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SUPERSEDING
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FEDERAL SPECIFICATION
CLEANING COMPOUND, HIGH PRESSURE (STEAM)CLEANER

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers alkaline steam cleaning compounds for use in steam cleaning machines for cleaning ferrous and nonferrous surfaces.

1.2 Classification. This specification covers steam cleaning compounds of the following types.

Type I. Compounds containing phosphates.

Type II. Compounds containing no phosphates.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

Federal Specifications:

O-S-604 - Sodium Metasilicate, Technical.
QQ-A-250/1 - Aluminum 1100, Plate and Sheet.
QQ-A-250/4 - Aluminum Alloy 2024, Plate and Sheet.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, US Government Printing Office, Washington, D.C. 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Philadelphia, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Houston, Denver, San Francisco, Los Angeles, and Seattle, WA.

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(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specifications:

MIL-L-6082 - Lubricating Oil: Aircraft Reciprocating Engine (Piston).
MIL-D-16791 - Detergents, General Purpose (Liquid Nonionic).

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

ASTM D217 - Cone Penetration of Lubricating Grease, Test Methods for.
ASTM D460 - Sampling and Chemical Analysis of Soaps and Soap Products, Methods for.
ASTM D502 - Particle Size of Soaps and other Detergents.
ASTM D800 - Chemical Analysis of Industrial Metal Cleaning Compositions.
ASTM E11 - Wire Cloth Sieves for Testing Purposes, Specification for.

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

Laws and Regulations:

16 CFR 1500 - Hazardous Substances and Articles; Administrative and Enforcement Regulations.

(The Code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)

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The Soap and Detergent Association:

Test Procedure and Standards - ABS and LAS Biodegradability. Scientific and Technical Report No. 3.

The Status of Biodegradability Testing of Nonionic Surfactants. Scientific and Technical Report No. 6.

(Application for copies should be addressed to The Soap and Detergent Association, 475 Park Avenue South, New York, NY 10016.)

3. REQUIREMENTS

3.1 Qualification. The cleaning compounds furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3 and 6.3). Any change in the formulation of a qualified product will necessitate its requalification. The material supplied under contract shall be identical, within manufacturing tolerances, to the product receiving qualification.

3.2 Material. The ingredient materials used in the manufacture of the steam cleaning compound covered by this specification shall be of high quality, intimately assembled and processed so as to produce a nonhygroscopic, nonsegregating, granular, free-flowing mixture which will show no evidence of caking in the as-received condition or during storage. When used in a steam cleaning machine of the high pressure-continuous tubular coil vapor generator type, the compound shall not impede nor clog the flow of solution by precipitation and building up of solids in the jets, coils, or orifices. The compound shall not adversely affect the user (skin burn or sneezing).

3.2.1 Condition as-received. The steam cleaning compound in the as-received condition shall show no evidence of caking (for example, lumping or agglomerating) when tested as specified in 4.4.16.

3.2.2 Ingredient materials. The ingredient materials used in the manufacture of the steam cleaning compound covered by this specification shall be granular, not powdered.

3.2.3 Synthetic detergents (biodegradability). The synthetic detergent in the compound shall be 90 percent (minimum) biodegradable when tested as specified in 4.4.17.

3.3 Composition. The steam cleaning compounds are not required to conform to definite chemical composition requirements. The manufacturer is given latitude in the selection of raw materials and processes of manufacture, provided the product meets all applicable requirements of this specification. The compounds shall be free from fatty acid, rosin, soaps, starch, abrasives, gritty material, inert fillers, carbonates, bicarbonates, and free sodium hydroxide. In addition, the Type II compound shall be free from phosphates.

3.3.1 Carbonates or bicarbonates. The compound shall show no effervescence, when tested as specified in 4.4.1.

3.3.2 Fatty acid, soap, rosin, and starch content. The compound shall give no evidence of the presence of fatty acid, rosin, soap, or starch when tested in accordance with 4.4.2.

