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400 COMMONWEALTH DRIVE WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 1475

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Revised

DEODORANT, AIRCRAFT TOILET
Formaldehyde Base

1. SCOPE:

1.1 Form: This specification covers a biodegradable, formaldehyde-base material, containing additives, in the form of a liquid.

1.2 Application: Primarily as an additive to be used in aircraft toilet systems to control corrosion, bacteria, color, and odor.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) and Aerospace Recommended Practices (ARP) shall apply. The applicable issue of other documents shall be as specified in AMS 2350 except that the latest issue of APHA publications in effect on date of invitation to bid or request for proposal shall apply.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 4049 - Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.26Cr (Alclad 7075; - T6 Sheet, -T651 Plate)

2.1.2 Aerospace Recommended Practices:

ARP 1512 - Corrosion of Aluminum Alloys by Aircraft Maintenance Chemicals, Sandwich Test

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D56 - Flash Point by Tag Closed Tester
ASTM D445 - Determination of Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D471 - Rubber Property - Effect of Liquids
ASTM D891 - Specific Gravity of Industrial Aromatic Hydrocarbons and Related Materials
ASTM D1331 - Surface and Interfacial Tension of Solutions of Surface-Active Agents
ASTM D1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates
ASTM D2194 - Concentration of Formaldehyde Solutions
ASTM D2667 - Biodegradability of Alkylbenzene Sulfonates
ASTM D2778 - Solvent Extraction of Organic Matter from Water
ASTM E70 - pH of Aqueous Solutions with the Glass Electrode
ASTM F483 - Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
ASTM F485 - Effects of Cleaners on Unpainted Aircraft Surfaces
ASTM F502 - Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
ASTM F503 - Preparing Aircraft Cleaning Compounds, Liquid Type, for Storage Stability Testing

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120 except as specified in 2.3.3.

2.3.1 Military Specifications:

MIL-C-83286 - Coating, Urethane, Aliphatic Isocyanate, for Aerospace Applications

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

2.3.3 U.S. Department of Labor, Occupational Safety and Health Administration Forms: Available from regional offices of U.S. Department of Labor, Bureau of Labor Standards.

OSHA Form 20 - Material Safety Data Sheet

2.4 APHA Publications: Available from American Public Health Association, 1015 Eighteenth Street, N.W., Washington DC 20036.

Standard Methods for the Examination of Water and Wastewater

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall consist of a biodegradable, formaldehyde-base material with suitable additives such as aromatic oils, buffers, etc, as necessary to provide a product meeting the requirements of 3.2.

3.1.1 The product shall be free of soaps; non-ionic and amphoteric detergents are acceptable provided the product contains adequate foam depressors to comply with 3.2.2.2.

3.1.2 The product shall not contain materials which are deleterious to aircraft toilet systems or aircraft structural aluminum alloys.

3.1.3 The product shall dilute readily with water with minimum agitation.

3.2 Properties: The product shall conform to the following requirements; tests shall be performed in accordance with specified test methods:

3.2.1 Product As-Received in Concentrated Form:

3.2.1.1 Specific Gravity: Shall be 1.00 - 1.05, determined in accordance with ASTM D891.

3.2.1.2 Flash Point: Shall be not lower than 93° C (200° F), determined in accordance with ASTM D56.

3.2.1.3 Color: The product shall exhibit a deep blue color to mask organic waste and indicate a chemically-charged toilet. Dye shall be pH-resistant and shall not break down when tested for 72 hr ± 1 in a water solution having a pH of 3 - 11. Formic acid and sodium hydroxide solutions shall be used for adjusting pH of the water solution.

3.2.1.4 Formaldehyde Content: Shall be 4.0% ± 0.1 by weight, unless otherwise specified by purchaser, determined in accordance with ASTM D2194; for colored solution, titrate electrometrically using a pH meter.

3.2.1.5 Effect on Painted Surfaces: The product shall neither produce a decrease in film hardness greater than two pencil hardness levels nor shall it produce any streaking, discoloration, or blistering of the paint film, determined in accordance with either ASTM F502 or with 3.2.1.5.1.

3.2.1.5.1 Two test panels prepared in accordance with MIL-C-83286 shall be placed in a horizontal position. The deodorant shall be applied to approximately one-half the painted area of each panel and shall be allowed to remain on the panels for not less than 30 minutes. The panels shall then be rinsed with water and allowed to dry for 24 hr ± 1 at room temperature. Hardness of exposed and unexposed paint surfaces shall be tested in accordance with MIL-C-83286. Exposed and unexposed panel areas shall be examined visually and compared for evidence of streaking, discoloration, and blistering.

3.2.1.6 Biodegradability: The product shall show not less than 90% surfactant reduction to be adequately biodegradable, determined in accordance with ASTM D2667.

3.2.1.7 Volatile Oil Content: Shall be 0.70 - 2.0%, determined in accordance with ASTM D2778.

3.2.1.8 Storage Stability: The product shall be stable in storage for not less than 12 months at room temperature. Product shall remain free of lumps and skin formation and shall remain homogeneous. Samples prepared as in 3.2.1.8.1 shall show no evidence of layering, separation, settling, or crystallization after being subjected to five freeze-thaw cycles as in 3.2.1.8.2. The product shall also be tested in accordance with ASTM F503 and the results reported.

