

January 6, 1966

## SUPERSEDING

Int. Fed. Spec. MMM-A-00131 (Army-MR)

March 22, 1965 and

MIL-A-14443A

October 17, 1961

## FEDERAL SPECIFICATION

# ADHESIVES: GLASS-TO-METAL (FOR BONDING OF OPTICAL ELEMENTS)

*This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.*

## 1. SCOPE AND CLASSIFICATION

**1.1 Scope.** This specification covers solvent-type, synthetic-resin adhesives in a two-part liquid form; and in dry film classes suitable for bonding glass to metal using heat and pressure.

**1.2 Classification.** Adhesives shall be of the following types and classes:

Type I—Liquid adhesive (composed of classes 1 and 2).

Class 1—Phenolic neoprene.

Class 2—Phenolic polyamide.

Type II—Dry film adhesive.

Class 1—Fiber glass carrier (see 4.5.1.1).

Class 2—Polyamide (nylon) carrier (see 4.5.1.1).

## 2. APPLICABLE SPECIFICATIONS AND STANDARDS

**2.1** The following specifications and standards of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

### *Federal Specifications:*

O-S-595—Sodium Dichromate, Technical Grade (Sodium Bichromate) Sodium Dichromate Dihydrate.

O-S-604—Sodium Metasilicate, Technical.

O-S-809—Sulfuric Acid, Technical.

QQ-A-250/4—Aluminum Alloy 2024, Plate and Sheet.

UU-T-101—Tape, Gummed; Mending and Reinforcing (Paper and Cloth).

CCC-T-191—Textile Test Methods.

PPP-B-585—Boxes, Wood, Wirebound.

PPP-B-591—Boxes, Fiberboard, Wood-Cleated.

PPP-B-601—Boxes, Wood, Cleated-Plywood.

PPP-B-636—Box, Fiberboard.

PPP-C-96—Cans, Metal, 28 Gage and Lighter.

PPP-T-60—Tape: Pressure-Sensitive Adhesive, Waterproof for Packaging.

PPP-T-66—Tape: Pressure-Sensitive Adhesive, Vinyl Plastic Film.

PPP-T-76—Tape, Pressure-Sensitive Adhesive Paper, (for Carton Sealing).

### *Federal Standards:*

Fed. Test Method Std. No. 141—Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing.

Fed. Test Method Std. No. 175—Adhesives: Methods of Testing.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly sup-

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plements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D.C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, and Seattle, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

#### *Military Specifications:*

MIL-G-174—Glass, Optical.

MIL-C-3955—Cans, Fiber, Spirally Wound.

MIL-L-10547—Liners, Case, and Sheet Overwrap; Water-Vaporproof or Waterproof, Flexible.

#### *Military Standards:*

MIL-STD-105—Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-129—Marking for Shipment and Storage.

MIL-STD-202—Test Method for Electronic and Electrical Component Parts.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

### 3. REQUIREMENTS

**3.1 Qualification.** The adhesive furnished under this specification shall be a product which has been tested, and passed the qualification tests specified herein, and has been listed on or approved for listing on the applicable Qualified Products List.

#### **3.2 Material.**

**3.2.1 Type I.** Type I liquid adhesive shall be of 2 parts and of thermosetting resins. The resins shall be class 1, phenolic neoprene; and class 2, phenolic polyamide.

**3.2.2 Type II.** Type II dry film adhesive shall consist of the adhesive materials specified in type I supported with a carrier. Class 1 carrier shall be of loosely-woven fiber-glass and class 2 carrier of polyamide fabric.

#### **3.3 Type II.**

**3.3.1 Width.** The width of type II film shall be as specified by the procuring agency (see 6.2).

#### **3.3.2 Thread counts of carrier for type II.**

**3.3.2.1 Class 1.** Class 1 carrier shall consist of warp and filling counts of 16 to 20 threads per inch of fiber glass (see 4.5.1.2).

**3.3.2.2 Class 2.** Class 2 carrier shall consist of warp filling counts of 60 to 72 threads per inch of polyamide (see 4.5.1.2).

**3.3.3 Thickness.** Thickness of dry films for classes 1 and 2 shall be 0.005 to 0.015 inch (see 4.5.1.3).

#### **3.4 Type I (classes 1 and 2).**

**3.4.1 Viscosity.** Type I, class 1 liquid adhesive shall have a viscosity of not more than 8 seconds; and type I, class 2 liquid adhesive shall have a viscosity of not more than 105 seconds, when tested as specified in 4.5.2.1.