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3.3.3 Free sodium hydroxide. When tested as specified in 4.4.3, not more than 0.2 ml of 0.1 normal HCl shall be required to discharge any pink coloration.

3.4 Performance requirements. The steam cleaning compound shall be equal to or superior in effectiveness to the comparison formula of the same type in 4.4.4.1.3 when tested as specified in 4.4.4.1 and 4.4.4.2. The compounds covered by this specification shall be tested simultaneously with the standard comparison steam cleaning compound of the same type as specified in 4.4.4.1.3.

3.4.1 Water softening or stability. When tested as specified in 4.4.4.1 at a temperature of 126.5°C - 129.5°C, a 0.25 percent solution of Type I, or a 0.15 percent solution of Type II, steam cleaning compound in water of 20 grain hardness shall give no evidence of precipitation or curd formation; nor shall there be an opalescence greater than that produced in a solution of the comparison compound of the same type as specified in 4.4.4.1.3, when the two compounds are tested simultaneously. The opalescence shall not be greater than that given by the statistical upper limit set forth in 4.4.4.1.5.

3.4.2 Cleaning efficiency. The cleaning compound shall be equal to or superior to the standard comparison steam cleaning compound of the same type in ability to remove a standard soil when tested as specified in 4.4.4.2. The residual soil of any test compound determination shall be not greater than the statistical upper limit as set forth in 4.4.4.1.5.

3.5 Solubility. The insoluble matter in a 10 percent distilled water solution of the compound shall not exceed 0.25 percent when tested as specified in 4.4.5.

3.6 pH value. The pH of a 0.50 percent solution of the Type I cleaning compound, or a 0.30 percent solution of the Type II cleaning compound in distilled water shall be not less than 10.5 nor more than 11.4, when tested as specified in 4.4.6.

3.7 Corrosion. Boiling solutions of the cleaning compound in distilled water shall cause no loss in weight of aluminum or aluminum alloy test specimens in excess of that indicated in table I when tested as specified in 4.4.7. There shall be no visible staining, discoloration, etching, or pitting of the test specimens.

TABLE I. Loss in weight permitted in corrosion test

Type	Percent solution	Fed. Spec. QQ-A-250/1 Al-1100	Fed. Spec. QQ-A-250/4 Al-2024
I	0.25	1.2 mg	0.8 mg
	1.2	0.8 mg	0.5 mg
II	0.15	1.2 mg	0.8 mg
	1.2	0.8 mg	0.5 mg

3.8 Surface tension. The surface tension of a 0.25 percent solution of the Type I compound, or 0.15 percent of the Type II compound, in distilled water shall be not more than 42 dynes per centimeter when determined as specified in 4.4.8.

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3.9 Dust forming properties. The dust forming properties shall be such that, when tested as specified in 4.4.9, the dust shall settle within a period of five seconds.

3.10 Penetration. When tested as specified in 4.4.10, the average penetration shall be not less than 30.0.

3.11 Segregation. When tested as specified in 4.4.11, the percent of any ingredient of the compound (such as silicates) taken from different portions of a container shall not differ by more than 2 percent from the average percentage of that ingredient in the compound. The compound shall be subjected to the test specified in 4.4.11 at the discretion of the inspection laboratory when segregation appears to have occurred.

3.12 Fineness. The particle size of the cleaning compound shall be such that 100 percent shall pass a No. 6 sieve and not more than 3.0 percent shall pass a No. 100 sieve when tested as specified in 4.4.12.

3.13 Rinsing. Solutions of the compound shall leave no white film on aluminum alloy when tested as specified in 4.4.13.

3.14 Phosphates. Type II compound shall show no evidence of phosphates when tested as specified in 4.4.14.

3.15 Caking in storage. When tested as specified in 4.4.15 the compound shall remain free flowing and of such a texture and granulation that 100 percent shall pass a No. 6 U.S. Standard sieve.

