NOT MEASUREMENT SENSITIVE

MIL-DTL-81772C
5 September 2019
SUPERSEDING
MIL-T-81772B(AS)
29 January 1986
AMENDMENT 1
25 October 1991

DETAIL SPECIFICATION

THINNER, AIRCRAFT COATING

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

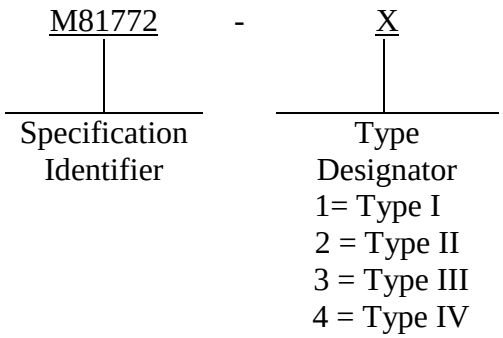
1. SCOPE

1.1 Scope. This specification covers the requirements for four types of thinner to be used in reducing aircraft coatings.

1.2 Classification. The aircraft coating thinners are furnished in the following types as specified (see 6.2):

Type I - Polyurethane thinner
Type II - Epoxy thinner
Type III - Acrylic and alkyd thinner
Type IV - Polyurethane and epoxy thinner (low-VOC and HAP-free)

1.3 Part or Identifying Numbers (PIN). PINs to be used for cataloging purposes of this material are created as follows:



Comments, suggestions, or questions on this document should be addressed to (Naval Air Warfare Center, Aircraft Division Lakehurst, Code 4.1.2.2, Mail Stop 120-3, Route 547, Joint Base MDL, NJ 08733-5100) or emailed to michael.sikora@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil

AMSC N/A FSC 8010

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-141	Paint, Varnish, Lacquer, and Related Materials: Methods of Inspection, Sampling and Testing
FED-STD-313	Material Safety Data, Transportation Data, and Disposal Data For Hazardous Materials Furnished to Government Activities

(Copies of these documents are available online at https://quicksearch.dla.mil.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

CODE OF FEDERAL REGULATION

29 CFR 1910.1200	Occupational Safety and Health Standards-Hazard Communication

(Copies of the Code of Federal Regulations are available online at https://www.ecfr.gov.)

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Method 313	Determination of Volatile Organic Compounds (VOC) by Gas Chromatography/Mass Spectrometry (GC/MS)

(Copies of this document are available online at http://www.aqmd.gov.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) INTERNATIONAL

ASTM D1209	Standard Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)
ASTM D1296	Standard Test Method for Odor of Volatile Solvents and Diluents
ASTM D1353	Standard Test Method for Nonvolatile Matter in Volatile Solvents for use in Paint, Varnish, Lacquer and Related Products
ASTM D1364	Standard Test Method for Water in Volatile Solvents (Karl Fischer Reagent Titration Method
ASTM D1613	Standard Test Method for Acidity in Volatile Solvents and Chemical Intermediates Used in Paint, Varnish, Lacquer, and Related Products
ASTM D2804	Standard Test Method for Purity of Methyl Ethyl Ketone by Gas Chromatography
ASTM D2879	Standard Test Method for Vapor Pressure-Temperature Relationship and Initial Decomposition Temperature of Liquids by Isoteniscope
ASTM D3278	Standard Test Method for Flash Point of Liquids by Small Scale Closed Cup Apparatus

(Copies of ASTM International documents are available online at https://www.astm.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Materials. Materials shall be of the highest quality used in commercial practice and entirely suitable for the purpose intended under normal conditions of use. Materials shall contain no chlorinated hydrocarbons nor other solvents of a toxic nature. Type I and type IV materials shall be free from water and alcohols that would adversely affect the performance of polyurethane coatings. The use of reclaimed thinner material is prohibited.

3.1.1 Prohibited materials (Type IV only). The Type IV thinner shall contain no hazardous air pollutants (see 6.5).

3.2 Composition. The composition shall conform to the percentages by volume as specified in table I.

3.3 Quantitative requirements. The thinner shall meet the quantitative requirements specified in table II.

3.4 Qualitative requirements.

3.4.1 Appearance. The appearance of the thinner shall be clear and free of suspended matter, when examined by transmitted light (see table III).

3.4.2 Odor. The odor shall be characteristic of the ingredients and not noticeable after drying from filter paper (see table III).

