

MIL-A-45059C
2 December 1983
SUPERSEDING
MIL-A-45059B(MR)
13 November 1968

MILITARY SPECIFICATION

ADHESIVE FOR BONDING CHIPBOARD TO TERNEPLATE, TINPLATE, AND ZINCPLATE

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 a one-part, ready to use, brushable adhesive for use in bonding chipboard to terneplate, tinplate, and zincplate in the manufacture of ammunition fiber containers.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, 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

FEDERAL

QQ-S-775 - Steel, Sheets, Carbon, Zinc-Coated.
UU-C-282 - Chipboard.
PPP-C-96 - Cans, Metal, 28 Gage and Lighter.

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 8040 /

MIL-A-45059C

MILITARY

MIL-T-10727 - Tin Plating Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals.

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
 MIL-STD-109 - Quality Assurance Terms and Definitions.
 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 document(s) 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 SOCIETY FOR TESTING AND MATERIALS (ASTM)

D1002 Test for Strength Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)

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

Industry 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 Material. The adhesive shall be a one-part, ready-to-use type conforming to the requirements of this specification (see 6.4).

3.2 Shelf Life. The adhesive shall have a shelf life of not less than six months when stored as specified in 4.7.2.1 and tested as specified in 4.7.2.2.

3.2.1 Certification. The test procedures for shelf life may be waived by the procuring agency upon certification by the contractor that the lot submitted for acceptance meets the requirements of 3.2. The certificate shall be signed by a responsible agent of the certifying organization and shall be accompanied by evidence of this agent's authority to bind his principal. The Government reserves the right to check test material submitted by the contractor under certification.

MIL-A-45059C

3.3 Shear strength.

3.3.1 Shear strength after one hour. The adhesive shall have a minimum average shear strength of 40 pounds per square inch and a minimum individual value of 30 pounds per square inch when prepared and tested as specified in 4.7.2.2

3.3.2 Shear strength after one week. The adhesive shall have minimum shear strength values shown in table I below, when prepared and tested as specified in 4.7.2.3.

Table I. Minimum shear strength values

Test temperature	Minimum individual shear strength value, psi.	Minimum average shear strength value, psi.
-40°F (-40°C)	65	75
+73.5°F (23°C)	50	60
+140°F (60°C)	17	25

3.4 Workmanship. The adhesive shall be free of foreign matter and shall be prepared in accordance with the best commercial practice for this type of material.

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 supplies and services conform to prescribed requirements.

4.2 Inspection. Inspection terms and definitions shall be in accordance with MIL-STD-109.

4.3 Classification of inspection.

4.3.1 Acceptance inspection. All inspection shall be to determine compliance with the requirements of this specification to serve as a basis for acceptance.

4.4 Lot. A lot shall consist of adhesive from one batch. A batch is defined as that quantity of material subject to some unit chemical or mixing process intended to make the product substantially uniform.

MIL-A-45059C

4.5 Sampling.

4.5.1 Examination. A random sample of filled containers shall be selected in accordance with level I of MIL-STD-105.

4.5.2 Tests. A sample consisting of 1 quart of adhesive representative of the lot shall be selected and placed in a wide-mouth, glass, one-quart container and sealed tightly.

4.6 Examination.

4.6.1 Visual. Sample units selected in accordance with 4.5.1 shall be examined for the defects and at the Acceptable Quality Level shown in table II.

4.6.2 Packaging, packing and marking for shipment. Examination shall be made for the defects and at the acceptable quality level (AQL) as shown in table II to determine compliance with section 5.

4.7 Tests.4.7.1 Test specimens.

4.7.1.1 Shelf life. The test specimen shall consist of approximately 1 pint of the sample selected in accordance with 4.5.2.

4.7.1.2 Shear strength. The quantity of adhesive remaining after removal of the shelf life sample shall be used as a test specimen. The following number and size of test panels shall be prepared from material conforming to the material specifications as shown in table III.

