

MIL-HDBK-725

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MILITARY HANDBOOK

ADHESIVES

**A GUIDE TO THEIR PROPERTIES AND USES AS DESCRIBED BY
FEDERAL AND MILITARY SPECIFICATIONS**



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DEPARTMENT OF DEFENSE

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Adhesives - A Guide To Their Properties And Uses As Described By Federal And
Military Specifications

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1. This standardization handbook was developed by the Department of Defense in accordance with established procedure.

2. This publication was approved on 1 May 1972 for printing and inclusion in the Military Standardization Handbook series.

3. Every effort has been made to reflect the latest information on the subject matter. It is the intent to review this document periodically to insure its completeness and currency. Users of this document are encouraged to report any errors discovered and recommendations for changes or inclusions to the Director, Army Materials and Mechanics Research Center, Watertown, Massachusetts 02172, ATTN. AMXMR-MS.

PREFACE

The purpose of the handbook is to provide a guide to information on the properties and uses of adhesives as described by Federal and Military specifications. The handbook is intended as a guide only. For specific applications the reader is encouraged to consult a competent adhesives technologist. The handbook will aid the technologist in selecting the appropriate specification for a given purpose. The handbook should also be useful in determining the need for proprietary items and new specifications.

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PURPOSE

Adhesive technologists faced with the task of specifying a suitable adhesive for a given intended use are often hindered by lack of information as to the proper specification without obtaining, classifying, reviewing and comparing a number of specifications. It is the purpose of this handbook to make most of this information readily available, and where feasible to promote the use of adhesives already in the supply system and that are covered by specifications.

SCOPE

This handbook covers the salient properties and intended uses of all current Federal and Military specifications on adhesives.

HOW TO USE THE HANDBOOK

- (1) The adhesive technologist should first note the materials in the substrates to be bonded. He should then turn to Table I, "Intended Uses by Substrates as Specified in Government Adhesive Specifications," and determine the specifications that reference the required substrates in their "Intended Use."
- (2) Explanation of Table I In a designation in Table I such as "3a⁵" the first number "3" indicates the number of the table that covers information on the adhesive. The letter "a" indicates the first specification in the table (the specifications are listed alphabetically). The exponential number "5" indicates note 5 on table 1.
- (3) The specifications referenced in Table I should be partially investigated by reviewing the information in tables 2 through 21.
- (4) Once a specification has been selected as a likely candidate for the intended purpose, the specification should be obtained and a careful comparison made of all the properties in the specification with all the required properties. This handbook should be used as an aid in selecting an adhesive specification, but no specification should be designated until a thorough investigation has been made of the actual document.

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TABLE 1 - INTENDED USE BY SUBSTRATES AS SPECIFIED IN GOVERNMENT ADHESIVE SPECIFICATIONS

	Paper	Fiberboard and Chipboard	Wood	Felt	Fabric	Coated Fabric	Plastics	Tile and Linoleum	Rubber	Leather	Glass or Ceramic	Metal
	Test No Test 3a5 21d 3b6	Test No Test 18d 21d	Test No Test 4a7 17f 10a22 21c 21d 21e27	Test No Test 11a 21e	Test No Test 7a9 10a 17g 18b 19a 21b 21d 21e	Test No Test	Test No Test 9c 9a 9d 17a 9f 17b 9g 17c15 9h 17f 9i28 18b 10b 20d 21e 20e 21a 21d25 21f	Test No Test 12a 12b	Test No Test 15a 20d 15b 20e 21e 21a 21d25 21f	Test No Test 18b 19a 21c 21e	Test No Test 9f 17f 10a12 18b 16a 20a 17b 20a 17c16 21d 17d 21e 17e 17f 17g18 17h18 18b 20b22 20c23 20d 20e 21b3a 21c 21f	Test No Test 9i28 17i 17a 20a 17b 21a 17c16 21d 17d 21e 17e 17f 17g18 17h18 18b 20b22 20c23 20d 20e 21b3a 21c 21f
Glass or Ceramic	3a 21d 3b	21d	9a 17f 21c 21d	11a13	10a 9a 18b 21d		17f 18b19 20a 20d 20e 21a 21d25	12a14 12b14	20d 20e 21a 21d25	9a 18b 21c	16b 9a 16c 10a 16d 17f 18b 20a 20d 20e 21a 21c 21d	
Leather	19a		9a 19a 21c 21e	21e	9a 18b 19a 21f		18b19 21e		21a	20a 9a 18b 21c 21e		
Rubber	3a 21d 3b	21d25	21d25 21e 21e27	21e	21d25 21e		21a 21d2528		14a 20d 14b 20e 15b 21a 21d25 21e 21f			
Tile and Linoleum			13a15 12a 12b 13a27									

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Plastics	3a ⁴ 21d ²⁵ 7b ⁴	21d ²⁵	9a 17f 21d ²⁵ 21e	21e	18b ¹⁹ 21d ²⁵ 21e	9b 9i ²⁵ 9e 17a 10b 17b 14c 21 17f 19b 20a 20d 20e 21a
Coated fabrics					14c 11	14a 8c 14d 8e 14f 14g
Fabric	4b 6a 21d	21d	20a 4b 9a 13a 21d	11a 21e	14b 4b 17f 9a 13 14b 20a 21d 21f	
Felt			21e ²⁷	11a 13 21e		
Wood	3a 4b 9b 20a 21d	21d	4b 9a 4c 21c 4d 21d 4e 21e 4f 4g 4b 5a ⁸ 17f			
Fiber-board and Chipboard	3a ² 20a 3b 21d	3d 4f 3e 18d 18c 20 21d				
Paper	2a 4b 2b ³ 11a ¹⁹ 2c ³ 20a 3c 21d 8a					

NOTES

- 1 Test - Specification Requires Test No Test - Listed in Intended Use only, no test requirement
- 2 If shown to be satisfactory for use on unlabeled substrates
- 3 Also used for photomounting
- 4 Paper labels to enamel painted surfaces
- 5 Paper labels to black iron galvanized iron and tin
- 6 Paper labels to steel with coating of black oxide to galvanized iron, to low-carbon steel and to tin-coated steel
- 7 Clad aluminum to wood
- 8 For gypsum lath (acoustical use)
- 9 Abrasive discs to metal discs
- 10 Treated duck to treated duck
- 11 Neoprene coated fabric to nylon
- 12 For attaching cork and fibrous glass insulation board to metal
- 13 For use with fiberglass roofing felt roof roofing and roofing fabric
- 14 Plastic tile to concrete
- 15 For linoleum, cork, carpet and certain other types of floor covering
- 16 Metal to painted or unpainted metal surfaces
- 17 Brake lining to steel and aluminum
- 18 Also listed as a nitrile phenolic synthetic rubber adhesive
- 19 For bonding some types of thermoplastics
- 20 For manufacture of spirally wound containers for ammunition
- 21 For adhering plastic inhibitors to cruciform grains of double base powder
- 22 A sealing material in the manufacture of filters in collective protectors
- 23 For fuel cell repair work
- 24 A general purpose adhesive with no specific recommendations for use specified
- 25 For bonding plastic films
- 26 For bonding foam rubber
- 27 For bonding cork
- 28 For painted steel and damping tiles

