selected for ballistic testing and shall meet the requirements when tested as specified in 4.6.2.

4.4.1.3 For ballistic test. Two plates, 12 inches by 36 inches of each thickness to be supplied on the contract, shall be submitted for ballistic testing in accordance with appendix A. The orientation of these plates with respect to the rolling direction shall be at the option of the producer.

4.4.1.4 For stress corrosion tests. The stress corrosion test specimens shall be removed from the same plate that has been selected for ballistic testing. The location and type of specimen shall be as specified in 4.6.4.

4.4.2 Sampling for acceptance of production lots.

4.4.2.1 Chemical composition. The sample shall meet the chemical composition requirements when tested as specified in 4.6.1.

4.4.2.1.1 Ingot analysis. At least one sample shall be taken from the molten metal representing the ingots poured as a unit from the same source molten metal. Complete ingot analysis records shall be available to the Government at the producer's facility.

4.4.2.1.2 Product analysis. When sampling has not been made in accordance with 4.4.2.1.1, one sample shall be randomly taken for each 4,000 pounds or less in a lot. Complete product analysis records shall be available to the Government at the contractor's facility.

4.4.2.2 For mechanical properties. Samples for tension tests shall be selected from each lot in accordance with table IV. Each sample shall be randomly selected from a different plate in the lot, and only one tension test specimen shall be made from each sample. The sample shall meet the requirements when tested as specified in 4.6.2.

TABLE IV. Number of Tension Tests

Lot size, pounds	Minimum number of samples 1/
To 8,000, incl.	2
8,001 to 12,000, incl.	3
12,001 to 20,000, incl.	4
20,001 up	5

1/ If a lot consists of only one plate, one sample shall be required.

4.4.2.3 Ballistic testing. One plate, 12 inches by 36 inches, shall be randomly selected from each lot for ballistic testing. The orientation of the plate with respect to the rolling direction shall be at the option of the producer. The sample shall meet the requirements when tested as specified in 4.6.3.

4.4.2.4 For stress corrosion tests. When required (see 6.2), one plate, 12 inches by 12 inches, shall be randomly selected from each lot for stress corrosion testing. The plate shall meet the requirements when tested as specified in 4.6.4.

4.5 Examination.

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

4.5.2 Dimensions. Plates within a lot shall be measured to determine compliance with requirements of paragraph 3.7 in accordance with the sampling procedures approved by the procuring activity (see 6.2).

4.5.3 Preparation for shipment. Prior to shipment, examination shall be made for compliance with the requirements of section 5.

4.6 Tests.

4.6.1 Chemical composition. Samples for chemical analysis shall be prepared and tested in accordance with method 111 or 112 of Fed. Test Method No. 151. In case of dispute, 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. Specimens shall be taken in the longitudinal direction. For material less than 0.500 inch in thickness, a standard rectangular tension test specimen shall be used. From plate in nominal thicknesses less than 0.500 to 1.500 inches, inclusive, tension test specimens shall be taken with the axis midway between the two plate surfaces; from plate in nominal thicknesses greater than 1.500 inches, the axis of the tension test specimen shall be three-fourths of the distance from one surface to the other.

4.6.3 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 as well as the required V_{50} protection ballistic limit. Thickness shall be determined as the average of at least four thickness measurements read on a deep throat micrometer or by means of an ultrasonic device to the nearest 0.001 of an inch and rounded off to the nearest 0.005 of an inch. Measurements shall be made on the intended impact area.

TABLE V. Acceptance Ballistic Test Plates

Ordered Thickness, Inches	Projectile	Angle of Obliquity in Degrees
0.500 - 0.749	Cal. .30 AP	30
0.750 - 1.000	Cal. .50 FSP	0
1.001 - 1.700 (2 types of projectiles)	20 mm FSP and Cal .30 AP M2	0
1.701 - 2.000	Cal. .30 AP M2	0
2.001 - 3.000	Cal. .50 AP M2	0

4.6.4 Stress corrosion. The stress corrosion specimens shall be stressed at 30 Ksi.

4.6.4.1 Capability requirements for resistance to stress corrosion. When stress corrosion testing is required (see 6.2), stress corrosion test specimens shall be prepared and tested in accordance with ASTM G 47.

