NOT MEASUREMENT SENSITIVE

MIL-PRF-11090H
7 April 2005
SUPERSEDING
MIL-PRF-11090G
3 September 1998

PERFORMANCE SPECIFICATION

CLEANING COMPOUND, DEGREASING AND DEPRESERVING SOLVENT

This specification is approved for use by all departments and agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers one class of degreasing and depreserving cleaning compound suitable for use in removing oils, greases, asphalt, tars, and rust preventive compounds, other than wax type, from metallic and painted surfaces.

2. APPLICABLE DOCUMENTS

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

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Richmond, ATTN: DSCR-VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616 or e-mailed to STDZNMGT@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST online database at http://assist.daps.dla.mil.

AMSC N/A FSC 6850

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications 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 (see 6.2).

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-11195 - Enamel, Lusterless, Fast Dry, VOC Compliant, (For Use on Ammunition and Other Metals).
MIL-PRF-10924 - Grease, Automotive and Artillery.

(Copies of these documents are available at http://assist.daps.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 (see 6.2).

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.1450 - Occupational Exposure to Hazardous Chemicals in Laboratories.
49 CFR 100-185 - Other Regulations Relating to Transportation.

(Copies of these documents are available online at http://www.access.gpo.gov/ or from Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954.)

ENVIRONMENTAL PROTECTION AGENCY (EPA)

SW-846 Method 8021B - Test Methods for Evaluating Solid Wastes Physical/Chemical Methods.

(Copies of these documents are available online at http://www.epa.gov/ or from U.S. EPA Office of Solid Waste and Emergency Response, Washington, DC 20460.)

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 (see 6.2).

ASTM INTERNATIONAL

ASTM D 93 - Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester.
ASTM D 490 - Standard Specification for Road Tar.
ASTM D 512 - Standard Test Methods for Chloride Ion Water.
ASTM D 808 - Standard Test Method for Chlorine in New and Used Petroleum Products (Bomb Method).
ASTM D 1783 - Standard Test Methods for Phenolic Compounds in Water.
ASTM D 2667 - Standard Test Method for Biodegradability of Alkylbenzene Sulfonates.
ASTM D 3951 - Standard Practice for Commercial Packaging.

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

Society for Automotive Engineers (SAE)

SAE-AMS QQ-A-250/2 - Aluminum Alloy 3003, Plate and Sheet.
SAE-AMS4376 - Plate, Magnesium Alloy 3.0AL 1.0ZN 0.20MN, (AZ31B-H26) Cold Rolled and Partially Annealed.
SAE-AMS4377 - Sheet and Plate, Magnesium Alloy 3.0AL 1.0ZN 0.20MN (AZ31B-H24) Cold Rolled, Partially Annealed.

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

The Society for Protective Coatings (SSPC)

SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel (Type I and Type II).

(Copies of these documents are available online at http://www.sspc.org/ or from The Society for Protective Coatings, 40 24th Street, 6th Floor, Pittsburgh PA 15222-4656.)

2.4 Order of precedence. 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 Toxic chemicals, hazardous substances, and ozone depleting substances (ODSs). The use of toxic chemicals, hazardous substances, or ODSs shall be avoided whenever feasible.

3.2 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.

3.3 Materials and chemical composition.

3.3.1 Biodegradability. The synthetic detergents used in the cleaning compound shall be biodegradable when tested as specified in 4.3.7.

3.3.2 Prohibited material. The compound shall contain no detectable concentrations of the materials listed in table I.

TABLE I. Prohibited materials.

Material	Test paragraph
Phenolic or cresylic acids or their salts[1]	4.4.4
Chlorine	4.4.5
Benzene or toluene	4.4.6

[1] Compounds in which a hydroxyl group is directly attached to an aromatic nucleus or in which the hydrogen of such a hydroxyl group has been replaced to form a metal derivative.

3.4 Physical properties. The compound shall have a minimum flash point (Pensky-Martin closed tester) of 60 °C (140 °F) when tested in accordance with 4.3.8.

3.5 Performance properties.

3.5.1 Soil removal properties. When tested in accordance with 4.3.10, the compound shall remove the soils listed in table II. The soils shall be prepared as a blend prior to testing as described in 4.3.10.2. No test panel shall show any residual soil or stain greater than that obtained with the comparison formula of 4.3.9.2 when tested in accordance with 4.3.10. The rating of cleaning performance of the compound being tested shall be as specified in 4.3.10.5. The bottom 3 mm (1/8 inch) of the panels shall be disregarded when making the comparison.

TABLE II. Soils.

Soil	Specification
Grease	MIL-PRF-10924
Tar	ASTM D 490

3.5.2 Corrosion. No test panel shall show any corrosion or discoloration greater than that obtained with the comparison formula of 4.3.9.2 when tested in accordance with paragraph 4.3.11.

3.5.3 Attack on paint. The compound shall show no evidence of loosening of paint when tested in accordance with 4.3.12.

3.5.4 Phase separation and stability. The compound shall not require agitation prior to use and shall show no separation, precipitation into separate phases, or gelation after six months storage greater than that obtained from the comparison formula similarly stored. In addition, the compound shall be equal in performance properties to the comparison formula of 4.3.9.2 when tested by the methods designated therein at the end of the storage period as specified in 4.3.13.

3.6 Instruction labels. A suitable label with the following instructions printed thereon shall be attached to each container:

> Instructions for use: The cleaning compound may be used by soak, brush, or spray application. Do not dilute. Allow the cleaning compound to remain on work for 3 to 5 minutes before rinsing. Two recommended procedures for spray application are as follows:
>
> Method 1: Apply the compound by spray gun at a pressure of 27.5 kPa (4 psi). Hold the spray nozzle or the gun about 15 cm (6 inches) away from the work. Use a heavy stream of liquid rather than dispersion. Examine the soil 3 to 5 minutes after application. If the soil has not softened, spray a second application of the compound. Allow 3 to 5 minutes, then rinse by means of a "Steam Jenny" at a pressure of 275 to 350 kPa (40 to 50 psi), or if not available, then with hot water, preferably at a pressure of 175 to 350 kPa (25 to 50 psi). If water must be avoided, rinse with Stoddard solvent.
>
> Method 2: Apply compound by spray gun at a pressure of 140 kPa (20 psi). Hold the spray nozzle or the gun about 15 cm (6 inches) away from the work. Do not rinse. In this method, the compound may be repeatedly recycled and reused.
>
> WARNING - COMBUSTIBLE
>
> Keep away from heat or flame.
> Use with adequate ventilation.
> Avoid breathing of vapor.
> May be irritating to skin, eyes, and respiratory tract.
> Protect hands by wearing gloves when using this material.
> If skin or eye contact occurs, flush with large amounts of water.
> Do not take internally.
>
> CAUTION: DO NOT USE ON ACRYLIC PLASTICS. Care should be exercised when using this solvent on other plastics, rubber, etc., including pretesting on the specific material to insure no deleterious effects.

3.6.1 Container label. Information on the container label must include the flash point by Pensky-Martin method using ASTM D 93 or other equivalent method. Labeling for this product must be in compliance with 49 CFR 100 - 185.

3.7 Toxicity. The cleaning compound shall have no adverse effect on the health of the personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the contracting activity to the appropriate departmental medical service who will act as an advisor to the contracting agency.

3.7.1 Safety procedures. All personnel performing laboratory tests should follow standard safety procedures including the use of recommended personal protective equipment, appropriate ventilation, and should receive training as specified by Occupational Safety and Health Administration (OSHA) in 29 CFR 1910.1450.

3.8 Workmanship. The ingredients shall be carefully formulated to produce a compound that is stable. The product shall be homogeneous and be free from abrasive materials.

4. VERIFICATION

4.1 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed on a lot. A lot shall consist of the cleaning compound produced by one manufacturer in no more than a 24 hours, at one plant, from the same materials, and under essentially the same manufacturing conditions, provided the operation is continuous. In the event the process is a batch process, each batch shall constitute a lot.

4.2 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 through 3.8 and the tests of 4.3. Failure of any test by any sample shall be cause for rejection of the lot represented.

TABLE III. Sampling for cleaning solution.

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

4.3 Test methods and procedures.

4.3.1 Test specimen preparation. A representative specimen of approximately 2 liters (2 quarts) shall be removed from each sample container and placed in a suitable, clean, dry container labeled to identify the lot or batch and the container from which it was taken.

4.3.2 Validation for high-flash point naphtha characteristics or change of supplier. When a contractor wishes to change the compound formulation by substituting a high-flash point naphtha not already used, a half liter (one pint) sample of the new high-flash point naphtha, together with a request for a wavier for its use, must be forwarded to Defense Supply Center Richmond, DSCR-JDT, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616.

4.3.3 Reagents. All reagents used in chemical composition tests shall be reagent grade.

4.3.4 Phenolic or cresylic acids or their salts.

4.3.4.1 Sample preparation. Measure 50 milliliters (mL) of the cleaning compound into a clean 250-mL seperatory funnel. Add 100 mL of 0.05 N calcium hydroxide solution. Shake vigorously for 2 minutes, venting frequently. Allow layers to separate, then transfer the aqueous layer to a 500-mL volumetric flask. Repeat the extraction two more times, combining the aqueous layers. Dilute the combined extracts to volume with distilled water.

4.3.4.2 Analysis. Analyze the sample according to Method B of ASTM D 1783. The preliminary distillation step described in the method is required. The pH of the sample shall be checked prior to distillation and again prior to analysis and adjusted as necessary to meet the limits required by the method. Using the above extraction technique, the detection limit is 0.5 milligram/liter (mg/L).

4.3.5 Halogenated hydrocarbons and other chlorine or halogen compounds. Either methods described in 4.3.5.1 or 4.3.5.2 may be used for determining halogen content. The second method, bomb combustion/mercuric nitrate titration, is simpler and will normally be the method of choice. While both methods are intended for determination of chlorine, the other halogens are positive interferences. Therefore, results should be reported as "total halogens as chlorine" rather than as "total chlorine".

4.3.5.1 Combustion/gravimetric method. Prepare and analyze the sample as directed in ASTM D 808. The detection limit for this method is 0.1 percent chlorine.

4.3.5.2 Combustion/mercuric nitrate titration method. Combust the sample as directed in ASTM D 808. Rinse the bomb interior, sample cup, cup supports, and terminal bases using distilled water and a rubber policeman. Collect the washings in a 60-mL glass Griffin beaker. Continue until the total volume of the bomb washings is about 350 mL. Do not test washings with methyl red. Analyze the washing in accordance with Method A of ASTM D 512 (mercuric nitrate titration).

4.3.6 Benzene and toluene.

4.3.6.1 Required material. In this method, which covers the determination of benzene and toluene in the commodity, the following apparatus and materials are required:

a. Standard laboratory glassware.
b. Gas chromatograph as specified in EPA SW-846 Method 8021B for the analysis of aromatic compounds.
c. Stock standard solutions: prepared solutions of benzene and toluene in hexane at a minimum of three concentrations. The lowest concentration should be equivalent to the detection limit of interest for the method (approximately 50 µg/g).

4.3.6.2 Test procedure.

4.3.6.2.1 Sample preparation. Add 1 gram of each sample to a glass container containing 50 mL of hexane.

4.3.6.2.2 Calibration standard preparation. Add 1 mL of each stock standard solution to a glass container containing 50 mL of hexane.

4.3.6.2.3 Reagent blank preparation. Add 1 mL of hexane to a glass container containing 50 mL of hexane. This is the reagent blank.

4.3.6.2.4 Injection sample preparation. Shake each container briefly to completely disperse the cleaning compound in the hexane. Allow any solids to settle. Remove 1 to 2 mL to an injection vial.

4.3.6.2.5 Chromatograph calibration. Inject 2 µL of each calibration standard into the gas chromatograph. Prepare a standard curve of the area or height versus concentration for both benzene and toluene. The correlation coefficient of the standard curve should be greater than 0.995.

4.3.6.2.6 Residual benzene and toluene. Inject 2 µL of the reagent blank into the gas chromatograph. Use the standard curve to calculate the benzene and toluene concentration in the reagent blank.

4.3.6.2.7 Concentration of benzene and toluene. Inject 2 µL of each sample extract into the gas chromatograph. Use the standard curve to calculate the benzene and toluene concentration in the sample.

4.3.6.2.8 Calibration verification. Re-inject one of the calibration standards every 10 injections to verify that the analytical system has remained in calibration. If the response of the standard has changed by more than 15 percent, the system must be recalibrated.

4.3.7 Biodegradability of the synthetic detergents. The supplier shall submit a certificate of compliance with the requirements for biodegradability. The certificate shall be accompanied by the actual test data (field and laboratory), including the test procedure utilized in making the biodegradability determination (see 6.2).

4.3.7.1 Anionic synthetic detergents. When the detergent is an alkyl benzene sulfonate or a linear alkylate sulfonate, the biodegradability shall be determined in accordance with ASTM D 2667.

4.3.7.2 Nonionics and other synthetic detergents. For nonionic detergents, testing for biodegradability shall be performed in accordance with a method currently being used by the detergent industry. The certificate of compliance shall be accompanied by the actual test data (field or laboratory), including the test procedures utilized in making the biodegradability determination.

4.3.8 Flash point. Determine the flash point by the Pensky-Martin closed tester in accordance with ASTM D 93.

4.3.9 Soil removal properties. The comparison formula (4.3.9.2) and the compound being evaluated shall each be tested for removal of a blend of grease tar soils. All compounds shall be tested as described in 4.3.10.4.

4.3.9.1 Soils used. The grease and tar soils described in this section shall be prepared as a blend prior to testing as described in 4.3.10.2.

4.3.9.1.1 Grease. The grease shall conform to MIL-PRF-10924.

4.3.9.1.2 Tar. The tar shall conform to grade RT-11 of ASTM D 490.

4.3.9.2 Comparison formula. The comparison formula shall consist of 70 percent by volume of solvent and 30 percent by volume kerosene.

4.3.9.2.1 Solvent. The solvent used in preparation of the comparison formula shall be an aromatic petroleum fraction containing less than one part per million (ppm) by weight of benzene and toluene and have a flash point (Pensky-Martin closed tester) of 60 °C (140 °F) minimum when tested in accordance with ASTM D 93.

4.3.10 Soil test.

4.3.10.1 Preparation of test panels. All soil tests shall be made on panels as prepared in this section. Panels shall be made of U.S. standard 19-gage 1010 cold-rolled steel (CRS) and shall measure 1.25 centimeter (cm) X 5 cm (1/2 inch X 2 inches). A 3-mm (1/8-inch) diameter hole shall be placed near one end. The face of the panel shall be polished in a rotating manner against coarse emery cloth until clean. It shall then be immersed in heptane, removed, dried with paper toweling, and placed in a desiccator over activated silica gel. Care shall be taken not to touch the panels with anything except forceps during the operation. Panels shall be kept in desiccated condition for not less than 16 hours nor more than 48 hours prior to soil application.

4.3.10.2 Preparation of soil blend. A mixture of grease conforming to MIL-PRF-10924 and tar conforming to grade RT-11 of ASTM D 490 is prepared by mixing three parts by weight of tar with one part by weight of grease in a beaker with heating by immersion of the bottom of the beaker in hot water (about 60 °C (140 °F)).

4.3.10.3 Application of soil blend to steel test panels. Apply 20 mg of soil blend to one side of each steel test panel after it has been prepared in accordance with 4.3.10.1. About 2.5 to 3.8 cm (1 inch to 1.5 inches) of the surface of the steel test panel shall be covered with the soil blend. Place the covered steel test panels in a horizontal position in an oven at 150 °C ± 2 °C (302 °F ± 4 °F) with all air vents open for one hour. Covered steel test panels shall not be allowed to touch each other. At the end of one hour, remove the panels from the oven and allow to cool to room temperature.

4.3.10.4 Test procedure.

4.3.10.4.1 Compound test. Four test panels shall be used for each compound tested. Four test tubes, each large enough to hold a steel test panel and containing about 15 mL of the cleaning compound, shall be set up in a test tube rack for each compound tested. Immerse the test panels in the cleaning compound at room temperature for 10 minutes.

4.3.10.4.2 Cleaning without water bath. Immediately upon removal from the compound, wipe two of the four steel test panels with a fresh paper towel and lay out for later inspection. Mark with an identification of the cleaning compound and a notation that the test strips were not dipped in boiling water. Note discoloration of the cleaning compound in the test tubes. Perform all wiping with one stroke of paper toweling, using moderate, uniform pressure from one steel test panel to the next within a series of tests.

4.3.10.4.3 Cleaning with water bath. Immediately upon removal from the cleaning compound, immerse the other two of the four steel test panels in a beaker containing boiling water for one minute. Remove and wipe each while still hot with a fresh paper towel and lay out for later inspection. Mark the panels with an identification of the cleaning compound and a note that the test strips were dipped in boiling water. Note discoloration of the cleaning compound in the test tubes and any scum floating on the boiling water in the beakers. Perform all wiping with one stroke of paper toweling using moderate, uniform pressure from one steel test panel to the next within a series of tests.

4.3.10.5 Evaluation. In any series of tests, cleaning compounds shall be compared with the comparison formula. Accordingly, the sequence of steps in 4.3.10.4 shall be carried out with each solvent being tested, as well as the comparison formula. Any cleaning compound that cleans as well or better than the comparison formula in both the immersion and non-immersion test is acceptable. Any cleaning compound that does not clean as well as the comparison formula in either the immersion or the non-immersion tests is unacceptable. The bottom 0.3 cm (1/8 inch) of each steel test panel shall be disregarded in making the comparison.

4.3.11 Corrosion. Aluminum panels conforming to SAE-AMS QQ-A-250/2 and steel test panels of 1010 CRS shall be 7.5 cm X 0.6 cm (3 inches X 1/4 inch) in size. Test panels of magnesium shall be cut 7.5 cm X 1.2 cm (3 inches X 1/2 inch) in size from approximately 0.9-mm (34/1000-inch) thick sheet magnesium conforming to SAE-AMS4376 or SAE-AMS4377. Drill a hole approximately 0.03 cm (1/8 inch) from each end of each panel so that the panels can be tied together. Polish the panels with No. 50 aluminum oxide cloth followed by No. 320 carborundum paper. Wash the panels with 95 percent ethyl alcohol and dry with paper toweling. Tie the three panels together at the top and bottom with cotton string, the magnesium being sandwiched between the aluminum and steel panels, place in a test tube, and cover with compound. Use four sets for the comparison formula compound and the comparison formula, separate, wash with water then alcohol, and dry. Examine each panel for pitting, other types of corrosion, and discoloration.

4.3.12 Attack on paint.

4.3.12.1 Preparation of panels. Panels shall be made of U.S. standard 20-gage 1010 CRS, 7.5 cm X 10 cm (3 inches X 4 inches). They shall be degreased in a trichloroethylene degreaser and wiped with a lint-free cloth to remove any soil. Repeat the degreasing. One coat of primer conforming to SSPC-Paint 25 shall be applied by spraying to give a coat thickness of 0.018 mm to 0.020 mm (0.7 mil to 0.8 mil). After the panel has been air dried for one hour, one topcoat of enamel conforming to MIL-DTL-11195, type I, shall be applied by spray to give a coat thickness of 0.018 mm to 0.020 mm (0.7 mil to 0.8 mil). After the panel has again been air dried for one hour, it shall be kept at 40 °C (120 °F) for 24 more hours, then at room temperature for not less than 24 hours nor more than 30 days.

4.3.13 Phase separation and stability. The cleaning compound, when received, shall be thoroughly mixed, and a representative sample poured into the liter glass-stoppered bottle until full. It shall be kept together with a liter of the comparison formula of 4.3.9.2 in a place relatively free from vibration at 37.8 °C (100 °F) for six months, and shall be compared at the end of that time to the comparison formula for evidence of precipitation, separation into separate phases, or gelation, for performance in all tests of 4.3.10.

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 requisite packaging requirements. Packaging requirements are maintained by the inventory control point's packaging activity within the military department or defense agency, or within the military department's system command. 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 degreasing and depreserving solvent cleaning compound is military unique. It is used in combat areas and must function in adverse terrain conditions found on the battlefield. Typical applications include the M-109 and M-110 Howitzers, the MK-19 machine gun, the Nimitz class carrier, and other ships and armament. No commercial alternative exists.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. The specific issue of individual documents referenced (see 2.2.1, 2.2.2, and 2.3).
c. Inspection conditions, if different (see 4.1).
d. Certificate of compliance with the requirements for biodegradability accompanied by the actual test data (field and laboratory), including the test procedure utilized in making the biodegradability determination (see 4.3.7).
e. Packaging requirements (see 5).

6.3 Subject term (key word) listing.

asphalt
grease
oil
rust
tar

6.4 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.

Custodians:
Army - MR
Navy - OS

Preparing Activity:
DLA - GS3

(Project 6850-1492)

Review Activities:
Army - AR, CR4, GL1, MD1
Navy - MC

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 http://assist.daps.dla.mil.