

MIL-A-82484

13 June 1967
SUPERSEDING
(See Section 6)

MILITARY SPECIFICATION

ADHESIVE AND SEALING COMPOUNDS, CELLULOSE
NITRATE BASE, SOLVENT TYPE (FOR ORDNANCE USE)

This specification is mandatory for use by all
Departments and Agencies of the Department
of Defense.

1. SCOPE

1.1 This specification establishes the requirements for cellulose
nitrate based adhesive and sealing compounds that are suitable for Ordnance
use (see 6.1).

1.2 Classification - The adhesive and sealing compounds shall be
of the following types, as specified (see 6.2, 6.6.1).

Type I - Adhesive, Ordnance (38 to 42 percent solids content)

Type II - Adhesive, Ordnance (Low Viscosity)

Type III - Sealing Compound, Ordnance (Clear or Colored by
Dye)

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

TT-B-838

Butyl Acetate, Normal (For Use in Organic
Coatings)

[FSC 8040]

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Federal (Continued)

TT-N-350	Nitrocellulose, Technical (For Use in Organic Coatings)
TT-P-143	Paint, Varnish, Lacquer and Related Materials; General Specification for Packaging, Packing and Marking

Military

MIL-E-463	Ethyl Alcohol (For Ordnance Use)
JAN-A-489	Acetone (For Ordnance Use)

STANDARDS

Federal

FED-STD-141	Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing
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Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
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(Copies of specifications and standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Data - No data is required by this specification or by the applicable documents referenced in Section 2 unless specified in the contract or order (see 6.2).

3.2 Materials (Type III) only - The Type III compound shall be a uniform solution or homogeneous dispersion of cellulose nitrate of different viscosities and organic plasticizers in relatively low boiling organic solvent mixtures, so formulated as to meet all the applicable requirements of this specification.

3.2.1 Suitability for Ordnance use (Type III only) - When specified by the procuring activity, the compound shall be subjected to such tests as necessary to demonstrate its acceptability for use in Ordnance (see 6.2).

3.2.2 Solvent toxicity (Type III only) - The manufacturer shall certify in writing that each of the organic solvents used in the compound has a threshold limit greater than 100 parts per million. The threshold limit value of any solvent shall be that published by the American Conference of Governmental Industrial Hygienists (see 4.4.1 and 6.8).

3.2.2.1 Benzene and chlorinated solvent (All Types) - When tested as specified in 4.5.6, there shall be no benzene or chlorinated solvent present in the compound.

3.3 Composition (Types I and II) - The manufacturer shall certify in writing that compounds conform to the requirements and proportions specified in Table I (see 4.4.1).

TABLE I

(COMPOSITION OF TYPES I AND II)

Ingredient	Specification	Percent (by weight)	
		Type I	Type II
Cellulose nitrate	TT-N-350, Type II	26 ±1	13 ±1
Methyl abietate	Good commercial grade, 90 percent	14 ±1	7 ±1
Ethyl alcohol	MIL-E-463, Grade 2	26 ±1	34 ±1
Acetone	JAN-A-489	17 ±1	23 ±1
Butyl acetate	TT-B-838	17 ±1	23 ±1

3.3.1 Color (Type III only) - When specified by the procuring activity (see 6.2), Type III compound shall be colored green or red by the addition of soluble dyes. When tested as specified in 4.5.9, the compound shall deposit a film that is distinctly green or red in color.

* 3.4 Properties (All Types) - The compounds shall conform to the applicable requirements specified in Table II.

* 3.5 Adhesion to and corrosion of brass (All Types) - When tested as specified in 4.5.7, the compound shall form a tough, adherent film on brass. The film shall be difficult to remove from the panel and shall strip off in a ribbon when scraped with a sharp knife blade. The brass, after removal of the cellulose nitrate film, shall show no sign of chemical attack or corrosion.

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TABLE II

Property	Test Method		Requirement		
	FED-STD-141	Para. No.	Type I	Type II	Type III
Non-volatile, %	4041	-	40 ±2	20 ±2	20 to 26
Viscosity, poise	4271	-	63 to 120	0.6 to 1.0	55 to 75
Air dry time, tack free <u>1/</u>	4061	-	-	-	5 minutes, max.
Air dry time, dry hard <u>2/</u>	-	4.5.2	30 minutes, max.	-	-
Shear strength, pounds per square inch, min.	-	4.5.3	200	150	-
Flexibility (after 4 hours 121 ±2° C) <u>3/</u>	6222	-	No cracking or flaking, 1/8 inch mandrel		-
Color (of clear compounds)	4242	-	No darker than No. 3 Hellige		
Cellulose nitrate	-	4.5.4	Positive		
Blushing	-	4.5.5	No more than slight streaking or discoloration		-

1/ 0.001 to 0.002 inch dry film.

