

METRIC

MIL-C-85704B
10 November 1992
 Superseding
 MIL-C-85704A
 7 April 1986

MILITARY SPECIFICATION

CLEANING COMPOUND, TURBINE ENGINE GAS PATH

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

1. SCOPE

1.1 Scope. This specification establishes the requirements for two types of turbine engine cleaning compounds, used for starter cranked engine cleaning operations.

1.2 Classification. The cleaning compounds covered by this specification shall be of the following types:

- Type I - Solvent emulsion cleaner. Contains aromatic hydrocarbon solvents.
- Type II - Aqueous cleaner. Contains no hydrocarbon solvents.
- Type IIA - Ready-for-use aqueous cleaner. Contains no hydrocarbon solvents. Requires no dilution.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (See 6.2).

SPECIFICATIONS

FEDERAL

QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet
QQ-A-250/5	Aluminum Alloy Alclad 2024, Plate and Sheet
QQ-A-250/11	Aluminum Alloy 6061, Plate and Sheet
QQ-A-250/12	Aluminum Alloy 7075, Plate and Sheet

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Naval Air Systems Command, AIR-5363, Washington, DC 20361-5360, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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QQ-A-250/13	Aluminum Alloy Alclad 7075, Plate and Sheet
QQ-P-416	Plating, Cadmium (Electrodeposited)
QQ-S-766	Steel Plates, Sheet and Strip - Corrosion Resisting
TT-L-32	Lacquer, Cellulose Nitrate, Gloss, For Aircraft Use
PPP-D-705	Drum, Shipping and Storage, Steel, 16 and 30 Gallon Capacity
PPP-D-729	Drums, Shipping and Storage, Steel, 55 Gallon (208 liters)
PPP-P-704	Pail, Metal (Shipping, Steel, 1 thru 12 Gallon)

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MIL-S-7952	Steel, Sheet and Strip, Uncoated, Carbon (1020 and 1025) (Aircraft Quality)
MIL-A-8625	Anodic Coatings, For Aluminum and Aluminum Alloys
MIL-T-9046	Titanium and Titanium Alloy, Sheet, Strip and Plate
MIL-G-9954	Glass Beads, For Cleaning and Peening
MIL-C-22750	Coating, Epoxy, Polyamide
MIL-L-23699	Lubricating Oil, Aircraft Turbine Engines, Synthetic Base
MIL-C-81751	Coating, Metallic, Ceramic
MIL-C-83286	Coating, Urethane, Aliphatic Isocyanate, for Aerospace Applications

STANDARDS**FEDERAL**

FED-STD-313	Material Safety Data Sheets, Preparation and Submission of
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-147	Palletized Unit Loads

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 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 are those cited in the solicitation.

CODE OF FEDERAL REGULATIONS

40 CFR - Protection of the Environment

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20370.)

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(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 93	Flash Point by Pensky-Martens Closed Tester
ASTM D 95	Water in Petroleum Products and Bituminous Materials by Distillation
ASTM D 445	Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
ASTM D 1141	Substitute Ocean Water
ASTM D 2240	Rubber Property - Durometer Hardness
ASTM D 2834	Non Volatile Matter(Total Solids) in Water Emulsion Floor Polishes, Solvent-Based Floor Polishes, and Polymer Emulsion Floor Polishes
ASTM D 3951	Standard Practice for Commercial Packaging
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 Cracking of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds
ASTM F 502	Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
ASTM F 945	Stress Corrosion of Titanium Alloys by Aircraft Engine Cleaning Materials
ASTM F 1110	Sandwich Corrosion Test

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

SOCIETY FOR AUTOMOTIVE ENGINEERS**Aerospace Material Specifications**

AMS 2416	Plating, Nickel-Cadmium, Diffused
AMS 4377	Magnesium Alloys, Sheet and Plate - 3.0 Al 1.0 Zn
AMS 5510	Sheet, Strip and Plate, 18Cr 10.5Ni 0.40Ti, Solution Heat Treated

MIL-C-85704B**AMS 5536****Sheet, Strip and Plate, 47.5Ni(eye) 22Cr 1.5Co 9.0Mo 0.60W
18.5Fe**

(Application for copies should be addressed to the Customer Service Department, Publications Group, SAE, 400 Commonwealth Drive, Warrendale, PA 15096.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, (except for associated detail specifications, specification sheets or MS standards) the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. Cleaning compounds furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.4 and 6.3).

3.2 Toxicity. The cleaning compound shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the contracting activity to the appropriate medical service who will act as advisor to the contracting agency (see 4.4.2 and 6.4).

3.3 Composition. The composition of the cleaning compound shall be optional with the supplier but shall conform to the requirements specified herein. The cleaning compound shall contain no known or suspected human carcinogens or heavy metals. The cleaning compound shall contain no Total Toxic Organic (TTO) compounds as defined in 40 CFR. Surface active agents used in the cleaning compound shall be at least 90 percent biodegradable, determined in accordance with methods appropriate to surface active agent type. Type II cleaning compounds shall contain no less than 50 percent water when tested as specified in 4.6. Type IIA cleaning compounds shall contain no less than 90 percent water when tested as specified in 4.6. In addition, Type II and Type IIA cleaning compounds shall contain no hydrocarbon solvents.

3.3.1 Compositional assurance. The cleaning compound shall be tested for water content and non-volatile content as specified in 4.6. The values shall be recorded, along with an infrared spectrogram of the non-volatile material for use in quality conformance inspection. Quality conformance inspection results shall not differ from the recorded values by more than ± 1.5 percentage points for water content or by ± 1.0 percentage points for non-volatile matter. There shall be no significant difference in spectrograms when run by the qualifying laboratory. Infrared spectrograms shall be recorded by the qualifying laboratory at the request of inspecting official (see 4.5.3).

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3.3.2 Elemental content. The elemental content of the Type I and Type II cleaning compounds shall not exceed the concentrations specified in Table I, when tested as specified in 4.6.1. The elemental content of the Type IIA cleaning compound shall not exceed 20.0 percent of the requirements specified in Table I, when tested as specified in 4.6.1.

TABLE I. Elemental Content.

Element	Maximum Concentration (ppm)
Sulfur	500
Chlorine	100
Sodium	50
Potassium	50
Phosphorous	50
Other metallic elements	10

3.3.3 Phenolic content. The cleaning compound shall contain no phenol or cresol.

3.3.4 Insoluble matter. The insoluble matter content of the cleaning compound shall be no more than 0.1 percent by weight for Type I, no more than 0.025 percent by weight for Type II and no more than 0.01 percent for Type IIA, as determined in 4.6.2.

3.3.5 Ash content. The ash content of the cleaning compound shall be no more than 0.05 percent by weight for Type I and Type II and no more than 0.01 percent by weight for Type IIA, as determined in 4.6.3.

3.4 pH. For Type I and Type II cleaning compounds (diluted to 20 volume percent with distilled water) and Type IIA cleaning compound (as received), the pH of the solution shall be no less than 7.0 and no more than 9.5 when tested as specified in 4.6.