4.7 Rejection and retest.

4.7.1 Unless otherwise specified in the contract or order, rejection and retest shall be conducted in accordance with the general section of Fed. Test Method No. 151 (see 6.2).

4.7.2 Ballistic. Rejection and retest of ballistic test plates shall be in accordance with A-50.2.

4.7.3 Stress corrosion. Immediately upon notification of the failure of the specimens, the manufacturer may at his own expense submit thirteen additional specimens for testing. A minimum of seven specimens shall show no cracks at the end of 96 hours when tested as specified in 4.6.4.

4.8 Reduced testing. At the discretion of the procuring activity, the amount of testing may be reduced provided the results on consecutive lots indicate that a uniform product meeting the testing requirements is being produced and providing the manufacturer agrees to maintain the same manufacturing procedures.

5. PREPARATION FOR DELIVERY

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 ensure acceptance and safe delivery by the carrier for the mode of transportation employed.

5.3 Marking. In addition to any special marking required by the contract or order, 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. Procurement documents should specify the following:

(a) Title, number and date of this specification and choice of alloy.
(b) Special mechanical properties and ballistic requirements, if required (see 3.3 and 3.3.1).
(c) When stress corrosion testing is required (see 3.5 and 4.6.4).
(d) Dimension and tolerance requirements if other than in 3.7.1.
(e) When impression stamping is permissible (see 3.8).
(f) Where ballistic testing shall be performed if different than in 4.1.1.
(g) Dimensional sampling procedure (see 4.5.2).

(h) Rejection and retest requirement, if other than in 4.7.1.
(i) Preparation for shipment, if other than in 5.1 and 5.2.
(j) Additional marking, if required (see 5.3).

6.3 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 3.4).

6.4 Potential suppliers. Potential suppliers who have not previously supplied armor plate to MIL-A-46027 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, U.S. Army Test and Evaluation Command, ATTN: DRSTE-TO-O, Aberdeen Proving Ground, MD 21005.

6.5 Forms. Form MIL46027 (see figure 1) may be reproduced and used for submittal of the required data.

Custodian:
Army - MR

Review Activities:
Army - AL, AV, TE, AR
DSA - IS

User activities:
Army - AT

Preparing activity:
Army - MR

Project No. 9535-A024

(KBWP# ID-0949A/DISK 0043A. FOR AMMRC USE ONLY)

APPENDIX A

BALLISTIC TESTING OF ALUMINUM ALLOY ARMOR PLATE 5083 AND 5456

A-10 SCOPE

A-10.1 Scope. This appendix covers the minimum ballistic limits for acceptable requirements of aluminum alloy armor plate, weldable, 5083 and 5456, when tested in accordance with the provisions of this specification.

A-20 APPLICABLE DOCUMENTS

A-20.1 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-T3 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 protection complete penetration is a penetration in which the projectile or one or more fragments of a projectile or plate pass beyond the back of the test plate and perforate the witness plate.

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

A-30.5 Gap. A gap is defined as the difference in velocity between the high partial penetration (HPP) velocity and the low complete penetration (LCP) velocity when the HPP velocity is lower than the LCP.

A-40 REQUIREMENTS

A-40.1 Resistance to penetration. The minimum required V_{50} ballistic limit shall be in accordance with the values shown in tables A-1 through A-5.

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 MIL46027.

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). Resubmission 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.

