SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-C-83873 REV. A

Issued 1999-06
Cancelled 2010-12

Superseding AMS-C-83873

Cleaning Compound, Precoating Surface, Aircraft and Aerospace Ground Equipment (AGE)

RATIONALE

AMS-C-83873 is being cancelled for the following reasons:

1. MIL-C-83873 was cancelled in 1996 but it was superseded by MIL-C-87937 Type II, and MIL-C-87937 was superseded by MIL-PRF-87937 in 1997.

2. Drawings and specifications that call out MIL-C-83873 should be using MIL-PRF-87937 Type II, not AMS-C-83873.

3. AMS-C-83873 is not recognized as an acceptable alternative for MIL-C-83873.

CANCELLATION NOTICE

This document has been declared "CANCELLED" as of December 2010. By this action, this document will remain listed in the Numerical Section of the Aerospace Standards Index.

Cancelled specifications are available from SAE.

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http://www.sae.org/technical/standards/AMSC83873A

NOTICE

This document has been taken directly from U.S. Military Specification MIL-C-83873A, Notice 1, and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-C-83873A, Notice 1. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical document.

1. SCOPE:

1.1 Scope:

This specification establishes the requirements for biodegradable, enzyme based, precoating surface cleaners.

2. APPLICABLE DOCUMENTS:

The following publications, 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.

2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

O-A-51	Acetone, Technical
P-D-680	Dry Cleaning Solvent
QQ-A-250/4	Aluminum Alloy, 2024, Plate and Sheet
QQ-A-250/5	Aluminum Alloy, Alclad 2024 Plate and Sheet
QQ-A-250/12	Aluminum Alloy, 7075, Plate and Sheet
QQ-M-44	Magnesium Alloy, Plate and Sheet (AZ31B)
TT-C-2756	Coating: Self-priming Topcoat, Low VOC
TT-E-529	Enamel, Alkyd Semi-gloss Low VOC
TT-I-735	Isopropyl Alcohol
TT-P-2760	Primer: Flexible, Polyurethane
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-636	Boxes, Shipping, Fiberboard
PPP-D-729	Drums, Shipping and Storage, Steel, 55 Gallons
PPP-F-320	Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade) and Cut Shapes
PPP-P-704	Pails, Metal: (Shipping, Steel, 1 through 12 gallons)
MIL-M-3171	Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on
MIL-P-5425	Plastic Sheet, Acrylic, Heat Resistant
MIL-C-5541	Chemical Conversion Coating of Aluminum and Aluminum Alloys
MIL-S-7952	Steel, Sheet and Strip, Uncoated, Carbon (1020 and 1025) (Aircraft Quality) (ASG)
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-T-9046	Titanium and Titanium Alloy, Sheet, Strip and (For Aircraft Use)
MIL-A-9962	Abrasive Mats, Nonwoven, Nonmetallic
MIL-P-23377	Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-P-25690	Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant

2.1 (Continued):

MIL-C-38334	Corrosion Removing Compound, Prepaint, for Aircraft Aluminum Surfaces
MIL-H-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft, NATO Code No. H-537
MIL-C-83286	Coating Urethane, Aliphatic Isocyanate, for Aerospace Application
MIL-P-83310	Plastic Sheet, Polycarbonate, Transparent
MIL-P-85582	Type I, Class II Primer Coatings: Epoxy, Waterborne
FED-STD-141	Paint, Varnish, Lacquer and Related Materials Methods of Inspection, Sampling and Testing
FED-STD-313	Material Safety Data Sheets, Preparation and the Submission of
FED-STD-595	Color
MIL-STD-109	Quality Assurance Terms and Definitions
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-147	Palletized Unit Loads
40 CFR	Protection of Environment
29 CFR	OSHA Safety and Health Standards (1910)

2.2 Federal Environmental Protection Agency (EPA) Standards:

USEPA, Environmental Monitoring and Support Laboratory, 26 West Martin Luther King Drive, Cincinnati, OH 45268.