4.7.1.2.1 Preparation of specimens. The metal test panels prepared according to 4.7.1.2 shall be cleaned by thoroughly degreasing in perchloroethylene vapors for 20 minutes after which they shall be removed and allowed to cool to room temperature. The metal and chipboard panels and the adhesive specimen shall then be conditioned at $23^{\circ} \pm 1^{\circ}\text{C}$ ($73.4 \pm 1.8^{\circ}\text{F}$) and 50 ± 4 percent relative humidity. Twenty terneplate, 20 tinplate and 20 zincplate panels each bonded to chipboard shall be prepared to form 1-inch lap-shear specimens. The specimens shall conform to figure 1 of ASTM D 1002 and shall be prepared by applying a thin (approximately 2 mil thickness of wet adhesive) uniform brush coat of adhesive to each of the mating surfaces and bonded immediately. A 200-gram weight shall be placed on each joint for 15 minutes and then removed.

MIL-A-45059C

Table II. Examination procedures and standards

Material	AQL Percent	Classification of defect	Defect	Method of inspection
Adhesive (see 3.4 and 4.5.1)	2.5	Major 101	Foreign matter	Visual
Container, open (see 4.5.1 and 5.1.1)	2.5	Major 102 Major 103	Improper type Improper fill	Visual Visual
Container, closed (see 4.5.1 and 5.1.1)	2.5	Major 104 Major 105	Leakage Improper closure	Visual Visual
Box, open (see 4.5.1 and 5.2.2)	2.5	Major 106 Major 107	Improper type Lack of, or improper strapping	Visual Visual
Box, closed (see 4.5.1 and 5.2.2)	2.5	Major 108 Major 109 Major 110	Gross weight, max Marking mis- leading or unidentifiable Improperly closed	Approved scale ^{1/} Visual Visual

^{1/}Approved by procuring agency.

Table III. Test Panels

Material	Number of panels	Thickness	Size		Specification
			Length	Width	
Tinplate	20	20-30 mils	4 inches	1 inch	MIL-T-10727
Zincplate	20	20-30 mils	4 inches	1 inch	QQ-S-775
Chipboard	60	1/8 inch	4 inches	1 inch	UU-C-282

MIL-A-45059C

4.7.2 Test procedures.

4.7.2.1 Shelf life. The specimen prepared in accordance with 4.7.1.1 shall be sealed tightly and shelf-aged at a temperature of $23 \pm 1^{\circ}\text{C}$ ($73.4^{\circ} \pm 1.8^{\circ}\text{F}$) for a period of 6 months. The adhesive shall then be thoroughly mixed and tested in accordance with 4.7.2.2. Adhesive conforming to all other requirements of this specification shall be considered satisfactory prior to the completion of this test provided the manufacturer furnished an affidavit to the procuring agency stating that the material has a minimum shelf life of 6 months when stored at $23 \pm 1^{\circ}\text{C}$ ($73.4^{\circ} \pm 1.8^{\circ}\text{F}$). Adhesive failing to conform to 3.2 after shelf aging shall be considered to have failed to meet the requirements of this specification.

4.7.2.2 Shear strength after one hour. Five of each type specimen prepared in accordance with 4.7.1.2.1 shall be tested in accordance with ASTM D1002 not less than 60 minutes nor more than 65 minutes after bonding.

4.7.2.3 Shear strength after one week. Forty-five specimens prepared in accordance with 4.7.1.2.1 shall be cured for 7 days at $23^{\circ} \pm 1^{\circ}\text{C}$ ($73.4^{\circ} \pm 1.8^{\circ}\text{F}$) before testing. Five of each type shall then be tested at $23^{\circ} \pm 1^{\circ}\text{C}$ ($73.4^{\circ} \pm 1.8^{\circ}\text{F}$). Five of each type shall be conditioned at $60^{\circ} \pm 2^{\circ}\text{C}$ ($140 \pm 3.6^{\circ}\text{F}$) for a minimum of one and one-half hours and shall be tested at $60^{\circ} \pm 2^{\circ}\text{C}$ ($140^{\circ} \pm 3.6^{\circ}\text{F}$). Five of each type shall be conditioned at $-40^{\circ} \pm 2^{\circ}\text{C}$ ($-40^{\circ} \pm 3.6^{\circ}\text{F}$) for a minimum of one and one-half hours and shall be tested at $-40^{\circ} \pm 2^{\circ}\text{C}$ ($-40^{\circ} \pm 3.6^{\circ}\text{F}$). Testing of all specimens shall be in accordance with ASTM D1002.