3.16 Workmanship. The steam cleaning compound shall be manufactured in accordance with the best commercial practice to produce a high quality, stable, nonhygroscopic, nonsegregating granular, free-flowing mixture.

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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 as specified herein. Except as otherwise specified in the contract or 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.

4.2 Sampling and inspection.

4.2.1 Lot. For purposes of sampling, a lot shall consist of material mixed or prepared at one time. Material shall be identified by order of production or batch number.

4.2.2 Sampling procedure. From each inspection lot three separate 1-pound samples shall be taken. In case the material is produced by a batch process and the inspection lot contains more than 2 batches, the three samples shall be taken from different batches. Samples shall be obtained in a manner calculated to disclose any nonuniformity of the material within the batch. Where material is produced by a continuous-run process, the three samples shall be taken so as to represent, respectively, the first part, the middle part, and the last part of the run which produced the inspection lot.

4.2.3 Examination of preparation for delivery. An examination shall be made to determine compliance with the requirements of Section 5. The sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with MIL-STD-105. The inspection level shall be S-2 with an AQL of 4.0 expressed in terms of percent defective.

4.2.4 Sampling for inspection for fill. A random sample of filled containers shall be taken from each lot in accordance with MIL-STD-105 at inspection level I and AQL of 2.5: expressed in terms of percent defective.

4.2.5 Inspection of filled containers. Each sample filled container, selected in accordance with 4.2.4 shall be weighed to determine the amount of contents. Any container in the sample under required fill shall be rejected, and if the number of rejections in any sample exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, the lot represented by the sample shall be rejected.

4.3 Classification of tests. Testing under this specification shall be for the following:

(a) Qualification.
(b) Acceptance of individual lots.

4.3.1 Qualification tests (see 6.3). Qualification tests shall consist of tests for all the requirements of this specification. For qualification testing a 10-pound sample is required plus a 125-pound sample in a metal drum as required for the caking in storage test. Interim approval will be granted a product passing all requirements of the specification except 3.15, subject to recision if 3.15 is failed.

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4.3.2 Acceptance tests. Inspection tests for acceptance of individual lots shall normally consist of tests for water softening and 1100 aluminum corrosion (0.25 per cent Type I or 0.15 percent Type II). If any sample is found to be not in compliance with this specification, the entire lot shall be rejected.

4.4 Test methods.

4.4.1 Carbonates or bicarbonates. Approximately, 6N hydrochloric acid shall be added drop-wise to a five percent (5 grams of compound in 100 ml of solution) distilled water solution of the compound and examined for effervescence.

4.4.2 Fatty acid, soap, rosin, and starch content.

4.4.2.1 Fatty acid, soap, rosin. Place 10 grams of the compound in a 100-ml tall-form beaker. Add 30 ml absolute ethyl alcohol. Place on a steam plate and stir for 5 minutes. Filter through dry, double, No. 41 Whatman papers. Evaporate filtrate to dryness. Dissolve residue in 20 ml distilled water. To half the solution add 5 ml of 1.0 N acetic acid. To the other half, add 5 ml of 1.0 N calcium chloride solution. Formation of precipitates in both solutions indicates the presence of soap, rosin or fatty acid.

4.4.2.2 Starch. Place one drop of an iodine solution on a freshly exposed surface of the sample. A violet color indicates the presence of starch.

4.4.3 Free sodium hydroxide. Place 10 grams of compound in a 100-ml tall-form beaker. Add 30 ml petroleum ether (boiling range 35-60°C), and stir 3 minutes with a glass rod. Decant off petroleum ether. Place on steam bath for five minutes to drive off hazardous gases, then dry in a vented oven for fifteen minutes at 105°C. Add 30 ml absolute ethyl alcohol and stir 2 minutes. Decant off alcohol through dry, triple, No. 41 Whatman filter paper. Transfer 15 ml of the filtrate to a 125 ml flask and add several drops phenolphthalein indicator solution. If pink coloration results, titrate with 0.1 normal hydrochloric acid. Compare titration with requirements of 3.3.3.