**3.4.2 Solid content.** The solid content for type I, class 1 shall be  $8 \pm 2$  percent; and for type I, class 2 the solid content shall be  $30 \pm 3$  percent. Tests shall be as specified in 4.5.2.2.

#### **3.5 Types I and II.**

**3.5.1 Curing treatment.** The maximum bonding pressure during the curing shall be 30 pounds per square inch and the maximum temperature shall be 280°F. (137.8°C.).

**3.5.2 Bond strength.** The bond strength for adhesives, both types I and II, shall be as indicated in table I when tested as outlined in 4.5.3.

TABLE I. Bond strength for types I and II

Group	Temperature and relative humidity		Pounds per 1/2 sq. inch average value
	For conditioning	For testing	
1	24 hours at 73.4° ± 1.8°F. (23° ± 1°C.) and 50 ± 2 percent relative humidity.	73.4° ± 1.8°F. (23° ± 1°C.) and 50 ± 2 percent relative humidity.	600
2	10 days at 160° ± 2°F. (71.1° ± 1.1°C.) and 100 ± 2 percent relative humidity.	73.4° ± 1.8°F. (23° ± 1°C.) and 50 ± 2 percent relative humidity.	160
3	1 hour at 160° ± 2°F. (71.1° ± 1.1°C.).	160° ± 2°F. (71.1° ± 1.1°C.)	500
4	1 hour at -60° ± 2°F. (-51.1° ± 1.1°C.).	-60° ± 2°F. (-51.1° ± 1.1°C.)	900

**3.5.3 Shock resistance (types I and II).** The prisms shall not become detached or cracked when tested as specified in 4.5.4.

**3.5.4 Storage life.** Types I and II adhesive shall meet the bond strength requirements of this specification after storage as specified in 4.5.5. The storage period shall be as follows:

Type I—6 months from date of manufacture.

Type II—1 year from date of manufacture.

**3.5.5 Identification of product.** The manufacturer shall designate each adhesive by a code number which shall be used to identify the adhesive. A trade name, if accompanied by a code number, may also be used.

**3.5.6 Instruction sheet.** The manufacturer shall provide a dated instruction sheet with each shipment of the adhesive outlining instruction for use of the adhesive in

bonding glass to metal. The instruction sheet shall cover the following:

(a) Mixing instruction as to percentage of solvent, if necessary.

(b) Complete recommended application procedure, including surface cleaning and recommended film thickness range, spread method, spread rate, number of coats, and method of cleaning equipment.

(c) Air-drying time between each coat. If a force dry is required, the time and temperature shall be stated.

(d) Time required between coated parts and assembly and curing.

(e) Curing cycle, including recommended time, temperature, and pressure to accomplish the bond.

(f) Any pertinent information relative to the use and storage of the adhesive.

(g) In addition, the instructions shall contain the following statement: "CAUTION! Avoid skin contact and excess inhalation of material."

**3.5.7 Workmanship.** The adhesive furnished under this specification shall be homogeneous and free from any lumps or foreign material. The adhesives shall be manufactured by processes which shall assure compliance with the requirements of this specification.

## 4. SAMPLING, INSPECTION, AND TEST PROCEDURES

**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, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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.

### 4.2 Sampling.



**4.2.1 Lot.** A lot shall consist of either type I adhesive of one class or type II adhesive. The material shall be of the same batch or blending operations, subjected to the same processing operations and conditions, produced by one manufacturer and offered for delivery at one time.

**4.2.2 Sampling for inspection.** Unless otherwise specified in the contract or order, a random sample of filled containers shall

be selected for inspection in accordance with level I of MIL-STD-105.

**4.2.3 Sampling for tests.** Unless otherwise specified in the contract or order, samples for testing shall be selected from each batch or shipment in accordance with level S-1 of MIL-STD-105.

**4.3 Examination.** Sample units selected in accordance with 4.2.2 shall be examined for listed defects and at the acceptable quality level (AQL) shown in table II.