2/ 0.020 ±0.002 inch wet film.

3/ Type I, 0.004 inch min. dry film, Type II, 0.002 inch min. dry film. Air dry 24 hours prior to baking.

* 3.6 Cold stability (All Types) - When stored at -25° C (-13° F) for 16 hours as specified in 4.5.8, the compound shall show no sign of gelation, separation, sedimentation, or any other deterioration.

* 3.7 Workmanship (All Types) - When examined visually, the compound shall be a homogeneous material that is free from lumps, gelation, separation, sedimentation and foreign matter.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all

inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

* 4.2 Lot formation - For purpose of sampling, a lot shall consist of an indefinite number of unit containers of the same size and construction that have been filled with compound from one batch, and presented for inspection at one time. A batch is defined as that quantity of adhesive which has been mixed, blended, or processed in a single operation intended to make the final product substantially uniform.

4.3 Quality conformance samples -

* 4.3.1 Samples for tests - Two 1-pint samples of the compound shall be selected at random from each lot either during or after the filling operation. Each sample shall be placed in a separate, clean, dry container. The container shall be sealed with a tight cover and marked with the lot number, the sample number, and the product identification.

* 4.3.2 Samples of the end item and preparation for delivery - Samples for the inspections specified in 4.4.2.1, 4.4.2.2, 4.4.2.3, and 4.4.2.4 shall be selected at random from each lot in accordance with MIL-STD-105 and Table III. The lot size shall be the number of unit containers for inspections 4.4.2.1, 4.4.2.2, and 4.4.2.3, and the number of shipping containers for inspection 4.4.2.4.

TABLE III

Inspection	Inspection Level	AQL	Sampling Unit
End item (4.4.2.1)	S-3	4.0	Filled unit container
Filled unit containers (4.4.2.2)	S-3	2.5	Filled unit container
Net contents (4.4.2.3)	S-2	-	Filled unit container
Shipping containers (4.4.2.4)	II	2.5	Shipping container fully prepared for delivery (just prior to closure)

4.4 Quality conformance inspection -

* 4.4.1 Inspection of samples for tests - Each sample selected in 4.3.1 shall be examined and tested to determine conformance to all the applicable

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requirements of Section 3 of this specification, except 3.7 (see 4.4.2 1). The manufacturer shall certify in writing that the compound to be supplied conforms to these requirements, as applicable: 3.2.2 - Solvent toxicity, 3.3 - Composition. Nonconformance of a sample to a single requirement shall be cause for rejection of the lot represented by the sample.

* 4.4.2 Inspection of the end item and preparation for delivery - The applicable samples selected in accordance with 4.3.2 and Table III shall be examined for the defects classified in 4.4.2.1, 4.4.2.2, 4.4.2.3 and 4.4.2.4 and to determine compliance with all the other applicable requirements of Section 5 of this specification. If the number of defective samples exceeds the Acceptable Quality Level (AQL) specified in Table III, the lot represented by the sample shall be rejected.

* 4.4.2.1 End item - Examine the end item samples for conformance to the Workmanship requirement, 3.7.

* 4.4.2.2 Filled unit containers -

EXAMINE

DEFECT

Material

Not material required.

Construction

Not size, type or class specified.
Closure not as specified.
Evidence of leakage.

Marking

Warning labels or marking missing, omitted, illegible, incorrect, incomplete. Not in accordance with contract requirements.

* 4.4.2.3 Net contents - If the average net contents of the samples selected in 4.3.2 is less than the amount specified in the contract or order, the lot represented by the sample shall be rejected (see 6.2).

* 4.4.2.4 Shipping containers fully prepared for delivery -

EXAMINE

DEFECT

Intermediate Packaging

Not level required by contract or purchase order.

Material or construction not as specified.

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Packing	Not level required by contract or purchase order. Materials or construction not as specified. Any nonconforming component, incomplete closures, inadequate strapping, bulged or damaged containers.
Count	Less than specified or indicated quantity of primary containers per shipping container.
Markings	Warning labels or marking missing Omitted, illegible, incorrect, incomplete or not in accordance with contract requirements.

Shipping containers fully prepared for delivery shall also be examined after closure for closure defects. This inspection, 4.4.2.4, is not necessary if the unit container is also the shipping container.

4.5 Test methods -

4.5.1 Test conditions - Unless otherwise specified herein, tests shall be conducted under the atmospheric conditions specified in FED-STD-141.