4.4.4 Performance tests. Performance tests shall consist of:

(a) Water softening or stability tests.
(b) Cleaning efficiency.

4.4.4.1 Water softening or stability tests.

4.4.4.1.1 Preparation of hard water stock solution. A 40-grain per gallon hard water solution is prepared by dissolving 0.8090 grams of ACS grade calcium acetate, $Ca(C_2H_3O_2)_2 \cdot H_2O$ and 0.5546 grams of ACS grade magnesium sulphate, $MgSO_4 \cdot 7H_2O$, per liter of freshly boiled distilled water.

4.4.4.1.2 Preparation of cleaning compound solution. Weigh 10 grams of the Type I cleaning compound, or 6 grams of Type II, and transfer to a 2-liter volumetric flask. Add 500 ml of hot distilled water and agitate to dissolve the cleaning compound. Cool to room temperature and dilute to volume with distilled water.

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4.4.4.1.3 Preparation of comparison cleaning compound solution. Using the appropriate composition in Table II or Table III, prepare a cleaning compound solution as specified in 4.4.4.1.2 to be used as the comparison standard.

TABLE II. Composition of Type I comparison compound

Component	Percent by weight
Sodium metasilicate, pentahydrate, Fed. Spec. O-S-604	35.0
Primary sodium phosphate, ACS grade $NaH_2PO_4 \cdot H_2O$	10.5
Sodium tripolyphosphate, technical grade Na_5P_3O	52.5
Nonionic surface-active agent, MIL-D-16791, type I	2.0

TABLE III. Composition of Type II comparison compound

Component	Percent by weight
Sodium metasilicate, anhydrous	54.2
Citric acid, monohydrate	23.6
Sodium citrate, dihydrate	20.2
Nonionic surface active agent, MIL-D-16791, type I with cloud point 54°C ± 3°C	2.0

4.4.4.1.4 Water softening test. To a test tube (200 mm long by 25 mm outside diameter) containing 20 ml of the cleaning compound solution (4.4.4.1.2), add 20 ml of hard water stock solution (4.4.4.1.1), and mix well. Immerse in the solution, a test panel of 1020, 20-gage, cold-rolled steel, 3 inches by 1/2 inch in size, which has been polished with coarse emery cloth and cleaned with acetone. Place the test tube in a laboratory steam sterilizer at 126.5°C-129.5°C (steam pressure of 21-24 lb per sq in) for 1 hour. Remove from the sterilizer. Cool to room temperature, and examine for precipitation. Use an electrophotometer to measure opalescence in terms of optical density. Tests shall be run in quadruplicate. The same test shall be run in quadruplicate using the comparison compound of the same type (4.4.4.1.3).

4.4.4.1.5 Statistical upper limit. The statistical upper limit at the 0.05 level in the water softening and cleaning tests of 4.4.4.1.4 and 4.4.4.2.4 may be determined with the following formula:

$$X + 0.72W$$

where: X = average of 4 determinations with the comparison compound.

W = difference between the maximum and minimum values in the four determinations with the comparison compound.

4.4.4.2 Cleaning efficiency test.

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4.4.4.2.1 Preparation of test panels. Test panels of 1020, 20-gage, cold-rolled steel shall be prepared 2-1/2 by 2 1/2 inches in size. Each test panel shall have a hole 1/4 inch in diameter placed 1/8 inch from o corner. Sharp edges shall be smoothed with coarse emery cloth. The panels shall then be degreased in ACS grade acetone. Both faces of each panel shall be polished with the same abrasive, stroking in one direction only. Clean in a hot alkaline solution until free from water-break. Rinse in water, then dip in absolute ethyl alcohol, and wipe dry with paper toweling.

