

MMM-A-180C
August 6, 1979
SUPERSEDING
Fed. Spec. MMM-A-180b
April 26, 1968, and
Fed. Spec. MMM-A-193c
October 26, 1967

FEDERAL SPECIFICATION

ADHESIVE, POLYVINYL ACETATE EMULSION

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 two types of polyvinyl acetate emulsion adhesives.

1.2 Classification. These adhesives shall be of the following types:

Class A - General purpose adhesive.

Class B - Wood adhesive.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or requests for proposal, form a part of this specification to the extent specified herein:

Federal Specifications:

PPP-B-636 - Boxes, Shipping, Fiberboard.
PPP-C-96 - Cans, Metal, 28 Gage and Lighter.

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single Copies of this specification, other Federal specifications, and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston; New York; Philadelphia; Washington, DC; Atlanta; Chicago; Kansas City, MO; Fort Worth; Houston; Denver; San Francisco; Los Angeles; and Seattle, WA.

(Federal Government activities may obtain copies of Federal specifications, standards,

and commercial item descriptions, and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies.)

Military Standard:

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

(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.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or requests for proposal shall apply.

American Society For Testing and Materials (ASTM) Standards:

- D 903 - Peel and Stripping Strength of Adhesive Bond.
- D 905 - Strength Properties of Adhesives Bonds in Shear by Compression.
- D 906 - Strength Properties of Adhesives in Plywood Type Construction in Shear by Tension Loading.
- D 1084 - Viscosity of Adhesives.
- D 1583 - Hydrogen Ion Concentration of Dry Adhesive Film.
- D 1951 - Ash in Drying Oils and Fatty Acids.
- D 1475 - Density of Paint, Varnish, Lacquer, and Related Products.

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

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Quantitative requirements. When tested as specified in 4.3, the adhesive shall meet the quantitative requirements in table I.

TABLE I. Quantitative requirements

Characteristic	Specified values			
	Class A		Class B	
	Minimum	Maximum	Minimum	Maximum
Weight per gallon, lbs	9.0	---	9.0	---
Nonvolatile content, percent	44.0	---	44.0	---
Ash, percent by wgt of adhesive	---	0.50	---	0.50
pH	4.0	6.0	4.0	6.0
Viscosity, centipoises				
as received	2000	6000	2000	6000
after 5 freeze-thaw	1500	7000	1500	7000
Peel strength lbs. per inch width				
as received	15	---	15	---
after 5 freeze-thaw cycles	15	---	15	---
Compression shear strength, psi				
Hardwood				
As received	2500	---	2900	---
After 5 freeze-thaw cycles	2500	---	2900	---
Plywood				
As received	700	---	700	---
After 5 freeze-thaw cycles	700	---	700	---
Lap shear, tension, plywood, psi				
At standard temperature	650	---	900	---
At 71 deg. C	100	---	175	---
After moisture exposure	300	---	300	---

3.2 Qualitative requirements.

3.2.1 Condition in container The adhesives in a freshly opened container shall be smooth, uniform, and free from lumps, skins, and foreign matter when tested as specified in table II.

3.2.2 Working properties. The adhesives shall flow and spread evenly and smoothly when applied by brushing, roller coating, or dipping. The dried film shall show no lap marks, gloss variation, or obvious brush strokes.

3.2.3 Alkali dispersibility (class A only) When tested as specified in 4.3.9.3, a dried film of the class A adhesive shall be soluble in an alkaline deinking solution.

3.2.4 Flexibility. When tested as specified in 4.3.9.4, the product shall not crack, flake, or chip.

3.3 Package sizes. The adhesive shall be supplied in 4-ounce, 8-ounce, 1-pint, 1-quart, 1-gallon, 5-gallon, and 55-gallon quantities.

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.

4.2 Sampling and inspections.

4.2.1 Lot. The containers of adhesive shall be assembled into lots as specified in MIL-STD-105.

4.2.2 Examination of preparation for delivery. An examination shall be made to determine compliance with the requirements of section 5. The sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with MIL-STD-105. The inspection level shall be S-2 with an acceptable quality level (AQL) of 4.0 expressed in terms of percent defective.

4.2.3 Sampling for tests. For purposes of sampling the lots shall be expressed in gallons. A random sample of the lot offered for delivery shall be selected in accordance with MIL-STD-105 at inspection level I and an AQL equaling 2.5 percent defective.

4.3 Test methods. All tests shall be conducted in accordance with the methods specified in table II to determine compliance with the requirements of section 3. Unless otherwise specified, all tests shall be conducted at standard conditions which are 25 deg. - 1 deg. C and a relative humidity of 50 +/- 5 percent. All test reports shall contain the individual values utilized in expressing the final result. The test results shall be evaluated for compliance and with the applicable requirement in section 3. Failure to pass any test, or noncompliance with any requirement, shall be cause for rejection of the sample.