EPA 420.1	Phenolics, Total Recoverable, Spectrophotometric Manual 4-AAP with Distillation

2.3 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 93	Test for Flash Point by Pensky-Martens Closed Tester
ASTM A 153	Zinc Coating (Hot Dip) on iron and steel Hardware
ASTM D 460	Chemical Analysis of Soaps
ASTM D 846	Xylene
ASTM D 891	Test Methods for Specific Gravity, Apparent, of Liquid Industrial Chemicals,
ASTM D 3951	Commercial Packaging, Practice for
ASTM E 70	pH of Aqueous Solutions with the Glass Electrode
ASTM F 483	Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
ASTM F 484	Stress Craze Test of Acrylic Plastics in Contact with Liquid and Semi-Liquid Compounds
ASTM F 485	Effects of Cleaners on Unpainted Aircraft Surfaces
ASTM F 502	Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
ASTM F 503	Preparing Aircraft Cleaning Compounds, Liquid Type, for Storage Stability Testing

2.3 (Continued):

ASTM F 519 Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals
ASTM F 1110 Test Method for Sandwich Corrosion Test
ASTM F 1111 Corrosion of Low Embrittling Cadmium Plate by Aircraft Maintenance Chemicals

2.4 Uniform Freight Classification Publications:

Available from the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.

Uniform Freight Classification Rules (Current Issue)

2.5 AISI Publications:

Available from the American Iron and Steel Institute, 1133 15th Street N.W., Suite 300, Washington, DC 20005. Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.

AISI 4340 High Strength, Low Alloy Steel

3. REQUIREMENTS:

3.1 Qualification:

3.1.1 Qualification (Initial): The cleaning compound furnished under this specification shall be a product which has been tested and has passed the qualification tests specified herein and has been listed or approved for listing on the applicable Qualified Products List (QPL).

3.1.2 Qualification (Periodic): The cleaning compound furnished under this specification must be retested or recertified by the qualifying activity at least every three years for the product to remain listed on the QPL. Qualification retesting shall be accomplished on any qualified cleaning compound for which a using activity issues a valid deficiency report. The cleaning compound shall also be subject to qualification retesting for any change in chemical formulation, material, process, or procedure in manufacturing the cleaning compound. Any cleaning compound which does not conform to all the qualification tests specified herein on periodic requalification testing shall be removed from the QPL.

3.2 Materials:

The composition and formulation of the cleaning compound shall be optional with the manufacturer within the restrictions specified herein.

3.2.1 Unacceptable Materials: The cleaning compounds shall not contain any chlorinated compounds, phosphates, abrasives, chromates, phenols, cresols, terpenes, amines, petroleum hydrocarbons, lead, mercury, cadmium, or chromium. The following materials are unacceptable unless they are being used as an essential active ingredient in the cleaner: sodium chloride, urea, sodium sulfate, nitrates, or nitrites. It also shall not contain any chemical listed by the current report of known carcinogens of the National Toxicology Program (NTP), or any hazardous compounds as defined in 40 CFR 261. (See paragraph 4.8).

3.2.2 Acceptable Materials: The cleaning compound shall consist of a stable, homogeneous product, composed of one or more of the materials listed below. Certification from the manufacturer as to the composition of the cleaning compound is required.

Bioenzyme mixture and nutrients
Surfactants
Corrosion Inhibitors
Buffers

3.3 Toxicity:

The cleaning compound shall have no adverse effect on the health of personnel when used for its intended purpose and with proper personal protective equipment (when required). The cleaner must be evaluated and approved for toxicity in accordance with EPA 600/4-89/001 procedure prior to listing on the QPL (see paragraph 4.7)

3.3.1 Formulation: The manufacturer must submit to the qualifying activity, SA-ALC-SFTT, 1014 Andrews Rd Suite 1, Kelly AFB TX 78241-5603, each of the following:

a. Written certification that the cleaning compound contains no substance known to be toxic as defined in 29 CFR and 40 CFR as of the date of qualification or requalification of the product.
b. A complete formulation including the chemical name and weight percent of each ingredient. Trade names alone are not satisfactory. All proprietary information shall be protected as such.

3.3.2 Material Safety Data Sheet: The manufacturer shall submit a material safety data sheet (MSDS) for each component of the product and for the finished product to the qualifying and procuring activities. The MSDS shall be prepared in accordance with the latest revision of FED-STD-313.

3.3.3 Toxicological Data: The manufacturer shall submit a copy of pertinent toxicological data/ information on their product to the qualifying activity. (See paragraph 4.7).

3.3.4 Biodegradability: The supplier of the cleaning compound shall furnish certification from the surfactant manufacturer(s) that the surfactants are readily biodegradable in accordance with 40 CFR, Part 796, Subpart D. Biodegradability testing shall be accomplished as specified in paragraph 4.7.1 on the finished product. Biodegradability on the finished product shall be determined over 28 days by the Shake Flask Method monitored by analysis of Total Organic Carbon (TOC). The product shall conform to a minimum of 85% biodegradable at the end of the 28 day period.

3.4 Compositional Assurance:

The cleaning compound shall be tested for nonvolatile matter as specified in paragraph 4.6.1. Results of this test as well as an infrared spectrogram of the nonvolatile matter (see 4.9) shall be recorded by the qualifying activity for use in quality conformance inspections (see 4.4). Quality conformance inspection results for nonvolatile matter shall not differ by more than 2 percent absolute from this recorded value. Quality conformance inspection infrared spectrograms shall show no significant difference when compared to the original qualifying spectrogram.

3.5 Chemical Properties:

3.5.1 Chemical Requirements: The cleaning compound shall meet the requirements listed in Table I.

3.5.2 Volatility: The volatility of a 6 percent solution of the cleaning compound (mixed with distilled water) shall be less than or equal to the volatility of distilled water when tested in accordance with 4.6.4.

3.5.3 Residue Rinsibility: When a freshly prepared solution of the cleaning compound is tested in accordance with 4.6.5, it shall not leave any residue or stains. (A freshly prepared solution is defined as one being prepared no longer than 30 minutes prior to testing.) Weight change shall be no greater than that obtained with standard hard water (plus or minus 0.2 mg) tested under the same conditions.

3.5.4 Solvent Content: The cleaning compound shall not contain more than 3.0 weight percent of organic solvents when tested in accordance with 4.6.16.

3.6 Physical Properties:

TABLE I. Quantitative requirements

REQUIREMENT	MIN	MAX	TEST METHOD
Insoluble Matter (wt%)	---	0.05	4.6.2
pH 6% Solution Conc. Solution	 7.0 7.5	 8.5 9.0	4.6.3
Flash Point, °C	None 1/	---	4.6.7
Emulsion Characteristics	---	0.5 ml	4.6.8
Hard Water Stability (ppm silica)	---	20.0	4.6.9

1/ No flash point should be observed up to the boiling point of the compound.

3.6.1 Cold Stability: The concentrated cleaning compound shall return to its original homogeneous condition when tested in accordance with 4.6.6.

3.7 Effect on Metals:

3.7.1 Total Immersion Corrosion: When tested in accordance with 4.6.10, the concentrated cleaning compound and a six (6) percent solution of the cleaning compound in distilled water shall not cause pitting corrosion or cause a weight change of an average of three (3) test panels greater than that shown in Table II.

3.7.1.1 Hot Dip Galvanized Total Immersion Corrosion: Steel panels conforming to MIL-S-7952, Grade 1020, Hot Dip Galvanized per ASTM A 153, immersed in the concentrated cleaning compound and a six (6) percent solution of the cleaning compound in distilled water shall not cause pitting corrosion or cause weight change of an average of three (3) test panels greater than 0.30 mg/cm^2/24 hours when tested in accordance with 4.6.10.1.

3.7.2 Low-Embrittling Cadmium Plate Corrosion: Steel panels coated with low-embrittling cadmium plate immersed in the concentrated cleaning compound and a six (6) percent solution of the cleaning compound in distilled water shall not show a weight change greater than 0.14 mg/cm^2 for 24 hours when tested in accordance with 4.6.11.

TABLE II. Total Immersion Corrosion Requirements

Alloy	Average of 3 Panels Weight Loss, Max (mg/cm^2/168hrs)
Magnesium (AZ 31B-H24) QQ-M-44 surface treated in accordance with Type III of MIL-M-3171	0.21
Aluminum, QQ-A-250/4, T3 surface treated in accordance with Type II, Class I of MIL-A-8625	0.49
Aluminum, QQ-A-250/4, Bare T3 Alloy	0.49
Aluminum, QQ-A-250/12, Bare T6 Alloy	0.49
Titanium, MIL-T-9046, 6AL-4V Class III, Composition C	0.35
Steel, MIL-S-7952, Grade 1020,	0.50

3.7.3 Effects on Unpainted Metal Surfaces: A six (6) percent solution of the cleaning compound in distilled water shall not cause streaking, stains or other deposits that cannot be easily removed with water when tested in accordance with 4.6.12.

3.7.4 Sandwich Corrosion: When tested in accordance with 4.6.17, the cleaning compound shall not cause a corrosion rating greater than two (2) on any test panel.

3.7.5 Wet Adhesion Tape Test: A six (6) percent solution of the cleaning compound, when used as directed, shall remove soil from a painted surface in preparation for repainting such that paint applied after cleaning with the compound shall adhere to the surface when tested in accordance with 4.6.9.

3.8 Effect on Painted Surfaces:

The concentrated cleaning compound and a six (6) percent solution of the cleaning compound in distilled water shall not cause streaking, blistering, discoloration or a permanent decrease in film hardness of more than one pencil hardness level when tested in accordance with 4.6.13.

3.9 Stress Crazing of Aircraft Transparencies:

A six (6) percent solution by volume of the cleaning compound in distilled water shall not cause stress crazing or staining acrylic plastics when tested in accordance with 4.6.14.

3.10 Long-term Storage Stability:

After being stored for a period of 12 months, in accordance with 4.6.15, the cleaning compound shall not separate, precipitate or cause corrosion of the shipping container and shall meet all requirements of this specification.

3.11 Foaming Properties:

The cleaning compound, when tested as specified in 4.6.18, shall produce a stabilized foam which shall not break down nor produce more than 80 ml of liquid after standing for 4 minutes. The foam produced with foam generating equipment shall cling to vertical and underside panel surfaces and shall remain on all panels tested for not less than 60 seconds.

3.12 Workmanship:

The cleaning compound shall be manufactured from materials entirely suitable for the purpose intended and shall be processed in a manner that shall produce a product harmless to metal surfaces and humans when used as directed.

3.13 Colormetric Test for Total Phenol:

The cleaning compound shall contain no more than 0.05 percent by weight of total phenols when tested in accordance with para 4.6.20.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification when such inspections are deemed necessary to assure supplies and services conform to prescribed requirement.

4.1.1 Responsibility for compliance: All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of Tests:

The inspection and testing of the cleaning compound shall be as follows: (as defined in MIL-STD-109)

a. Qualification inspection (4.3).
b. Quality conformance inspection (4.4).

4.3 Qualification inspection:

Qualification inspection shall consist of all inspections and tests specified herein.

4.3.1 Qualification Samples: The initial qualification samples shall consist of 9.5 liters (2.5 gallons) of the cleaning compound. The cleaning compound shall be furnished in containers of the type specified in para 5.1. Samples shall be identified as follows and forwarded to the activity responsible for testing, as designated in the letter of authorization from the activity responsible for qualification (See 6.3).

- Samples for Qualification Tests.
- Cleaning Compound, Precoating Surface, Aircraft and AGE.
- MIL-C-83873.

4.3.1 (Continued):

- (Manufacturers Product and Code Number.)
- (Name and Address of Contractor.)
- Submitted by (Name), (Date) for Qualification Testing in Accordance with the Requirements of MIL-C-83873 Under Authorization (Reference Authority Letter).
-(Mixing and Other Important Instructions.)
- (Safety Information and Precautions.)

4.3.2 Test Reports: In addition to the qualification test samples, the contractor shall furnish a certified test report showing that the material conforms to all the requirements of this specification with the exception of the storage stability. Additionally, a certified statement shall be furnished to the qualifying activity that specifically identifies each ingredient including solvent, in the cleaning compound by a readily recognizable chemical name, source and percentage by weight contained in the compound. Trade names alone shall not be considered satisfactory.

4.3.3 Qualification Required: Prior to actual procurement, the cleaning compound shall pass the qualification inspections and requirements specified herein. If the product is later modified in any way, the modified form shall be subjected to and shall pass the same qualification inspections (see 3.1.1). Any changes or modifications from the formulation used at the initial qualification shall be approved by the qualifying activity and shall require requalification. All qualifications shall be granted contingent upon compliance with the long term storage stability requirement specified in paragraph 3.10 (Government conducted). QAR shall verify that each batch/lot consists of the same formulation as used in the initial qualification.

4.4 Quality Conformance Inspection:

Quality conformance inspection of the cleaning compound shall consist of the following tests.

A. Cold Stability
B. Immersion Corrosion *
C. Emulsion Characteristics
D. Nonvolatile Matter
E. pH
F. Flash Point
G. Insoluble Matter
H. Hard Water Stability
I. Infrared Spectrogram
J. Wet Adhesion Tape Test

* Immersion Corrosion Quality Conformance Test run on Aluminum QQ-A-250/4, Bare T3 alloy panel only.

If during the quality conformance testing a lot fails any of the above acceptance tests, all tests required for qualification shall be reinstituted. These qualification tests shall be required until two successive lots meet all requirements of the specification, after which quality conformance testing shall again be authorized (See paragraph 4.4)

4.4.1 Sampling: Unless otherwise specified, not less than a 3.8 liter (1 gal) container of the cleaning compound shall be selected at random from each batch and subjected to the tests specified in 4.4.

4.4.2 Lot: A lot shall consist of one of the following:

a. The cleaning compound produced in not more than 24 consecutive hours from a continuous process which is used to fill shipping containers directly from the process output. A continuous process shall be the production of product by continuous input of raw materials and output of finished product by one manufacturer in one plant with no change in manufacturing conditions of materials.

b. The cleaning compound from individual runs of a batch process which is used to fill shipping containers directly from the process output. A batch process shall be the production of product by runs from single additions of raw materials which are mixed, reacted, and/or purified forming the product.

c. The cleaning compound from either or both the continuous and batch processes which is held in a single storage tank and subsequently withdrawn to fill shipping containers. The product shall be homogeneous at the time of withdrawal and shall not be added to while being withdrawn. After each addition to the storage tank, the contents shall constitute a separate batch.

4.4.3 Sampling of Product: Unless otherwise specified, quality conformance tests shall be made on the sample of product taken directly from the filled containers. The number of filled containers selected for sampling from each lot shall be in accordance with Table III. The first and last containers to be filled within a given lot shall be sampled. Other containers shall be selected at random. The contents of each selected container for sampling shall be thoroughly mixed by rolling and inverting immediately prior to sampling. The samples may be obtained in any convenient manner that does not compromise the integrity of the sample. The sampled containers shall be subjected to the inspections specified in 4.4.5.

4.4.4 Inspection of Materials: The contractor is responsible for insuring that materials and components used are manufactured, tested and inspected in accordance with the requirements of referenced subsidiary specifications and standards to the extent specified, or, if none, in accordance with this specification. (See 2.3)

4.4.5 Inspection of the End Item: Examination of the end item shall be made in accordance with the following classification of defects. The lot size, for purposes of determining the sample size in accordance with Table III, shall be expressed in units of filled primary containers for the examination specified in 4.4.5.1, and 4.4.5.2, and in units of shipping containers for the examinations specified in 4.4.5.3

4.4.5.1 Examination for Container Defects: The end item containers shall be examined for defects in appearance, closure, construction, workmanship, and markings in accordance with Table IV.

TABLE III. Sampling for Tests

Number of Containers in lot	Number of Containers to be sampled
2 to 15	2
16 to 25	3
26 to 90	5
91 to 150	8
151 to 280	13
281 to 500	20
501 to 1200	32
1201 to 3200	50
3201 to 10000	80
10001 to 35000	125
35001 to 150000	200
150001 to 500000	315
500001 and over	500

TABLE IV. Examination for Container Defects

EXAMINATION	DEFECT
- Appearance, construction, and workmanship	Not in container specified, cracked, crushed, or any defect affecting serviceability. Not clean; evidence of dirt, rust, or foreign matter.
- Closure	Any leakage or seepage of contents in either an upright or horizontal position. Closure not as specified.
- Markings	Omitted, illegible, incorrect, or not in accordance with contract requirements.

4.4.5.2 Examination for Net Contents: The quality of the lot shall be unacceptable if the average net content is less than the specified or indicated quantity.

4.4.5.3 Examination of Preparation for Delivery: An examination shall be made to determine the packing, palletization, and markings comply with Section 5 and Table V.

4.4.6 Rejection and Retest: Rejected material shall not be resubmitted for acceptance without prior approval of the qualifying activity. The application for resubmission shall contain full particulars concerning previous rejections and all measures taken to correct those defects. Samples for retest shall be taken from previously unopened product containers.

4.5 Standard Conditions:

Standard conditions are defined by FED-STD-141, Section 9. All laboratory tests shall be conducted at standard conditions unless otherwise specified herein.