TABLE A-I. Minimum Required Ballistic Limits - Caliber .30 AP M2 Projectiles at 30° Obliquity

Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps
0.475	1291	0.580	1482	0.685	1651
0.480	1300	0.585	1490	0.690	1659
0.485	1310	0.590	1499	0.695	1667
0.490	1320	0.595	1507	0.700	1674
0.495	1329	0.600	1515	0.705	1682
1/ 0.500	1339	0.605	1524	0.710	1689
0.505	1348	0.610	1532	0.715	1697
0.510	1357	0.615	1540	0.720	1704
0.515	1366	0.620	1548	0.725	1712
0.520	1376	0.625	1556	0.730	1719
0.525	1385	0.630	1564	0.735	1726
0.530	1394	0.635	1573	0.740	1734
0.535	1403	0.640	1581	0.745	1741
0.540	1412	0.645	1589	2/ 0.749	1747
0.545	1421	0.650	1597	0.750	1748
0.550	1430	0.655	1604	0.755	1755
0.555	1438	0.660	1612	0.760	1763
0.560	1447	0.665	1620	0.765	1770
0.565	1456	0.670	1628	0.770	1777
0.570	1464	0.675	1636	0.775	1784
0.575	1473	0.680	1644		-

1/ Specification requirements for this test start at ordered thickness 0.500 inches.

2/ Specification requirements for this test end at ordered thickness 0.749 inches.

TABLE A-II. Minimum Required Ballistic Limits, Caliber .50 Fragment Simulating Projectiles at 0 Deg. Obliquity: 5083 Alloy

Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps
0.720	1657	0.835	2020	0.945	2438
0.725	1672	0.840	2038	0.950	2458
0.730	1686	0.845	2055	0.955	2479
0.735	1701	0.850	2073	0.960	2500
0.740	1716	0.855	2091	0.965	2522
0.745	1731	0.860	2109	0.970	2543
1/ 0.750	1746	0.865	2127	0.975	2565
0.755	1761	0.870	2145	0.980	2587
0.760	1776	0.875	2164	0.985	2609
0.765	1791	0.880	2182	0.990	2631
0.770	1807	0.885	2201	0.995	2653
0.775	1823	0.890	2220	2/ 1.000	2676
0.780	1838	0.895	2239	1.005	2699
0.785	1854	0.900	2258	1.010	2722
0.790	1870	0.905	2277	1.015	2745
0.795	1886	0.910	2297	1.020	2768
0.800	1903	0.915	2316	1.025	2792
0.805	1919	0.920	2336	1.030	2815
0.810	1936	0.925	2356	1.035	2839
0.815	1952	0.930	2376	1.040	2863
0.820	1969	0.935	2396	1.045	2888
0.825	1986	0.940	2417	1.050	2912
0.830	2003				

1/ Specification requirements for this test start at ordered thickness 0.750 inches.

2/ Specification requirements for this test end at ordered thickness 1.000 inches.

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

Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps
0.940	1284	1.140	1653	1.340	2031
0.945	1293	1.145	1663	1.345	2041
0.950	1302	1.150	1672	1.350	2051
0.955	1312	1.155	1681	1.355	2061
0.960	1321	1.160	1690	1.360	2072
0.965	1330	1.165	1700	1.365	2082
0.970	1339	1.170	1709	1.370	2092
0.975	1349	1.175	1718	1.375	2103
0.980	1358	1.180	1727	1.380	2113
0.985	1367	1.185	1737	1.385	2124
0.900	1376	1.190	1746	1.390	2134
0.995	1385	1.195	1755	1.395	2145
1/1.000	1395	1.200	1764	1.400	2156
1.005	1404	1.205	1773	1.405	2167
1.010	1413	1.210	1783	1.410	2178
1.015	1422	1.215	1792	1.415	2188
1.020	1432	1.220	1801	1.420	2199
1.025	1441	1.225	1810	1.425	2210
1.030	1450	1.230	1820	1.430	2221
1.035	1459	1.235	1829	1.435	2233
1.040	1469	1.240	1838	1.440	2244
1.045	1478	1.245	1847	1.445	2255
1.050	1487	1.250	1857	1.450	2266
1.055	1496	1.255	1866	1.455	2278
1.060	1506	1.260	1875	1.460	2289
1.065	1515	1.265	1884	1.465	2300
1.070	1524	1.270	1894	1.470	2312
1.075	1533	1.275	1903	1.475	2324
1.080	1543	1.280	1913	1.480	2335
1.085	1552	1.285	1922	1.485	2347
1.090	156	1.290	1932	1.490	2359
1.095	1570	1.295	1942	1.495	2371
1.100	1579	1.300	1951	1.500	2382
1.105	1589	1.305	1961	1.505	2394
1.110	1598	1.310	1971	1.510	2406
1.115	1607	1.315	1981	1.515	2418
1.120	1616	1.320	1991	1.520	2431
1.125	1626	1.325	2000	1.525	2443
1.130	1635	1.330	2010	1.530	2455
1.135	1644	1.335	2021	1.535	2467