TABLE II. *Classification of defects*

Materials	AQL percent	Classification of defect	Defect	Method of inspection
		Critical	Not defined	
		Major		
Adhesive (see 3.5.7 and 4.2.2)  (See 3.2.1) ----- (See 3.3.1) ----- (See 1.2) -----	1.5	101	Not homogeneous	Visual
		102	Contains lumps	Visual
		103	Foreign matter	Visual
		104	Not in 2 parts (type I only)	Visual
		105	Wrong width (type II)	Measure
		106	Wrong type carrier (type II)	Visual
Unit container Type I (see 4.2.2 and 5.2.1.1.1)-----	1.5	107	Wrong type	Visual
		108	Wrong size	Visual
		109	Improper fill	Visual <sup>1</sup> and approved scale <sup>2</sup>
		110	Leakage	Visual
		111	Improper closure	Visual
Type II (see 4.2.2 and 5.2.1.1.2)-----	1.5	112	Layers not separated properly	Visual
		113	Wrong type cans or tubes	Visual
		114	Improper tape or taping	Visual
Box open (see 4.2.2 and 5.3)-----	1.5	115	Improper type	Visual
		116	Improper size	Visual
		117	Improper case liner (when required)	Visual
		118	Lack of, or improper strapping	Visual
Box closed (see 4.2.2 5.3, and 5.4)-----	1.5	119	Gross weight maximum	Approved scale <sup>2</sup>
		120	Marking improper or unidentifiable	Visual
		121	Improperly closed	Visual
		122	Missing or improper instruction sheet	Visual

<sup>1</sup>The fill of the containers shall be determined by comparison of the weight with the weight of a container filled with a minimum required quantity of adhesive.

<sup>2</sup>Approved by procuring activity.

**4.4 Classification of inspection.** The inspection and testing of adhesive shall be classified as follows:

- (a) Qualification inspection (see 4.4.1).
- (b) Acceptance inspection (see 4.4.2).

**4.4.1 Qualification inspection, types I and II.** Qualification inspection shall consist of all requirements of this specification.

**4.4.2 Acceptance inspection, types I and II.** Acceptance inspection shall consist of examination and the tests of 4.5.1.2 and 4.5.1.3 or 4.5.2.1 (as applicable) and the bond strength test of group 1 of 4.5.3.5.

## 4.5 Test procedures.

### 4.5.1 Type II.

**4.5.1.1 Material of woven carrier.** The material of which the woven carrier is made (see 1.2), shall be identified as follows:

Class 1—fiber glass by method 1410 of CCC-T-191.

Class 2—polyamide (nylon) by method 1530 of CCC-T-191.

**4.5.1.2 Thread count of carrier.** The thread count of the carrier shall be determined in accordance with method 5050 of CCC-T-191.

**4.5.1.3 Thickness of dry film.** The thickness of the dry film of type II adhesive shall be tested in accordance with method 5030 of CCC-T-191.

### 4.5.2 Type I.

**4.5.2.1 Viscosity.** The viscosity of type I, classes 1 and 2 adhesives shall be tested in accordance with method 4282 of Fed. Test Method Std. No. 141.

**4.5.2.2 Solid content.** The solid content of type I, classes 1 and 2 shall be tested in accordance with method 4021 of Fed. Test Method Std. No. 175.

### 4.5.3 Bond strength.

**4.5.3.1 Preparation of surfaces prior to bonding.** Panels for adherends shall be 1- by 4- by 0.64-inch and shall be of aluminum

to conform to QQ-A-250/4. The panels shall be degreased by immersion in toluene for 2 to 3 minutes, removed, and wiped. They shall then be alkaline cleaned by immersion for 5 minutes at 175°F. (79.4°C.) in a 3 percent solution consisting of 90 percent sodium metasilicate pentahydrate conforming to O-S-604, and 10 percent surfactant. The surfactant shall be a salt or an alkyl aryl sulphonate (see 6.4). Adherends shall be rinsed in running hot water, followed by a 5 minute pickle at 165°F. (73.9°C.) in a solution composed of 85 grams (g.) sodium dichromate conforming to O-S-595, and 454 grams concentrated sulfuric acid conforming to O-S-809, in two liters of water. The adherends shall be rinsed in running hot water and allowed to air-dry, before use. A glass microslide 1- by 1- by 0.040-inch shall be cleaned for 5 minutes at 145°F. (62.8°C.) in a cleaning solution composed of 20 g. sodium dichromate to which shall be added enough water to make a thick paste, then followed by the addition of 300 milliliters (ml.) of concentrated sulfuric acid. The glass shall be rinsed in running hot water, followed by a rinse in hot distilled water, and air-dried.