TABLE II. Index of test

Characteristics	Applicable Test Methods		
	Required reference	ASTM method	Paragraph reference
Classes A & B			
Weight per gallon	TABLE I	D 1475	4.3.1
Nonvolatile content	TABLE I	----	4.3.2
Ash	TABLE I	D 1951	-----
ph	TABLE I	D 1583	4.3.3
Viscosity	TABLE I	D 1084[1]	4.3.5
Peel strength	TABLE I	D 903	4.3.6
Compression shear strength	TABLE I	D 905	4.3.7
Lap shear tension	TABLE I	D 906	4.3.8
Condition in container	3.2.1	----	4.3.9.1
Working properties	3.2.2	----	4.3.9.2

Alkali dispersibility	3.2.3	----	4.3.9.3
Flexibility	3.2.4	----	4.3.9.4

[1] Method B of D 1084

4.3.1 Weight per gallon. The weight per gallon shall be determined as specified in ASTM D 1475.

4.3.2 Nonvolatile content.

4.3.2.1 Test sample. Five grams of sample in the as-received condition shall be stirred by transferring from original container and returning to original container by hand until thoroughly mixed.

4.3.2.2 Apparatus. The apparatus shall consist of an oven set at 105 deg. \pm 3 deg. C (221 deg. \pm 5 deg. F), an analytical balance, a shallow weighing pan, and a desiccator.

4.3.2.3 Procedure. The test specimen shall be weighed accurately into an open, shallow weighing pan, the initial weight recorded and the sample placed in the heated oven. The sample shall be heated in the oven until constant weight is obtained. The sample shall be cooled to standard conditions in a desiccator before each weighing. Run the test in duplicate and report the average result.

4.3.3 pH value. The pH shall be determined as specified in ASTM D 1583.

4.3.4 Freeze-thaw stability. One pint of the adhesive shall be placed in a suitable container and stored at a temperature of -29 deg. \pm 2 deg. C (-20 deg. \pm 4 deg. F) for 18 hours. The sample shall be restored to a temperature of 23 deg. \pm 1 deg. C (73 \pm 2 deg. F), without stirring. The sample shall then be subjected to four additional freeze-thaw cycles. Following these cycles, the adhesive shall be tested to meet the applicable requirements of table I. The test shall be performed in accordance to 4.3.5, 4.3.6, 4.3.7, and 4.3.8.

4.3.5 Viscosity. The viscosity of the adhesives shall be determined as specified in ASTM D 1084, method B, using model RVF with No. 2 spindle at 4 r.p.m.

4.3.6 Peel strength. The peel strength of the adhesives shall be determined as specified in ASTM D 903, using cotton duck as the adherent of the size specified in this method.

4.3.7 Shear strength (compression). The shear strength of the adhesive bond by compression loading shall be determined on hard maple blocks in accordance with ASTM D 905. In addition this test shall also be performed using plywood as called out in ASTM D 906, with the exception that the plywoods thickness shall be 3/4 inch rather than 1/16 inch.

4.3.8 Plywood shear test (tension). The shear strength of the adhesive bond on plywood shall be determined in accordance with ASTM D 906. In addition to the conditions called out in D 906, the test shall be performed at 71 deg. \pm 3 deg. C (160 deg. \pm 5 deg. F), and after moisture exposure.

4.3.8.1 Shear strength at 71 deg. \pm 3 deg. C (160 deg. \pm 5 deg. F). The jaws of the testing apparatus shall be enclosed in a chamber maintaining an air temperature of 71 deg. \pm 3 deg. C (160 deg. \pm 5 deg. F). Each specimen shall be kept unloaded in the

chamber at this temperature for 30 +/- 2 minutes and then rapidly placed in the jaws of the machine and tested at the same temperature.

4.3.8.2 Shear strength after moisture exposure. Specimens shall be exposed for 1 week at 23 deg. +/- 1 deg. C (73 deg. +/- 2 deg. F) and 90 percent relative humidity. In this exposure, the specimens shall be placed so as to permit good air circulation between them. Following the exposure period, the specimens shall be removed individually from the exposure chamber and tested immediately at standard conditions with precautions being taken to avoid any change in moisture content.

4.3.9 Qualitative Properties.

4.3.9.1 Condition in container. Examine the adhesive for skinning, thickening, ingredient separation and foreign matter by flowing some material onto a glass panel. Evaluate for compliance with 3.2.1.

4.3.9.2 Working properties. Apply a coat of the adhesive to a clean 1 foot square panel of cold-rolled steel or aluminum. Note whether the material brushes easily and has good flowing and spreading qualities, and evaluate for compliance with 3.2.2.