TABLE V. Examination of Preparation for Delivery

EXAMINATION	DEFECT
- Packing	Container not as specified. Arrangement or number of unit containers per pallet (as applicable) not in accordance with contract requirements. Loose or inadequate strappings, bulged or distorted containers.
- Palletization	Palletization not in accordance with requirements.
- Markings	Data illegible, incorrect, incomplete or not in accordance with contract.

4.6 Test Methods:

4.6.1 Nonvolatile Matter: Weigh 5.00 ± 0.01 g of the sample in a porcelain or glass dish about 6 to 8 cm in diameter and about 2 to 4 cm in depth. Dry to constant weight using a forced circulation oven at a temperature of 105 ± 2 °C. Constant weight is attained when successive heating for 1-hour periods shows a loss (or gain) of not more than 0.1%. Nonvoltile matter determinations shall be made on a minimum of two samples and the average shall be reported. If the two weights differ by more than 0.5% relative, the procedure shall be repeated. The nonvolatile content of the each sample shall be calculated as follows:

$$\%NVM = \left[\frac{A}{B}\right] \times 100$$

Where: A = Weight of residue

B = Weight of sample

%NVM = Percent nonvolatile matter

4.6.2 Insoluble Matter: The concentrated cleaning compound shall be thoroughly agitated and a 200 ml test sample withdrawn. The insoluble matter shall be collected with the aid of a suitable vacuum source connected to a filtering apparatus consisting of a 2,000 ml Erlenmeyer flask, a size 4 (126 mm ID) Buchner funnel and a piece of 126 mm diameter Whatman No 5 filter paper, or equivalent. The filter paper shall be dried at 60 °C (140 °F) for 30 minutes in a gravity convection oven, cooled for 3 minutes in a desiccator, and weighed to the nearest 0.1 mg. The filter paper shall be placed in the Buchner funnel so that its circumference coincides with the circumference of the funnel. The vacuum shall be started and the filter paper wetted with approximately 10 ml of distilled water in order to secure it properly in place. The test sample shall be filtered. The sides of the beaker which contained the test sample shall be rinsed with 25 ml of distilled water from a wash bottle, and the rinse transferred to the funnel, insuring that any remaining insoluble matter is completely transferred with the rinse. When all the initial liquid and the rinse have been transferred through the filter, the sides of the funnel shall be washed with 25 ml of distilled water from a wash bottle and the rinse allowed to filter. The vacuum on the flask shall be relieved and the filter paper removed from the funnel. The filter paper shall be dried for 1 hour at 60 °C (140 °F) in a gravity convection oven, cooled for 3 minutes in a desiccator, and weighed to the nearest 0.1 mg. The percent insolubles shall be calculated as follows:

$$I = \left[\frac{A - B}{W}\right] \times 100$$

Where: A = Final filter paper weight

B = Initial filter paper weight

W = Weight of sample

I = % wt Insoluble matter

4.6.2 (Continued):

Care should be exercised throughout the final drying and weighing cycle to maintain the flat surface of the filter paper in a horizontal position in order that none of the insoluble matter shall be lost. Insoluble matter determinations shall be made on a minimum of two samples and the average shall be reported. If the two results differ by more than 0.5% relative, the procedure shall be repeated.

4.6.3 pH Value: The pH value of the concentrated cleaning compound and a 6 percent solution of the cleaning compound in freshly boiled distilled water shall be measured in accordance with ASTM E 70.

4.6.4 Volatility: A petri dish, 90 mm in diameter and 15 mm deep shall be placed on each pan of a two-pan beam balance with a minimum of a ± 0.5 gram precision. Sufficient compound shall be added to cover the entire bottom of one of the dishes. Distilled water shall be carefully poured in the other dish until the dish containing the compound is counterbalanced. The balance with filled dishes on the pans shall be exposed for 60 minutes in a draft free atmosphere having a temperature of 25 ± 3 °C (75 ± 5 °F). At the end of the exposure period, the comparative weight loss shall be determined.

