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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
1 May 1972

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 "3a[5]" 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.

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	Test	No Test	Test	No Test	Test	No Test	Test	No Test	Test	No Test	Test	No Test	Test	No Test	Test	No Test	Test	No Test	Test	No Test	Test	No Test
Metals	3a[5] 3b[6]	21d	18d	21d	4a[7] 10a[12]	17f 21c 21d 21e[27]		11a 21e	7a[9] 17g 19a 21a 21b 21d 21e	10a 18b			9c 9d 9f 9g 9h 9f[28] 10b 21e	9a 17a 17b 17c[16] 17f 18b 20d 20e 21a 21d[25] 21f	12a 12b		15a 15b 21e	20d 20e 21a 21d[26] 21f		18b 19a 21c 21e	9f 10a[12] 16a	17f 18b 20a 20d 20e 21a 21c 21d 21f	9f[28] 17a 17b 17c[16] 17d 17e 17f 17g[17] 17h[18] 18b 20b[22] 20c[23] 20d 20e 21b[24] 21c 21f	17f 20a 21a 21d 21e
Glass or Ceramic	3a 3b	21d	21d		9a 17f 21c 21d		11a[13]		10a	9a 18b 21d			17f 18b[19] 20a 20d 20e 21a 21d[25]		12a[14] 12b[14]		20d 20e 21a 21d[26]		9a 18b 21c		16b 16c 16d	9a 10a 17f 18b 20a 20d 20e 21a 21c 21d		
Leather		19a			9a 19a 21c 21e		21e			9a 18b 19a 21f			18b[19] 21e				21e		20a	9a 18b 21c 21e				
Rubber	3a 3b	21d	21d[26]		21d[26] 21e 21e[27]		21e			21d[26] 21e			21a 21d[25, 26]				14a 14b 15b	20d 20e 21a 21d[26] 21e 21f						
Tile and Linoleum					13a[15]	12a 12b 13a[27]																		

Plastics	3a[4] 7b[4]	21d[25]	21d[25]	9a	4c 17f 21d[25] 21e	21e	14b[19] 21d[25] 21e	9b 9e 10b 14e[23] 9f[28] 17a 17b 17f 19b 20a 20d 20e 21a
Coated Fabrics							Mc[11]	Ma Bc Hd Be Mf Mg
Fabric	4b 6a 21d	21d	20a	4b 9a 13a 21d	11a 21e		Hb[10] 17l	4b 9a 11a[13] 14b 20a 21d 21f
Felt				21e[27]	11a[13] 21e			
Wood	3a 3b 4b 20a 21d	21d	4b 4c 4d 4e 4f 4g 4b 5a[9] 17f	9a 21c 21d 21e				
Fiber-board and Chipboard	3a[2] 3b 20a 21d	3d 3e 18c[20]	4f 18d 21d					
Paper	2a 2b[3] 2c[3] 3c 6a 4b 11a[13] 20a 21d							

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 unlisted 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 felts roll 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 dampling tiles

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 (GSA-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)

TABLE 3 - PACKAGING AND PACKING ADHESIVES (Continued)

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-A-260A(2) 6 Aug 68 MU (c)	Adhesive, water-resistant (for sealing water-proofed paper)	TYPE I - For machine application TYPE II - For hand application 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 submerged 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
MMM-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 equipment TYPE II - For hand application	Composition not specified other than that it be nontoxic	No	LAP SHEAR STRENGTH ON WEATHER-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° ± 3.5°F - 100 lb min After 24 hrs at -40° ± 1.5°F - 100 lb min After 24 hrs immersion in clean water at 73.5° ± 3.5°F - 10 lb min
MIL-A-43529(1) 20 Jan 70 CE (c)	Adhesive for palletized unit loads	Used in small amounts to securely hold fiberboard containers together when packed in loads A non-fiber tearing adhesive	The adhesive shall be homogeneous aqueous, vegetable or resin based material for use without thinner	No	SHEAR STRENGTH on fiberboard (Type CF class domestic variety SW, grade 200 or higher of PPP-F-320) shall be 40 ± 20 psi when tested in accordance with Method 116 of FTMS 101

TABLE 4 - WOOD ADHESIVES

MMM-A-138a 2 Mar 67 AS (a)	Adhesive metal to wood structural	TYPE I - Primarily for use in structural bonding of aluminum 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	700
					Specimens of aluminum-wood-aluminum		