**4.5.3.2 Application of adhesive, type I, classes 1 and 2.** Class 1 adhesive shall be applied by spraying to one side of the aluminum adherends to cover an area of 1 square inch at one end of the specimen and allowed to dry for at least 3 minutes. The thickness of the coating shall be not more than 0.001 inch, as indicated by micrometer or other suitable instrument for thickness measuring. The application of succeeding coatings and drying periods shall be continued until approximately 0.008 inch thick film has been deposited. Air-dry for 30 minutes after the final coating to allow release of all the solvent, then oven dry for 1 hour at 210°F. (98.9°C.). On returning to room temperature, adhesive class 2 shall be applied by spraying over the former coating. The thickness of the adhesive coating shall be not more than 0.001 inch.

Permit to dry for at least 8 minutes. Sufficient number of coats shall be applied to give a dried film thickness of approximately 0.002 inch. Air-dry for 30 minutes after the final coating, then oven dry for 3 minutes at 210° F. (98.9°C.). Allow the parts to cool to room temperature before assembly.

A glass microslide shall be scribed with a glasscutter at 1 inch from one end, prior to the application of adhesive. A masking tape shall be applied to both sides of the microslide so that one edge of the tape just covers the scribed line.

The adhesive classes 1 and 2 shall be applied to both sides on one end of the glass microslide in the same manner as that described for the aluminum adherends.

**4.5.3.3 Assembly of type I specimens.** The adhesive coated areas are to be assembled as shown in figure 1 with the glass forming a bond of one square inch to one aluminum adherend and one half square inch to the other aluminum adherend. The specimen shall be wrapped with cellophane tape conforming to UU-T-101, type II, one inch wide. The glass microslide shall be tapped to cause fracture of the glass at the scribed line. Ten such assembled specimens shall be placed side by side on a steel plate. The steel plate with the specimen shall be placed in a press having platens preheated at 275° F. (135°C.). A pressure of  $25 \pm 5$  p.s.i. shall be applied and maintained throughout the curing time of 1 hour. The curing time begins when temperature of the specimens reaches 275°F. (135°C.). An apron shall be placed around the platens of the press to prevent drafts from cooling the specimens during the curing treatment. After the required cure, the pressure shall be released, specimens removed with the steel plate and allowed to cool to room temperature. The specimens shall be stripped of their cellophane tape and conditioned at

room temperature for 24 hours prior to testing.

**4.5.3.4 Assembly of type II specimens.** The aluminum adherend and the glass microslides shall be sprayed with adhesive type I in a manner similar to that described in 4.5.3.2, except that the dried adhesive film shall be only 0.001 inch thick. The final coating shall be air-dried for 30 minutes followed by oven drying 1 hour at 180° F. (82.2°C.).

Lap shear tensile specimens shall be prepared as shown in figure 2 with type II adhesive sandwiched between coated aluminum adherends and glass microslide. The specimen shall be wrapped with cellophane tape conforming to UU-T-101, type II, one inch wide. The glass microslide shall be tapped to cause fracture of the glass at the scribed line. Ten such assembled specimens shall be placed side by side on a steel plate. The steel plate with the specimen shall be placed in a press having platens preheated to 275°F. (135°C.). A pressure of  $25 \pm 5$  p.s.i. shall be applied and maintained through the curing time of one hour. The curing time begins when temperature of the specimens reaches 275°F. (135°C.). An apron shall be placed around the platens of the press to prevent drafts from cooling the specimens during the curing temperature. After the required cure, the pressure shall be released, specimens removed with the steel plate and allowed to cool to room temperature. The specimens shall be stripped of their cellophane tape and conditioned at room temperature for 24 hours prior to testing.

**4.5.3.5 Conditioning and testing of specimens.** The prepared lap shear specimens shall be divided into 4 groups of 10 specimens each and each group shall be conditioned and tested in accordance with the atmospheric conditions of table III.