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TABLE 2 - OFFICE USE AND PHOTOMOUNTING ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-M-792B(2) 15 Jan 60 GSA (a)	Mucilage	A moderately quick-setting adhesive for general office use	Manufactured from gums or synthetic resins, preservatives and water to form a liquid product of a light uniform color	No	ADHESIVE STRENGTH - Fiber failure on No. 2 Kraft paper shall be the same as that of the standard sample
MMM-A-177A(2) 5 Jan 65 SA (b)	Adhesive, paste, office and photomounting	TYPE I - For general office use and photomounting TYPE II - For office use only Both types moderately quick setting	The adhesives shall be of even consistency and guaranteed for one year	No	TYPE I - A solid (hard) white paste TYPE II - A semiliquid paste ADHESIVE STRENGTH - The separation shall be in the fibers of the papers, (i.e., Grade B, No. 2, Kraft paper of UU-P-268 and Type II, white bond paper of UU-P-121) when pulled apart and not in the adhesives.
MMM-A-00185A 10 Nov 64 (CSA-FSS) (c)	Adhesive, rubber (for paper bonding)	For mounting photographic prints, maps, drawings and charts	Essentially a hydrocarbon solvent system of crepe natural rubber or synthetic rubber together with resin modifiers as required	No	ADHESIVE STRENGTH - Bond paper 15 mm wide shall be pulled apart with an average strength of not less than 165 grams. The adhesive is colorless and shall not wrinkle, curl or shrink the paper

**TABLE 3 - PACKAGING AND PACKING ADHESIVES
 (ALSO SEE 20 A TYPE 1)**

MMM-A-178(1) 6 Feb 68 MR (a)	Adhesive, paper label, water-resistant	For use on soft wood, fiberboard, black iron, galvanized iron, glass, tin, enamel-painted metal, rubber surfaces, and if shown to be satisfactory on other surfaces	Composition not specified (Will probably contain an organic solvent)	No	The adhesive is of brushing consistency, substantially colorless, and shall dry tack free in 5 minutes (max) and dry hard in 16 hours (max). Adhesion tests for the label shall be made on the following materials: soft wood, fiberboard, black iron, galvanized iron, glass, tin, enamel-painted surface and rubber
MMM-A-179 28 Feb 66 MR (b)	Adhesive, paper label, water resistant, water emulsion type	For attaching paper labels to a variety of rigid substrates where there is no flexing. For use where the toxicity and flammability of comparable adhesives of the organic type would be objectionable	This is a water-resistant, water-emulsion type adhesive. The composition of the material is not specified	No	The adhesive is of brushing consistency, transparent and shall air-dry tack free in 15 min (max). Adhesion tests for the label shall be made on the following materials: plywood fiberboard, low carbon steel with and without coating of black oxide, galvanized iron, glass, tin coated steel, enamel painted metal surfaces and rubber

* Qualification Required (QPL)

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TABLE 3 - PACKAGING AND PACKING ADHESIVES (Continued)

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
WMM-A-260A(2) 6 Aug 68 MU (c)	Adhesive, water-resistant (for sealing water-proofed paper)	TYPE I - For machine appli- cation TYPE II - For hand applica- tion by brushing GRADE A - For subsistence items GRADE B - For other than subsistence items Primarily for use in seam bonding and closure of water- proof paper bags, wraps and case liners	Composition not specified CLASS 1 - solvent-base adhesive CLASS 2 - water-emulsion adhesive CLASS 3 - hot-melt adhesive	No	The adhesive shall be flexible and resist fungi and heat ADHESIVE AFTER WATER IMMERSION After barrier material specimens are sub- merged in water at 70 ± 5°F for 4 hours the adhesive bond shall not shear under a tension of less than 10 lb per inch
WMM-A-250B 27 June 68 MU (d)	Adhesive, water-resistant (for closure of fiberboard boxes)	For use in closing of shipping containers and boxes TYPE I - For application by automatic equip- ment TYPE II - For hand application	Composition not specified other than that it be nontoxic	No	LAP SHEAR STRENGTH ON WATER-RESISTANT FIBERBOARD Failure shall be by pulling out fibers or the fiberboard shall sustain the following loads After normal conditioning - 100 lb min After 24 hrs at 140° ± 3 °F - 100 lb min After 24 hrs at -40° ± 1 °F - 100 lb min After 24 hrs immersion in clean water at 71 °F ± 3 °F - 10 lb min
MIL-A-4329(1) 20 Jan 70 G.I (c)	Adhesive for palletized unit loads	Used in small amounts to securely hold fiberboard con- tainers together when packed in loads. A non-fiber retaining adhesive	The adhesive shall be homo- geneous, aqueous, vegetable or resin based material for use without thinner	No	SHEAR STRENGTH on fiberboard (Type C F class domestic variety SW, grade 200 or higher of PPT-4-320) shall be 40 ± 20 psi when tested in accordance with Method 116 of FLYS 101

TABLE 4 - WOOD ADHESIVES

Specification Date Preparer	Adhesive	Intended Use	Material	Q R	Properties
WMM-A-138a 2 Mar 67 AS (a)	Adhesive, resin to wood structural	TYPE I - Primarily for use in structural bonding of alu- minum alloy to wood TYPE II - Primarily for use in fabricating aluminum- wood-aluminum structural sandwich panel construction, not for primary structure in aircraft	Resin or resins furnished in liquid or jelly form with or without hardener, or in solid form as stick, powder, or film	Yes	SHEAR STRENGTH (psi/min) TYPE I TYPE II Initial 900 900 At 180° ± 2°F 700 700 After 7 days immersion in water 700 500 in salt water 700 500 in hydrocarbon fluid 700 500 Specimens of aluminum-wood-aluminum

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TABLE 4 - WOOD ADHESIVES (Continued)

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-A-181b 5 Oct 67 MR (b)	Adhesive, phenol, resorcinol, or melamine base	Where non-staining properties are desired for bonding of wood, veneer, paper and tex- tiles, adhesive having a mel- amine-resin base may be used	Resins Only resins based on phenol, melamine, or resorcinol shall be used in making the adhesive	No	PLYWOOD SHEAR STRENGTH (by tension loading) DRY - average not less than 400 psi. WET - average not less than 400 psi after 3 hours immersion in boiling water or 48 hours in water at 73.4° ± 1.8°F Three types for different temperature settings (Type I - 75°-95°F) (Type II - 95°-190°F) (Type III - 190°-300°F)
MMM-A-188b 8 Nov 60 /SH (c)	Adhesive, urea-resin-type (liquid and powder)	For assembly gluing of wood items and the bonding of plastic laminate sheets to ph- wood For use where a mod- erate (not fully) waterproof adhesive is required.	This specification covers an unextended urea-formaldehyde thermosetting resin adhesive	No	PLYWOOD SHEAR STRENGTH (by tension loading) DRY - average not less than 340 psi WET - (after 48 hours cold soaking) average not less than 280 psi
MMM-A-193c 28 Oct 67 MR (d)	Adhesive, vinyl acetate resin emulsion	For assembly gluing of wood items for normal indoor tem- peratures and without high humidity or big fluctuations (for furniture and small wood patterns) not suitable for edge gluing and laminating of fur- niture parts	A vinyl acetate resin emul- sion suitably modified to meet the requirements of this speci- fication		PLYWOOD SHEAR STRENGTH (by tension loading) DRY - (at 73.4° ± 1.8°F) 400 psi min (at 160° ± 5°F) 250 psi or 40% of above, whichever is larger AFTER MOISTURE EXPOSURE - Not less than 250 psi or 40% of dry strength, which- ever is larger
MIL-A-22397 12 June 64 SH (e)	Adhesive, phenol and re- sorcinol resin base (for marine service use)	For bonding wood where an adhesive bond with high strength, resistance to salt water, extreme shrinking and swelling resistance and long- time durability is required	Resins Only resins based on phenol, resorcinol or a com- bination of both shall be used in making the adhesive Hard- ener is either liquid or powder	Yes	RESISTANCE TO SHEAR BY COMPRESSION LOADING - In white oak in all cross sections shall show not less than 80 percent wood failure (average) BLOCK SHEAR STRENGTH - Not less than 2000 psi average for all cross sections Cure period and temperature recommended by manufacturer
MMM-A-100c 25 July 67 GL (f)	Adhesive, animal glue	For use in woodworking and in the manufacture of ammu- nition primers and spirally wound fiber ammunition con- tainers	Manufactured from raw mate- rials derived from animals	No	TYPE I (dry form) 6 grades (flake ground or other form as specified) No strength re- quirement TYPE II (liquid form) SHEAR STRENGTH BY COMPRESSION LOADING shall be 2800 psi and 50 percent wood failure minimum on hard maple blocks when tested similar to method ASTM D 905

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TABLE 4 - WOOD ADHESIVES (Continued)

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MIL-G-413B 9 Oct 63 SH (g)	Glue, marine and aviation marine (waterproof)	CLASS I - For fastening sheeting between inner and outer wood skins of floats, batten seam construction on wood boats, etc	CLASS I - AVIATION MARINE GLUE - Rosin, pine tar, denatured alco- hol and a drying oil	No	CLASS I - Shall pass tests for plasticity, waterproofing and tackiness
MMM-A-125c 18 Mar 69 MR (h)	Adhesive, casein-type, water and mold resistant	TYPE I - For use where re- sistance to water is required and primarily in the wood- working industry TYPE II - For use where re- sistance to water and mold is required and is used primarily for lumber laminating	The adhesive shall be in a form of drv, uncaked pow- der and in such condition that it can be mixed with water	No	PLYWOOD SHEAR STRENGTH (By Tension Loading) - One hour and four hours after mixing the dry shear strength shall be 340 psi (minimum), and the wet shear (water resistance) shall be 140 psi (mini- mum) after 48 hours immersion

TABLE 5 - ACOUSTICAL ADHESIVE

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-A-00150a 3 Oct 62 AS (a)	Adhesive for acoustical materials	For bonding prefabricated acoustical materials to the inside walls and ceilings of rooms in buildings Not for the sole support of acoustical materials for ceilings weighing over 2-1/2 lb/sq ft	The adhesive shall be uniform and free from ingredients that will affect the serviceability of the adhesive or have a dele- terious effect on the acoustical material	No	Gypsum lath is used for adherends The adhesive is required to maintain a tensile adhesion (bond strength) of not less than 1/2 lb/sq ft for a long period of time under the temperature and mois- ture conditions likely to be encountered and to maintain sufficient plasticity to allow for movement of parts of the build- ing as it ages

TABLE 6 - PAPER TO CLOTH ADHESIVE

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MIL-A-17682C 22 Nov 68 MC (a)	Adhesive, starch	One type of adhesive for adhering paper targets to paper cloth	Base of pure wheat in fine powdered form with preserva- tive, put up in packages for mixing with water	No	FIBER FAILURE - When pulled apart as in opening a book the paper (MIL-P-10831 Paper, target, T) shall show a separa- tion in the fibers of the paper and not in the adhesive CONSISTENCY - The powder shall dissolve in cold water and mix readily to a smooth creamy adhesive

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TABLE 7 - CLOTH TO METAL ADHESIVES

Specification Date Preparator	Title	Intended Use	Material	Q R	Properties
MIL-C-14064B 22 June 67 MR (a)	Cement, grinding disk	For bonding of abrasive disks to metal disks	Latitude is allowed in the selection of raw materials provided finished product complies with specification	No	PEEL STRENGTH - 10 lb minimum per inch at 73 4° ± 2°F and 9 lb/in (min) after accelerated aging, and 6 lb/in at 150° ± 2°F when abrasive cloth is peeled from QQ-S-634 steel (ASTM method D 903-49 (1965))

TABLE 8 - COATED (OR TREATED) FABRIC ADHESIVES

MMM-A-139 4 Feb 69 AS (a)	Adhesive natural or synthetic - natural rubber	Primarily for the manufacture and repair of articles made of materials coated with natural or synthetic natural rubber. Three classes - heat cure, RT cure, and RT cure for repair	Only natural or synthetic natural rubber is used. The adhesive is one part or with a base and a separate accelerator	Yes	SEAM STRENGTH of rubber-coated fabric: as received 425 lb/2 in width, after bond aging 80% of "as received" value STRIP ADHESION As received 5 lb/in width These adhesives shall not be used for bonding nylon
MIL-C-2399B(1) 24 Feb 70 GL (b)	Cement, liquid, tent patching.	For patching tentage as specified in applicable maintenance manuals.	An oil resistant elastomer in a designated solvent blend. The cement shall contain a minimum of 30 percent total solids by weight	No	Tests made on cloth cotton duck, Type III 12 29 oz of CCC-C-419 that has been treated for fire, water, weather and mildew resistance SHEAR STRENGTH - 100 lb/in minimum STRIPPING STRENGTH After 3 hrs at 73 4° ± 2°F and 50 ± 4% RH 5 lb 18 lb After 100 hrs at 158°F After 48 hrs in water at 73 4° ± 2°F 12 lb
MIL-A-5540(AS)(1) 4 June 70 AS (c)	Adhesive, polychloroprene	Five classes of neoprene adhesives for joining neoprene coated fabric to itself and to nylon	Base polymer polychloroprene. One part, or two parts with a base and a separate accelerator.	Yes	CLASS 1 - Heat cure for manufacture (coating to coating, heat stable to 140°F) CLASS 2 - R T cure for manufacture (coating to coating, heat stable to 140°F) CLASS 3 - R T cure for repair (coating to coating, heat stable to 140°F) CLASS 4 - Heat cure for manufacture (coating to nylon) CLASS 5 - R T cure for repair (coating to nylon)
MIL-A-22611(AS) 18 Aug 60 AS (d)	Adhesive for polyvinyl chloride-coated cloth	For use in repairing covers made of nylon cloth (MIL-C-20696, Type II, Class 4) coated with a vinyl chloride polymer or co-polymer containing a fire retardant	Two adhesives of the solvent type Type I - Vinyl chloride polymer base Type II - Synthetic rubber base	No	SOI ID CONTENT (min) 20% Type I, 23% Type II SHEAR STRENGTH (min) 360 psi Type I 240 psi Type II The adhesive is of brush consistency, stable, and resistant to salt water

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TABLE 8 - COATED (OR TREATED) FABRIC ADHESIVES (Continued)

