

MMM-A-125D
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SUPERSEDING
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FEDERAL SPECIFICATION

ADHESIVE, CASEIN-TYPE, WATER AND MOLD RESISTANT

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 casein types of adhesives for adhering wood surfaces (see 6.1).

1.2 Classification. The adhesives shall be of the following types, as specified (see 6.2):

Type I - Water resistant.
Type II - Water and mold resistant.

2. APPLICABLE DOCUMENTS

2.1 Government publications. The following documents, 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 Specification:

PPP-C-96 - Cans, Metal, 28 Gage and Lighter.
PPP-D-723 - Drums, Fiber.
PPP-D-729 - Drums, Metal, 55-Gallon (for Shipment of Non-corrosive Material).

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

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Federal Standards:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civilian Agencies).

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions 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 and 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, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.)

(Federal Government activities may obtain copies of Federal Standardization documents and the Index of Federal Specifications Standards and Commercial Item Descriptions from established distribution points in their agencies.)

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
 MIL-STD-129 - Marking for Shipment and Storage.
 MIL-STD-147 - Pelletized Unit Loads
 NN-P-71 - Pallets, Material Handling Wood Stringer Construction 2-way
 and 4-way (partial)

(Copies of Military Specifications and Standards required by suppliers 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 document(s) 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)

D 905 - Strength Properties of Adhesive Bonds in Shear by Compression Loading.
 D 906 - Strength Properties of Adhesives in Plywood Type Construction in Shear by Tension Loading.
 D 3951 - Commercial Packaging

(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.)

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3. REQUIREMENTS

3.1 Material. The adhesive shall be in the form of a dry, uncaked powder and in such condition that it can be mixed with water.

3.2 Instructions for use. The supplier shall provide complete instructions for use of the adhesive. The instructions shall be placed on the outside of all unit containers by stencil, lithograph, or by a securely affixed label or instruction sheet and shall include the following:

- (a) Proportion of water and powder recommended to produce an adhesive that shall meet all the requirements of this specification.
- (b) Surface preparation.
- (c) Complete instructions as to the application of the adhesive.
- (d) Any other pertinent information relative to the preparation, use or storage of the powder or the adhesive.

3.3 Plywood shear tests.

3.3.1 Dry shear. The adhesive applied 1 hour and 4 hours after mixing shall produce specimens capable of withstanding an average test of 340 pounds per square inch when tested on dry plywood specimens in accordance with 4.5.1.1.

3.3.2 Wet shear (water-resistance). The adhesive 1 hour and 4 hours after mixing shall withstand an average test of 140 pounds per square inch when tested on plywood specimens in accordance with 4.5.1.2.

3.4 Block shear test. The adhesive shall withstand an average block shear test on maple blocks of 2800 pounds per square inch when tested in accordance with 4.5.2.

3.5 Working life. The adhesive shall have a working life at 73.4 deg. +/- 2 deg. F (23 deg. +/- 1.1 deg. C) of at least 5 hours, when tested in accordance with 4.5.3.

3.6 Setting properties. Type I adhesive shall set to a firm jelly within 24 hours. Type II adhesive shall set to a firm jelly within 48 hours. Tests shall be made as specified in 4.5.4.

3.7 Mold resistance (applicable to type II only). The adhesive shall withstand an average test of 140 pounds per square inch when tested on plywood shear specimens that have been exposed to mold cultures, in accordance with 4.5.5.

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3.8 Workmanship. The adhesive shall be homogeneous and free from foreign matter.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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.

4.2 Lot. A lot shall consist of material of one type from the same batch or blending operation, subjected to the same processing operations and conditions, and produced by one manufacturer and offered for delivery at one time.

4.3 Sampling.

4.3.1 Sampling for visual examination. A random sample of unit containers shall be selected from each lot in accordance with MIL-STD-105 at inspection level I, to verify compliance with all requirements of this specification not covered by tests (see 4.4). The unit of product shall be one container (see 5.2).

4.3.2 Sampling for tests. Sixteen ounces (avoirdupois) of the adhesive which is representative of the lot shall be taken for tests. The sample shall be placed in an air-tight glass container and labeled to show the name of the material, manufacturer, plant, contract or purchase order number, lot number, and lot size. All acceptance tests shall be performed on this sample.