4.5.2 Dry time (Types I and II) - Two panels of cold-rolled low-carbon steel, 4 by 6 inches, shall be cleaned with acetone. Apply by a means of a doctor blade or other suitable device, a coating of the compound 0.020 \pm 0.002 inch thick when wet and covering an area of 3 by 5 inches. Allow the panels to dry at 25 \pm 2° C (77 \pm 3.6° F) and a relative humidity of 50 \pm 2 percent. Use the thumb and forefinger to exert a maximum pressure (without twisting) on the film. Lightly polish the contacted area with a soft cloth. The film shall be considered dried-hard when no mark is left on the film after the polishing operation.

4.5.3 Shear strength (Types I and II) -

4.5.3.1 Panel preparation - Prepare 12 panels of cold-rolled low-carbon steel measuring approximately 0.064 inch by 1 inch by 5 inches. Clean one face of each panel by buffing with number 400 emery cloth and washing with acetone. Allow to dry. Using a stiff brush apply a coating of the compound to one end of each of the panels for a length of 1 inch. Center and lay over the adhesive on each of six panels a 2 inch square of white sulfite bond paper (32 pound, 17 inches x 22 inches - 1000 sheets). Place the adhesive-coated end of each of the remaining six panels

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over the paper so that the paper is embedded in the compound, so that the coated faces of the two panels are together, and so that the panels overlap an area of exactly one square inch. Bond the panels by applying and maintaining a pressure of 50 psi at a temperature of $50 \pm 2^\circ \text{C}$ for 48 hours.

4.5.3.2 Procedure - Allow the six test specimens prepared as directed in 4.5.3.1 to cool at $25 \pm 2^\circ \text{C}$ ($77 \pm 3.6^\circ \text{F}$), 50 ± 2 percent relative humidity, for 4 hours. Clamp the test strips in the tensile testing machine using shims in the grips so that the applied force will be in the plane of the cemented area. The machine shall be a power-driven testing machine of tested accuracy and shall be set to give a constant rate of load increase of 800 psi per minute. Record the maximum load attained as the shear strength.

4.5.4 Cellulose nitrate polymer (All Types) - Apply a coat of the compound to a piece of glass and allow to dry at room temperature. Apply a drop of a 1 percent solution of diphenylamine in 96 percent chemically pure sulfuric acid to the dry film. The immediate appearance of a dark blue color identifies the polymer as cellulose nitrate.

4.5.5 Blushing (Types I and II) - Clean a panel of cold rolled low-carbon steel 4 x 6 inches, with acetone and apply, by means of a doctor blade or other suitable device, a coat of the material 0.020 ± 0.002 inch thick when wet, and approximately 3 x 5 inches in area. Immediately place the panel in an atmosphere maintained at 35°C and 100 percent relative humidity (see 6.5). After 30 minutes have elapsed, remove the panel and examine for evidence of blushing as indicated by streaking or discoloration.

4.5.6 Benzene and chlorinated solvent (Type III) - Benzene content shall be determined as specified in Method 5091 of FED-STD-141. To detect the presence of chlorinated solvent in the compound, flame clean a bright copper wire and allow to cool. Dip the cleaned end of the wire into the compound and place it in the flame. A green color indicates the presence of chlorinated solvent.

4.5.7 Adhesion to and corrosion of brass (All Types) - Using a doctor blade, apply one or more coats of the compound to a clean, smooth brass panel until a dry film thickness of 0.002 to 0.003 inch is attained. The dry film thickness shall be measured as specified in Method 6183 of FED-STD-141. Allow 60 minutes air dry between coats. Place the panel in an air circulating oven at $105 \pm 1^\circ \text{C}$ ($222 \pm 2^\circ \text{F}$) for 24 hours. Remove the panel after 24 hours and cool to room temperature. Scrape the test film with a sharp knife blade held at an angle of 30 degrees to the panel. Note whether the film is easy or difficult to remove from the panel. Observe also for film brittleness. A brittle film will powder or chip off in small pieces; a nonbrittle film will strip off in ribbons. Remove the remaining film with acetone or other suitable solvent. Using a bright light and a 10 power magnification, examine the brass for any sign of chemical attack or corrosion.

4.5.8 Cold stability (All Types) - Transfer a two fluid ounce sample of the compound to a 4 ounce jar. After tightly sealing the jar place it in a cold box at $-25 \pm 3^{\circ} \text{C}$ ($-13 \pm 6^{\circ} \text{F}$) for 16 hours. After 16 hours examine the compound while still in the cold box for signs of gelation, separation, sedimentation or any other deterioration. Introduce the recommended thinner into the sample while stirring with a spatula and observe for ease of reduction at -25°C . Extreme difficulty in incorporating the thinner into the compound will be evidence that the compound has gelled.