4.6.5 Residue Rinsibility: Six (6) smooth aluminum dishes containing no creases or crevices shall be cleaned in a solution of Brite-Boy, (from 3D Inc., or equivalent), rinsed, dried, and weighed. 10 ml of 25 percent by volume solution of the cleaning compound in standard hard water (See 4.6.9.1) shall be placed in three of the precleaned dishes and tested as follows: Dry for 7 1/2 hours in a forced circulation oven at 68 ± 2 °C (154 ± 4 °F) with full draft. Cool in desiccator overnight and weigh. Rinse with running distilled water for 1 minute. Brush with sash-type brush containing long-fiber bristles (25 mm diameter by 38 mm to 64 mm long) for 1 minute using distilled water. Rinse for 30 seconds with running distilled water. Dry in oven, cool and reweigh. Check for compliance with 3.5.3. Standard hard water, prepared as described in 4.6.9.1, shall be tested as control for weight change comparison in the remaining three precleaned dishes, using the same procedure as above.

4.6.6 Cold Stability: A 50 ml sample of the cleaning compound shall be poured into a suitable test tube and cold to 0 °C (32 °F). This temperature shall be maintained for one hour. The compound shall be allowed to reach room temperature. After 5 (five) complete temperature inversion cycles of the test tube, the compound shall be examined for homogeneity.

4.6.7 Flash Point: The flash point of the concentrated compound shall be determined in accordance with ASTM D 93.

4.6.8 Emulsion Characteristics: 10 ml of a 6 percent by volume solution of the cleaning compound shall be placed in a 50 ml glass-stoppered, graduated cylinder. 30 ml of dry cleaning solvent conforming to P-D-680 Type II shall be added. An emulsion shall be formed by 10 inversions of the graduate followed by a vigorous 15 second shake. The 15 seconds of agitation shall be repeated after the emulsion has stood for 5 minutes. The resulting emulsion shall be allowed to stand for 2 hours. At the end of the 2-hour period, the emulsion shall be examined. There shall be no more than 0.5 ml separation of the P-D-680, water and cleaner.

4.6.9 Hard-Water Stability:

4.6.9.1 Preparation of Stock Solution: A 20-grain (as $CaCO_3$) hard-water stock solution shall be prepared by dissolving 0.40 ± 0.005 gm of reagent grade Calcium Acetate, $Ca(C_2H_3O_2)_2 \cdot 2H_2O$ and 0.28 ± 0.005 gm of reagent grade Magnesium Sulfate, $MgSo_4 \cdot 7H_2O$, in 1 liter of boiled distilled water.

4.6.9.2 Procedure: Using a 5 ml volumetric pipet transfer 5 ml of a 25 percent by volume solution of cleaning compound into each of 3 clean 50 ml volumetric flasks. Add hard-water stock solution to each of 3 flasks to make 50 ml. Each solution shall be well mixed and allowed to stand undisturbed for 24 hours at 25 ± 5 °C (77 ± 9 °F). Each solution shall then be visually examined for precipitation. Agitate each solution by inverting the flask five times. The turbidity shall be measured with a Hellige turbidimeter or equivalent nonphotometric instrument and calibrated as ppm silica.

4.6.10 Total Immersion Corrosion: The total immersion corrosion effects of the cleaning compound on the new, unused metals and metal alloys listed in 3.7.2 and Table II shall be determined in accordance with ASTM F 483. The specimens shall remain immersed for 168 hours. Wherever ASTM F 483 calls for the use of 1,1,1-trichloroethane, Acetone (O-A-51) may be substituted.

4.6.10.1 Hot Dip Galvanized Total Immersion Corrosion: The total immersion corrosion effect of the concentrated cleaning compound and a six (6) percent solution of the cleaning compound and distilled water on Steel, MIL-S-7952, Grade 1020, Hot Dip Galvanized per ASTM A 153 shall be evaluated per ASTM F 483. The specimens shall remain immersed for 168 hours. The metal gain or loss shall be divided by seven (7) and recorded as $mg/cm^2/24$ hrs.

4.6.11 Low Embrittling Cadmium Plate Corrosion: The cleaning compound shall be evaluated for corrosion on low-embrittling cadmium plate in accordance with ASTM F 1111.

4.6.12 Effects on Unpainted Metal Surfaces: The cleaning compound shall be evaluated for effects on unpainted metal surfaces to the requirements of ASTM F 485.