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MIL-A-43346(GL)(I) 29 Dec 69 GL (e)	Adhesive, patching for chloroprene coated or chlorosulfonated polyethylene coated fabrics	Repair and patching of inflated, dual-wall shelters and end items made of chloroprene base coated, chlorosulfonated polyethylene top coated, synthetic fabric, in a wide temperature range	An oil-resistant elastomer in a solvent blend of petroleum naphtha, toluol, xylol or ketones	No	SOI ID CONTENT - 25 to 30 percent by weight SHEAR STRENGTH - 100 psi min on coated fabric PFFT STRENGTH - Two strips of coated fabric 1-in wide shall be adhered and after 10 to 20 minutes a 2 lb weight shall be hung on one strip After 4 hours at 70° to 90°F the fabric shall not have peeled more than 1/4 inch
MIL-A-43346(GL) 7 July 65 GI (f)	Adhesive (for field repair of tents, vinyl-coated fabric)	Used for hot patching in the field repair of the frame type tent (Jamesway), sectional, M 1948 and other tents made from vinyl coated fabric conforming to MIL-C-10799	The adhesive is in sheet form mounted on strip-off material. The adhesive itself is composed of a suitable heat activated thermoplastic resin material	No	RESISTANCE TO DEAD LOAD PFFT - Two strips of coated fabric 1-in wide shall be adhered and after 1 hour a 1-lb weight shall be hung on one strip After 4 hours at standard conditions the strip shall not have peeled more than 1/4 inch The adhesive is FLEXIBLE and RESISTANT TO OVEN AGING after application
MIL-A-52611(ME) 23 May 68 ME (g)	Adhesive, vinyl, fumigant shroud	The adhesive will bond a vinyl fabric to itself or to other substrates through either wet bonding or reactivation	Composed of homogeneous synthetic elastomer base polymeric solution in a volatile solvent	No	SHEAR STRENGTH vinyl laminate MIL-C-43008 (TV I) Initial 150 psi (min) After low temperature 150 psi (min) After ultraviolet exposure 150 psi (min) PFFT STRENGTH Initial 30 lb/in (min) After water immersion 30 lb/in (min) After ultraviolet exposure 40 lb/in (min)

TABLE 9 - PLASTICS ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-A-130A 15 June 64 ME (a)	Adhesive, contact	For contact bonding of flexible plastic, decorative, laminates to clean dry and smooth wood and metal surfaces. Also will firmly bond such materials as leather, wood, fabrics, unglazed ceramics, hardboards, carpet and cover base to themselves and each other	A light-colored, solvent system composed of a poly-chloroprene (neoprene) rubber, synthetic resin, and organic solvents	No	SHEAR STRENGTH of decorative plastic (L-P-508) and plywood adherends shall be 150 psi min immediately after bonding, and 200 psi min after cyclic aging as specified in Method 2051T of FTMS 175 Total solids 18 to 25 percent by weight Viscosity 400 to 1500 (centipoises (easily brushable))

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TABLE 9 - PLASTICS ADHESIVES (Continued)

Specification Data Preparer	Title	Intended Use	Material	Q R	Properties
MIL-A-8576B(2) 12 Aug 69 AS (b)	Adhesive, acrylic base, for acrylic plastic	For bonding acrylic-monomer base adhesives.	Base resin shall contain methyl methacrylate monomer as the principal polymerizable ingredient. A catalyst is furnished as a separate ingredient with each container	No	TENSILE STRENGTH OF BONDED BUTT JOINTS - Two pieces of acrylic plastics (MIL-P-5425 for Type I and MIL-P-8184 for Type II) shall be bonded face to face TYPE I - 1800 av - TYPE II - 2700 av at standard conditions - psi min
MIL-A-21016E 26 Jan 67 SH (c)	Adhesive, resilient deck covering.	For securing resilient covering to decks (steel)	A water-base latex free of all ingredients which may affect the serviceability or have a deleterious effect on metal or resilient deck covering	Yes	EDGE ADHESIVE STRENGTH - Lifting plastic, fire-retardant tile (MIL-T-18830) at 90° for 1/8 in shall have minimum edge strength as follows DRYING TIME LOAD AT SEPARATION (HOURS) (LB/IN) 1 1 5 96 7 5 Tests are added for edge lift requirements after water immersion, fire resistance and corrosion of metals tests are included
MIL-A-21366A (SHIPS) 16 Feb 66 SH Validated Aug 66 (d)	Adhesive, for bonding plastic table top material to aluminum	Flexible adhesive for bonding plastic table top material conforming to MIL-T-17171 to aluminum, at room temperature with only normal pressure	One part system. It may be neoprene-resin combination or other combination which will meet all applicable requirements of the specification	No	TENSILE EDGE LIFT ADHESIVE STRENGTH - When plastic laminate is lifted away from aluminum for a 1/16 in edge separation with a load applied at right angles, the strength shall exceed 20 lb/in of width DEAD LOAD ADHESIVE STRENGTH - Not more than 25 percent of the specimens shall fail after being subjected to a dead weight load of 10 lbs for 24 hours at 20° ± 2°F, 73° ± 2°F and 122° ± 2°F
MIL-A-22010A(1) 9 June 61 SH Validated July 66 (e)	Adhesive, solvent type, polyvinyl chloride	For assembling rigid high-impact PVC pipe and socket fittings. The adhesive is suitable for use with drinking water pipes and other applications	Solvent-type PVC adhesive of brush consistency. Solid content of polyvinyl chloride resin and such colors, fillers, and additives as are needed for a commercial product	No	ULTIMATE SHEAR STRESS - For zero-open time and 60 seconds open time shall be 1000 psi and 600 psi, respectively. Rigid high-impact PVC sheet shall be used as the adherend material in a special test. Jig HYDROSTATIC TEST shall show no leakage or failure of the cemented joints
MIL-A-24084(1) 7 July 70 SH (f)	Adhesive, plastic sheet vibration damping	For use in bonding vibration damping tiles to steel hull plating	A two-component, chemically-reactive, epoxy adhesive	Yes	INITIAL ADHESIVE STRENGTH - Glass tape pulled perpendicular from a mild-steel plate shall have an initial adhesive strength of not less than 4 oz/in of width HARDNESS (SHORE A) of cured adhesive shall be not less than 85 and the adhesive shall be shock, fuel and water resistant.

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TABLE 9 - PLASTICS ADHESIVES (Continued)

Specification Date	Preparer	Title	Intended Use	Material	Q R	Properties
MIL-A-18065A(SH) 26 June 66	SH (g)	Adhesives, high initial bond	For use in securing elastomeric/plastic-foam insulation (MIL-P-15280) to metal surfaces in submarines	CLASS 1 - Fast-setting - (volatile-solvent type) CLASS 2 - Slow-setting - (non-hardening non-toxic-solvent type - high flash point) Both classes have high initial bond	Yes	SHEAR STRENGTH shall be sufficient to support a one-lb weight (on a 6x6x1) section of plastic foam insulation to steel without slippage for 72 hours INITIAL BOND STRENGTH shall not be less than 60 lb/sq ft (plastic foam to aluminum)
MIL-A-52194A 16 Jan 67	MR (h)	Adhesive, epoxy (for bonding glass reinforced polyester)	For bonding two halves of plastic gun stock. The adhesive is of paste consistency to prevent drain-off during cure	Two component, R T curing epoxy resinous base and a hardener	No	SHEAR STRENGTH (Steel Adherends) MIN IND VALUE AVG MINIMUM At -54° ± 2°C (-65° ± 3.6°F) 1790 1500 At 23° ± 1°C (73.4° ± 2°F) 1360 1100 At 71° ± 2°C (160° ± 3.6°F) 290 250 IMPACT STRENGTH 18 ft.-lb minimum average for 1 1/2-in bonded area
MIL-A-24456(SH) 30 Nov 71	SH (i)	Adhesive for plastic vibration - damping tiles	For use aboard ships to bond plastic vibration damping tiles to ship structures	Epoxy supplied in a two-part room temperature curing system	Yes	Adhesion to painted steel and damping tiles Resistance to shock