(Continued on next page)

TABLE A-III. (Continued)

Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps
1.540	2480	1.615	2673	1.685	2867
1.545	2492	1.620	2686	1.690	2881
1.550	2505	1.625	2700	1.695	2896
1.555	2517	1.630	2713	2/1.700	2910
1.560	2530	1.635	2727	1.705	2925
1.565	2542	1.640	2741	1.710	2940
1.570	2555	1.645	2754	1.715	2954
1.575	2568	1.650	2768	1.720	2969
1.580	2581	1.655	2782	1.725	2984
1.585	2594	1.660	2796	1.730	2999
1.590	2607	1.665	2810	1.735	3014
1.595	2620	1.670	2824	1.740	3029
1.600	2633	1.675	2838	1.745	3045
1.605	2646	1.680	2853	1.750	3060
1.610	2660	-	-	-	-

1/ Specification requirements for this test start at ordered thickness 1.001 inches.

2/ Specification requirements for this test end at ordered thickness 1.700 inches.

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

Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps
0.940	1744	1.165	2002	1.390	2231
0.945	1750	1.170	2007	1.395	2236
0.950	1757	1.175	2013	1.400	2240
0.955	1763	1.180	2018	1.405	2245
0.960	1769	1.185	2023	1.410	2250
0.965	1775	1.190	2029	1.415	2255
0.970	1781	1.195	2034	1.420	2260
0.975	1787	1.200	2039	1.425	2264
0.980	1793	1.205	2044	1.430	2269
0.985	1799	1.210	2050	1.435	2274
0.990	1805	1.215	2055	1.440	2279
0.995	1811	1.220	2060	1.445	2283
1/ 1.000	1816	1.225	2066	1.450	2288
1.005	1822	1.230	2071	1.455	2293
1.010	1828	1.235	2076	1.460	2298
1.015	1834	1.240	2081	1.465	2302
1.020	1840	1.245	2086	1.470	2307
1.025	1846	1.250	2091	1.475	2312
1.030	1852	1.255	2096	1.480	2316
1.035	1857	1.260	2102	1.485	2321
1.040	1863	1.265	2107	1.490	2326
1.045	1869	1.270	2112	1.495	2330
1.050	1875	1.275	2117	1.500	2335
1.055	1880	1.280	2122	1.505	2340
1.060	1886	1.285	2127	1.510	2344
1.065	1892	1.290	2132	1.515	2349
1.070	1897	1.295	2137	1.520	2353
1.075	1903	1.300	2142	1.525	2358
1.080	1909	1.305	2147	1.530	2362
1.085	1914	1.310	2152	1.535	2367
1.090	1920	1.315	2157	1.540	2372
1.095	1925	1.320	2162	1.545	2376
1.100	1931	1.325	2167	1.550	2381
1.105	1937	1.330	2172	1.555	2385
1.110	1942	1.335	2177	1.560	2390
1.115	1948	1.340	2182	1.565	2394
1.120	1953	1.345	2187	1.570	2399
1.125	1959	1.350	2192	1.575	2403
1.130	1964	1.355	2197	1.580	2408
1.135	1970	1.360	2202	1.585	2412
1.140	1975	1.365	2207	1.590	2417
1.145	1980	1.370	2212	1.595	2421
1.150	1986	1.375	2216	1.600	2426
1.155	1991	1.380	2221	1.605	2430
1.160	1997	1.385	2226	1.610	2434