TABLE III. *Atmospheric conditions for testing*

Group	Temperature and relative humidity	
	For conditioning	For testing
1	24 hours at $73.4^{\circ} \pm 1.8^{\circ}\text{F.}$ ( $23^{\circ} \pm 1^{\circ}\text{C.}$ ) at $50 \pm 2$ percent R. H.	$73.4^{\circ} \pm 1.8^{\circ}\text{F.}$ ( $23^{\circ} \pm 1^{\circ}\text{C.}$ ) at $50 \pm 2$ percent R. H.
2	10 days at $160^{\circ} \pm 2^{\circ}\text{F.}$ ( $71.1^{\circ} \pm 1.1^{\circ}\text{C.}$ ) and 100 $\pm 2$ percent R. H.	$73.4^{\circ} \pm 1.8^{\circ}\text{F.}$ ( $23^{\circ} \pm 1^{\circ}\text{C.}$ ) at $50 \pm 2$ percent R. H.
3	1 hour at $160^{\circ} \pm 2^{\circ}\text{F.}$ ( $71.1^{\circ} \pm 1.1^{\circ}\text{C.}$ )	$160^{\circ} \pm 2^{\circ}\text{F.}$ ( $71.1^{\circ} \pm 1.1^{\circ}\text{C.}$ )
4	1 hour at $-60^{\circ} \pm 2^{\circ}\text{F.}$ ( $-51.1^{\circ} \pm 1.1^{\circ}\text{C.}$ )	$-60^{\circ} \pm 2^{\circ}\text{F.}$ ( $-51.1^{\circ} \pm 1.1^{\circ}\text{C.}$ )

**4.5.3.5.1 Testing machine.** For testing specimens, an apparatus outlined in method 1011 of Fed. Test Method Std. No. 175 shall be used. All specimens shall be pulled at a jaw separation rate of 0.05 inch per minute. The testing machine shall be equipped with a suitable housing to provide testing of specimens at low and elevated temperatures.

#### 4.5.4 Shock resistance (types I and II).

**4.5.4.1 Prism specimens.** The specimen shall consist of a right angle optical prism (glass, type 541-599 of MIL-G-174, 2- by 2- by 2-inches and bonded to an aluminum plate, 3- by 3- by 0.25-inch, of commercial aluminum alloy 2024 or 7075).

**4.5.4.2 Preparation of surfaces prior to bonding.** The aluminum plate shall be prepared in the same manner as described for the aluminum adherends of the lap shear tensile specimens; namely, they shall be solvent degreased, alkaline cleaned and pickled, rinsed, and air-dried. The glass prism shall be cleaned in the same manner as the microslides described for the lap shear tensile specimens, except that the temperature of the cleaning solution shall be  $120^{\circ}\text{F.}$  ( $48.9^{\circ}\text{C.}$ ) rather than  $145^{\circ}\text{F.}$  ( $62.8^{\circ}\text{C.}$ ). This shall be done to eliminate cracking the glass by thermal shock.

**4.5.4.3 Assembly.** The adhesive shall be applied as outlined in 4.5.3.2. The assemblies shall be held together by means of cellophane tape conforming to UU-T-101, type II, and placed on a steel plate and covered with chipboard. A pressure of 25 pounds  $\pm 5$  pounds shall be applied to the assembly and the heating control set at  $275^{\circ} \pm 5^{\circ}\text{F.}$  ( $135^{\circ} \pm 2.8^{\circ}\text{C.}$ ). The assembly shall be kept under pressure for 1 hour at this temperature and then permitted to remain under pressure while the temperature is slowly reduced to room temperature (approximately  $30^{\circ}\text{F.}$  ( $16.6^{\circ}\text{C.}$ ) per hour). Five prism assemblies are required.

**4.5.4.4 Testing.** The prism assemblies shall be shock tested at  $-45^{\circ} \pm 2^{\circ}\text{F.}$  ( $-42.8^{\circ} \pm 1.1^{\circ}\text{C.}$ ) in the vertical and horizontal planes in accordance with method 202A of MIL-STD-202. The specimens shall be refrigerated by placing them in a cold box at room temperature, allowing the temperature to drop to  $-60^{\circ} \pm 2^{\circ}\text{F.}$  ( $-51.1^{\circ} \pm 1.1^{\circ}\text{C.}$ ) and maintaining that temperature for 2 hours. The specimens shall then be removed from the cold box and mounted on a fixture of the shock test machine and then shock tested. This must be done expeditiously so that the temperature of the assembly does not increase above  $-45^{\circ}\text{F.}$  ( $-42.8^{\circ}\text{C.}$ ). The test shall consist of raising the fixture with the specimen to the appropriate heights and dropping it (free fall) onto an anvil. The shock-test testing machine shall have a spring constant of 3.3 by 105 pounds per inch and a time duration of shock impulse of  $1.00 \pm 0.25$  milliseconds. The mounted prism shall first be shock tested at 250 g. and the shock test increased at increments of 50 g. until the 500 g. has been reached. One shock test shall be made at each interval.