TABLE 10. THERMAL INSULATION ADHESIVES

MIL-A-3316B(2) 30 Apr 68	SH (a)	Adhesive, fire-resistant thermal insulation	For securing cloth and tape to certain thermal insulations and for securing certain thermal insulations to metal surfaces	No restrictions other than that the material be effective for the purpose intended without heating or the addition of other ingredients	Yes	CLASS 1 for bonding Fibrous glass cloth to unfaced/fibrous-glass insulation Cotton battier cloth to fibrous-glass insulation Sealing edges and bonding fibrous glass type to the joints of fibrous glass board CLASS 2 for attaching fibrous glass insulation to metal CLASS 3 for attaching cork and fibrous glass insulation board to metal surfaces
MIL-A-24179A(1) 11 July 69	SH (b)	Adhesive, flexible unicellular-plastic thermal insulation	High initial strength, heat and water resistant contact type adhesive for bonding flexible unicellular-plastic thermal insulation to itself and to metal surfaces	Ty I - Dispersed in water Ty II - Dispersed in non-halogenated organic solvent Class 1 - Low flash point Class 2 - Inter flash point Ty III - Dispersed in non-flammable, organic solvent	Yes	Application by brush or roller shall sustain a 10 lb/sq ft load of plastic (MIL-P-15280 type II) to steel as follows At 100° ± 2°F for 168 hours At 160° ± 2°F for 24 hours At 20° ± 2°F for 24 hours

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TABLE 11 - ROOFING ADHESIVE

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMX-A-150B 2 Jan 59 GSA (a)	Adhesive compound, fatty acid pitch base (for use with fiberglass, roofing felts, roll roofing, roofing fabric)	For spot repairing or resurfacing various kinds of old roofing, and it may be used for new installations	Composed of a suitable inorganic filler or pigment, a suitable volatile inorganic solvent, and a binder consisting essentially of a cottonseed fatty acid pitch material. The adhesive is a thick, smooth, uniform mixture	No	ADHESION - Two sq in of asphalt-saturated, felt (Fed Spec HH-F-191a), adherends shall withstand a 35 lb. pull after 96 hours without separation of the adhesive. NON-VOLATILE MATTER - At 105° - 110°C the adhesive compound shall contain not less than 60 percent non-volatile matter

TABLE 12 - TILE ADHESIVES (ASPHALT BASE)

MMX-A-110A 16 Mar 66 GSA (a)	Adhesive, asphalt, cut-back type (for asphalt and vinyl asbestos tiles)	For adhering asphalt tile and vinyl asbestos tile to primed and unpainted concrete sub-floors. It may also be used for bonding these floor coverings to steel and certain metal and wood floors	The adhesive shall consist of an asphaltic-base material, a volatile solvent, and an asbestos fiber or other mineral filler. The adhesive shall not contain toxic materials	No	BONDING STRENGTH - The amount of sag shall not exceed 1/2 in. in a special test with a 3 lb weight placed on a 4-1/2 x 4-1/2 x 1/8 in. asphalt tile held vertical against a steel plate for one hour. The adhesive is spread and conditioned prior to test at 73 5° ± 2°F and 65 percent relative humidity
MMX-A-115A 3 Jan 64 YD (b)	Adhesive, asphalt, water-emulsion type (for asphalt and vinyl asbestos tile)	The adhesive is a water-emulsion type of asphalt adhesive suitable for the installation of asphalt and vinyl asbestos tiles	The adhesive shall consist of an asphaltic-base material dispersed in water. The dispersing agent of the Class 1 adhesive shall be a clay type substance. The dispersing agent of the Class 2 adhesive shall be a chemical type substance	No	BONDING STRENGTH - The amount of sag shall not exceed 1/2 in. in a special test with a 3 lb weight placed on a 4-1/2 x 4-1/2 x 1/8 in. asphalt tile held vertical against a steel plate for one hour. The adhesive is spread and conditioned prior to test at 77° ± 2°F

TABLE 13 - LINOLEUM ADHESIVE

MMX-A-137c 2 July 65 GSA-FSS (a)	Adhesive linoleum	One type of adhesive for securing linoleum and similar resilient flooring to sub-floors and floor underlayments. Not recommended for use with floor covering installed over steel or other metal subfloors	The adhesive shall consist of a binder in a water-base suspension, intimately mixed with inorganic filler and other desirable additives to control odor and prohibit mold growth	No	The adhesive shall adhere satisfactorily to the back side of linoleum. Two types linoleum, one with burlap backing and the other felt backed, shall be adhered to a common, white-pine board. The peel strength shall be 4 lb minimum, or the break shall be in the felt on a 2 in specimen pulled at 90°
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TABLE 14 - RUBBER TO RUBBER ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMV-A-182A 6 Oct 67 MU/EA (a)	Adhesive, rubber	TYPE I - For cold patching of tire inner tubes and similar rubber articles TYPE II - Primarily for bonding components of natural rubber in the assembly of protective masks	Rubber in the adhesive is first quality, smoked sheet, pale crepe or fine para. Modifying resins may be added. The solvents are naphtha	No	ADHESION TYPE I - No separation over 2 sq. in. rubber to rubber (22-1 550) with a load of 25 lb TYPE II - No separation Rubber to rubber (MIL-F-51109) with a load of 5 lb before and after aging
MIL-C-23092A (Ships) 1 Nov 68 (b)	Cement, natural rubber	For making vulcanized and unvulcanized bonds of natural or synthetic rubber to vulcanized, synthetic rubber	Natural rubber dissolved in a suitable solvent and easily applied by brush	No	ADHESION INITIAL (Friction Machine Method) Between repair tape (MIL-F-22755) and a standard rubber for both vulcanized and unvulcanized rubber is 15 lb minimum per inch of width pulled AGED - After 28 days at 140° ± 2°F the adhesion between the tape and the samples shall be 15 lbs min. per inch of width pulled

TABLE 15 - RUBBER TO METAL ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMV-A-121 16 Dec 66 SH (a)	Adhesive bonding, vulcanized synthetic rubber to steel	For bonding rubber to steel in miscellaneous non-structural uses where high adhesive strength bonds are not required (for bonding vulcanized synthetic-rubber gaskets, mats etc. to steel)	Best commercial quality, ready for use, and have no deleterious effect on steel surfaces to which it is applied	Yes	STRIP ADHESION - Standard gasket stock bonded to sheet-steel panels shall strip a maximum of 3 in. with a dead weight load of 5 lb/in. for Class 1 and 2, and 4 lb/in. for Class 3 gasket, stock in 3 minutes with the pull at a 90° angle. Several adhesion tests made under various conditions on three types of gasket stock
MIL-A-25457B(1) 8 July 69 84 (b)	Adhesive, air-drying, silicone rubber	For bonding silicone rubber to itself and to aluminum without the use of heat or pressure	Wide latitude given in the selection of raw materials in order that a product of high quality may be produced	No	PEEL STRENGTH AFTER 24 HRS 3 DAYS Silicone rubber to 8 lb/in 10 lb/in silicone rubber (min) (min) silicone rubber to 8 lb/in 10 lb/in aluminum (min) (min) Tests are also included for resistance to water, oil and 400°F temperature

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TABLE 16 - OPTICAL (GLASS TO GLASS OR METAL) ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-A-131A 6 Jan 66 MR (a)	Adhesives, glass-to-metal (for bonding of optical elements)	The materials for bonding include glass prisms and other optical glass elements to metal supports in optical fire control instruments.	TYPE I - Two parts ther- moetting resins CLASS 1 - Phenolic neoprene CLASS 2 - Phenolic polyamide TYPE II - Dry film adhesives, Type I with a carrier CLASS 1 - Loosely woven fiberglass carrier, CLASS 2 - Polyamide fabric	Yes	LAP SHEAR TEST (ALUMINUM TO GLASS) TYPES I and II CONDITIONING TESTING AVG LBS / 1/2-IN 24 hrs at 73 °F and 73 °F and and 50% R H. 50% R H. '600 10 days at 160°F 73 °F and and 100% R H. 50% R H. 160 1 hr at 160°F 160°F 500 1 hr at -60°F -60°F 900
MIL-A-003920A (Ord) 11 July 58 MU (b)	Adhesive, optical, thermo- setting	For bonding glass-to-glass elements for use in military optical instruments	A polymerizable resin com- posed of a styrene monomer and an unsaturated polyester The activator used to polymer- ize the adhesive is tertiary butyl perbenzoate	Yes	A liquid adhesive with properties for un- polymerized adhesive at 25° ± 1°C as follows Refractive Index - 1.5290 to 1.5310 Density - 1.085 to 1.090 Viscosity - 170 to 300 centipoises Color - The platinum cobalt color shall not exceed 300
MIL-A-3920 14 May 54 MU (c)	Adhesive optical thermo- setting	For bonding optical elements Fire control shop practices Nos S-2 and S-3.	Styrene 40% by wt. Polyester 60% by wt. CATALYST tertiary butyl perbenzoate representing one percent of the weight of the adhesive and added just before using	No	Glass to glass specimens shall be tested for 3 cycles of (1) immersion in distilled water at 100°F, (2) exposure in cold box at -65°F, (3) exposure in chamber at 160°F and 100% R H (4) exposure in accelerated weather- ometer The adhesive shall then be ex- amined for defects Refractive Index - 1.5290 ± .0005 Color of unpolymerized adhesive shall be clear light straw
MIL-C-3469C 3 July 67 MR (d)	Canada balsam	Used for cementing optical elements	Prepared from oleoresin exuded by the balsam fir The adhesive shall be reasonably free from adulterants	No	In the form of sticks of solid material 3 in long and 1/2 in in diameter. When 70 parts of Canada balsam are dis- solved in 30 parts by weight of xylene, the ASTM color number is 1-1/2 and the vis- cosity 60 to 100 centipoises at 100° ± 2°F

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TABLE 17 - METAL TO METAL ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-A-132 30 Apr 65 /AS (a)	Adhesive, heat resistant, airframe structural, metal to metal	For primary and secondary structural and external metal- airframe parts which will be exposed to temperatures within the range of -67° to 500°F. If substantiated, can also be used for metal-to- plastic or plastic-to-plastic bonding	Thermonetting with no restriction on the chemical type or physical form (such as liquid, film or powder or multiple or mixed system thermo)	Yes	TENSILE SHEAR STRENGTH (at 75° ± 5°F) Type I and II specimens aluminum alloy, and Types III and IV specimens of corrosion re- sistant steel (psi) TYPE I CLASS 1 CLASS 2 CLASS 3 5000 2500 2500 TYPE II TYPE III TYPE IV 2250 2250 2250 Also several other strength tests
MIL-A-25463(2) 19 Oct 61 AS (b)	Adhesive, metallic, struc- tural sandwich construction	These adhesives are for bonding metal facings to metal cores and to metal components of sandwich panels which are intended for use in primary and sec- ondary air frame parts that may be exposed to tempera- tures up to 500°F	No restrictions other than the adhesives be thermo- setting and have no dele- terious effect on the metal There are four types of adhesives and two classes	Yes	SANDWICH PEEL STRENGTH (020-in clad alum alloy and alum) Types I and II 8.5 lb/in of width (avg) Types III and IV 3.5 lb/in of width (avg) FLATWISF TENSILE STRENGTH Types I, II, III and IV (normal temperature) 450 psi (min) I and II Alum to alum - III and IV Stainless steel to stainless steel Also tests to 500° ± 5°F and -67° ± 2°F
MIL-A-22895(1) 25 June 62 SH (c)	Adhesive, metal, identifica- tion plate	For use in bonding without heat or pressure of metal identification plates to painted or unpainted surfaces where the plates are exposed to severe conditions of ex- terior exposure, vibration and shock	CLASS A is a liquid poly- sulfide base polymer and a separate curing agent CLASS B is a compounded neoprene or nitrile rubber base polymer in a volatile solvent	No	The requirements for the adhesive include tests of aluminum alloy plates on steel for the following Shock and vibration resistance Impact bending resistance Class A is for knife application and Class B is for brush application Both result in a solid elastomeric adhesive without applica- tion of heat or pressure
MIL-A-81236(OS)2 9 Sep 68 OS (d)	Adhesive, epoxy resin with polyamide curing agent	Used as an adhesive in rocket motors	Base material an epoxy resin type and a polyamide curing agent	No	VISCOSITY Resin at 25°C 120-160 poises Curing agent at 77°F 2-6 poises CURE - The mixture shall cure to a shore D hardness of 75 ± 10 in not more than 16 hours at 110° ± 5°F TENSILE SHEAR - Minimum of 1500 psi at 75° ± 5°F when cured for not more than 16 hours at 110° ± 5°F The adherends shall be aluminum (QQ-A-362)

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TABLE 17 - METAL TO METAL ADHESIVES (Continued)

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MIL-A-81253(OS)1 16 Nov 66 OS (e)	Adhesive, modified, epoxy resin with polyamine curing agent	For use as an adhesive in rocket-motor systems	Made from a low-viscosity modified-epoxy resin and triethylenetetramine.	No	Viscosity shall be between 2100 and 3600 centipoises. Tensile shear steel-to-steel after 2 to 8 hours cure at $100 \pm 5^\circ\text{C}$ ($212 \pm 9^\circ\text{F}$) shall be a minimum individual value of 3250 psi
MMM-A-134 17 Aug 70 AS (f)	Adhesive, epoxy resin, metal to metal structural bonding	For structural bonding such as the fabrication and repair of airframe parts, components and other applications requiring bonding of a similar quality. For use on metals, principally clad aluminum alloys, but after investigation may also be suitable for bonding other constructions including wood, glass, phenolic, polyester and epoxy resin laminates to each other or in combination	Types I and II are two-part, epoxy-resin systems consisting of an adhesive base and an activator which may be of an amine derivation. Type III shall be a one-part epoxy furnished as a film or in wet form	Yes	Application Life (Min.) Type I 1/2 hour Type II 2-1/2 hours Type III 1 year <u>Maximum Cure Time and Temperature</u> Type I 1 Hour at 164°F or 7 days at 86°F Type II 2 Hours at 210°F plus 7 days at 73°F Type III 7 Hours at 350°F Tensile shear at 73°F Types I, II and III - 2500 psi (min) avg aluminum alloy specimens Also various other tests
MIL-A-46091A(2) 25 Mar 71 MR (g)	Adhesive, brake lining to metal	For use in bonding brake lining and clutch facings to metals in braking applications	Liquid and in film form One component, heat curing material	No	DISK SHFAR TEST of SAE recommended practice J 840 shall show results as follows Steel to steel 1000 psi min Aluminum to aluminum 1000 psi min Above test at 400°F shall be 350 psi for both metals
MIL-A-81270(OS)1 9 Sep 68 OS (h)	Adhesive, synthetic rubber	Intended for use as an adhesive in rocket motors	One type of nitrile phenolic, synthetic rubber adhesive	No	SHEAR STRENGTH shall be not less than 1200 psi (cold rolled steel adherends), ASTM method D 1002-53T with modifications
MIL-A-82569(OS) 12 Jan 69 OS (i)	Adhesive, neoprene base, medium viscosity	For use as an adhesive in rocket motors	Polychloroprene (neoprene) base and volatile aromatic solvents as a vehicle	No	Total solids content - 18-25 percent viscosity - 3000-4000 centipoises peel strength - cotton duck from cotton duck, 17 lbs/in. of width min, storage - 1 year min

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TABLE 18 - AMMUNITION ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MIL-G-46030B 23 Nov 70 MR (a)	Glue, animal (protective colloid)	Primarily for use in the hardening operation in ball propellant manufacture	The glue is manufactured from raw materials of animal origin	No	PREPRODUCTION SAMPLE - Contractor must submit 200 lbs of glue for performance test based on particle size and shape in production. The glue shall be in granular or pelletized form with 14 percent moisture content (max.), 2.5 percent grease content (max.), 6.0 percent ash content (max.) and a pH of 6.00 - 7.00
MIL-A-32494 13 Jun 67 OS (b)	Adhesive and sealing compounds, cellulose nitrate base, solvent type (for ordnance use)	Three types for ammunition I and II adhesives for glue, leather, metal, textiles and some types of thermoplastics. Type III is a sealing compound used in the manufacture of ammunition	TYPES I and II not specified. TYPE III - A uniform solution of homogeneous dispersion of cellulose nitrate of different viscosities and organic plasticizers in relatively low boiling, organic-solvent mixtures	No	SHEAR STRENGTH (low-carbon steel to low-carbon steel with a layer of paper in middle of the adhesives) Type I - 200 psi minimum Type II - 150 psi minimum ADHESION (ALL TYPES) shall show a tough adherend film on brass Type III - 20 to 25 percent non-volatile matter and 5 minutes maximum drying time (tack free)
MIL-A-13374C 30 Jun 69 MR (c)	Adhesive, dextrin	For use in the manufacture of spirally wound containers used for packing ammunition and components	Dextrin produced from starch Class 1 - Liquid in prepared form Class 2 - Cold-water-soluble (Must be mixed with water) Class 3 - Prepared dry adhesive (Must be first cooked with water) Class 4 - Dextrin base in dry form (Chemicals may be added)	No	FIBER FAILURE - Ammunition container board (MIL-B-20390) shall show a fiber failure in the bonded area of not less than 75 percent (1) after 24 hours at 75 ± 5°F and 50 ± 5 percent R.H. (2) after 24 hours at 160 ± 2°F and 20 ± 5 percent R.H. Tests made by peeling specimens apart with hands
MIL-A-45059 B (MR) 13 Nov 68 MR (d)	Adhesive for bonding chipboard to template, thimble and zincplate	Intended primarily to provide a bond between chipboard and the metals between time of manufacture and loading of ammunition into fiber containers	A one-part, ready-to-use brushable adhesive composition not specified	No	SHEAR STRENGTH AFTER ONE HOUR - 40 psi average (min.) SHEAR STRENGTH AFTER ONE WEEK shall be as follows TEST TEMPERATURE MINIMUM AVG -10°F 75 psi 73.5°F 60 psi 140°F 25 psi The test panels for the above tests are chipboard bonded to template, thimble and zincplate
MIL-A-3167 (1) 21 Aug 51 OS Validated Jan 71 (e)	Adhesives (for plastic inhibitors)	TYPE I, CLASS 1 and 2 - For adhering ethyl cellulose inhibitors (MIL-I-3166) TYPE II, CLASS 1, 2, 3 & 4 - For cellulose acetate inhibitors (MIL-I-3166) TYPE III, CLASS 1 - For either ethyl cellulose or cellulose acetate inhibitors of MIL-I-3166	Cellulose nitrate, ethyl lactate, butyl acetate, methyl pivalate, ethyl glycolate, cellulose acetate, diacetone alcohol, acetone, ethylene glycol mono-methyl ether, ethyl glycol mono-ethyl ether	No	Percentages of ingredients are given ADHESION - The adhesives shall adhere wet and end-molded plastic inhibitors (MIL-I-3166) to cruciform grains of double-base powder. After application and storage in an oven at 130°F ± 10°F for 72 hours, specimen examination shall reveal no bubble formation nor unbonded edges

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TABLE 19 - LEATHER TO VARIOUS MATERIALS ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-A-180B 26 Apr 68 /AS (a)	Adhesive, polyvinyl acetate resin emulsion (alkali dispersible).	For bonding leather to various materials such as metal, wood, cloth, paper, etc., and to be useful as a general bookbinding adhesive for hand operations.	The adhesive is a polyvinyl acetate emulsion of the alkali dispersible type (soluble in de-inking solution)	No	PEEL OR STRIPPING STRENGTH shall be not less than 15 lb/in of width using cotton duck as the adherend (ASTM D903)

TABLE 20 - SEALING ADHESIVES

MMM-A-105 23 June 67 AS (a)	Adhesive and sealing compounds cellulose nitrate base, solvent type	TYPE I - For attaching printed paper labels to shipping containers TYPE II - For repairing and mending many materials including glass, metals, leather, textiles, paper, china and some plastics as well as anchoring certain materials.	Uniform solutions of homogeneous dispersions of cellulose nitrate of different viscosities and organic plasticizers in relatively low-boiling organic solvent mixtures	No	PEEL STRENGTH Type I - 3 psi fabric to wood Type II - 8 psi leather to leather (Both dry and after 1 hr immersion in water) Viscosity Type I - 22-27 poises Type II - 69-99 poises
MIL-A-3562B 2 Oct 59 MU Validated Aug 66 (b)	Adhesive, sealing (for filters)	For use as a sealing material in the manufacture of filters used in collective protectors	Nitrile rubber dissolved in acetone.	Yes	COLD FLOW - The bond failure time with an 8 lb load and a drying time of 5 to 20 minutes shall be not less than 1 hour when tested as specified in ASTM D816 SOLID CONTENT not less than 32 percent Tests for DIOCTYLPHTHALATE PENETRATION and cold brittleness
MIL-A-9117D 19 Apr 71 (c)	Adhesive, sealing, for aromatic fuel cells and general repair	For use in fuel cell repair work and for other general repair work where resistance to aromatic fuel is required	A synthetic, elastomeric adhesive	No	PEEL STRENGTH - Rubber (H-Stock) peeled at 180° shall be 5 lb (min) after 4 hours cure and 10 lb (min) after 24 hours cure per inch of width Also tests for AROMATIC FUEL RESISTANCE and HEAT RESISTANCE (158° F)

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TABLE 20 - SEALING ADHESIVES (Continued)

Specification Date Preparer	Title	Intended Use	Material	Q. R	Properties
MIL-A-48106A 18 Sep 70 MR (d)	Adhesive, - sealants, silicone, RTV, general-purpose (for electrical and mechanical sealing)	Used in a wide variety of applications in the automotive, marine, aerospace, metal working, aerospace, aircraft, building construction, communication, computer, electrical, electronic, and other industries. Used in sealing instrument cases, as weather sealants, terminal sealants, and high temperature sealants, and as moisture barriers and thermal barriers.	Acetoxy curing type - generates acetic acid during cure. The silicone compounds are supplied in a one-part, soft, spreadable thixotropic paste or self-leveling liquid form that shall cure at room temperature upon contact with moisture in the air, to produce rubbery compounds to meet the physical and electrical properties of the specification. Primers are also covered.	No	Hardness Shore A Durometer 20 15 Tensile strength (psi) min 175 150 Elongation (%) min 300 150 Peel strength lbs /1" width min (ASTM D907) 10 4 Aluminum 10 4 Steel 10 4 Also Electrical Requirements These adhesive sealants are not resistant to many types of fluids such as fuel and hydraulic fluid. When cured in contact with certain metals such as copper and other sensitive metals a slight corrosion may occur.
MIL-A-46146 9 Nov 70 MR (e)	Adhesives - sealants, silicone, RTV, non-corrosive (for use with sensitive metals and equipment).	The uses for this material are similar to those of MIL-A-46106A, except that these materials are higher priced, and because they are non-corrosive to copper and other sensitive metals, are preferred where delicate electronic devices are involved.	Alkoxy curing type - generates alcohol during cure - other qualities similar to MIL-A-46106A above.		Same as MIL-A-46106 except for their corrosion resistance to copper and other sensitive metals.