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 textiles, adhesive having a melamine-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 3 - 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 plywood For use where a moderate (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 26 Oct 67 MR (d)	Adhesive, vinyl acetate resin emulsion	For assembly gluing of wood items for normal indoor temperatures and without high humidity or big fluctuations (for furniture and small wood patterns) not suitable for edge gluing and laminating of furniture parts	A vinyl acetate resin emulsion suitably modified to meet the requirements of this specification		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, whichever is larger
MIL-A-22397 12 June 64 SH (e)	Adhesive, phenol and resorcinol 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 combination of both shall be used in making the adhesive Hardener 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 ammunition primers and spirally wound fiber ammunition containers	Manufactured from raw materials derived from animals	No	TYPE I (dry form) 6 grades (flake ground or other form as specified) No strength requirement 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

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 1 - For fastening sheeting between inner and outer wood skins of floats, batten seam construction on wood boats, etc	CLASS 1 - AVIATION MARINE GLUE - Rosin, pine tar, denatured alcohol and a drying oil	No	CLASS 1 - 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 resistance to water is required and primarily in the woodworking industry TYPE II - For use where resistance to water and mold is required and is used primarily for lumber laminating	The adhesive shall be in a form of dry, uncaked powder 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 (minimum) after 48 hours immersion

TABLE 5 - ACOUSTICAL ADHESIVE

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 deleterious 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 moisture conditions likely to be encountered and to maintain sufficient plasticity to allow for movement of parts of the building as it ages

TABLE 6 - PAPER TO CLOTH ADHESIVE

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 preservative, 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, Ty I) shall show a separation 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

TABLE 7 - CLOTH TO METAL ADHESIVES

Specification Date Preparor	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 After 100 hrs at 158°F 18 lb 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	SOLID 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

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

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MIL-A-43316A(GL)(1) 29 Dec 69 GL (e)	Adhesive, patching for chloroprene coated or chlorosulphonated polyethylene coated fabrics	Repair and patching of inflated, dual-wall shelters and end items made of chloroprene base coated, chlorosulphonated 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	SOLID CONTENT - 25 to 30 percent by weight SHEAR STRENGTH - 100 psi min on coated fabric PEEL 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 1/8 inch
MIL-A-43346(GL) 7 July 65 GL (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 PEEL - 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 1/8 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-43006 (Ty I) Initial 150 psi (min) After low temperature 150 psi (min) After ultraviolet exposure 150 psi (min) PEEL STRENGTH Initial 30 lb/in (min) After water immersion 50 lb/in (min) After ultraviolet exposure 40 lb/in (min)

TABLE 9 - PLASTICS ADHESIVES

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 cove base to themselves and each other	A light-colored, solvent system composed of a polychloroprene (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)

TABLE 9 - PLASTICS ADHESIVES (Continued)

Specification Date 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-retardent tile (MIL-T-18830) at 90° for 1/8 in shall have minimum edge strength as follows DRYING TIME (HOURS) — LOAD AT SEPARATION (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 4° ± 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 PYC pipe and socket fittings The adhesive is suitable for use with drinking water pipes and other applications	Solvent-type PYC adhesive of brush consistency Solid content of polyvinyl chloride resin and such colors, stabilizers, 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.

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 AVG IND VALUE MINIMUM At -54°±2°C (-65°±3 6°F) 1790 1500 At 23°±1 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 a 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)	Adhesives, 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 brattice cloth to fibrous-glass insulation Sealing edges and bonding fibrous glass tape 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

TABLE 11 - ROOFING ADHESIVE

Specification Date Preparer	Title	Intended Use	Material	Q R.	Properties
SS-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)

MMM-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 subfloors 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 6 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
MMM-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 6 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

MMM-A-137c 2 July 65 GSA-FSS (a)	Adhesive linoleum	One type of adhesive for securing linoleum and similar resilient flooring to subfloors 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°

TABLE 14 - RUBBER TO RUBBER ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-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 vulcanize, synthetic rubber	Natural rubber dissolved in a suitable solvent and easily applied by brush	No	ADHESION INITIAL (Friction Machine Method) Between repair tape (MIL-T-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

MMM-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 AFTER 3 DAYS Silicone rubber to silicone rubber 8 lb/in (min) 10 lb/in (min) Silicone rubber to aluminum 8 lb/in (min) 10 lb/in (min) Tests are also included for resistance to water, oil and 400°F temperature