4.4.4.2.2 Standard soil. The soiling material shall be Grade 1065 (NATO No. 0-113) conforming to MIL-L-6032. The cleaned panels, prepared as described in 4.4.4.2.1, are suspended on a "S" hook and dipped one at a time into a 400-ml beaker of the oil maintained at a temperature of 25°C ± 1°C. They are then removed and allowed to drain at a temperature of 25°C ± 1°C for 30 minutes. The remaining drop of oil in the lower corner of each panel is then removed with absorbent cotton.

4.4.4.2.3 Preparation of cleaning solutions. In a 2-liter beaker, place 1,600 ml of 0.5 percent distilled water solution of the Type I compound or 0.3 percent solution of the Type II compound (see 4.4.4.1.2). Bring solution to a boil and keep at this temperature throughout the test. Maintain solution level throughout test by addition of distilled water as required.

4.4.4.2.4 Cleaning procedure. Immerse the soiled test panels, prepared as specified in 4.4.4.2.2, in the cleaning solution and in the comparison solution by means of an iron or copper hook, one end of which passes through the 1/4-inch hole and the other end over a glass rod placed across the top of the 2-liter beaker. At the end of 2-1/2 minute and 5 minute intervals, respectively, the test panel is moved forward and backward, 3 times in each direction, and then up and down, 3 times in each direction; total agitation shall require not more than 6 seconds. At the end of 5 minutes immersion, the panel is removed from the cleaning solution and given 2 six second rinses in distilled water (no agitation); there shall be a four second drain between rinses. The rinsing solutions shall consist of 2 one liter beakers, each containing 800 ml of distilled water at 25°C ± 1°C. The panel is then dried in a 50°C oven for 20 minutes, cooled and weighed. The panel is thoroughly washed with acetone, rinsed in absolute ethyl alcohol, dired with paper toweling and reweighed. The difference in weight is the amount of residual soil. Tests shall be run in quadruplicate.

4.4.5 Solubility. Weigh 10 grams of the compound and add to 100 ml of distilled water at 25°C ± 1°C in a 250 ml beaker. Stir until compound is thoroughly dissolved. Let stand 10 minutes. Filter through a tared Gooch crucible with an asbestos mat. Wash with distilled water until washings give no alkaline reaction to phenolphthalein. Dry at 105°C for 3 hours, cool and weigh. Gain in weight of crucible and contents is insoluble matter.

4.4.6 pH value.

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4.4.6.1 Apparatus. The test shall be made with a pH meter having a sensitivity and readability of at least 0.05 pH. A sealed type, alkali-resistant glass electrode shall be used with a calomel reference electrode. The meter shall be standardized against a pH 10 buffer solution immediately before making a test.

4.4.6.2 Procedure. Prepare 100 ml of a 0.5 percent distilled water solution of the Type I compound or 0.3 percent of the Type II compound. Determine the pH at a temperature of 25°C ± 1°C. No correction shall be made for sodium ion concentration.

4.4.7 Corrosion test.

4.4.7.1 Preparation of test panels. Test panels of 1100 aluminum shall be cut 3 inches by 3/4 inch in size from approximately 0.034 inch thick sheet aluminum conforming to QQ-A-250/1, H14 or H24 temper. Test panels of 2024-T3 aluminum shall be cut 3 inches by 3/4 inch in size from approximately 0.025 inch thick sheet conforming to QQ-A-250/4. Sharp edges shall be smoothed with No. 150 alundum (Al_2O_3) polishing paper. Polish both faces with the same abrasive, stroking in one direction only. The 1100 aluminum panels should be lightly polished to avoid smearing of the surface, with approximately 18 milligrams of metal removed in polishing.

4.4.7.2 Cleaning of panels. Panels shall be cleaned with ACS grade acetone using a swab of absorbent cotton. They shall then be wiped with paper toweling, dipped in absolute ethyl alcohol, and again wiped with paper toweling.