4.3.9.3 Alkali dispersibility. Cast a film of the adhesive on a glass slide and allow to dry at room temperature for 24 hours. Partially immerse the coated glass slide in a beaker of deinking solution of the following composition and heat to boiling:

Deinking Solution

Caustic soda -----	0.40 grams
Sodium carbonate (soda ash) -----	0.20 grams
Tetrasodium pyrophosphate (TSPP) -----	0.50 grams
Water to make 100 ml	

The adhesive shall completely disperse in the above solution to pass this test.

4.3.9.4 Flexibility. Apply a uniform coating of the adhesive to a freshly sandblasted 28-30 gauge steel panel measuring 2.75 by 5.87 inches. Use the manufacturer's recommendations for thickness and drying of the adhesives. Condition the dried adhesive at standard conditions for 30 minutes; then place the panel with the adhesive side up, on a 1/8-inch diameter mandrel and bend the panel 180 deg. in about one second. Evaluate for compliance with 3.2.4.

5. PREPARATION FOR DELIVERY

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

5.1.1 Level A. Class A adhesive shall be furnished in 4-ounce, 8-ounce, 1-pint, 1-quart, 1-gallon, 5-gallon or 55-gallon quantities, as specified (see 6.2). Class B adhesive shall be furnished in 1-pint, 1-quart, 1-gallon, and 5-gallon quantities, as specified (see 6.2). The 4-ounce and 8-ounce quantities shall be packaged in a plastic squeeze bottle having an extended spout applicator with snap-on closure. The 1-pint, 1-quart, and 1-gallon quantities shall be packaged in metal cans conforming to PPP-C-96, type V, class 2. Exterior Plan B coating shall be required. Twenty-four 4-ounce or twelve 8-ounce plastic bottles shall then be packaged in a snug fitting fiberboard box conforming to

PPP-B-636, class domestic. Each box shall be fitted with full height partitions to separate the bottles.

See paragraph 5.2.1 for the preparation for delivery of 5-gallon and 55-gallon quantities.

5.1.2 Commercial. The 4-ounce, 8-ounce, 1-pint, 1-quart, and 1-gallon quantities of adhesive shall be packaged in accordance with normal commercial practice. The complete package shall be designed to protect the adhesive against damage during shipment, handling, and storage.

See paragraph 5.2.1 for the preparation for delivery of 5-gallon and 55-gallon quantities.

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

5.2.1 Level A. Four intermediate boxes of 4-ounce or 8-ounce plastic bottles, or forty-eight 1-pint cans, or twelve 1-quart cans, or four 1-gallon cans of adhesive packaged as specified in 5.1.1, shall be packed in a close fitting box conforming to PPP-B-636, grades V3c V3s, or V2s. The boxes shall be closed, waterproofed, and reinforced in accordance with the appendix of PPP-B-636. Alternatively, wirebound, cleated plywood, or nailed wood boxes shall be acceptable shipping containers when lined with a waterproof barrier material. The barrier material shall be sealed at the edges with waterproof tape or adhesive. The 5-gallon quantities and 55-gallon quantities of adhesive shall be furnished in metal cans and metal drums, respectively, conforming to item 260 of the National Motor Freight Classification and rule 40 of the Uniform Freight Classification.

5.2.2 Commercial. The adhesive shall be packed in a manner that will assure acceptance by common carrier and provide product protection against loss and damage during multiple shipments, handling, and storage. The shipping container shall be in compliance with the National Motor Freight Classification and Uniform Freight Classification.

5.3 Marking. Marking shall be as specified in the contract or order.

6. NOTES

6.1 Intended use. The class A polyvinyl acetate adhesive is for bonding leather to such materials as metal, wood, cloth, paper, etc., and for a general bookbinding adhesive for hand operations. The class B polyvinyl acetate adhesive is for assembly gluing of wood items which are placed or stored in normal indoor temperature service conditions where the relative humidity is not high and does not fluctuate between wide limits. This adhesive is intended for such joints as dowel, mortise-tenon, lock, and finger in the assembly wood furniture. It is also considered suitable for use in fabricating small wood patterns and models. This adhesive is not considered suitable for edge-gluing and laminating for furniture parts.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Size and type of container required (see 5.1).
- (c) Selection of the applicable levels of packaging and packing (see 5.1 and 5.2).
- (d) Marking if required (see 5.3).

6.3 Class A of this specification supersedes MMM-A-180b, dated April 26, 1968, and class B of this specification supersedes MMM-A-193C dated October 26, 1967.

MILITARY INTEREST:

CIVIL AGENCY COORDINATING ACTIVITIES:

COORDINATING ACTIVITY

GPO

COMMERCE-NBS

Army - MR

Custodians:

Preparing Activity:

Army - MR

GSA-FSS

Navy - AS

Air Force - 99

REVIEW ACTIVITIES

Army - AR, EL, MI

USER ACTIVITIES

Army - AT, EA

Navy - YD

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein.