

METRIC

MIL-PRF-32177A

21 August 2012

SUPERSEDING

MIL-PRF-32177

27 September 2004

PERFORMANCE SPECIFICATION
CLEANING COMPOUND, NONSKID

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 a compound for cleaning nonskid surfaces on aircraft carriers and other air-capable ships.

1.2 Classification. The cleaning compound will conform to the following types, as specified (see 6.2).

- a. Type I - For use with fresh (potable) water.
- b. Type II - For use with seawater.

1.3 Part or identifying number (PIN). PINs to be used for cleaning compounds acquired to this specification are created as follows:

<u>M</u>	<u>32177</u>	:	<u>X</u>
Prefix for Military Specification	Specification number		1 for Type I or 2 for Type II (see 1.2)

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents

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

COMMERCIAL ITEM DESCRIPTIONS

A-A-2294 - Eductor (By-Pass & Inline)

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

MIL-PRF-32177A

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-23699	-	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number O-156
MIL-DTL-24441/21	-	Paint, Epoxy-Polyamide, Haze Gray Formula 151, Type III
MIL-PRF-24635	-	Coating Systems, Weather-Resistant, Exterior Use
MIL-PRF-24667	-	Coating System, Non-Skid, for Roll, Spray, or Self-Adhering Application
MIL-DTL-5624	-	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-PRF-85285	-	Coating: Polyurethane, Aircraft and Support Equipment
MIL-PRF-87257	-	Hydraulic Fluid, Fire Resistant; Low Temperature, Synthetic Hydrocarbon Base, Aircraft and Missile

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

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

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.1003	-	13 Carcinogens (4-Nitrobiphenyl, etc.)
40 CFR 59, Subpart C	-	National Volatile Organic Compound Emission Standards for Consumer Products
40 CFR 82	-	Protection of Stratospheric Ozone
40 CFR 131.36	-	Toxics criteria for those states not complying with Clean Water Act section 303(c)(2)(B)
40 CFR 141	-	National Primary Drinking Water Regulations
40 CFR 261	-	Identification and Listing of Hazardous Waste
40 CFR 355, Appendices A and B	-	The List of Extremely Hazardous Substances and Their Threshold Planning Quantities (Alphabetical Order and CAS Number Order)
40 CFR 372.65	-	Chemicals and chemical categories to which this part applies
40 CFR 797, Subpart B	-	Aquatic Guidelines

(Copies of these documents are available from the Superintendent of Documents, U.S. Government Printing Office, Washington DC 20401 or online at www.gpoaccess.gov/index.html.)

MIL-PRF-32177A

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

- | | | |
|-------------------------|---|---|
| EPA OPPTS 835.3110 | - | Ready Biodegradability |
| EPA OPPTS 835.3120 | - | Sealed-Vessel Carbon Dioxide Production Test |
| EPA SW-846, Method 5021 | - | Volatile Organic Compounds in Soils and Other Solid Matrices Using Equilibrium Headspace Analysis |
| EPA SW-846, Method 8260 | - | Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) |

(Copies of these documents are available from the Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Avenue, N.W., Washington DC 20460 or online at www.epa.gov.)

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (NIEHS)

National Toxicology Program (NTP) latest annual Report on Carcinogens

(Copies of this document are available from the National Toxicology Program, P.O. Box 12233, Mail Drop K2-02, Research Triangle Park, NC 27709 or online at www.niehs.nih.gov.)

NAVAL SEA SYSTEMS COMMAND (NAVSEA) PUBLICATIONS

- | | | |
|-----------------------|---|--|
| T9074-BD-GIB-010/0300 | - | Base Materials for Critical Applications: Requirements for Low Alloy Steel Plate, Forgings, Castings, Shapes, Bars, and Heads of HY-80/100/130 and HSLA-80/100 |
|-----------------------|---|--|

(Copies of this document are available online at <https://n111.ahf.nmci.navy.mil>. This publication can be located by searching the Navy Publications Index for the TMIN without the suffix.)

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

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

Documentation of the Threshold Limit Values for Physical Agents

(Copies of this document are available from the American Conference of Governmental Hygienists, 1330 Kemper Meadow Drive, Cincinnati, OH 45240 or online at www.acgih.org.)

ASTM INTERNATIONAL

- | | | |
|---------------|---|---|
| ASTM B6 | - | Standard Specification for Zinc |
| ASTM B96/B96M | - | Standard Specification for Copper-Silicon Alloy Plate, Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels |
| ASTM B148 | - | Standard Specification for Aluminum-Bronze Sand Castings |
| ASTM B209 | - | Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate |
| ASTM D93 | - | Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester |
| ASTM D329 | - | Standard Specification for Acetone |
| ASTM D1141 | - | Standard Practice for the Preparation of Substitute Ocean Water |
| ASTM D1193 | - | Standard Specification for Reagent Water |

MIL-PRF-32177A

ASTM D2834	-	Standard Test Method for Nonvolatile Matter (Total Solids) in Water-Emulsion Floor Polishes, Solvent-Based Floor Polishes, and Polymer-Emulsion Floor Polishes
ASTM D3363	-	Standard Test Method for Film Hardness by Pencil Test
ASTM D6361/D6361M	-	Standard Guide for Selecting Cleaning Agents and Processes
ASTM D6450	-	Standard Test Method for Flash Point by Continuously Closed Cup (CCCFP) Tester
ASTM E70	-	Standard Test Method for pH of Aqueous Solutions With the Glass Electrode
ASTM E168	-	Standard Practices for General Techniques of Infrared Quantitative Analysis
ASTM F483	-	Standard Practice for Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
ASTM F502	-	Standard Test Method for Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
ASTM F519	-	Standard Test Method for Mechanical Hydrogen Embrittlement Evaluation of Plating/Coating Processes and Service Environments
ASTM F718	-	Standard Specification for Shipbuilders and Marine Paints and Coatings Product/Procedure Data Sheet

(Copies of these documents are available from ASTM International, 100 Barr Harbor Dr., P.O. Box C700, West Conshohocken, PA 19428-2959 or online at www.astm.org.)

INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

International Agency for Research on Cancer (IARC) Monographs on the Evaluation of Carcinogenic Risks to Humans

(Copies of this document are available from WHO Press, World Health Organization, CH-1211 Geneva 27, Switzerland or online at www.who.int/bookorders.)

SAE INTERNATIONAL

SAE-AMS-QQ-A-250/9	-	Aluminum Alloy 5456, Plate and Sheet
SAE-AMS-5046	-	Carbon Steel, Sheet, Strip, and Plate, (SAE 1020 and 1025), Annealed

(Copies of these documents are available from SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or online at www.sae.org.)

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

3. REQUIREMENTS

3.1 Qualification. The cleaning compounds furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.2 Material. Cleaning compounds supplied under this specification shall comply with all Navy occupational health and safety regulations, and meet the following characteristics:

MIL-PRF-32177A

3.2.1 Volatile organic content (VOC). The VOC of the undiluted cleaning compound shall not exceed 10 weight percent (see 4.4.1).

3.2.2 Hazardous air pollutants (HAPs). The content of HAPs solvents in the cleaning compound diluted in accordance with 3.2.5.1 or 3.2.5.2 shall be not greater than the weight percent (% WT) values listed in [table I](#) (see 4.4.2).

TABLE I. Hazardous solvent content.

Hazardous solvent in total cleaning compound	Maximum, %WT
Benzene	0.05
Chlorine or Fluorine containing solvents, total	0.05
Class I or Class II ozone depleting chemicals as defined in 40 CFR 82	0.01
Ethyl Benzene	0.05
Methyl, Ethyl, and Butyl Mono-Ethers of Ethylene Glycol or the Acetates thereof, total (Methyl, Ethyl, and Butyl Cellosolves and Methyl, Ethyl, and Butyl Cellosolve Acetates)	0.05
Methyl Ethyl Ketone (MEK)	0.05
Methyl Isobutyl Ketone (MIBK)	0.05
Toluene	0.05
Xylene (all forms), total	0.01

3.2.3 Toxicity. When evaluated in accordance with 4.4.3 (the HHA), the cleaning compound shall have no adverse effect on the health of personnel when used for its intended purpose (see 4.4.3 and 6.5).

3.2.3.1 Prohibited materials. Unless specific maximum levels are cited herein (see 3.2), the addition of any of the following prohibited materials shall be not allowed: carcinogens defined by 29 CFR 1910.1003; Group 1, 2A, and 2B compounds from the latest IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; compounds listed in the National Toxicology Program (NTP) latest annual Report on Carcinogens; Group A1, A2, and A3 compounds from the American Conference Of Governmental Industrial Hygienists (ACGIH document), Documentation of the Threshold Limit Values for Physical Agents; and extremely hazardous substances (EHS) and toxic chemicals identified in 40 CFR 355, Appendices A and B, and 40 CFR 372.65, respectively. When any of these prohibited materials are present, as a result of a trace or impurity in another ingredient(s), the concentration shall not equal or exceed 0.1 percent by weight of the cleaning compound.

3.2.3.2 Certification of material hazards. The cleaning compound shall not contain any hazardous material or exhibit any hazardous characteristic as defined by 40 CFR 261. Formulation changes shall require a reevaluation of the material.

3.2.4 Non-volatile content. When the cleaning compound is diluted in accordance with 3.2.5.1 or 3.2.5.2, as required by classification type (see 1.2), the non-volatile content shall be less than 20 percent by weight (see 4.4.4).

3.2.5 Cleaning compound dilution. When diluted cleaning compound is specified herein, the cleaning compound shall be diluted in accordance with the following:

3.2.5.1 Type I dilution. Type I cleaning compounds shall be diluted with 18 parts potable water to 1 part cleaning compound (see 4.4.15).

3.2.5.2 Type II dilution. Type II cleaning compounds shall be diluted with 18 parts seawater to 1 part cleaning compound (see 4.4.16).

3.2.6 Undiluted cleaning compound. When undiluted cleaning compound is specified herein, the cleaning compound shall be in as-received condition.

MIL-PRF-32177A

3.3 Flash point. The flash point of the undiluted cleaning compound shall be greater than or equal to 60 °C (140 °F) (see 4.4.5).

3.4 pH. The pH of the cleaning compound diluted in accordance with 3.2.5.1 or 3.2.5.2, as required by classification type (see 1.2), shall be greater than or equal to 6.5 and less than or equal to 12.4 (see 4.4.6).

3.5 Cleaning efficiency. The average Coefficient of Friction (CoF), F_C , reading after cleaning with the cleaning compound when diluted in accordance with 3.2.5.1 or 3.2.5.2, as required by classification type (see 1.2), shall be greater than or equal to F_R , the minimum restored CoF (see 4.4.7).

3.6 Total immersion corrosion. When tested, the cleaning compound, undiluted and diluted in accordance with 3.2.5.1 or 3.2.5.2, as required by classification type (see 1.2), shall not cause a weight change greater than that caused by immersion in ASTM D1141 seawater alone (see 4.4.8).

3.7 Effect on organic coatings. When tested, the cleaning compound, undiluted and diluted in accordance with 3.2.5.1 or 3.2.5.2, as required by classification type (see 1.2), shall not (see 4.4.9):

- a. Soften epoxy polyamide paint conforming to MIL-DTL-24441/21 by more than 2 pencil hardness values.
- b. Soften nonskid coatings conforming to MIL-PRF-24667 Type I to allow insertion of a dull putty knife.
- c. Soften aircraft polyurethane topcoats conforming to MIL-PRF-85285 Type I, Class H by more than 1 pencil hardness value.
- d. Soften silicone-alkyd topside coatings conforming to MIL-PRF-24635 Type II or III and polysiloxane topside coatings conforming to MIL-PRF-24635 Type V by more than 2 pencil hardness values.
- e. Cause loss of adhesion.
- f. Cause discoloration or other sign of deterioration.
- g. Soften color toppings conforming to MIL-PRF-24667 by more than 2 pencil hardness values.

3.8 Effect on polyimide insulated wire. When tested, the undiluted cleaning compound shall not cause dissolution, cracking, or dielectric breakdown (leakage) of the polyimide insulated wire in excess of that produced by distilled water (see 4.4.10).

3.9 Biodegradability. The biodegradability of the cleaning compound, diluted in accordance with 3.2.5.1 or 3.2.5.2, as required by classification type (see 1.2), shall be a minimum of 50 percent in 23 days (see 4.4.11).

3.10 Aquatic toxicity. The product shall be not toxic to aquatic life as determined by 40 CFR 797, Subpart B for the following three criteria: acute (Daphnia or fish), acute (algae), and chronic (Daphnia) effects (see 4.4.12).

3.11 Service evaluation. When tested, the cleaning compound diluted in accordance with 3.2.5.1 or 3.2.5.2, as required by classification type (see 1.2), shall satisfy the following (see 4.4.13):

- a. Not discolor the nonskid coating being cleaned, or cause discoloration or other sign of deterioration.
- b. Not cause cracking, checking, loss of adhesion, or blistering of the nonskid coating being cleaned.
- c. Not display any other deficiency which would adversely affect its cleaning performance or the performance of the nonskid coating being cleaned.
- d. Be visually homogeneous.
- e. Not exhibit separation, lumps, curds, or gel formation.
- f. Not cause any visible corrosion in deck equipment, or aircraft launch or recovery equipment.
- g. Be dispersible with an 18:1 (6 percent mix) inline eductor of A-A-2294 (Type II classification only).

3.12 Workmanship. The undiluted cleaning compound shall be a homogeneous liquid, free of foreign matter, with no lumps, curds, or gel formation (see 4.4.17).

3.13 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

MIL-PRF-32177A

3.14 Hydrogen embrittlement. The cleaning compound, undiluted and diluted in accordance with 3.2.5.1, shall be non-embrittling; the cleaning compound shall be considered non-embrittling only if none of the test specimens, immersed and loaded at 45% notch fracture strength (NFS), fracture within 150 hours (see 4.4.14).

3.15 Identification characteristic. The infrared spectra of the non-volatile content of the cleaning compound shall be determined (see 4.4.18).

3.16 Phosphorus content. The maximum phosphorus content of the cleaning compound when diluted 18 parts to one part shall be 0.1 percent by weight (see 4.4.19).

4. VERIFICATION

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

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.1.1 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed in accordance with the test conditions specified in 4.2, 4.3, and 4.4. A lot shall consist of the cleaning compound produced by one manufacturer, at one plant, from the same materials, and under the same manufacturing conditions, offered for delivery at one time, provided that the process is continuous. In the event the process is a batch process, each batch shall constitute a lot.

4.2 Qualification inspection. Qualification inspection shall consist of the examination of and tests specified in [table II](#).

TABLE II. Qualification inspection.

Inspections	Requirements	Tests
Volatile organic content (VOC)	3.2.1	4.1.1
Hazardous air pollutants (HAPs)	3.2.2	4.4.2
Toxicity	3.2.3	4.4.3
Non-volatile content	3.2.4	4.4.4
Flash point	3.3	4.4.5
pH	3.4	4.4.6
Cleaning efficiency	3.5	4.4.7
Total immersion corrosion	3.6	4.4.8
Effect on organic coatings	3.7	4.4.9
Effect on polyimide insulated wire	3.8	4.4.10
Biodegradability	3.9	4.4.11
Aquatic toxicity	3.10	4.4.12
Service evaluation	3.11	4.4.13
Workmanship	3.12	4.4.17
Hydrogen embrittlement	3.14	4.4.14
Non-volatile content composition	3.15	4.4.18
Phosphorus content	3.16	4.4.19

4.2.1 Qualification sample. The qualification sample shall consist of a volume sufficient to run all the tests from each type of cleaning compound acquired at any one time.

MIL-PRF-32177A

4.3 Conformance inspection. Conformance inspection shall be performed on a representative sample. Sampling shall be conducted in accordance with [table III](#). This inspection shall include the requirements of 3.3, 3.4 and 3.12. Failure of any test, by any sample, shall be cause for rejection unless the procedure described in 6.7 is followed.

TABLE III. Sampling for cleaning compound.

Number of containers in a batch or lot	Number of sample containers
2 to 25	2
26 to 150	3
151 to 1,200	5
1,201 to 7,000	8
7,001 to 20,000	10
20,001 to 35,000	15
Over 35,000	20

4.4 Test procedures.

4.4.1 Volatile organic content (VOC). The VOC content of the cleaning compound shall be determined using 40 CFR 59, Subpart C.

4.4.2 Hazardous air pollutants (HAPs). The content of HAPs solvents in the cleaning compound shall be determined by EPA SW-846 Methods 5021 and 8260. Alternate methods of analysis shall be reviewed and approved by NAVSEA. Formulation data may be used by manufacturers in lieu of testing to demonstrate compliance with hazardous air pollutant requirements of this specification. The formulation data must have a consistent and quantitatively known relationship to the testing required.

4.4.3 Toxicity. A Health Hazard Assessment shall be conducted to ensure conformance to 3.2.3, as required by the qualifying activity. The Navy and Marine Corps Public Health Center (NMCPHC) will evaluate the cleaning compound using the administrative Health Hazard Assessment (HHA) data provided by the manufacturer/distributor to NMCPHC.

4.4.4 Non-volatile content. The non-volatile content of the cleaning compound shall be determined by ASTM D2834 as a water-emulsion specimen requiring approximately two grams of sample. The resultant non-volatile content shall be used for determination of non-volatile content composition (see 4.4.18).

4.4.5 Flash point. The flash point of the cleaning compound shall be determined by ASTM D93 or ASTM D6450.

4.4.6 pH. The pH of the cleaning compound shall be determined by ASTM E70.

4.4.7 Cleaning efficiency. Testing shall be conducted as follows:

4.4.7.1 Test panel preparation. The test shall consist of three 0.6- by 0.6-meter (2- by 2-foot) blast-cleaned steel panels. The individual 0.6- by 0.6-meter panels shall be laid side by side, such that the final dimensions are 1.8 by 0.6 meter (6 by 2 feet), and coated with a qualified MIL-PRF-24667 Type I nonskid system (primer and nonskid coating only), in accordance with the manufacturer's ASTM F718 product data sheet. The nonskid coating shall be rolled parallel to the 1.8-meter (6-foot) dimension of the arranged panels. The nonskid coating shall be cured one week prior to proceeding to soil application. The CoF value for each cured panel shall be measured and recorded, in accordance with 4.4.7.4, prior to application of soil. The average CoF of all three original, unsoiled test panels shall be calculated and recorded as F_0 for use in the calculation in 4.4.7.3.1. The CoF of the cured nonskid coating shall meet the minimum requirements as specified in MIL-PRF-24667 before soil application.

MIL-PRF-32177A

4.4.7.2 Soil composition formulation. One part of hydraulic fluid conforming to MIL-PRF-87257 (or commercial equivalent automobile hydraulic brake fluid), one part JP-5 jet fuel conforming to MIL-DTL-5624 (or commercial equivalent automobile diesel fuel), and one part turbine oil conforming to MIL-PRF-23699 (or commercial equivalent aircraft engine lubricating oil) shall be combined using a powered mixing blade.

4.4.7.2.1 Soil application. The soil described in 4.4.7.2 shall be gently brushed onto the entire surface of each 0.6 by 0.6 meter test panel with a soft bristle paint brush. After application, the wet soil shall then be stroked in one direction parallel to the raised ridges of the nonskid surface with the soft bristle paint brush. The test area shall be allowed to dry for one week at ambient laboratory conditions, which shall be not less than 20 °C (68 °F). The CoF value for each panel, in accordance with 4.4.7.4, shall be measured and recorded prior to cleaning. The average CoF of all three soiled test panels shall be calculated and recorded as FS for use in the calculation in 4.4.7.3.1.

4.4.7.3 Cleaning and evaluation. Two hundred fifty milliliters of diluted cleaning compound shall be poured over the entirety of the soiled panel. A hand-held palmyra scrub brush shall be used to scrub the panels parallel to the raised ridges of the nonskid surface from side to side, overlapping each row by approximately 50 percent (see [figure 1](#)). The surface of the panels shall only be cleaned once. Upon completion of the scrubbing, the panel shall be propped up at an angle of approximately 45 degrees and rinsed four times with 600 milliliters (2400 milliliters total) of potable water or seawater, in accordance with 3.2.5.1 or 3.2.5.2 as required by classification type (see 1.2). After drying for a minimum of 24 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F), the CoF shall be determined in accordance with 4.4.7.4. The average CoF reading of all three panels after cleaning with diluted cleaning compound at an 18:1 dilution rate shall be calculated and recorded as FC.

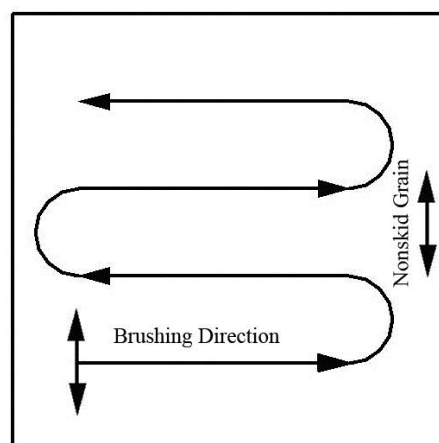


FIGURE 1. Cleaning diagram.

4.4.7.3.1 Calculations. Minimum restored CoF (F_R) shall be calculated as follows:

$$F_R = \frac{(F_0 - F_S)}{2} + F_S$$

F_R = Minimum restored CoF is defined by the equation above as the average CoF of the soiled panels plus 50 percent of the difference between the averages of the unsoiled and soiled panels.

F_S = Average CoF reading of the three soiled test panels.

F_0 = Average CoF reading of the three original, unsoiled test panels.

MIL-PRF-32177A

4.4.7.4 Coefficient of friction test apparatus. CoF test apparatus shall be in accordance with the CoF meter defined in MIL-PRF-24667.

4.4.7.4.1 Test procedure. The test shall be conducted on the three panels prepared in accordance with 4.4.7.1. Each panel shall have three CoF measurements taken in accordance with CoF meter manufacturer's directions. The unit shall be moved 25 to 51 millimeters (1 to 2 inches) between runs to minimize overlap of consecutive measurements.

4.4.8 Total immersion corrosion. Corrosion specimens shall be fabricated from the metals detailed in [table IV](#) with dimensions as specified in ASTM F483.

TABLE IV. Corrosion specimens.

Alloy name	UNS ^{1/} Designation	Specification
Aluminum Alloy (AL5456)	A95456	SAE AMS-QQ-A-250/9 or ASTM B209
Mild Steel (C1020)	G10200	SAE AMS-5046 (SAE 1020)
High Strength Steel (HY80)	K31820	T9074-BD-GIB-010/0300
Aluminum Bronze	C95300	ASTM B148
Bronze	C65500	ASTM B96
Zinc	Z13001	ASTM B6, SHG ^{2/}
NOTES:		
^{1/} Unified Numbering System (UNS)		
^{2/} Special High Grade (SHG)		

4.4.8.1 Precleaning. The test specimens shall be precleaned as detailed in ASTM F483 section "Precleaning Test Specimens."

4.4.8.2 Test set-up. The ratio of volume of solution to area of immersed metal shall be a minimum of 8 milliliters per square centimeter. There shall be separate test vessels for each of the following test solutions: undiluted cleaning compound, diluted cleaning compound, and seawater conforming to ASTM D1141. Specimens of different alloys shall be not immersed in the same test vessel. The test shall be conducted at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).

4.4.8.3 Procedure. Two sets of three specimens of the same alloy shall be weighed to the nearest 0.1 milligram. One set shall be immersed in the undiluted cleaning compound test vessel, and the second set shall be immersed in the diluted cleaning compound test vessel. One set of ten specimens of the same alloy shall be weighed to the nearest 0.1 milligram and immersed in the test vessel containing seawater conforming to ASTM D1141. The specimens shall be maintained at the required temperature for 48±2 hours. Upon completion of the immersion period, the test specimens should be removed and the following procedures shall be performed:

- Rinse thoroughly under hot tap water, 49 to 60 °C (120 to 140 °F).
- Rinse in water conforming to ASTM D1193, Type IV at room temperature.
- Rinse with a stream of acetone, conforming to ASTM D329, from a wash bottle.
- Oven dry at 120 °C (250 °F).
- Desiccate until cooled to ambient temperature.
- Weigh and record. Weight changes shall be calculated as milligrams per square centimeter per 24 hours.
- Repeat for all test specimens.

MIL-PRF-32177A

4.4.9 Effect on organic coatings.

4.4.9.1 Epoxy-polyamide paint. The effect on epoxy-polyamide paint shall be determined with paint conforming to MIL-DTL-24441/21.

- a. The paint shall be mixed and applied to a blast-cleaned, steel panel in accordance with the paint manufacturer's ASTM F718 product data sheet.
- b. The paint shall be cured for 24 hours at 40 °C (104 °F) and then scribed through to the substrate metal in an "X" pattern at least 102 millimeters (4 inches) square in two places.
- c. Pencil hardness shall be determined in accordance with ASTM D3363 before exposure to cleaning compound.
- d. Ten milliliters of diluted cleaning compound and 10 milliliters of undiluted cleaning compound shall be applied and centered over separate scribes of the test panel and covered with watch glasses.
- e. The panel shall be exposed as described in 4.4.9.1.d for 2 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).
- f. The watch glasses shall be removed and the test areas allowed to dry for 24 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).
- g. After exposure, pencil hardness shall be determined in accordance with ASTM D3363.
- h. Scribed areas shall be inspected for loss of adhesion and wetted areas for discoloration.

4.4.9.2 Nonskid coatings. The effect on nonskid coatings shall be determined with a nonskid coating conforming to MIL-PRF-24667 Type I.

- a. The nonskid coating shall be mixed and applied to two blast-cleaned, steel panels in accordance with the coating manufacturer's ASTM F718 product data sheet.
- b. The nonskid coating shall be cured for 168 hours at 40 °C (104 °F) and then scribed through to the substrate metal in an "X" pattern at least 102 millimeters (4 inches) square in two places.
- c. One panel shall be immersed in diluted cleaning compound and a second panel in undiluted cleaning compound so that only one scribed area of each panel is fully immersed.
- d. The test panels shall be immersed for 2 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).
- e. The test panels shall be removed from the cleaning compounds and the test areas allowed to dry for 24 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).
- f. After exposure, the immersed and non-immersed areas of the test panels shall be probed with a dull putty knife, 32 millimeter (1.25 inch) width carbon-steel or stainless-steel blade, and any softening determined.
- g. Scribed areas shall be inspected for loss of adhesion and wetted areas for discoloration.

4.4.9.3 Aircraft polyurethane topcoats. The effect on aircraft polyurethane topcoats shall be determined with a paint conforming to MIL-PRF-85285 Type I, Class H.

- a. The paint shall be mixed and applied, in accordance with the paint manufacturer's ASTM F718 product data sheet, to an aluminum panel prepared in accordance with ASTM F502.
- b. The coating shall be cured for 24 hours at 40 °C (104 °F) and then scribed through to the substrate metal in an "X" pattern at least 102 millimeters (4 inches) square in two places.
- c. Pencil hardness shall be determined in accordance with ASTM D3363 before exposure to cleaning compound.
- d. Ten milliliters of diluted cleaning compound and 10 milliliters of undiluted cleaning compound shall be applied and centered over separate scribes of the test panel and covered with watch glasses.
- e. The panel shall be exposed as described in 4.4.9.3.d for 2 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).

MIL-PRF-32177A

f. The watch glasses shall be removed and the test areas allowed to dry for 24 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).

g. After exposure, pencil hardness shall be determined in accordance with ASTM D3363.

h. Scribed areas shall be inspected for loss of adhesion and wetted areas for discoloration.

4.4.9.4 MIL-PRF-24635 coatings. The effect on MIL-PRF-24635 coatings shall be determined with both a silicone-alkyd paint conforming to MIL-PRF-24635 Type II or III and a polysiloxane paint conforming to MIL-PRF-24635 Type V.

a. Each paint shall be mixed and applied to a blast-cleaned steel panel in accordance with the paint manufacturer's ASTM F718 product data sheet.

b. Each coating shall be cured for 24 hours at 40 °C (104 °F) and then scribed through to the substrate metal in an "X" pattern at least 102 millimeters (4 inches) square in two places.

c. Pencil hardness shall be determined in accordance with ASTM D3363 before immersion in cleaning compound.

d. Ten milliliters of diluted cleaning compound and 10 milliliters of undiluted cleaning compound shall be applied and centered over separate scribes of each test panel and covered with watch glasses.

e. The panels shall be exposed as described in paragraph 4.4.9.4.d for 2 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).

f. The test panels shall be removed from the cleaning compounds and the test areas allowed to dry for 24 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).

g. After exposure, pencil hardness shall be determined in accordance with ASTM D3363.

h. Scribed areas shall be inspected for loss of adhesion and wetted areas for discoloration.

4.4.9.5 MIL-PRF-24667 color toppings. The effect on MIL-PRF-24667 color toppings shall be determined with each color topping paint conforming to MIL-PRF-24667.

a. Each paint shall be mixed and applied to a primed steel panel that has been primed with one coat of MIL-DTL-24441/21 in accordance with the paint manufacturer's ASTM F718 product data sheet.

b. Each coating shall be cured for 24 hours at 40 °C (104 °F) and then scribed through to the substrate metal in an "X" pattern at least 102 millimeters (4 inches) square in two places.

c. Pencil hardness shall be determined in accordance with ASTM D3363 before immersion in cleaning compound.

d. Ten milliliters of diluted cleaning compound and 10 milliliters of undiluted cleaning compound shall be applied and centered over separate scribes of each test panel and covered with watch glasses.

e. The panel shall be exposed as described in 4.4.9.5.d for 2 hours at ambient laboratory conditions, which shall be not less than 20 °C (68 °F).

f. The watch glasses shall be removed and the test areas allowed to dry for 24 hours at ambient laboratory conditions which shall be not less than 20 °C (68 °F).

g. After exposure, pencil hardness shall be determined in accordance with ASTM D3363.

h. Scribed areas shall be inspected for loss of adhesion and wetted areas for discoloration.

4.4.10 Effect on polyimide insulated wire. The effect of the cleaning compound on polyimide insulated wire shall be determined in accordance with ASTM D6361, Appendix XI.

4.4.11 Biodegradability. The biodegradability of the cleaning compound shall be determined by either EPA OPPTS 835.3110 or EPA OPPTS 835.3120. Formulation data may be used in lieu of testing to demonstrate compliance with biodegradability requirements of this specification. The formulation data must have a consistent and quantitatively known relationship to the testing required.

MIL-PRF-32177A

4.4.12 Aquatic toxicity. The aquatic toxicity of the cleaning compound shall be determined by 40 CFR 797, Subpart B. Formulation data may be used in lieu of testing to demonstrate compliance with aquatic toxicity requirements of this specification. The formulation data must have a consistent and quantitatively known relationship to the testing required.

4.4.13 Shipboard appearance and performance. A shipboard service test of the cleaning compound shall be conducted on a flight deck under NAVSEA direction upon the successful completion of the remaining technical requirements stated herein. The cleaning compound shall be utilized in accordance with manufacturer's instructions by ships' force to perform routine flight deck cleaning.

4.4.14 Hydrogen embrittlement. The cleaning compound shall be tested in accordance with ASTM F519 service environment test method, service chemical testing procedure for passive chemicals utilizing Type 1a.1 (notched, round, tension, standard size) test specimens, plated and coated in accordance with Treatment B of table titled 'Electroplating Bath Compositions and Operating Conditions for Sensitivity Test.'

4.4.15 Potable water dilution. Ensure potable (fresh) water used for cleaning compound dilution meets EPA definition in 40 CFR 141 and 40 CFR 131.36 or is water supplied by a municipal water system or another source for human consumption.

4.4.16 Seawater dilution. Ensure seawater used for cleaning compound dilution meets the requirements of ASTM D1141, or is drawn from an undiluted ocean source and has a salinity of at least 33 parts per thousand (‰) (chloride).

4.4.17 Workmanship. Visually inspect cleaning compound.

4.4.18 Identification characteristic. The infrared spectra of the non-volatile content of the cleaning compound shall be determined in accordance with ASTM E168. The non-volatile content sample shall be obtained from the non-volatile content test procedure (see 4.4.4).

4.4.19 Phosphorus content. Formulation data shall be used to demonstrate compliance with phosphorus content requirements of this specification.

5. PACKAGING

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

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The cleaning compound covered by this document is intended for use in cleaning nonskid surfaces on air-capable ships.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type (see 1.2).
- c. Toxicity conformance (see 3.2.3 and 6.5).
- d. Inspection conditions (see 4.1.1).
- e. Packaging requirements (see 5.1).
- f. Material Safety Data Sheet (MSDS) (see 6.4).

MIL-PRF-32177A

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 32177 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 orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil>.

6.4 Material safety data sheets. Contracting officers will identify those activities requiring companies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. In order to obtain the MSDS, FAR clause 52.223-3 must be in the contract.

6.5 Toxicity evaluation. The Navy and Marine Corps Public Health Center (NMCPHC) requires sufficient information to permit an HHA of the product. Upon completion of the HHA, a copy will be provided by the NMCPHC to the Government for evaluation.

6.6 Shelf-life. This specification covers items where the assignment of a Federal shelf-life code is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order, and should include, as a minimum, shelf-life code, shelf-life package markings in accordance with MIL-STD-129 or FED-STD-123, preparation of a materiel quality storage standard for type II (extendible) shelf-life items, and a minimum of 85 percent shelf-life remaining at time of receipt by the Government. These and other requirements, if necessary, are in DoD 4140.27-M, *Shelf-life Management Manual*. The shelf-life codes are in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoD 4140.27-M, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points that manage the item and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: <https://www.shelflife.hq.dla.mil/>.

6.7 Noncompliance. If a sample fails to pass its conformance inspection, the contractor should notify the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected; which were manufactured with essentially the same materials and processes; and which are considered subject to the same failure. Acceptance and shipment of the product should be discontinued until corrective action, suitable to the inspection activity, has been taken. After the corrective action has been taken, appropriate inspections should be repeated on additional sample units. In the event of failure after re-inspection, information concerning the failure should be furnished to the cognizant inspection activity.

6.8 Subject term (key word) listing.

Cleaner

Detergent

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

MIL-PRF-32177A

Custodians:

Army – EA
Navy – SH
Air Force – 68

Preparing Activity:

Navy – SH
(Project 7930-2009-001)

Review Activities:

Army – MR
Navy – AS
Air Force – 50
DLA – GS

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