4.4 Examination.

4.4.1 Visual. Sample units selected in accordance with 4.3.1 shall be examined for the defects and at the acceptable quality level shown in table I.

4.4.2 Packaging, packing, and marking. Examination for packaging, packing, and marking shall be for the defects and at the acceptable quality level shown in table I.

TABLE 1. Classification of Defects

| Item | AQL percent | Classification of defects | Defects | Method of inspection |
|--|-------------|---------------------------|---|------------------------------|
| | | Critical | None defined | |
| Adhesive (see 3.1 and 3.8) | 2.5 | Major 101 | Not dry | Tactile and Visual |
| | | Major 102 | Not uncaked powder | Visual |
| | | Major 103 | Not homogeneous | Visual |
| | | Major 104 | Not free from foreign matter | Visual |
| Unit container (see 3.2 and 5.1.1 5.1.2 or 5.1.3 and 5.3) | 2.5 | Major 104 | Missing or improper instructions | Visual |
| | | Major 105 | Improper type | Visual |
| | | Major 106 | Improper size | Visual |
| | | Major 107 | Improper fill | Approved scale ^{1/} |
| | | Major 108 | Improper closure | Visual |
| | | Major 109 | Fiber drums with improper liner (if applicable) | Visual |
| | | Major 110 | Improper marking | Visual |
| Box open (see 5.2.1, 5.2.2 or 5.2.3, and 5.3 as applicable) | 2.5 | Major 111 | Improper size | Visual |
| | | Major 112 | Improper type | Visual |
| | | Major 113 | Lack of or improper strapping | Visual |
| Box closed (see 5.2.1, 5.2.2 or 5.2.3 and 5.3 as applicable) | 2.5 | Major 114 | Improperly closed | Visual |
| | | Major 115 | Gross weight, max. | Approved scale ^{1/} |
| | | Major 116 | Marking misleading or unidentifiable | Visual |

^{1/}Approved by the procuring agency

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4.5 Tests. Tests shall be performed upon the adhesive and water mixture in the proportion recommended by the supplier (see 3.2). All samples shall comply with the following tests:

4.5.1 Plywood shear test. The plywood shear tests shall be conducted in accordance with ASTM D 906 with the following modifications. The tests for both the dry plywood shear and wet plywood shear shall be made using the adhesive 1 hour \pm 5 minutes and 4 hours \pm 10 minutes after mixing. The panels shall be placed under pressure 5 to 10 minutes after applying the adhesive, the adhering pressure shall be 175 \pm 25 pounds per square inch, and the panels shall be held under pressure for at least 4 hours.

4.5.1.1 Dry shear. The plywood shall be tested in the dry condition in accordance with ASTM D 906 and 4.5.1 of this specification. Specimens shall be conditioned in accordance with ASTM D 906.

4.5.1.2 Wet shear. The plywood shall be tested in the wet condition in accordance with ASTM D 906 and 4.5.1 of this specification. The test specimens shall be immersed in distilled water for 48 \pm 2 hours and the strength test made immediately upon removal from the water. Test specimens from the same sample may be immersed in one container, but specimens from different samples shall be immersed in separate containers. The temperature of the water shall be maintained at 73.4 \pm 2 deg. F (23 \pm 1.1 deg. C).

4.5.2 Block shear test. The test block shall be conditioned and tested in accordance with ASTM D 905 with the following modifications. The test blocks shall be placed under pressure between 10 and 20 minutes after spreading the adhesive, the adhering pressure shall be 175 \pm 25 pounds per square inch, and the test blocks shall be held under pressure for at least four hours. Whenever a specimen fails at a load of less than 2,800 pounds per square inch and the failure occurs 50 percent or more in the wood, the specimen shall be disregarded in computing the average. In case the shearing strength of one or more specimens is 2,800 pounds per square inch or higher, and the variation among individual specimens is 10 percent or more (based on the strongest joint) the test shall be run again, provided the average is less than the required 2,800 pounds per square inch.