(Continued on next page)

TABLE A-IV. (Continued)

Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps
1.615	2439	1.785	2585	1.955	2724
1.620	2443	1.790	2589	1.960	2728
1.625	2448	1.795	2593	1.965	2732
1.630	2452	1.800	2598	1.970	2736
1.635	2456	1.805	2602	1.975	2740
1.640	2461	1.810	2606	1.980	2744
1.645	2465	1.815	2610	1.985	2748
1.650	2470	1.820	2614	1.990	2752
1.655	2474	1.825	2618	1.995	2756
1.660	2478	1.830	2623	2/2.000	2760
1.665	2483	1.835	2627	2.005	2763
1.670	2487	1.840	2631	2.010	2767
1.675	2492	1.845	2635	2.015	2771
1.680	2496	1.850	2639	2.020	2775
1.685	2500	1.855	2643	2.025	2779
1.690	2504	1.660	2647	2.030	2783
1.695	2509	1.865	2651	2.035	2787
1.700	2513	1.870	2655	2.040	2791
1.705	2517	1.875	2660	2.045	2794
1.710	2522	1.880	2664	2.050	2798
1.715	2526	1.885	2668	2.055	2802
1.720	2530	1.890	2672	2.060	2806
1.725	2543	1.895	2676	2.065	2810
1.730	2539	1.900	2680	2.070	2814
1.735	2544	1.905	2684	2.075	2818
1.740	2547	1.910	2688	2.080	2822
1.745	2552	1.915	2692	2.085	2825
1.750	2556	1.920	2696	2.090	2829
1.755	2560	1.925	2700	2.095	2833
1.760	2564	1.930	2704	2.100	2837
1.765	2568	1.935	2708		
1.770	2573	1.940	2712		
1.775	2577	1.945	2716		
1.780	2581	1.950	2720		

1/ Specification requirements for this test start at ordered thickness 1.001 inches.

2/ Specification requirements for this test end at ordered thickness 2.000 inches.

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

Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps
1.950	2027	2.150	2138	2.350	2217
1.955	2030	2.155	2141	2.355	2217
1.960	2032	2.160	2144	2.360	2217
1.965	2035	2.165	2147	2.365	2217
1.970	2038	2.170	2149	2.370	2217
1.975	2041	2.175	2152	2.375	2217
1.980	2043	2.180	2155	2.380	2217
1.985	2046	2.185	2158	2.385	2217
1.990	2049	2.190	2160	2.390	2217
1.995	2052	2.195	2163	2.395	2217
1/ 2.000	2054	2.200	2166	2.400	2217
2.005	2057	2.205	2168	2.405	2217
2.010	2060	2.210	2171	2.410	2217
2.015	2063	2.215	2174	2.415	2217
2.020	2066	2.220	2176	2.420	2217
2.025	2069	2.225	2179	2.425	2217
2.030	2072	2.230	2182	2.430	2217
2.035	2074	2.235	2184	2.435	2217
2.040	2077	2.240	2187	2.440	2217
2.045	2080	2.245	2190	2.445	2220
2.050	2083	2.250	2193	2.450	2223
2.055	2086	2.255	2195	2.455	2226
2.060	2088	2.260	2198	2.460	2228
2.065	2091	2.265	2201	2.465	2231
2.070	2904	2.270	2203	2.470	2234
2.075	2097	2.275	2206	2.475	2237
2.080	2100	2.280	2209	2.480	2239
2.085	2102	2.285	2211	2.485	2242
2.090	2105	2.290	2214	2.490	2245
2.095	2108	2.295	2217	2.495	2248
2.100	2111	2.300	2217	2.500	2250
2.105	2114	2.305	2217	2.505	2253
2.110	2116	2.310	2217	2.510	2256
2.115	2119	2.315	2217	2.515	2259
2.120	2122	2.320	2217	2.520	2261
2.125	2125	2.325	2217	2.525	2264
2.130	2127	2.330	2217	2.530	2267
2.135	2130	2.335	2217	2.535	2270
2.140	2133	2.340	2217	2.540	2272
2.145	2136	2.345	2217	2.545	2275