4.6.13 Effect on Painted Surfaces: Prepare a six (6) percent solution of cleaning compound with distilled water. Test both the six (6) percent solution and concentrate in accordance with ASTM F 502 except that the panels used for testing shall be coated with the paint systems listed in Table VI. All paint systems shall be tested and a separate panel shall be required for both six (6) percent solution and concentrate. A total of five (5) paint systems shall be tested. Test panels shall consist of the following paint systems found in Table VI:

1. Panel Code No. (A) primer with (D) topcoat
2. (A) primer with (E) topcoat
3. (B) primer with (D) topcoat
4. (C) primer with (E) topcoat
5. (F) self priming topcoat

4.6.14 Stress Crazing of Aircraft Transparencies: The cleaning compound shall be evaluated for stress crazing of Stretched Modified Acrylic Sheet, MIL-P-25690, Plastic Sheet Polycarbonate, Transparent, MIL-P-83310, and Sheet Acrylic Plastic, MIL-P-5425 in accordance with ASTM F 484 except that only the 6 percent solution by volume of the cleaning compound in distilled water shall be tested.

4.6.15 Long Term Storage Stability: The cleaning compound shall be prepared and stored for long term storage stability in accordance with ASTM F 503 using two (2) 3.8 liter (one-gallon) cans conforming to high density polyethylene or polypropylene containers. This test shall be conducted by the Air Force.

4.6.16 Solvent Content: The organic solvent content shall be determined by analyzing for volatile hydrocarbons in accordance with ASTM D 460.

4.6.17 Sandwich Corrosion: The cleaning compound shall be tested in accordance with ASTM F 1110, except that nonconformance shall be determined by the requirements specified in paragraph 3.7.4.

4.6.18 Foaming Properties: One part of the concentrated cleaning compound shall be mixed with 15 parts water. 100 ml of this mixture shall be placed in a 500 ml capacity blender with a maximum 95 mm (3.75 inch) outside diameter. The blender shall be turned on and run for 2 minutes at 8000 ± 1000 rpm. A stabilized foam is indicated by negligible agitation at the upper surface. The blender shall be turned off after 2 minutes and allowed to stand undisturbed for 4 minutes. After standing for 4 minutes, less than 80 ml of liquid shall be present at the bottom of the container. If the cleaning compound meets these requirements the test should be continued by spraying as a foam from a B&B Chemical Portafoamer 20 or equivalent, using tap water. The first application shall be made to an aluminum panel, 61 x 61 cm (24 x 24 in), from a hose having an inside diameter of 2.5 cm (1 in) and 15.2 x 22.9 m (50 to 75 ft) long at a dilution ratio set at 1 part compound to 9 parts water. The second application shall be made to a similar panel with a hose having an inside diameter of 1.9 cm (3/4 in) and 7.6 m (25 ft) in length with dilution set at 1 part compound to 9 parts water. The panels shall be held at an angle of 60 degrees to the horizontal.

TABLE VI. Test Panel Finishes

Primer Coatings				
Panel Set No.	Primer Material Specification	Dry Film Thickness Per Coat/ mm (inches)	No. of Coats	Drying Time Before Topcoating
A	MIL-P-23377, Primer, Coating Epoxy-Polyamide	0.0178 - 0.0229 (0.0007 - 0.0009)	1	2 - 8 hours
B	MIL-P-85582, Primer, Coating Waterborne, Epoxy	0.0178 - 0.0229 (0.0007 - 0.0009)	1	2 - 8 hours
C	TT-P-2760, Primer Coating Polyurethane	0.0203 - 0.0305 (0.0008 - 0.0012)	1	2 - 8 hours

Top Coats						
Panel Set	Topcoat Material	Dry Film Thickness Per Coat/ mm (inches)	No. of Coats	Drying Time Between Coats	Dry Film Thickness mm (inches)	Time Before Testing (Days)
D	TT-E-529 Enamel, Semigloss	0.0203 - 0.0305 (0.0008 - 0.0012)	2	1 hour	0.0457 - 0.0610 (0.0018 - 0.0024)	7
E	MIL-C-83286 Polyurethane	0.0203 - 0.0305 (0.0008 - 0.0012)	2	1 hour	0.0457 - 0.0610 (0.0018 - 0.0024)	7
F	TT-C-2756 Coating, Self Priming, Low VOC, Poly.	0.0203 - 0.0305 (0.0008 - 0.0012)	2	1 hour	0.0457 - 0.0610 (0.0018 - 0.0024)	7

4.6.19 Wet Adhesion (Tape Test): This method tests the intercoat adhesion of an organic coating system. This procedure is used to determine the cleanliness of the surface prior to coating.