**4.5.5 Storage life.** Two cans of adhesive of the type offered for inspection shall be stored at a temperature of  $73.4^{\circ} \pm 2^{\circ}\text{F.}$  ( $23^{\circ} \pm 1.1^{\circ}\text{C.}$ ). At the end of the storage period (see 3.5.4), the adhesive shall be

resubmitted for tests in accordance with 4.5.3.

## 5. PREPARATION FOR DELIVERY

**5.1 Application.** The packaging, packing, and marking requirements specified herein apply only to direct purchases by or direct shipments to the Government.

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

### 5.2.1 Level A.

**5.2.1.1 Unit packaging.** Unless otherwise specified, the adhesives shall be packaged as follows:

**5.2.1.1.1 Type I.** Type I liquid adhesive shall be furnished in 1 pint or 1 quart containers as specified (see 6.2). The containers shall conform to type V, class 2 of PPP-C-96.

**5.2.1.1.2 Type II.** Type II dry film adhesives shall be furnished in rolls with each layer separated by a nonblocking film backing. The rolls shall be enclosed in suitable commercial metal cans, or specification fiberboard tubes as specified in 5.2.1.1.2.1 or 5.2.1.1.2.2, as applicable.

**5.2.1.1.2.1 Rolls less than 3 inches wide.** Rolls less than 3 inches wide shall be packaged in water resistant metal containers slightly larger in diameter than the outside diameter of the roll and of a 2-piece design. The top section of the container shall fit the bottom section with a snug friction fit. Each unit container shall be sealed with one complete wrap of pressure sensitive tape conforming to PPP-T-66, type I or PPP-T-60, type I or II, class 2 or 3.

**5.2.1.1.2.2 Rolls 3 inches wide or over.** Rolls 3 inches wide or over shall be packaged in fiberboard tubes conforming to MIL-C-3955, type II, grade B, style b, class as required. Each unit container shall be sealed with one complete wrap of pressure sensitive tape conforming to PPP-T-66, type I, or PPP-T-60, type I or II, class 2 or 3.

**5.2.2 Level C.** Adhesive in the capacity of container specified (see 6.2), shall be packaged in accordance with the supplier's standard commercial practice. Protection shall be such as to prevent deterioration during shipment and ensure safe delivery at destination.

**5.3 Packing.** Packing shall be level A, B, or C as specified (see 6.2).

**5.3.1 Level A.** Unless otherwise specified by the procuring activity, material packaged as specified in 5.2, shall be packed in exterior type fiberboard; wirebound-wood; fiberboard, wood-cleated or wood, cleated-plywood boxes conforming to PPP-B-636, class weather resistant; PPP-B-585, class 3; PPP-B-591 overseas type; or PPP-B-601, overseas type. The gross weight of wood-cleated boxes shall not exceed 200 pounds and of fiberboard boxes, the limitations of the box specification. Unless otherwise specified, each shipping container shall be provided with a sealed case liner conforming to type I or II, grade B or C, class 2, of MIL-L-10547. Boxes conforming to PPP-B-636 will not require case liners when all seams, including the manufacturer's joint, are sealed with tape (minimum 3 inches wide) conforming to PPP-T-76. As far as practical, containers shall be of uniform shape and size, be of a minimum cube and tare consistent with the protection required and contain identical quantities. Containers shall be closed and strapped in accordance with applicable container specification or appendix thereto.

**5.3.2 Level B.** Material, packaged as specified in 5.2.1, shall be packed in domestic type specification type containers listed in 5.3.1. Case liners will not be required. Weight limitations for wood-cleated and wirebound containers shall not exceed 200 pounds. The weight limitation of the domestic type fiberboard containers shall be as specified within the limitation of the box specification. As far as practical, containers shall be of uniform shape and size, be



of a minimum cube and tare consistent with the protection required and contain identical quantities. Closure of the boxes shall be as required by the appendix of the specification for domestic or level B packing.

**5.3.3 Level C.** The adhesive shall be packed for shipment in compliance with common carrier regulations applicable to that mode of transportation to ensure safe delivery at destination at lowest transportation costs without assessment of penalty charges for improper packing.