3.5 Flashpoint. The Pensky-Martens flash point of the cleaning compound shall be greater than 60°C (140°F), when tested as specified in 4.6.

3.6 Viscosity. The kinematic viscosity of the cleaning compound shall be no less than 15 and no more than 25 centistokes at 27°C (80°F) for Type I and no more than 25 centistokes at 27°C (80°F) for Types II and IIA, when tested with a Cannon-Fenske viscometer as specified in 4.6.

3.7 Cleaning efficiency. Type I cleaning compound shall remove at least 85 percent of the baked-on soil when tested as specified in 4.6.4.1. Type II and Type IIA cleaning compounds shall remove at least 99 percent of the brushed-on soil when tested as specified in 4.6.4.2.

MIL-C-85704B**3.8 Corrosivity.**

3.8.1 Total immersion corrosion. The cleaning compound shall not cause any visual corrosion nor an average weight change of any specimen greater than that shown in Table II, when tested in accordance with 4.6 and 4.6.5.

TABLE II. Corrosion Limits.

Test Panel	Weight change in mg/cm²/24 hrs.
Aluminum (QQ-A-250/11 -0)	1.0
Aluminum (QQ-A-250/4 -T3)	1.0
Magnesium, Chrome pickled (AMS 4377)	5.0
Titanium (MIL-T-9046 Type III, Comp C)	1.0
Nickel Alloy (AMS 5536)	1.0
Steel (MIL-S-7952)	2.0
Stainless steel (QQ-S-766, Class 410)	2.0
Cadmium - plated steel (MIL-S-7952; plated and treated in accordance with QQ-P-416, Type I)	5.0
Nickel - cadmium plated steel (MIL-S-7952; plated and treated in accordance with AMS 2416)	5.0
Sermetel W coated steel (MIL-S-7952; coated with MIL-C-81751, Type I, Class 4)	2.0

3.8.2 Hot corrosion. The cleaning compound shall produce no visual corrosion and no significant localized microscopic corrosion (maximum permissible depth of attack is 0.0076 mm (0.0003 inches) when examined at 250x magnification, after the exposure specified in 4.6.6.

3.8.3 Titanium stress corrosion. The cleaning compound shall not produce any microscopic cracking when tested and examined metallographically at 500x magnification, as specified in 4.6.

3.8.4 Sandwich corrosion. The cleaning compound shall not cause a corrosion rating greater than 1, when tested as specified in 4.6.7.

3.9 Effect on polymeric materials.

3.9.1 Effect on painted surfaces. The cleaning compound shall not decrease the hardness of paint finishes by more than 2 pencil hardness values, when tested as specified in 4.6 and 4.6.8.

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3.9.2 Effect on silicone elastomers. The cleaning compound shall not change the durometer hardness of the elastomers by more than the amount shown in Table III after testing as specified in 4.6.9.

TABLE III. Allowable Durometer Changes.

Elastomer ^{1/}	Change in hardness, pts
Elastomer No. 1 (Dow Corning Silastic J)	5
Elastomer No. 2 (Dow Corning 93-118)	7
Elastomer No. 3 (General Electric RTV 159)	5
Note: ^{1/} Elastomers shall be as specified or equivalent molecular structure.	

3.9.3 Effect on epoxy adhesives. The cleaning compound shall not decrease the pencil hardness of adhesive films by more than the amount shown in Table IV when tested as specified in 4.6.10.

TABLE IV. Allowable Hardness Changes.

Adhesive ^{1/}	Change in pencil hardness values
Adhesive No. 1 (3M Company AF 163)	3
Adhesive No. 2 (Dexter-Hysol EA 9649)	1
^{1/} Adhesives as specified, or equivalent molecular structure	

3.9.4 Stress crazing of acrylics. The cleaning compound shall cause no crazing or cracking of stressed acrylic plastic, when tested as specified in 4.6.

3.10 Emulsibility. Type I and Type II cleaning compounds, when mixed with water, shall form a homogeneous emulsion and shall not separate, when tested as specified in 4.6.11.

3.11 Rinsability. When applied to a salt-coated surface, the cleaning compound shall rinse clean leaving no visible non-rinsable film, when tested as specified in 4.6.12.

3.12 Hard water stability. When mixed with synthetic hard water, the cleaning compound solution shall exhibit no separation, when tested as specified in 4.6.13.

3.13 Salt water stability. The cleaning compound shall exhibit no separation, when tested as specified in 4.6.14.

3.14 Acid stability. The cleaning compound shall exhibit no separation, when tested as specified in 4.6.15.

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3.15 Accelerated storage stability. The cleaning compound shall show no marked color change, shall not separate, and shall not corrode or stain the steel specimen, when tested as specified in 4.6.16.

3.16 Low temperature stability. Type I cleaning compound shall not solidify or crystallize at -12°C ($+10^{\circ}\text{F}$) nor shall it separate upon warming to room temperature from -26°C (-15°F) and Type II and Type IIA cleaning compounds shall not separate upon warming to room temperature from -26°C (-15°F), when tested as specified in 4.6.17.

3.17 Storage stability. The cleaning compound shall meet specification requirements when subjected to the evaluations specified in 4.6.18.

3.18 Service test. The service test shall be initiated upon successful completion of all laboratory tests (see 4.4). The cleaning compound shall improve the performance of aircraft gas turbine engines which have suffered power loss due to soiled compressor surfaces, when subjected to field evaluation, as specified in 4.6.19.

3.19 Workmanship. When examined visually at room temperature, the cleaning compound shall be a homogeneous liquid free of foreign matter. A faint turbidity shall not be cause for rejection.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, 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 where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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 assuring 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 acceptance of defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.4).

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b. Quality conformance inspection (see 4.5).

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with standard conditions. Standard condition shall be a temperature of $22 \pm 2^{\circ}\text{C}$ ($72 \pm 4^{\circ}\text{F}$) and a relative humidity of 50 ± 20 percent.

4.4 Qualification inspection. The qualification inspection shall consist of all tests specified in Table V.

4.4.1 Qualification sample.

4.4.1.1 Laboratory test sample. Type I laboratory test samples shall consist of two four-liter (one-gallon) glass containers of the cleaning compound. Type II and Type IIA laboratory test samples shall consist of two four-liter (one gallon) glass or high density polyethylene containers of the cleaning compound. Samples shall be identified as follows and forwarded to the Naval Air Warfare Center, Aircraft Division (Code 6062), Warminster, PA 18974-5000 (qualifying activity) as designated in the letter of authorization (see 6.3):

Cleaning Compound, Turbine Engine Gas Path
Qualification test samples
Specification MIL-C-85704B Type I, Type II or Type IIA
Manufacturer's name and product number
Submitted by (name and date) for qualification testing in accordance with
authorization (reference authorizing letter)

4.4.1.2 Service test samples. Service test samples shall be packaged in accordance with 5.1.1. Samples shall be forwarded in accordance with instructions contained in the authorizing letter granting service test, which will be sent to the manufacturer on satisfactory completion of all laboratory tests. In addition to the identification in 4.4.1.1, each drum shall be labeled in 2-inch bold lettering with the manufacturer's name and the words:

**QUALIFICATION SAMPLE: CLEANING COMPOUND,
TURBINE ENGINE GAS PATH - TYPE I, TYPE II, or TYPE IIA**

4.4.2 Manufacturer's data. The manufacturer shall furnish two copies of the qualification inspection report. Included with the report shall be:

a. Certification showing the material conforms to 3.3 (carcinogens, heavy metals, Total Toxic Organics, biodegradability and hydrocarbon solvents), 3.3.2 (elemental content) and 3.3.3 (phenolic content) in lieu of actual test data.

b. Material safety data sheets prepared in accordance with FED-STD-313.

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TABLE V. Qualification Inspection.

Characteristics	Paragraph	
	Requirement	Test
Composition	3.3	1'
Compositional assurance Water content Non-volatile content Infrared spectrogram	3.3.1	4.6
Elemental content	3.3.2	4.6.1
Phenolic content	3.3.3	1'
Insoluble matter	3.3.4	4.6.2
Ash content	3.3.5	4.6.3
pH	3.4	4.6
Flash point	3.5	4.6
Viscosity	3.6	4.6
Cleaning efficiency	3.7	4.6.4
Total immersion corrosion	3.8.1	4.6.5
Hot corrosion	3.8.2	4.6.6
Titanium stress corrosion	3.8.3	4.6
Sandwich corrosion	3.8.4	4.6.7
Effect on painted surfaces	3.9.1	4.6.8
Effect on silicone elastomers	3.9.2	4.6.9
Effect on epoxy adhesives	3.9.3	4.6.10
Effect on acrylic materials	3.9.4	4.6
Emulsibility	3.10	4.6.11
Rinsability	3.11	4.6.12
Hard water stability	3.12	4.6.13
Salt water stability	3.13	4.6.14
Acid stability	3.14	4.6.15
Accelerated storage stability	3.15	4.6.16
Low temperature stability	3.16	4.6.17
Storage stability	3.17	4.6.18
Service test	3.18	4.6.19
Workmanship	3.19	2'
Notes:		
1' Supplier shall certify to this requirement for qualification (see 4.4.2).		
2' Visual examination.		

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4.4.3 Retention of qualification. In order to retain qualification of a product approved for listing on the Qualified Products List (QPL), the manufacturer shall verify by certification to the qualifying activity that the manufacturer's product complies with the requirements of this specification. The time of periodic verification by certification shall be in two-year intervals from the date of original qualification. The Government reserves the right to re-examine the qualified product whenever deemed necessary to determine that the product continues to meet any or all of the specification requirements.

4.5 Quality conformance inspection.

4.5.1 Lot formation. A lot shall consist of all the cleaning compound produced by one supplier, at one plant, from the same materials, under essentially the same manufacturing conditions provided the operation does not exceed 24 hours. When the process is considered a batch operation, each batch shall constitute a lot.

4.5.2 Visual inspection. A random sample of filled containers, prior to closure, shall be selected from each lot in accordance with Inspection Level I and Acceptable Quality Level (AQL) of 1.25 defects per hundred units, of MIL-STD-105. The sample unit shall be one filled container. Inspection shall be in accordance with Table VI.

TABLE VI. Quality Conformance Visual Inspection.

Examine	Defect
Fill	Average net content per container less than specified in contract or order (Volume corrected to 16°C (60°F)).
Material	Not as specified
Appearance	Presence of foreign matter. Not homogeneous.

4.5.2.1 Physical property inspection. Two containers shall be randomly selected from each lot and tested to the requirements specified in Table VII. Each sample selected shall be thoroughly mixed prior to testing. Failure of either sample to conform with any requirement specified in Table VII shall be cause to reject the entire inspection lot.

4.5.2.2 Packaging inspection.

4.5.2.2.1 Examination for packaging and marking. An examination shall be made to determine that packaging and marking comply with the requirements of Section 5 of this specification. Defects shall be scored in accordance with Table VIII. The sample unit for this examination shall be one shipping container fully prepared for delivery except that it shall not be palletized and need not be sealed. Shipping containers fully prepared for delivery that have not been palletized shall be examined for closure defects. The lot size shall be the number of shipping containers in the end item inspection lot. The samples for this examination shall be selected at random in accordance with MIL-STD-105, inspection level S-2.

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4.5.2.2.2 Examination for palletization. An examination shall be made to determine that palletization complies with the requirements of Section 5 of this specification. Defects shall be scored in accordance with Table IX. The sample unit shall be one palletized unit load fully prepared for delivery. The lot size shall be the number of palletized unit loads in the end item inspection lot. The samples for this examination shall be selected at random in accordance with MIL-STD-105, inspection level S-1.

TABLE VII. Quality Conformance - Physical Testing.

Characteristic	Paragraph	
	Requirement	Test
Compositional assurance ^{1/}	3.3.1	4.6
Ash content	3.3.5	4.6.3
pH	3.4	4.6
Flash point	3.5	4.6
Viscosity	3.6	4.6
Total immersion corrosion	3.8.1	4.6.5
Emulsibility	3.10	4.6.11
Salt water stability	3.13	4.6.14
Acid stability	3.14	4.6.15
Accelerated storage stability ^{2/}	3.15	4.6.16
Workmanship	3.19	Visual
Note: ^{1/} See 4.5.3 ^{2/} Examine for conformance after one 24-hour cycle and discontinue test		

TABLE VIII. Packaging Inspection.

Examine	Defect
Packaging	Container not as specified; closures not accomplished by specified or required methods or materials. Leakage or seepage of contents. Non-conforming component, component missing, damaged or otherwise defective. Bulged or distorted container.
Markings	Data omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements.

4.5.3 Rejection and retest. Failure to meet any quality conformance test shall result in rejection of the batch represented and may constitute sufficient justification for removal of the product from the Qualified Products List. Rejected material shall not be resubmitted for acceptance without prior approval from the Naval Air Warfare Center Code 6062. The application for resubmission shall contain full particulars concerning previous rejections and

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measures taken to correct these deficiencies. Samples for retest shall be randomly selected as in 4.5.2 and forwarded to the qualifying activity for evaluation to include an IR spectrogram of non-volatile matter.

TABLE IX. Palletization Inspection.

Examine	Defect
Finished dimension	Length, width, or height exceeds specified maximum requirement.
Palletization	Not as specified. Pallet pattern not as specified. Interlocking of loads not as specified. Load not banded with required straps as specified.
Weight	Exceeds maximum load limits.
Marking	Omitted, incorrect, illegible, of improper size, location, sequence or method of application.

4.6 Test methods. The tests of this specification shall be conducted in accordance with the Test Methods in Table X and paragraphs 4.6.1 through 4.6.19.

4.6.1 Elemental content. Elemental content shall be determined using the test methods listed in Table XI. For Type I cleaning compound, a 10 weight percent solution in distilled water shall be prepared for analysis by inductively coupled plasma (ICP) and atomic absorption (AA) and a 10 weight percent solution in reagent grade ethanol shall be prepared for analysis by microcoulometry. For Type II cleaning compound, a 10 weight percent solution in distilled water shall be prepared for all elemental analyses. Procedures shall be in accordance with recognized analytical practice. For Type IIA cleaning compound, no dilution shall be used. Results shall be calculated in parts per million of undiluted cleaning compound and shall conform to 3.3.2.

4.6.2 Insoluble matter. Undiluted cleaning compound, after having been stored undisturbed for at least one week, shall be thoroughly agitated and two 100 gram (g) samples withdrawn and weighed to the nearest gram. The insoluble matter shall be collected with the aid of a vacuum filtering apparatus capable of producing 200 - 250 mm of vacuum (water tap filter pump), a 250 milliliter (ml) filtering flask, a 4.25 cm Buchner funnel and three pieces of filter paper (Whatman no. 1 or equivalent). Two filter papers for each determination shall be dried at $60^{\circ} \pm 2^{\circ}\text{C}$ ($140^{\circ} \pm 4^{\circ}\text{F}$) for 30 minutes and cooled in a desiccator and then weighed to the nearest milligram (mg). The filter papers shall be stacked in the Buchner funnel (the unweighed paper on the bottom), the vacuum started and the test sample filtered. The sides of the sample container shall be rinsed with 25 ml of the filtrate and the rinse mixture transferred to the funnel. The sides of the funnel shall be rinsed with an additional 25 ml of the filtrate and liquid filtered. The vacuum shall be maintained for an additional five minutes. The filter papers shall then be dried for 10

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TABLE X. Test Methods.

Requirements Paragraph	Test	Test Method
3.3.1	Water content	ASTM D95
3.3.1	Non-volatile content and infrared spectroscopy ^{1/}	ASTM D 2834
3.4	pH	ASTM E 70
3.5	Flash point	ASTM D 93
3.6	Viscosity (Cannon-Fenske)	ASTM D 445
3.8.1	Total immersion corrosion ^{2/}	ASTM F 483
3.8.3	Titanium stress corrosion ^{3/}	ASTM F 945
3.8.4	Sandwich corrosion ^{4/}	ASTM F 1110
3.9.1	Effect on painted surfaces ^{5/}	ASTM F 502
3.9.4	Acrylic stress crazing ^{6/}	ASTM F 484
<p>Notes:</p> <p>^{1/} Non-volatile content shall be determined using 2-3 gram sample weights, 100 mm diameter glass Petri dishes, and a forced draft oven at $105^{\circ} \pm 2^{\circ}\text{C}$ ($221 \pm 4^{\circ}\text{F}$) for 16 hours. An infrared spectrogram of the non-volatile matter smeared on a sodium chloride plate shall be recorded using a double beam diffraction gradient spectrophotometer with a minimum resolution of 3 wavenumbers.</p> <p>^{2/} As modified in 4.6.5.</p> <p>^{3/} Using the concentrate in Method A for both alloys</p> <p>^{4/} As modified in 4.6.7.</p> <p>^{5/} As modified in 4.6.8.</p> <p>^{6/} Type A and Type C specimens shall be stressed to 2000 and 3000 psi, respectively.</p>		

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minutes at $105^{\circ} \pm 2^{\circ}\text{C}$ ($221^{\circ} \pm 4^{\circ}\text{F}$) and cooled in a desiccator and weighed to the nearest 1 mg. The percent insolubles shall be calculated as follows:

$$\text{Percent insolubles} = \frac{A_2 - \left(\frac{B_2}{B_1}\right) A_1}{\text{Weight of Sample}} \times 100$$

where:

A_1 = initial weight of top filter paper.

B_1 = initial weight of middle filter paper.

A_2 = final weight of top filter paper.

B_2 = final weight of middle filter paper.

TABLE XI. Elemental Content Determination Methods.

Element	Method
Sulfur	Inductively Coupled Plasma Spectroscopy - Atomic Emission Spectroscopy (ICP-AES)
Chlorine	Microcoulometric filtration
Sodium, Potassium	Atomic Absorption (AA)
Other Metals	ICP-AES or AA

4.6.3 Ash content. Approximately 10 g of undiluted cleaning compound shall be weighed to the nearest 0.1 mg in a tared porcelain crucible. The crucible shall be heated at $105^{\circ} \pm 1^{\circ}\text{C}$ ($221^{\circ} \pm 2^{\circ}\text{F}$) for 24 hours, then heated at $240^{\circ} \pm 2^{\circ}\text{C}$ ($464^{\circ} \pm 4^{\circ}\text{F}$) for the next 24 hours. Following this, the crucible and its contents shall be carefully ignited over a bunsen type gas burner. The crucible shall then be placed in a muffle furnace at 1040°C (1900°F) for 2 hours. The crucible shall be weighed and the ash content calculated as the percentage of the initial weight of cleaning compound.

4.6.4 Cleaning efficiency.

4.6.4.1 Type I. Cleaning compound solution shall be prepared by diluting the cleaning compound to 20 volume percent with distilled water.

4.6.4.1.1 Test panels and apparatus. Test panels shall be 150 mm (6-inch) diameter 2024-T3 (QQ-A-250/4) bare aluminum alloy disks of 0.51 mm (0.020 inch) thickness scribed

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with a 95 mm (3.75 inch) circle centered on the panel. The cleaning apparatus shall be capable of rotating these panels vertically at 220 rpm in front of a nozzle perpendicular to the panel which travels back and forth across the scribed area nine times per minute. The nozzle tip shall remain 83.8 ± 2.5 mm (3.3 ± 0.1 inches) from the test panel through the cleaning and rinsing cycles (see figure 1).

4.6.4.1.2 Soil. 500 g of MIL-L-23699 lubricating oils shall be mixed with 50 grams of Raven 1040 carbon black (Columbia Carbon Company or equal) in a one liter (quart), wide-mouth jar. The jar shall be placed in an oven at $240^\circ \pm 5^\circ\text{C}$ ($464^\circ \pm 10^\circ\text{F}$). A 6.35 mm (0.25 inch) I.D. glass tube connected to a metered air supply shall be inserted into the mixture with an air flow of 8.5 ± 0.5 cubic centimeters per second. The mixture, shall be heated at $240^\circ \pm 5^\circ\text{C}$ ($464^\circ \pm 10^\circ\text{F}$), with aeration for 120 hours, then cooled to room temperature and mixed until homogeneous.

4.6.4.1.3 Panel preparation. The test panels shall be abraded with a Scotchbrite fine abrasive mat (3M Company), or equivalent, wiped with clean tissue soaked in reagent grade toluene followed with isopropanol, then dried to constant weight. Record the weight to the nearest 0.1 mg. Apply approximately 240 mg of soil by brush to cover the scribed area uniformly and bake at $232^\circ \pm 3^\circ\text{C}$ ($455^\circ \pm 7^\circ\text{F}$) for 20 ± 0.2 minutes. Cool the panels and weigh to the nearest 0.1 milligram. Use only panels with more than 135 mg and less than 165 mg of soil.

4.6.4.1.4 Test procedure. Prepare 1000 ml of a 20 volume percent cleaning solution and aspirate it through the nozzle (with an air pressure of 10.0 ± 0.3 psig) onto the rotating soiled panel. Adjust the flow of cleaning solution to 100 ± 10 ml per minute. Rinse the test panel with 100 milliliters of distilled water applied in the same manner. The rinsed panel shall be heated to $105^\circ \pm 5^\circ\text{C}$ ($221^\circ \pm 10^\circ\text{F}$) for 10 minutes, cooled to room temperature, then weighed to the nearest 0.1 mg. Calculate the cleaning efficiency (%C.E.) as follows:

$$\%C.E. = \frac{A - B}{A - C} \times 100$$

where: A = weight of the soiled panel before cleaning

B = weight of the soiled panel after cleaning

C = weight of the unsoiled panel

Report the cleaning efficiency as the average of four tests.

4.6.4.2 Type II and IIA. Type II cleaning compound shall be diluted to 20 volume percent with distilled water for testing; Type IIA cleaning compound shall be tested as received. Use the same test panels, apparatus, soil, and panel preparation as above, except that soiled test panels shall not be baked but shall be placed in a horizontal position with the soiled surface facing up for at least 30 minutes at room temperature. Modify the test apparatus by connecting the air pressure inlet of the nozzle to an 8-10 psig steam line.

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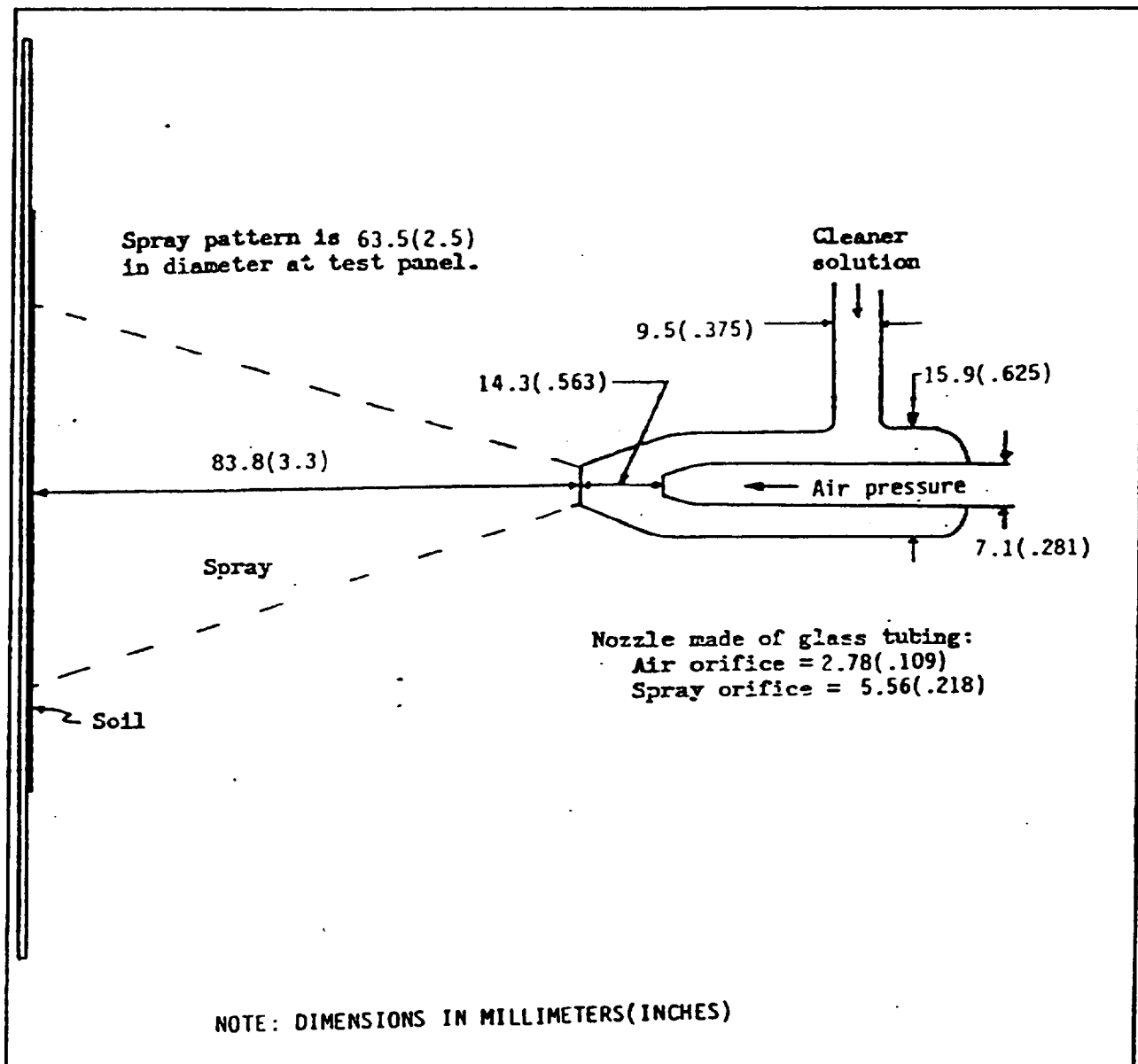


Figure 1. Side View of Test Apparatus for Cleaning Efficiency.

Aspirate the cleaning compound solution through the nozzle at a rate of 100 ± 10 ml per minute. Rinse the test panel by pouring 100 ml of distilled water over the test panel. Dry and weigh the test panel and calculate the cleaning efficiency of the cleaning compound as above.

4.6.5 Total immersion corrosion. Type I and Type II cleaning compounds shall be diluted to 20 volume percent with distilled water for testing; Type IIA cleaning compound shall be tested as received. Corrosion specimens shall be fabricated from the following substrates as specified by the dimensional requirements of ASTM F483: aluminum (QQ-A250/11 -0 and QQ-A-250/4-T3), steel (MIL-S-7952), and stainless steel (QQ-S-766, class 410), chrome pickled magnesium (AMS 4377) and titanium (MIL-T-9046, Type III,

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Composition C). Cadmium plated steel specimens shall be prepared in accordance with QQ-P-416, Type I and nickel-cadmium plated steel specimens shall be prepared in accordance with AMS 2416. Sermetel W coated steel specimens shall be prepared in accordance with MIL-C-81751, Type I, Class 4. Immediately prior to testing, untreated specimens (not plated or coated) shall be abrasive blasted using MIL-G-9954, Size 13 glass beads. Specimens shall be exposed as required by ASTM F 483, except that the cleaning compound solution shall be conditioned at 57°C (135°F) for one and one-half hours prior to immersion and the immersion shall be carried out at 57°C (135°F) for one-half hour. Weight changes shall be calculated in units of milligrams per square centimeter per 24 hours and shall conform to 3.8.1.

TABLE XII. Hot Corrosion Test Temperatures

Corrosion Specimen	Temperature °C (°F)
Titanium alloys	482 (900)
Aluminum alloys	454 (850)
Coated and plated specimens	454 (850)
Stainless steel (QQ-S-766, Class 410)	482 (900)
Stainless steel (AMS 5510)	871 (1600)
Nickel Alloy (AMS 5536)	1093 (2000)
Steel (MIL-S-7952)	454 (850)

4.6.6 Hot corrosion. Type I and Type II cleaning compounds shall be tested as received; Type IIA cleaning compound shall be prepared for testing by boiling to 20 percent of its original volume in a pyrex glass beaker. Corrosion specimens, 25 by 50 by 1.5 mm (one-inch by two-inches by 0.060 inches), shall be cut from the following alloys: titanium (MIL-T-9046, Type II, Comp F and MIL-T-9046, Type III, Comp C), aluminum (QQ-A-250/11 -0 and QQ-A-250/4 -T3), Steel (MIL-S-7952), stainless steel (QQ-S-766, Class 410 and AMS 5510) and Nickel alloy (AMS 5536). Nickel-cadmium plated steel specimens shall be prepared in accordance with AMS 2416. Sermetel W coated specimens shall be prepared in accordance with MIL-C-81751, Type I, Class 4. Untreated specimens (unplated or uncoated) shall be degreased by wiping with absorbent paper tissue wet with methyl ethyl ketone (reagent grade) followed by wiping with isopropanol. After drying at ambient conditions for one hour, corrosion specimens of each alloy shall be immersed in cleaning compound for 15 seconds then withdrawn, air dried, and baked at the temperatures in Table XII for 8 hours. A control specimen of each alloy and surface treatment, degreased but not exposed to the cleaning solution, shall be baked for purposes of comparison. All specimens shall be cross-sectioned, mounted and examined at 250X magnification in accordance with standard metallographic practice.

4.6.7 Sandwich corrosion. The corrosivity of the undiluted cleaning compound and a cleaning compound solution of 20 volume percent in distilled water (except Type IIA) shall be tested in accordance with ASTM F 1110 on the following alloys:

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2040-T3 aluminum alloy conforming to QQ-A-250/4 (Do not anodize)
 2024-T3 aluminum alloy alclad conforming to QQ-A-250/5
 7075-T6 aluminum alloy conforming to QQ-A-250/12 (Do not anodize)
 7075-T6 aluminum alloy alclad conforming to QQ-A-250/13

4.6.8 Effect on painted surfaces. Type I and Type II cleaning compounds shall be diluted to 20 volume percent with distilled water for testing; Type IIA cleaning compound shall be tested as received. The effect shall be determined in accordance with ASTM F 502 using finishes listed in Table XIII, except the exposure shall be for 15 minutes at room temperature, and the panels shall be allowed to dry at room temperature for 24 hours.

TABLE XIII. Test Panel Finishes.

Panel Designation	Coating	Number of coats	Thickness per coat, mils (mm)	Drying time ^{1/} between coats (min)
A	TT-L-32 (Color No. 17875)	2	0.7 - 1.0 (0.018 - 0.025)	1 hour at room temperature
B	MIL-C-22750 (Color No. 17875)	1	mist coat 1.2 - 1.4 (0.030 - 0.036)	½ hour at room temperature
C	MIL-C-83286 (Color No. 17875)	1	mist coat 1.7 - 2.3 (0.043 - 0.058)	½ hour at room temperature
Note: ^{1/} All specimens shall be baked for 1 week at 66° ± 1°C (150° ± 2°F) following final coat.				

4.6.9 Effect on silicone elastomers.

4.6.9.1 Preparation of test specimens. Dow Corning elastomers Silastic J and 93-118 and General Electric elastomer RTV 159 (or equivalent) shall be mixed as specified by the manufacturer and pressed in a 1/8-inch thick sheet mold until cured. Silastic J and RTV 159 shall be cured at room temperature for one week, while 93-118 sealant shall be cured at 150°C (302°F) for 2.25 hours. 25 by 50 mm (one inch by two inch) specimens shall be cut from the sheet stock.

4.6.9.2 Test procedure. Type I and Type II cleaning compounds shall be diluted to 20 volume percent with distilled water for testing; Type IIA cleaning compound shall be tested as received. Immerse two specimens of each elastomer in the cleaning solution at 66° ± 1°C (150° ± 2°F) for 30 minutes. Remove from the solution, rinse with cool tap water, and test within 30 minutes for Shore A hardness in accordance with ASTM D 2240.

MIL-C-85704B**4.6.10 Effect on epoxy adhesives.**

4.6.10.1 Preparation of test specimens. Using unprimed, 0.51 mm (0.020 inch) 2024 (QQ-A-250/4) bare aluminum sheet, prepare panels coated with .13 to .25 mm (5 to 10 mils) of 3M Company AFL63 adhesive (or equal) cured for one hour at $121^{\circ} \pm 1^{\circ}\text{C}$ ($250^{\circ} \pm 2^{\circ}\text{F}$) at 40 psi. Panels coated with .13 to .25 mm (5 to 10 mils) of Dexter-Hysol EA 9649 adhesive (or equal) shall be cured for 1 hour at $177^{\circ} \pm 1^{\circ}\text{C}$ ($350^{\circ} \pm 2^{\circ}\text{F}$) at 55 psi. Panels shall be cured in a press using a sheet of polyvinyl fluoride to release the adhesive coated panel from the top plate.

4.6.10.2 Test procedure. Type I and Type II cleaning compounds shall be diluted to 20 volume percent with distilled water for testing; Type IIA cleaning compound shall be tested as received. Immerse a two-inch square test specimen in the cleaning solution at $66^{\circ} \pm 1^{\circ}\text{C}$ ($150^{\circ} \pm 2^{\circ}\text{F}$) for 30 minutes. Remove from the solution, rinse with cool tap water, and test for pencil hardness (ASTM F 502) after 24 hours at room temperature.

4.6.11 Emulsibility (Type I and II only). Add 10 ml of undiluted cleaning compound to a clean 50 ml glass-stoppered graduated cylinder and place in a chamber refrigerated to $5 \pm 1^{\circ}\text{C}$ ($41 \pm 2^{\circ}\text{F}$). Maintain the graduate at this temperature throughout the test. Cool distilled water to the same temperature, add 40 ml to the graduate and replace the stopper. After 60 seconds, slowly invert the graduate once and return it upright, taking two full seconds for this procedure. After 60 seconds, pour the contents of the graduate onto a horizontal black glass plate and examine for homogeneity. The presence of any clotting, coagulation or gelation constitutes a failure. If a homogeneous mixture forms, shake the graduate for 15 seconds and allow to stand undisturbed for 48 hours. The presence of any phase separation constitutes a failure.

4.6.12 Rinsability.

4.6.12.1 Test panels. Panel C (conforming to Table XI) shall be used in this test.

4.6.12.2 Synthetic sea water. Synthetic sea water shall be prepared in accordance with ASTM D 1141, Formula a.

4.6.12.3 Procedure. Type I and Type II cleaning compounds shall be diluted to 20 volume percent with distilled water for testing; Type IIA cleaning compound shall be tested as received. The panels shall be placed in a horizontal position, lacquered surface up, and sprayed with the synthetic sea water. An atomizer, paint spray gun or equivalent may be used for this operation. When the panels are thoroughly covered by sea water droplets, the panels shall be dried under an infrared lamp. The salt-coated panels shall be partially immersed in a glass tray, approximately 125 by 200 mm (5 by 8 inches), containing 150 ml of cleaning solution. The panels shall be tilted from the horizontal in such a manner that only half of the panel is beneath the surface of the solution. The panels shall be soaked in this manner for one minute without agitation, then removed and allowed to drain in an upright position for one minute. They shall then be dried under the infrared lamp. The panels shall then be rinsed in a moderate stream of distilled water until the salt on the portion of the panel that has not been submerged in the cleaning solution, appears to have

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been dissolved. The panel shall then be dried under the infrared lamp. The presence of a residue shall then be determined by visual comparison of the immersed and nonimmersed halves of the panel.

4.6.13 Hard water stability.

4.6.13.1 Preparation of stock solution. A 10-grain hard water stock solution shall be prepared by dissolving 0.20 ± 0.005 grams (g) of analytical reagent grade calcium acetate, $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$, and 0.14 ± 0.005 g of analytical reagent grade magnesium sulfate, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, in one liter of boiled distilled water.

4.6.13.2 Procedure. Ten ml of undiluted cleaning compound (Type I, II or IIA) shall be added to a 50-ml graduated cylinder. Forty ml of the synthetic hard water shall be added to the graduated cylinder and the contents shaken vigorously for 15 seconds. Allow the solution to stand undisturbed for 16 hours at a temperature of $25^\circ \pm 5^\circ\text{C}$ ($77^\circ \pm 10^\circ\text{F}$). At the end of the 16 hours examine the solution for separation.

4.6.14 Salt water stability. Type I and Type II cleaning compounds shall be diluted to 20 volume percent with distilled water for testing; Type IIA cleaning compound shall be tested as received. To fifty ml of cleaning solution, add 5 ml of synthetic salt water prepared in accordance with ASTM D 1141, and shake vigorously for 15 seconds. Examine after 1 hour for separation.

4.6.15 Acid stability. Type I and Type II cleaning compounds shall be diluted to 20 volume percent with distilled water for testing; Type IIA cleaning compound shall be tested as received. To fifty ml of cleaning solution add 5 ml of a 1 percent acetic acid solution, and shake vigorously for 15 seconds. Examine after 1 hour for separation.

4.6.16 Accelerated storage stability.

4.6.16.1 Preparation of test sample. A 150 ml portion of a well shaken undiluted cleaning compound shall be poured into each of two chemically clean 250 ml pressure resistant clear glass bottles which shall be approximately 240 mm (9.5 in.) in height and 64 mm (2.5 in.) in outside diameter. One bottle shall be capped and stored in the dark for at least six days at room temperature. A strip of steel 150 by 125 by 0.5 mm, (6 by 0.5 by 0.02 in.) conforming to MIL-S-7952 shall be polished with 280-grit silicon carbide paper to remove surface contamination and then cleaned by boiling for one minute in chemically pure isopropyl alcohol and one minute in mineral spirits. The steel strip shall be placed in the other test bottle and the bottle shall be capped. The capped bottle containing the steel strip shall be thoroughly shaken for one minute.

4.6.16.2 Procedure. The capped bottle containing the steel strip shall be placed in a water bath and heated to $60 \pm 2^\circ\text{C}$ ($140 \pm 4^\circ\text{F}$) for Type I and $49 \pm 2^\circ\text{C}$ ($120 \pm 4^\circ\text{F}$) for Type II and held at that temperature for a period of eight hours. The bath shall then be allowed to cool to room temperature over the next 16 hours. The above heating procedure shall be repeated each day for five days. (This test need not necessarily be attended if an interval timer is used to regulate the temperature automatically. The test

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may be started on a Wednesday, Thursday or Friday and still have the pressure bottle removed on a normal workday.) On the morning of the sixth day, the bottle shall be removed from the bath, uncapped, examined for separation and the steel strip carefully withdrawn from the cleaning compound. Separation into layers shall be cause for rejection. The portion of the steel strip which had been immersed in the compound shall be examined for evidence of pitting, corrosion and uneven darkening. The open bottle shall be capped and the two bottles shall be thoroughly shaken for one minute, then allowed to remain undisturbed for one hour at room temperature and then examined. Any marked change in the color and uniformity of the aged sample shall be considered as showing unsatisfactory stability properties.

4.6.17 Low temperature stability.

4.6.17.1 Type I. Approximately 50 milliliters of undiluted cleaning compound shall be poured into a suitable test tube and capped. The sample shall be subjected to a temperature of -12.2°C (10°F) for 16 hours and examined for crystallization or gellation. The sample shall then be refrigerated at -26°C (-15°F) for 24 hours then removed from the cold box to room temperature for 8 hours, after which it shall be examined for homogeneity.

4.6.17.2 Type II and IIA. Approximately 50 milliliters of undiluted cleaning compound shall be poured into a suitable test tube and capped. The sample shall be subjected to a temperature of -26°C (-15°F) for 24 hours then removed from the cold box to room temperature for 8 hours, after which it shall be examined for homogeneity.

4.6.18 Storage stability. A 4 liter (one gallon) metal pail conforming to PPP-P-704, type I, class 1, filled with cleaning compound furnished for storage stability shall be stored for 6 months at $21^{\circ} \pm 3^{\circ}\text{C}$ ($70^{\circ} \pm 5^{\circ}\text{F}$). In addition, one gallon of the cleaning compound shall be poured into a glass container to which has been added a cleaned and polished metal strip conforming to MIL-S-7952. The total surface area of both sides of the steel strip shall be 150 ± 12.5 sq mm (6 ± 0.5 sq in.). The second sample shall be stored under the same conditions of time and temperature. After the 6 month storage period, specimens from both samples shall be tested for pH (4.6), cleaning efficiency (4.6.4), rinsability (4.6.12), salt water stability (4.6.14), and acid stability (4.6.15).

4.6.19 Service test. Service evaluation shall consist of the cleaning and examination of aircraft turbine engines at an engine test cell designated by the qualifying activity. The supplier shall provide a sufficient quantity of cleaning compound to the designated test facilities for this evaluation, not to exceed 1890 liters (500 gallons).

5. PACKAGING

5.1 Preservation. Preservation shall be level A or Commercial, as specified (see 6.2.1).

5.1.1 Level A. The cleaning compound shall be furnished in 19, 57 or 208-liter (5-, 15- or 55-gallon) containers, as specified (see 6.2.1). Unless otherwise specified in the contract or order, the containers shall conform to type I, class 3 of PPP-P-704; type II of

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PPP-D-705 and type II of PPP-D-729, respectively. The flanges shall have three or more full threads, and the plugs shall have sufficient length of thread that three or more full threads are engaged when the plug is screwed tight with gaskets in place. The threads shall be American Standard modified pipe threads. The 19-liter (5-gal.) pail in which the cleaning compound is furnished for uses, other than the foam generator, shall have a flexible spout. The internal surfaces of all containers shall be protected with a material that shall not adversely affect nor be adversely affected by the cleaning compound. In addition to the above requirements, Type IIA cleaning compounds shall be packaged in containers having a 1 mm (0.040 inch) polyethylene liner.

5.1.2 Commercial. The cleaning compound shall be preserved in accordance with ASTM D 3951.

5.2 Packing. Packing shall be level A, B or Commercial, as specified (see 6.2.1).

5.2.1 Level A and B. The cleaning compound, when packaged as specified in 5.1.1, shall require no overpacking. Standard 4-way entry pallets are required for handling by mechanical equipment.

5.2.2 Commercial. The cleaning compound packaged as specified in 5.1.2, shall be packed in accordance with ASTM D 3951.

5.3 Palletization. Unless otherwise specified (see 6.2.1), cleaning compound of one type only, packaged in 19, 57 or 208 -liter (5, 15 or 55-gal.) containers as specified in 5.1.1, shall be palletized in accordance with load type III of MIL-STD-147, except that for overseas shipment, the over-all height of the load shall not exceed 1.1 meters (43 inches). Each prepared load shall be banded with primary, secondary and horizontal straps in accordance with means K, L and E and shall have storage aid 5 applied.

5.4 Marking. In addition to any special marking required by the contract or order, shipping containers and palletized unit loads, when applicable, shall be marked in accordance with MIL-STD-129.

5.4.1 Type I.

5.4.1.1 Product identification. The following identification marking shall appear in 2-inch high bold block lettering on each product container:

**TURBINE ENGINE GAS PATH CLEANER, TYPE I
SOLVENT EMULSION CLEANER**

5.4.1.2 Warnings. The following warning shall appear on each product container:

Do not use full strength (dilute 1 part cleaner to 4 parts fresh water).

Do not use in a hot engine (allow a minimum of 45 minutes after engine operation).

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Rinse with fresh water within 30 minutes of cleaning engine.

Windmill or run engine to dry out thoroughly.

Contains aromatic hydrocarbon solvents.

5.4.2 Type II.

5.4.2.1 Product identification. The following identification shall appear in 2-inch high bold block lettering on each product:

**TURBINE ENGINE GAS PATH CLEANER, TYPE II
WATER-BASE CLEANER CONCENTRATE**

5.4.2.2 Warnings. The following warning shall appear on each product container:

Do not use full strength (dilute 1 part cleaner to 4 parts fresh water).

Windmill or run engine to dry out thoroughly.

5.4.3 Type IIA.

5.4.3.1 Product identification. The following identification shall appear in 2-inch high bold block lettering on each product:

**TURBINE ENGINE GAS PATH CLEANER, TYPE IIA
WATER-BASED CLEANER, READY-FOR-USE**

5.4.3.2 Warnings. The following warning shall appear on each product container:

Do not dilute. This cleaning compound is ready for use.

Windmill or run engine to dry out thoroughly.

6. NOTES

6.1 Intended use. The cleaning compound covered by this specification is intended for cleaning the compressor section of gas turbine aircraft engines. The cleaning compound will remove accumulated salt, dirt and oily residues from the gas path.

6.1.1 General instructions for starter cranked cleaning. For specific instructions, use engine maintenance instruction manuals.

- a. Prepare turbine engine for washing as described in applicable maintenance manuals.

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- b. Prepare a 20% by volume solution of cleaning compound using fresh water (Do not dilute Type IIA)
- c. With ignition off, crank engine at maximum starter rpm, observing starter motor limitations.
- d. Spray 5 gallons (2.5 gallons for small engines) of the cleaning solution into the compressor inlet duct.
- e. Allow a 15 minute soak time, then spray the same areas with fresh water until water running from exhaust port is clear. (Usually 5 gallons (20 liters) of water is sufficient.)
- f. Dry engine by windmilling or running for several minutes.
- g. Service engine as required.

6.2. Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number and date of this specification.
- b. Issue of DODISS to be cited in the solicitation and if required the specific issue of individual documents referenced (see 2.3)
- c. Type and quantity of cleaning compound desired.
- d. Type and capacity of containers required (see 5.1.1).
- e. Selection of applicable levels of preservation and packing (see 5.1 and 5.2).
- f. When palletization is not required (see 5.3).

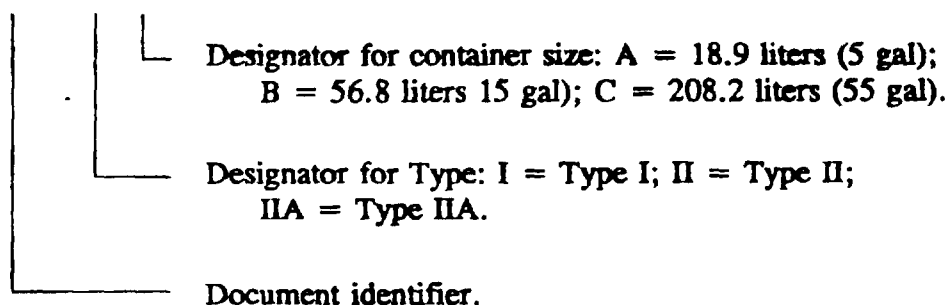
6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in Qualified Products List (QPL-85704) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Department of the Navy, Washington, DC 20361; however, information pertaining to qualification of products and letter of authorization for submittal of sample may be obtained from the Naval Air Warfare Center, Code 6062, Warminster, PA 18974-5000.

6.4 Material Safety Data Sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. The pertinent government mailing addresses for submission of data are listed in FED-STD-313.

6.5 Part Numbers. Part numbering system shall be as indicated below. This number is intended for cataloging and ordering purposes.

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85704 - I - A



6.6 Subject term (key word) listing.

Cleaner, Solvent Emulsion
Cleaner, Aqueous
Compound, Cleaning
Wash, Crank

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

CONCLUDING MATERIAL

Custodians:

Army - AV
Air Force - 68
Navy - AS

Preparing Activity:

Navy - AS
Project No. 6850-1097

Review activities:

Army - MR, MD
DLA - GS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
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3. The preparing activity must provide a reply within 30 days from receipt of the form.

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I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-C-85704B

2. DOCUMENT DATE (YYMMDD)
921110

3. DOCUMENT TITLE
CLEANING COMPOUND, TURBINE ENGINE GAS PATH

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)

7. DATE SUBMITTED
(YYMMDD)

(1) Commercial

(2) AUTOVON
(If applicable)

8. PREPARING ACTIVITY

a. NAME

b. TELEPHONE (Include Area Code)

(1) Commercial

(2) AUTOVON

Naval Air Systems Command AIR-5363C

202-692-2653

222-2653

c. ADDRESS (Include Zip Code)

Naval Air Systems Command

AIR-5363C

Washington, DC 20361-5360

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Defense Quality and Standardization Office
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466
Telephone (703) 756-2340 AUTOVON 289-2340