4.5.3 Working life. The approximate working life may be determined by observation of the change in spreading characteristics. The adhesive shall be considered to have reached the end of its working life when it can no longer be spread conveniently to produce a uniform film on the wood. For referee tests of working life, a sample of adhesive as prepared for use shall be tested, at 30 minute intervals from the time of mixing, in any suitable viscometer, calibrated in absolute units, in which the adhesive mixture shall be maintained at a temperature of 73.4 deg. \pm 2 deg. F (23 deg. \pm 1.1 deg. C). The adhesive shall be considered to have reached the end of its working life when it reaches a viscosity of 800 poises. The adhesive may be stirred at 15 minute intervals if necessary for a proper viscosity determination.

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4.5.4 Setting properties. A sample of adhesive as prepared for use shall be stored in a closed or covered glass or enameled container in a room where the temperature is 75 deg. +/- 5 deg. F (23.9 deg. +/- 2.8 deg. C) for the time specified in 3.6. The jelly shall be considered firm if on removal from the container, the jelly retains approximately the shape of the container.

4.5.5 Mold resistance (applicable to type II). At least 30 dry specimens with at least 3 from each panel shall be prepared as specified in 4.5.1 and then soaked for 1 minute in a water suspension of mold spores. The water suspension shall be prepared by immersing moldy casein-soaked veneer (see 6.3) in tap water, removing the spores with a stiff-bristled brush, and mixing the spores with water. The soaked shear specimens shall then be stacked on small wooden stickers or on glass rods, each layer one specimen deep, in a humidity chamber. The humidity chamber shall also contain a suitable control specimen similar to the test specimen but susceptible to the mold species used. The humidity chamber shall be a glass desiccator or metal container with a tight fitting cover. The humidity chamber should be as large as is convenient and in no case smaller than one which shall provide a volume ratio of subject material to net air space in the humidity chamber of at least 1 to 200. Sufficient water shall be placed in the bottom of the humidity chamber to insure a saturated atmosphere and the stickered pile of specimens shall be raised above the water. The humidity chamber containing the specimens shall be stored in a room maintained at temperatures between 74 deg. and 80 deg. F (23.3 deg. and 26.7 deg. C) on a shelf or other support above the floor of the room. The inoculated specimens shall be exposed for 14 days in the humidity chamber and tested immediately upon removal in the manner specified in the procedure of ASTM D 906. Failure of the control specimen to develop mold in the 14 days incubation shall invalidate the test, and the test shall be repeated.

5. PREPARATION FOR DELIVERY

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

5.1.1 Level A. Unless otherwise specified, the adhesive in net weights of 4 ounces, 1 pound, 5 pounds, 100 pounds or 300 pounds, as specified (see 6.2) shall be packaged in one of the following containers:

- (a) Metal containers conforming to PPP-C-96 type V, class 2 (for quantities of 50 pounds maximum)
- (b) Fiber drums conforming to PPP-D-723, type II, grade A, or type III, grade A, (for quantities of 200 pounds maximum)
- (c) Metal drums conforming to PPP-D-729, type III, or type IV (for quantities of 400 pounds maximum)

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Insofar as possible, containers shall be uniform in shape and size, with minimum cube and tare consistent with the protection required. Containers shall contain equal quantities and shall be closed (as required), in accordance with the applicable container specification. All fiber drums shall be furnished with an 0.004 inch thick polyethylene liner, properly heat sealed. For military activity packs (5.1.1a), exterior coating shall be plan B with side seam striped.

5.1.2 Level B. Unless otherwise specified, the adhesive in net weights of 4 ounces, 1 pound, 5 pounds, 100 pounds or 300 pounds, as specified (see 6.2) shall be packaged in one of the following containers:

- (a) Metal containers conforming to PPP-C-96, type V, class 2 (for quantities of 50 pounds maximum)
- (b) Fiber drums conforming to PPP-D-723, type I, grade A (for quantities of 200 pounds maximum)
- (c) Metal drums conforming to PPP-D-729, type III, or type IV (for quantities of 400 pounds maximum)

Insofar as is possible, containers shall be uniform in shape and size with minimum cube and tare consistent with the protection required. Containers shall contain equal quantities and shall be closed (as required) in accordance with the applicable container specification. All fiber drums shall be furnished with an 0.004 inch thick polyethylene liner, properly heat sealed.