3.4.3 Spot test. The thinner shall leave no oily spot or stain on the filter paper (see table III).

4. VERIFICATION

4.1 Conformance inspection. Conformance inspection shall be performed on each lot of thinner offered for inspection and shall consist of thinner properties testing (see 4.3).

4.2 Sampling for conformance inspection.

4.2.1 Inspection lot. An inspection lot of the thinner material shall consist of one production run, produced by one manufacturer under the same processing conditions, without change in ingredients or ingredient lots and offered for delivery at one time. In the event that the process is a batch process, each batch shall constitute a lot.

4.2.2 Inspection of filled containers. Two filled containers shall be selected at random for each inspection lot. If more than one lot is represented in the shipment, each lot represented shall be treated as a separate shipment for sampling purposes. The contents of each filled container, selected at random for sampling, shall be thoroughly mixed immediately prior to sampling. Each sample shall be tested to determine compliance with this specification. The samples selected shall be subjected separately to the tests specified in 4.3. If either sample fails one or more of these tests, the lot shall be rejected.

4.3 Test procedures. The thinner shall be tested in accordance with table III.

4.3.1 Alcohol content. The alcohols present and their concentration shall be determined in accordance with ASTM D2804. Alcohol content shall be determined by summing the percentages of all alcohols typically present in the individual components, including diacetone alcohol, methyl amyl carbinol, methyl isoamyl carbinol, 1-methoxy-2-propanol (also known as propylene glycol monomethyl ether), in addition to the alcohols referenced in ASTM D2804.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM

products, or by contacting the responsible packaging activity.

6. NOTES

6.1 Intended use. The thinner covered by this specification is intended for use in reducing aircraft coatings to the desired viscosity. The materials covered by this specification are compatible with the below listed primers and topcoats; however, any manufacturers' recommendations for thinning of coatings take precedence. These materials can be used for pre-paint solvent cleaning and for paint equipment cleaning.

Type I - Polyurethane thinner is intended for use with:

SAE AMS-C-83231	-	Coatings, Polyurethane, Rain Erosion Resistant for Exterior Aircraft and Missile Plastic Parts
MIL-PRF-85285	-	Coating: Polyurethane, Aircraft and Support Equipment
MIL-PRF-85322	-	Coating, Elastomeric, Polyurethane, Rain-Erosion

Type II - Epoxy thinner is intended for use with:

MIL-PRF-22750	-	Coating, Epoxy, High-Solids
MIL-PRF-23377	-	Primer Coatings: Epoxy, High-Solvents

Type III - Acrylic and alkyd thinner is intended for use with:

A-A-3164	-	Synthetic, Lacquer, Camouflage, Exterior, VOC Compliant
A-A-3165	-	Lacquer, Gloss, For Aircraft Use
TT-P-1757	-	Primer Coating, Alkyd Base, One Component
MIL-PRF-81352	-	Coatings, Aircraft Touch-up

Type IV - Low-VOC, HAP-free polyurethane and epoxy thinner is intended for use with:

MIL-PRF-22750	-	Coating, Epoxy, High-Solids
MIL-DTL-53022	-	Primer, Epoxy Coating, Corrosion Inhibiting Lead and Chromate Free
MIL-DTL-53039	-	Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant
MIL-PRF-23377	-	Primer Coatings: Epoxy, High-Solids
MIL-PRF-85285		Coating: Polyurethane, Aircraft and Support Equipment

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification.
b. Type of thinner desired (see 1.2).
c. Quantity desired.

6.3 Certified test report. The manufacturer of the thinner should furnish, with each lot, a certified test report showing the thinner conforms to the specification requirements herein.

6.4 Safety Data Sheet (SDS). A Safety Data Sheet should be prepared and submitted in accordance with FED-STD-313 and be in accordance with the requirements of 29 CFR 1910.1200. When FED-STD-313 is at variance with the CFR, 29 CFR 1910.1200 takes precedence over, modifies and supplements FED-STD-313.

6.5 Hazardous Air Pollutant (HAP). HAP is defined as any substance listed under Section 112 of the Clean Air Act or its modifications. The text of the Clean Air Act, listed pollutants and modifications are kept by the Environmental Protection Agency (EPA) and are accessible through the website http://www.epa.gov.

6.6 VOC and vapor pressure limits. The South Coast Air Quality Management District (SCAQMD) current and foreseeable future permissible limits for aerospace wipe solvent operations are a vapor pressure of 25 mm Hg (20 °C) and VOCs of 200 g/l. The composite vapor pressure of 25 mm Hg (20 °C) dictates that the procured material contain no greater than ~79% tert-butyl acetate when accounting for manufacturing tolerances (i.e. +/- 2%). The VOC limit of 200 g/l dictates that the procured material contain no greater than ~24% methyl amyl ketone when accounting for manufacturing tolerances (i.e. +/- 2%).