TABLE 21 - GENERAL PURPOSE ADHESIVES

MMM-A-122a(1) 3 Feb 69 MR (a)	Adhesive, Butadiene acrylonitrile base, medium solids, general purpose	For high strength bonding of a wide variety of materials including metal, glass, plastics, and synthetic rubber, particularly of the nitrile types. Also as a primer for other adhesives. Specifically for resistance to oil, gasoline and aromatic fuel.	Butadiene acrylonitrile base in appropriate solvent with appropriate modifications.	No	Strip adhesive strength of No. 10 disk to clad aluminum shall be not less than 10 lb/in. of width. Also requirements for water, oil, and fuel resistance.
MMM-A-189A 8 Oct 68 MR (b)	Adhesive, synthetic rubber, thermoplastic general purpose	General purpose but information is needed for specific use since all adherenda are not tested. Not for continuous high stress or stress at elevated temperatures. Class 2 for porous surfaces.	Two classes of adhesives. Class 1 - 20% non-volatile. Class 2 - 30% non-volatile.	No	SHEAR STRENGTH (steel to steel) Same for both classes After 24 hrs at 73 ± 1 8°F, 1200 psi avg (min) After 24 hrs at 170 ± 1 8°F, 1200 psi avg (min) After 24 hrs immersion in toluene, 1000 psi avg (min) After 2 hrs at 122 ± 1 8°F, 700 psi avg (min) Peel strength average 12 lb/in. of width min (cotton sheeting on steel)

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TABLE 21 - GENERAL PURPOSE ADHESIVES (Continued)

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-A-187a 20 Mar 68 GSA (c)	Adhesive, synthetic, epoxy resin base paste form, general purpose	Repair or bonding of metals, porcelain, ceramics, leather, wood and various other mate- rials. Not for structural bonding or high stress or excessive vibration	Two parts - base polymer of the epoxy type and an activator by equal parts by volume or weight Fur- nished as a kit	No	FORM - Paste SETTING AND CURING - Adhesive shall cure at 68° to 86°F within 24 hours and at 158° - 164°F within one hour CONTACT PRESSURE only and shall not run, drip or sag. Shall maintain a bond at -50° to 250°F TENSILE SHEAR strength minimum average 1500 psi with panels of aluminum alloy FEEL STRENGTH shall be not less than 5 lb/in (180° pull cotton duck from gal- vanized steel panels) A sprayed dry film of the adhesive shall be translucent and shall be not darker than a light cream in color
MMM-A-001058 10 June 68 GSA (d)	Adhesive rubber base (in pressurized dispensers)	The adhesive in pressurized containers provides a quick convenient method for bond- ing a wide variety of adher- ends. Not for structural use or for bonding where critical properties of high pressure or dielectric strength may be required	An elastomeric material with a hydrocarbon propellant and a suitable solvent as required	No	Strip adhesion strength (lb/in min) as received Pulled at 180° TYPES I. II. III 12 15 10 Aluminum to duck Aluminum to polychloroprene 15 Aluminum to vinyl Requirements also for after immersion, after bond aging, and after accelerated storage SHEAR STRENGTH steel to steel lap shear tensile strength without activator shall be as follows SHEAR STRENGTH SFTTING TEST TYPE I TYPE II TIME TFMP TYPE I TYPE II 2 min 73 5°F 1000 psi 1000 psi 15 min 73 5°F 2000 psi 1800 psi 24 hrs 160°F 2500 psi 2000 psi 24 hrs -65°F 2500 psi 2000 psi
MMM-A-1617 5 Apr AS (e)	Adhesive rubber base, general purpose	For non-critical uses where the unit stress on the ad- hesive is not appreciable. Under no circumstances for structural purposes or for life rafts. Inflatable boats, radome covers, pontoons, de-icer, boot manufacture or repair	Type I - Natural rubber base Synthetic natural (poly- isoprene), styrene buta- diene (SBR), reclaim, or combination thereof, non- oil-resistant. Type II - Polychloroprene rub- ber base oil-resistant. Type III - Butadiene acrylo- nitrile (nitrile) rubber base, fuel resistant A suitable alkyl alpha cyano- acrylate monomer. An ac- timator when supplied shall consist of a suitable amine	Yes	Strip adhesion strength (lb/in min) as received Pulled at 180° TYPES I. II. III 12 15 10 Aluminum to duck Aluminum to polychloroprene 15 Aluminum to vinyl Requirements also for after immersion, after bond aging, and after accelerated storage SHEAR STRENGTH steel to steel lap shear tensile strength without activator shall be as follows SHEAR STRENGTH SFTTING TEST TYPE I TYPE II TIME TFMP TYPE I TYPE II 2 min 73 5°F 1000 psi 1000 psi 15 min 73 5°F 2000 psi 1800 psi 24 hrs 160°F 2500 psi 2000 psi 24 hrs -65°F 2500 psi 2000 psi
MIL-A-46050B 11 Dec 70 MR (f)	Adhesives, cyanoacrylate, rapid room-temperature curing, solventless	For rapid joining of various materials when the speed of curing is the primary con- sideration. Not for ordinary applications because of cost and other factors	A suitable alkyl alpha cyano- acrylate monomer. An ac- timator when supplied shall consist of a suitable amine	No	Strip adhesion strength (lb/in min) as received Pulled at 180° TYPES I. II. III 12 15 10 Aluminum to duck Aluminum to polychloroprene 15 Aluminum to vinyl Requirements also for after immersion, after bond aging, and after accelerated storage SHEAR STRENGTH steel to steel lap shear tensile strength without activator shall be as follows SHEAR STRENGTH SFTTING TEST TYPE I TYPE II TIME TFMP TYPE I TYPE II 2 min 73 5°F 1000 psi 1000 psi 15 min 73 5°F 2000 psi 1800 psi 24 hrs 160°F 2500 psi 2000 psi 24 hrs -65°F 2500 psi 2000 psi

MIL-HDBK-725

1 MAY 1972

Custodians

Army - MR
Navy - AS
Air Force -84

Preparing Activity

Army - MR

Project No. 8040-0322

Review activities

Army - EL, GL, ME, MI
Navy - AS, SH
Air Force - 11

User activities

Army - AT, MU, WC
Navy - MC, OS, SA, YD

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No 22-R255
INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.		
SPECIFICATION		
ORGANIZATION		
CITY AND STATE	CONTRACT NUMBER	
MATERIAL PROCURED UNDER A ☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? ☐ YES ☐ NO (If "yes", in what way?)		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity - Optional)		DATE

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1 JAN 66

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