(Continued on next page)

TABLE A-V. (Continued)

Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps	Thickness (inch)	Required BL(P)fps
2.550	2278	2.735	2380	2.920	2481
2.555	2281	2.740	2382	2.925	2484
2.560	2283	2.745	2385	2.930	2487
2.565	2286	2.750	2388	2.935	2490
2.570	2289	2.755	2391	2.940	2492
2.575	2292	2.760	2393	2.945	2495
2.580	2294	2.765	2396	2.950	2498
2.585	2297	2.770	2399	2.955	2501
2.590	2300	2.775	2402	2.960	2503
2.595	2303	2.780	2404	2.965	2506
2.600	2305	2.785	2407	2.970	2509
2.605	2308	2.790	2410	2.975	2512
2.610	2311	2.795	2413	2.980	2514
2.615	2314	2.800	2415	2.985	2517
2.620	2316	2.805	2418	2.990	2520
2.625	2319	2.810	2421	2.995	2523
2.630	2322	2.815	2424	2/ 3.000	2525
2.635	2325	2.820	2426	3.005	2528
2.640	2327	2.825	2429	3.010	2531
2.645	2330	2.830	2432	3.015	2534
2.650	2333	2.835	2435	3.020	2536
2.655	2336	2.840	2437	3.025	2539
2.660	2338	2.845	2440	3.030	2542
2.665	2341	2.850	2443	3.035	2545
2.670	2344	2.855	2446	3.040	2547
2.675	2347	2.860	2448	3.045	2550
2.680	2349	2.865	2451	3.050	2553
2.685	2352	2.870	2454	3.055	2556
2.690	2355	2.875	2457	3.060	2558
2.695	2358	2.880	2459	3.065	2561
2.700	2360	2.885	2462	3.070	2564
2.705	2363	2.890	2465	3.075	2567
2.710	2366	2.895	2468	3.080	2569
2.715	2369	2.900	2470	3.085	2572
2.720	2371	2.905	2473	3.090	2575
2.725	2374	2.910	2476	3.095	2578
2.730	2377	2.915	2479	3.100	2580

1/ Specification requirements for this test start at ordered thickness 2.001 inches.

2/ Specification requirements for this test end at ordered thickness 3.000 inches.

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CHECK LIST FOR ALUMINUM ARMOR DATA	DCASR OR OTHER GOVT. AGENCY
INSTRUCTIONS: To be filled in by typewriter, carbon reversed or manually with india ink.	Contract
Prime Contractor:	
Mfg.	Type of Armor _____ Wrought
Address	Specification MIL-A-46027 ___Rev. ___Amend.
Mfg. Record No. and Date	Firing Date
Shipping Date	Firing Record No.
Shipped To	Sample ___First Article ___Retest ___Other
Purpose ___Acceptance ___Development ___Other ___Production	Represents lbs.
Material for Use on (Specific Vehicle)	

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 - TOTAL	REMAINDER - AL

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

_____

MECHANICAL PROPERTIES

UTS - Ksi	YS (.2% OFFSET) Ksi	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 Met (failed to meet) the ballistic requirements of Specification MIL-A-46027 | TECOM or TRMS No.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-A-46027G(MR)	ARMOR PLATE, ALUMINUM ALLOY, WELDABLE 5083 AND 5456

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*