4.4.7.3 Preparation of test solutions. Weigh 2.5 gram of the Type I cleaning compound or 1.5 gram of the Type II cleaning compound into a 1 liter volumetric flask. Add 500 ml of hot distilled water and agitate to dissolve the cleaning compound. Cool to room temperature and dilute to volume with distilled water. Prepare another solution of the same type and in the same manner using 12.0 gram of the compound.

4.4.7.4 Corrosion test procedure. Each cleaned test panel shall be weighed to 0.0001 gram and immersed completely in 200 ml of the boiling solution of the compound in a 250 ml beaker. The solution is kept at a boil throughout the test, the solution level being maintained by additions of distilled water as required. After 60 minutes, the test panel shall be removed from the boiling solution, rinsed under flowing tap water (cold), rinsed in distilled water (25°C ± 1°C), dipped in absolute ethyl alcohol, wiped dry with paper toweling, and reweighed. The presence of corrosion products shall be noted. Tests shall be run in duplicate on each aluminum material in each solution.

4.4.8 Surface tension. Using 100 ml of the 0.25 percent distilled water solution of the Type I compound or 100 ml of the 0.15 percent solution of the Type II compound prepared as in 4.4.7.3, determine the surface tension at 25°C ± 1°C using a Dunouy tensiometer or interfacial tensiometer. Harkins-Jordan (J. Am. Chem. S. 52: 1930, p. 1751) correction factors shall be applied.

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4.4.9 Dust forming properties. The inside walls of a 250-ml glass-stoppered graduate shall be rendered completely free of any grease and moisture. A 25-gram sample of the cleaner shall then be placed on the bottom of the clean graduate. The graduate shall then be stoppered, inverted and immediately returned to its original position. After any suspended dust has been allowed to settle for 5 seconds, the stopper of the graduate shall be removed and a moistened piece of red litmus paper suspended in the graduate without touching the walls so that the lower end of the litmus paper strip coincides with the 210 ml mark at the upper end of the graduate. After 60 seconds, the litmus paper shall be removed and examined for any color change.

4.4.10 Penetration. Place 100 grams of the compound in a flat bottom, straight side, Pyrex glass crystallizing dish, 40 mm high by 80 mm diameter. Place sufficient lead shot into a 250-ml low-form beaker so that the combined weight of the beaker and shot equals 800 grams. Place the weighted 250-ml beaker on top of the 100 grams of compound. Place the assembly in a dessicator containing a saturated solution of potassium sulphate (K_2SO_4). Place the dessicator in an oven maintained at 43°C-46°C for 24 hours. Remove the assembly from oven and dessicator; remove weighted 250-ml beaker from compound, and allow crystallizing dish containing compound to cool at room temperature for 2 hours. Determine penetration at three points on the surface, each at least 12 mm from the side of the crystallizing dish, using the penetrometer and grease-penetrometer cone prescribed in ASTM D217 with a 5-second hold, 250 grams total weight of the cone and attachments and the temperature of the compound at 25°C ± 1°C. Run test in duplicate.

4.4.11 Segregation. Samples taken from different portions of the container shall be analyzed for one constituent of the compound (such as silicates using ASTM D800).

4.4.12 Fineness. A No. 6 and No. 100 sieve shall be used in a Ro-Tap (or equal) sieve shaking apparatus. The sieves shall be 8-inch diameter U.S. Standard wire cloth sieves conforming to ASTM E11. Transfer a 100 ± 0.1 gram sample, without previous drying, to the No. 6 sieve. Allow the shaking apparatus to run 10 minutes. Examine the No. 6 screen for any retained cleaning compound and weigh the portion passing the No. 100 sieve and calculate to percentage. If a sieving machine is not available, use the hand sieving procedure of ASTM D502.