5.1.3. Level C.

5.1.3.1 (For civil agency use). Unless otherwise specified, the adhesive shall be packaged in 4 ounce, 1 pound, 5 pounds, 100 pounds or 300 pound containers, as specified (see 6.2). The containers shall afford adequate protection against corrosion, deterioration, and damage during shipment from supply source to the first receiving activity for immediate use.

5.1.3.2 Commercial (For use by military activities). Adhesive shall be unit packed commercial in accordance with ASTM D 3951.

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

5.2.1 Level A. Containers as specified in PPP-C-96 shall be packed in accordance with the overseas shipment requirements of the appendix to PPP-C-96. Drums as specified in PPP-D-723 or PPP-D-729 will require no overpacking.

5.2.2 Level B. Containers as specified in PPP-C-96 shall be packed in accordance with the domestic shipment requirements of the appendix to PPP-C-96. Drums as specified in PPP-D-723 or PPP-D-729 will require no overpacking.

5.2.3 Level C.

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5.2.3.1 (For civil agency use). Packing shall be in accordance with good commercial practice, adequate to ensure acceptance and safe delivery by the carrier for the mode of transportation employed. Containers shall comply with carrier rules and regulations applicable to the mode of transportation used.

5.2.3.2 Commercial (for use by military activities). Adhesive shall be packed commercially in accordance with ASTM D 3951.

5.3 Marking. Marking shall be in accordance with 5.3.1 or 5.3.2 as applicable (see 6.2).

5.3.1 Civil agencies. In addition to any marking required by the contract or order, interior packages and shipping containers shall be marked in accordance with Fed. Std. No. 123. In addition, each shipping container shall be marked with the date of manufacture or contents, by month and year, not by code.

5.3.2 Military agencies. In addition to any marking required by the contract or order, Level A and B unit packs, intermediate packs, and packs shall be marked in accordance with MIL-STD-129. Commercial unit packs and packs shall be marked in accordance with ASTM D 3951. Unless otherwise specified, bar-coding in accordance with MIL-STD-129 shall be applied to unit packs and packs. In addition, each shipping container shall be marked with the date of manufacture of contents by month and year, not by code.

5.4 Unitization. Uniform quantities of Level A or B packs shall be palletized in accordance with MIL-STD-147 using the type IV softwood pallet of NN-P-71.

6. NOTES

6.1 Intended use.

6.1.1 Type I. Type I adhesive is intended for use where an adhesive with resistance to water is required and is used primarily in the woodworking industry.

6.1.2 Type II. Type II adhesive is intended for use where an adhesive with resistance to water and mold is required and is used primarily for lumber laminating.

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) Type of adhesive required (see 1.2).
- (c) Quantity required.
- (d) Size of unit container (see 5.1.1, 5.1.2 or 5.1.3).
- (e) Levels of packaging and packing required (see 5.1 and 5.2).
- (f) Special marking if required (see 5.3.1 or 5.3.2).

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6.3 Moldy veneer. Moldy casein soaked veneer may be prepared as follows: Prepare a casein adhesive and water mixture in the ready for use proportions. Any commercial adhesive without preservatives is satisfactory for this purpose.) Add additional water to the mixture so that the adhesive to water ratio will be 1 to 8 and stir to obtain a thin adhesive free of lumps. Soak 2 or 3 sheets of sapwood veneer (about 1 foot square) for an hour in the thinned adhesive and then remove and store the wet sheets in a loosely covered, damp chamber (e.g. over water) at room temperature. The panels should be left in the chamber until their surfaces are covered with a heavy growth of mold. A week's time should be adequate for this purpose.

6.4 Applicability. The requirements of section 5 apply only to purchase by or direct shipment to the Government.

MILITARY INTEREST:

Preparing activity:

Custodians:

Army - MR

Army - MR

Navy - YD

Air Force - 84

Civil Agency Coordinating Activities:

GSA-FSS

AGR

D of C

HEW

JUS

LABOR

V.A.

Review Activities:

Army - MD, AR, AL, GL, EA

Navy - AS

Air Force - 99

User activities:

Army - ER, ME, MI

Navy - SH

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