4.5.9 Color (Type III with dye) - Apply a brush coat of the compound to a smooth, clean brass panel. After air drying for 30 minutes at room temperature, examine the film deposited on the panel for a distinctly red or green coloration.

5. PREPARATION FOR DELIVERY

5.1 Packaging and packing - Packaging and packing shall be in accordance with the requirements of TT-P-143 for unpigmented liquid products. Packaging shall be Level A or C, packing shall be Level A, B or C as specified (see 6.2).

5.2 Marking - All containers shall be marked in accordance with TT-P-143.

5.2.1 Additional marking (All Types) -

5.2.1.1 All containers (unit, intermediate and shipping) shall be marked with the following.

(a) DANGER: HIGHLY FLAMMABLE. DO NOT USE NEAR HEAT OR FLAME

(b) CAUTION: USE WITH ADEQUATE VENTILATION

5.2.1.2 Unit containers only shall be marked with the following

Directions for use - Directions for use to include but not be limited to (1) thinning instructions for spray application, and for material that has thickened in storage (as applicable); (2) surface preparation, priming, method of application and bonding, and drying conditions shall be marked on each unit container.

6. NOTES

6.1 Intended use -

Types I and II compounds are intended for general Ordnance use in ammunition. General use does not imply that the compounds are to be used as

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all purpose adhesives; they are not recommended for use with concrete, wood, rubber, ceramics or paper. Types I and II may be used to provide good bonds for glass, leather, metals, textiles and some types of thermoplastics.

Type III compound is intended for use as a sealing compound in the manufacture of ammunition.

6.2 Ordering data - Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Type of compound and whether dye shall be added to Type III compound (see 3.3.1).
- (c) Size and type of unit container (see 5.1).
- (d) Quantity required.
- (e) Levels of packaging and packing (see 5.1).
- (f) Whether special Ordnance tests are required (see 3.2.1).
- (g) Additional data, if required (see 3.1).

6.3 Influences on application techniques - In applying compounds procured under this specification, the using activity should maintain flexibility in its application techniques. For example, variations in temperature and humidity influence drying time. Variations in surface conditions may require cleaning of the surface to remove waxes, oils, or greases. Porous surfaces may require a preliminary coat of adhesive to seal the surface.

6.4 Thinner (Types I and II only) - The following thinner composition is considered satisfactory for use with Types I and II compounds.

Ethyl alcohol	42 ±2 percent
Acetone	29 ±2 percent
Butyl acetate	29 ±2 percent

6.5 Humidity - The conditions specified in 4.5.5 may be obtained by placing a wet towel, one end of which dips in a beaker of water, in an oven at 35° C.

6.6 Supersession data - This specification supersedes the requirements of MIL-A-11238A (ORD) dated 18 September 1962, and Type III, only, of MIL-A-388A, dated 9 June 1959.

6.6.1 Cross reference -

Superseded specifications

Type I	identical to Type I of MIL-A-11238A(ORD)
Type II	identical to Type II of MIL-A-11238A(ORD)
Type III	identical to Type III of MIL-A-388A

NOTE

Types I and II of MIL-A-388A have been superseded by Types I and II, respectively, of MMM-A-105.

6.7 Marginal notations - The margins of this specification are marked with an asterisk to indicate where changes (deletions, additions, etc.) to the superseded documents were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the superseded documents.

6.8 Toxicity - Any questions regarding possible toxic effects on personnel from contact, or by breathing vapors, shall be referred to the appropriate departmental medical authority. In the case of Army procurement, the procuring agency will determine that the adhesive and sealing compounds, when used for their intended purposes are not likely to result in adverse effects on health of personnel. The Surgeon General will act as advisor in those instances where professional medical advice is indicated.

Military custodians:

Army - MR
Navy - OS
Air Force - 84

Preparing activity:

Navy - OS

Project No. 8040-0188

Review activities

Army - GL, MR, MU
Navy - AS, OS
Air Force - 84

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No 119-R004

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 (as indicated on reverse hereof).

SPECIFICATION

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ADHESIVE AND SEALING COMPOUNDS, CELLULOSE NITRATE
BASE, SOLVENT TYPE (FOR ORDNANCE USE)

ORGANIZATION (Of submitter)

CITY AND STATE

CONTRACT NO

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

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 (Printed or typed name and activity)

DATE

DD FORM 1426
NOV 64

REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE

C-827



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