6.7 Basis of purchase. The thinner covered by this specification should be purchased by volume. The unit of purchase is one gallon (231 cubic inches at 20 °C). The volume of delivery may be determined by dividing the net weight (in pounds) by the density (weight per gallon). To obtain the weight per gallon, multiply the specific gravity, at 20 °C, by 8.322. One gallon of thinner at 20 °C weighs between 7.36 and 7.49 pounds.

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

6.9 Subject term (key word) listing.

Methyl Amyl Ketone
Methyl Ethyl Ketone
Methyl Isobutyl Ketone
Paints
Reduction
Safety Data Sheet (SDS)
Tert-butyl acetate
Toluene
Viscosity
Xylene

TABLE I. Composition.

MATERIAL 1/	Percent by volume			
	Type I	Type II	Type III	Type IV 2/
Methyl ethyl ketone	30 min	50 min	30 min	
Methyl amyl ketone				24 max
Methyl isobutyl ketone		20 max		
Ethyl acetate			30 min	
Butyl acetate	10 min			
T-Butyl acetate				76 min
Propylene glycol methyl ether acetate (ethyl 3-ethoxypropionate, or oxo-hexyl acetate are acceptable substitutes)	40 min		20 min	
Propylene glycol methyl ether		30 min		
Toluene	12 max		12 max	
Xylene	8 max		8 max	

1/ The Chemical Abstracts Service (CAS) registry numbers for the compounds in table I are as follows:

Methyl ethyl ketone: 78-93-3
Methyl amyl ketone: 110-43-0
Methyl isobutyl ketone: 108-10-1
Ethyl acetate: 141-78-6
Butyl acetate: 123-86-4
T-Butyl acetate: 540-88-5
Propylene glycol methyl ether acetate: 108-65-6
Ethyl 3-ethoxypropianate:763-69-9
Oxo-hexyl acetate: 88230-35-7
Propylene glycol methyl ether: 107-98-2
Toluene: 108-88-3
Xylene: 1330-20-7

2/ The composite vapor pressure of 25 mm Hg (20°C) dictates that the procured material contain no greater than ~79% tert-butyl acetate. The VOC limit of 200 g/L dictates that the procured material contain no greater than ~24% methyl amyl ketone.

TABLE II. Quantitative requirements.

Characteristic	Requirements			
	Type I	Type II	Type III	Type IV
Maximum water content, percent by weight	0.2	-	-	0.02
Maximum alcohol content, percent by weight	0.6			0.04
Maximum nonvolatile content, grams per 100 ml	0.02	0.02	0.02	0.02
Minimum flash point, ºF	38 ºF	32 ºF	26 ºF	40 °F
Maximum volatile organic compounds, lbs/gallon (g/L) (see 6.6)				1.67 (200)
Maximum acidity, percent by weight				0.01
Maximum composite vapor pressure, mm Hg (see 6.6)				25
Maximum Platinum-Cobalt Scale color				10

TABLE III. Test methods.

Requirement paragraph or table	Property	ASTM	FED-STD-141 Test method no.
3.2	Composition 1/	-	-
3.3	Water content (Fischer titration)	D1364	-
3.3	Alcohol content	(see 4.3.1)	-
3.3	Nonvolatile content	D1353	-
3.3	Flash point (Setaflash)	D3278	-
3.4.1	Appearance	-	4261
3.4.2	Odor	D1296	-
3.4.3	Spot test	-	4491
Table II	Volatile organic compounds		2/
Table II	Acidity	D1613	
Table II	Composite vapor pressure	D2879	
Table II	Platinum-Cobalt Scale Color	D1209	

1/ The manufacturer must certify that the compositions for Types I, II, III, and IV were manufactured using the CAS Numbers specified in table I. The manufacturer must also certify that the Type IV composition does not contain any Hazardous Air Pollutants (HAPs) (see 3.1.1 and 6.5).
2/ Volatile Organic Compounds (VOC) content will be determined in accordance with SCAQMD Method 313.

CONCLUDING MATERIAL

Custodians:
Army - MR
Navy - AS
Air Force - 20

Review activities:
Army - AR
Air Force - 84

Preparing activity:
Navy - AS
Project 8010-2019-004

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using ASSIST Online database at https://assist.dla.mil.