4.4.13 Rinsing. Test panels of 2024-T3 aluminum shall be cut 2-1/2 by 2-1/2 inches in size from approximately 0.025-inch-thick sheet conforming to QQ-A-250/4. They shall be polished and cleaned as specified in 4.4.7.1 and 4.4.7.2. Duplicate panels shall be tested. Prepare a 1.0 percent solution using 10 grams of cleaning compound. Immerse a panel for 5 minutes in 400 ml of the boiling solution contained in a 600-ml beaker. Remove the panel, suspend at an angle of 45 degrees until dry, then suspend the panel in about 1 liter of distilled water at 70°C ± 2°C for 3 minutes, withdrawing the panel slowly once each minute. Repeat the last step with a fresh sample of distilled water at 70°C. Remove the panel, and let dry at an angle of 45 degrees as before. When dry, examine the panel for residue. Then place a drop of absolute ethyl alcohol on the panel, allow to evaporate, and re-examine for white residue.

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4.4.14 Phosphates. Type II composition only.

4.4.14.1 Ammonium molybdate solution (Johnson's formula). Mix 55 g of $(NH_4)_6Mo_7O_{24} \cdot 4H_2O$ and 50 g of NH_4NO_3 with 18 ml of 15N NH_4OH and 20 ml of water. Stir and dilute to about 700 ml with water. Heat with stirring for 30 minutes until all salts have dissolved. Dilute to 1 liter with water, let stand overnight and filter, but do not wash the residue.

4.4.14.2 Test procedure. Place 1 g of the test compound into a 250 ml beaker and ignite over a gas flame. Triturate and dissolve the residue in 50 ml water. Neutralize with HNO_3, add 10 ml of concentrated HNO_3 in excess, and filter into a second 250 ml beaker. Boil 30 minutes with beaker covered; remove cover and evaporate to dryness. Dissolve residue in 60 ml of water and add 15 ml of concentrated HNO_3 with stirring. Filter and add 6 g NH_4NO_3 to the filtrate. Filter again if there is any undissolved material. Heat the filtrate to near 80°C but no higher. To 10 ml of the filtrate add 25 ml of the ammonium molybdate solution (see 4.4.14.1) and stir thoroughly. A yellow precipitate indicates the presence of phosphates.

4.4.15 Caking in storage. The steam cleaning compound, 125 pound net weight and in a 16 gallon steel drum fitted with a steel cover with an airtight gasket attached, shall be stored in an unheated warehouse at Fort Belvoir, Virginia for twelve months. The drum shall then be opened and the contents examined for free flowing and granular characteristics. If there is visual evidence of caking or lumping, transfer a single lump of the caked material obtained from the bottom third of the drum, and having a weight between 90 and 110 grams, to a No. 6, U.S. Standard Wire cloth sieve conforming to ASTM E11. The sieve shall be placed in a Ro-Tap sieve shaking apparatus, and screened for 5 minutes. Examine the screen for 100 percent passage of material. Lumping of material that is broken up by the sieving operation to permit 100 percent passage through the No. 6 screen will not be cause for failure of this test.

4.4.16 Condition as-received. An as-received container of the steam cleaning compound shall be emptied, and the contents examined for lumping or agglomerating of material. Visual evidence of either shall be cause for rejection of the compound. Type I compound shall have a dry appearance. Type II compound may have a moist appearance because of the nature of the ingredients.

4.4.17 Biodegradability of the synthetic detergent. The supplier shall submit a certificate of compliance with the requirements for biodegradability. The certificate shall be submitted with the qualification sample, and be accompanied by actual test date (field or laboratory), including the test procedure used in making the determination.

4.4.17.1 Anionic synthetic detergents. When the detergent is an alkyl benzene sulfonate (ABS) or a linear alkylate sulfonate (LAS), the biodegradability shall be determined in accordance with the Test Procedure and Standards-ABS and LAS, Scientific and Technical Report No. 3 of The Soap and Detergent Association (see 2.2).

4.4.17.2 Nonionic and other synthetic detergents. Until a standard test method for determining the biodegradability of a nonionic detergent is agreed upon by industry, and is acceptable to the Government, the supplier shall determine the biodegradability in accordance with one of the current methods of the Soap and Detergent Association (see 2.2).