4.8 Rejection

4.8.1 Examination. Any nonconforming sample units shall be rejected and if the number of rejected units is greater than the acceptance number for the sample size, the lot shall be rejected.

4.8.2 Tests. A lot shall be rejected for failure to comply with the test requirements when tested in accordance with 4.7.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A or level C as specified (see 6.2).

5.1.1 Level A. Unless otherwise specified, adhesive shall be furnished in type V, class 2 containers of PPP-C-96, of capacity specified in contract or order. Closure of filled containers shall be in accordance with Appendix of PPP-C-96. Containers shall be packaged in accordance with the Appendix of PPP-C-96, when required by that appendix.

MIL-A-45059C

5.1.2 Level C. Adhesive shall be packaged in accordance with manufacturer's best commercial practice.

5.2 Packing. Packing shall be level A or level C as specified (see 6.2).

5.2.1 Level A. Adhesive, packaged as specified in 5.1.1, shall be packed in accordance with Appendix of PPP-C-96.

5.2.2 Level C. Packing shall be in accordance with commercial practice adequate to ensure acceptance and delivery by the carrier for the mode of transportation employed. Containers shall comply with carrier rules and regulations applicable to the mode of transportation.

5.3 Marking. In addition to any special marking (see 6.2) required by the contract or order, all interior and exterior containers shall be marked in accordance with MIL-STD-129, and Appendix to PPP-C-96. In addition, the following marking shall appear on each container:

- (a) Store in a cool place.
- (b) Keep from freezing.
- (c) Other requirements, or changes to existing requirements, if required.
- (d) Manufacturers instructions for use (To include thinning directions, if applicable; and shelf life, if greater than that specified in 3.2, or if less than that value when permitted (see 6.2)).

6. NOTES

6.1 Intended use. This adhesive is intended for use in bonding chipboard to terneplate, zincplate, and tinplate in the manufacture of ammunition fiber containers and similar applications where resistance to water, oil, mold, etc. are not requirements. The adhesive is intended primarily to provide a bond between chipboard and the metal between time of manufacture and loading of the ammunition into the fiber containers.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Selection of applicable levels of packaging and packing (see section 5.1 and 5.2).
- (c) Other requirements, or changes to existing requirements, if required.
- (d) Special marking (see 5.3).

6.3 Shear strength test technique. An insulated box is placed around the jaws of the testing machine with the specimens preconditioned and tested within this test chamber. The test temperature is attained by utilizing a "packaged air" unit which is thermostatically controlled. Dry ice is used to

MIL-A-45059C

attain low temperatures while electrically heated elements are used to furnish the heat for elevated temperatures. Other means of controlling the temperature may be used if they can be shown to be equivalent.

6.4 The formulation for the adhesives to meet the requirements of this specification is left to the discretion of the manufacturer.

Custodians:

Army - MR
Navy - AS
Air Force - 99

Preparing activity:

Army - MR

Review activity:

Army - AR

Project No. 8040-0421

(KBWP# ID-0265A/DISK 0108A. FOR AMMRC USE ONLY)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

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

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

(Fold along this line)

(Fold along this line)

DEPARTMENT OF THE ARMY



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 12062 WASHINGTON D. C.

POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE ARMY

Director
US Army Materials & Mechanics Research Center
ATTN: DRXMR-SMS
Watertown, MA 02172