#### 5.4 Marking and labeling.

**5.4.1 Packages.** Each unit package shall be marked in accordance with MIL-STD-129. In addition the marking shall contain the following information:

- (a) Type and class.
- (b) Contract number.
- (c) Manufacturer's code destination.
- (d) Batch or lot number.
- (e) Name of contractor (if different from manufacturer).
- (f) Precautionary markings.
- (g) Instructions for use.
- (h) Date of manufacture.
- (i) Date by which adhesive should be used.

**5.4.2 Shipping containers.** Each shipping container shall be marked in accordance with requirements of MIL-STD-129.

**5.4.3** A copy of the manufacturer's instructions shall be inclosed with or attached to each container of adhesive as specified (see 3.5.6).

#### 6. NOTES

**6.1 Intended use.** The adhesives covered by this specification are intended for bonding glass to metal. The materials for bonding include glass prisms and other optical glass elements to metal supports in optical fire control instruments.

**6.2 Ordering data.** Purchasers should exercise any desired options offered herein and procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type and class of adhesive (see 1.2).
- (c) Width of film if type II (see 3.3.1).
- (d) Quantity desired.
- (e) Capacity of containers (see 5.2).
- (f) Selection of level of preservation, packaging, and packing (see section 5).
- (g) Whether case liners are required (see 5.3.1).

**6.2.1 Unit of purchase.** The unit of purchase to be a U. S. pint or U. S. quart at 60°F.

**6.3** With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is Frankford Arsenal, Philadelphia, Pa., 19137, and information pertaining to qualification of products may be obtained from that activity.

**6.4** Sodium alkyl aryl sulfonate (Nacconal-NR) is manufactured by the National Aniline and Chemical Co., New York, N. Y.

#### MILITARY CUSTODIANS:

Army—MR  
Navy—YD  
Air Force—11

#### Review:

MR, MD, MO, 11, 69

#### User:

YD

#### Preparing Activity:

Army—MR

Review/User information is current as of the date of this document: draft circulation should be based on the information in the current DOD Standardization Documents.

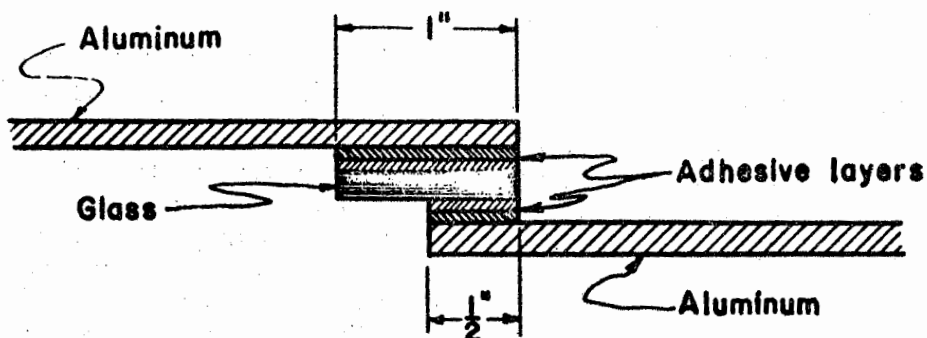


FIGURE 1. Assembly of type I specimens

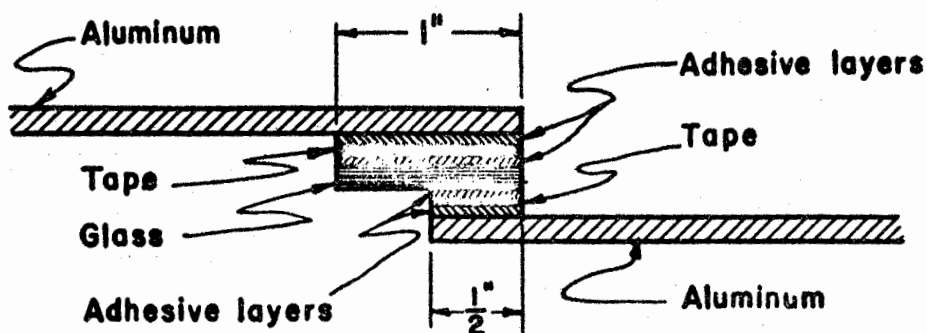


FIGURE 2. Assembly of type II specimens

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