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5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A or commercial as specified (see 6.2).

5.1.1 Level A. The product shall be packaged in 25-, 125-, and 400-pound quantities. The 25-pound quantity shall be packaged in a 3.5-gallon pail; the 125-pound quantity in a 16-gallon drum; and the 400-pound quantity in a 55-gallon drum. The pail and each drum shall be of metal construction, previously unused, contain a 3-mil thick polyethylene bag liner, and be fitted with a metal cover with an airtight gasket attached.

5.1.2 Commercial. The cleaning compound shall be packaged in shipping containers to insure delivery at destination, to provide for redistribution by the initial receiving activity, and shall be acceptable by common carrier under National Motor Freight Classification and Uniform Freight Classification. Shipping containers shall be fitted with 3-mil thick polyethylene liners.

5.2 Packing. No overpacking is required.

5.3 Marking. Marking shall be as specified in the contract or order (see 6.2).

6. NOTES

6.1 Intended use. The steam cleaning compounds covered by this specification are intended for use in high pressure steam cleaning machines of the continuous tubular coil vapor-generating type, for cleaning of ferrous and nonferrous surfaces of equipment.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

(a) Title, number, and date of this specification.

(b) Type of steam cleaning compound required (See 1.2).

(c) Unit quantity required - this compound should be purchased on the basis of net weight in pounds.

(d) Packaging required (see 5.1).

(e) Marking 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 the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, 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. The activity responsible for the Qualified Products List is the US Army Mobility Equipment Research and Development Command, ATTN: DRXFB-RMO, Fort Belvoir, VA 22060, and information pertaining to qualification of products may be obtained from that activity.

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6.4 Packaging. It has been found that compounds packaged in drums permeable to moisture and carbon dioxide tend to cake in storage. Fiber drums especially are susceptible to this action. Regardless of type of drum a 3-mil thick, polyethylene bag liner is required.

6.4.1 Mixing. It has been found that compounds prepared by charging the granular ingredients into the blender followed by a short premix and then admixing the liquid surfactant has less tendency to lump or agglomerate than when produced by other orders of mixing.

6.5 Directions for use. Each container shall be durably and legibly marked with the directions for use of the compound as follows:

For Type I compounds

Directions for use. The compound shall be thoroughly dissolved to give a concentration of approximately 10 ounces of the compound per gallon of water, using the soap tank of the cleaning machine, or a separate drum outside the cleaning machine and then transferring to the soap tank of the cleaning machine. The dry compound must be added to hot water in preparing the solution, and not vice versa. Adjust the concentrate solution metering device to obtain the desired results. A nozzle concentration of 0.3 percent (0.4 ounce per gallon) is suitable for average cleaning. When the machine is shut down at the end of a shift, a "blow-down" is essential for retarding scale formation in the coils of the machine.

For Type II compounds

Directions for use. The compound shall be thoroughly dissolved to give a concentration of approximately 10 ounces of the compound per gallon of water, using the soap tank of the cleaning machine, or a separate drum outside the cleaning machine and then transferring to the soap tank of the cleaning machine. The dry compound must be added to hot water in preparing the solution, and not vice versa. Adjust the concentrate solution metering device to obtain the desired results. A nozzle concentration of 0.2 percent (0.25 ounce per gallon) is suitable for average cleaning. When the machine is shut down at the end of a shift, a "blow-down" is essential for retarding scale formation in the coils of the machine.

Military Custodians:
Army - MR
Navy - SH
Air Force - 68

Review activities:
Army - MI, MR, AR
Navy - AS, SH
Air Force - 68

User activities:
Navy - YD, MC

Preparing activity:
Army - MR

Civil Agency Coordinating Activity:
GSA - FSS

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein. Price (10) cents each.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR ☐ USER ☐ MANUFACTURER ☐ OTHER *(Specify)*: _____
b. ADDRESS *(Street, City, State, ZIP Code)*	

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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