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 thermosetting 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 4°F and 50% R H. / 73 4°F and 50% R.H / 600 10 days at 160°F and 100% R H / 73 4°F and 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, thermosetting	For bonding glass-to-glass elements for use in military optical instruments	A polymerizable resin composed of a styrene monomer and an unsaturated polyester The activator used to polymerize the adhesive is tertiary butyl perbenzoate	Yes	A liquid adhesive with properties for unpolymerized 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 thermosetting	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 weatherometer The adhesive shall then be examined 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 dissolved in 30 parts by weight of xylene, the ASTM color number is 1-1/2 and the viscosity 60 to 100 centipoises at 100° ± 2°F

TABLE 17 - METAL TO METAL ADHESIVES

Specification Date Preparer	Title	Intended Use	Material	Q R	Properties
MMM-A-132 30 Apr 65 /AS (a)	Adhesives, heat resistant, airframe structural, metal to metal	For primary and secondary structural and external metallic 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	Thermosetting with no restriction on the chemical type or physical form (such as liquid, film or powder or multiple or mixed system thereof)	Yes	TENSILE SHEAR STRENGTH (at 75° ± 5°F) Type I and II specimens aluminum alloy, and Types III and IV specimens of corrosion resistant steel (psi) TYPE I CLASS 1 5000 CLASS 2 2500 CLASS 3 2500 TYPE II 2250 TYPE III 2250 TYPE IV 2250 Also several other strength tests
MIL-A-25463(2) 19 Oct 61 AS (b)	Adhesive, metallic, structural 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 secondary air frame parts that may be exposed to temperatures up to 500°F	No restructions other than the adhesives be thermosetting and have no deleterious 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) FLATWISE 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, identification 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 exterior exposure, vibration and shock	CLASS A is a liquid polysulfide 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 application 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 110-160 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)

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 ± 5°C (212 ± 9°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 Maximum Cure Time and Temperature 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 5°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 SHEAR 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

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-82494 13 June 67 OS (b)	Adhesive and sealing compounds, cellulose nitrate base, solvent type (for ordnance use)	Three types for ammunition I and II adhesives for glass, 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 26 percent non-volatile matter and 5 minutes maximum drying time (tack free)
MIL-A-13374C 30 June 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 terplate tinplate 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 -40°F 75 psi 73 5 F 60 psi 140°F 25 psi The test panels for the above tests are chipboard bonded to terplate tinplate 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 phthalyl (ethyl glycollate), cellulose acetate, diacetone alcohol acetone, ethylene glycol mono-methyl ether, ethylene glycol mono-ethyl ether	No	Percentages of ingredients are given ADHESION - The adhesives shall adhere web 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

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 - 69-89 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 ($158° I_2F$)

TABLE 20 - SEALING ADHESIVES (Continued)

Specification Date Preparer	Title	Intended Use	Material	Q.R	Properties
MIL-A-46106A 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, appliance, 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 thixotronic 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	Type I Type II Hardness Shore A Durometer 20 15 Tensile strength (psi) min 175 150 Elongation (%) min 300 150 Peel strength lbs /1" width min (ASTM D903) 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, gasolene and aromatic fuel	Butadiene acronitrile base in appropriate solvent with appropriate modifications	No	Strip adhesive strength of No 10 duck 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 adherends 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 4° ± 1 8°F, 1200 psi avg (min) After 24 hrs at 170 6° ± 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)

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 materials 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 Furnished 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
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 bonding a wide variety of adherends 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	PEEL STRENGTH shall be not less than 5 lb/in (180° pull cotton duck from galvanized 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-1617 5 Apr AS (e)	Adhesive rubber base, general purpose	For non-critical uses where the unit stress on the adhesive 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 (polyisoprene), styrene butadiene (SBR), reclaim, or combination thereof, non-oil-resistant. Type II - Polychloroprene rubber base oil-resistant. Type III - Butadiene acrylonitrile (nitrile) rubber base, fuel resistant	Yes	Strip adhesion strength (lb/in min) as received Pulled at 180° TYPES I II III Aluminum to duck 12 15 10 Aluminum to polychloroprene 15 Aluminum to vinyl 8 Requirements also for after immersion, after bond aging, and after accelerated storage
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 consideration Not for ordinary applications because of cost and other factors	A suitable alkyl alpha cyanoacrylate monomer. An activator when supplied shall consist of a suitable amine	No	SHEAR STRENGTH steel to steel lap shear tensile strength without activator shall be as follows SHEAR STRENGTH SETTING TIME / TEST TEMP / (MIN AVERAGE) 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

Custodians

Army - MR
Navy - AS
Air Force -84

Review activities

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

User activities

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

Preparing Activity

Army - MR

Project No. 8040-0322

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

DD FORM 1 JAN 66 1426

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED

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