3.2.1.8.1 Two 6-oz (177-mL) samples of the product shall be placed in two 8-oz (237-mL) clear glass bottles, sealed, and, from that time until test is completed, shall be handled so as to minimize movement of the sample.

3.2.1.8.2 Samples shall be exposed for not less than 12 hr at -23° C (-9° F) or lower as necessary to completely freeze the sample. At the end of the 12 hr, samples shall be removed to a room-temperature environment and allowed to thaw completely.

3.2.1.9 Environmental Properties: Environmental standards vary from area to area and, therefore, acceptance standards for the following properties shall be as agreed upon by purchaser and vendor:

3.2.1.9.1 Total Alkalinity or Acidity: Shall be determined as ppm $CaCO_3$ in accordance with APHA Method 201.

3.2.1.9.2 Chemical Oxygen Demand: Shall be determined in accordance with APHA Method 220, using the dichromate reflux procedure.

3.2.1.9.3 Biological Oxygen Demand: The 5-day biological oxygen demand at 20° C (68° F) shall be determined in accordance with APHA Method 219, using filtered raw sewage seed.

3.2.1.9.4 Total Inorganic Phosphate: Shall be determined in accordance with APHA Method 223E, stannous chloride procedure.

3.2.1.9.5 Phenols: Shall be determined by distilling 500 mL of the product in accordance with APHA Method 222B, followed by chloroform extraction in accordance with APHA Method 222C.

3.2.1.9.6 Heavy Metals: Chromium, copper, cadmium, mercury, nickel, silver, and zinc contents shall be determined in accordance with APHA Method 211.

3.2.1.10 Miscibility: The product shall be miscible in all proportions with ethylene glycol and a 50% mixture shall have complete product stability after 7 days at 24° C ± 3 (75° F ± 5).

3.2.2 Product in Diluted Form: Shall be as follows, determined on product diluted with distilled or deionized water to the midpoint of the use dilution concentration range recommended by the manufacturer:

3.2.2.1 Viscosity: Shall not exceed by more than 10% the viscosity of deionized or distilled water at 10° C (50° F) and 30° C (86° F), determined in accordance with ASTM D445.

3.2.2.2 Foam Volume: Shall not exceed 5 mL when 100 mL of diluted product is shaken in a 200 mL graduate for 15 sec ± 1 and allowed to stand for 60 sec ± 1.

3.2.2.3 Surface Tension: The product shall have wetting characteristics such that it reduces the surface tension of water to below 45 dynes/cm (4.5 Pa), determined in accordance with ASTM D1331 at 25° C ± 3 (77° F ± 5).

3.2.2.4 Waste Material Reactivity: The product shall mask color and odor of human waste materials. A green-to-blue color and an odor which remains slightly perfumed, never offensive or overpowering, shall be retained during the test of 3.2.2.4.1.

3.2.2.4.1 Tests shall be conducted on the diluted product or as a solution of 0.25 fl oz (7.4 mL) or as a solution of 0.25 fl oz (7.4 mL) of concentrate in 1 qt (946 mL) of water; 25 g of fecal matter and 25 mL of urine shall be added to the diluted solution and mixed vigorously to ensure dispersion of the waste material. Color and odor of the mixture shall be observed at intervals up to 24 hr while temperature of the solution is maintained at 25° C ± 5 (77° F ± 9).

3.2.3 Product Tested Both as a Concentrate and Diluted as in 3.2.2:

3.2.3.1 pH: Shall be 7.5 - 9.5, determined in accordance with ASTM E70.

3.2.3.2 Effect on Unpainted Surfaces: There shall be no visible stains or residue on test panels tested in accordance with either ASTM F485 or 3.2.3.2.1.

3.2.3.2.1 Two 2 x 6 in. (50 x 150 mm) panels of AMS 4049 aluminum alloy shall be cleaned with acetone and then immersed in a sufficient quantity of the product to cover approximately one-half of each panel. The coated panels shall be placed at approximately 45 deg from horizontal in an oven maintained at 38° C ± 1 (100° F ± 2) for 30 min. ± 3. After the 30-min. period, remove the panels from the oven, rinse with room-temperature distilled water, and allow to dry. The treated and untreated areas of the panel shall be examined visually and compared for the presence of stains and residue.

3.2.3.3 Effect on Metallic Surfaces:

3.2.3.3.1 Sandwich Corrosion: Specimens of AMS 4049 aluminum alloy, after test, shall show a rating not worse than 1, determined in accordance with ARP 1512.

3.2.3.3.2 Total Immersion Corrosion: The product shall neither show evidence of corrosion of the panels nor cause a weight change greater than 0.3 mg/cm^2/24 hr for any single panel of AMS 4049 aluminum alloy, determined in accordance with ASTM F483.

3.2.3.4 Temperature Stability: The product shall show no chemical or physical deterioration, including evidence of discoloration, layering, or other change denoting loss of stability after being exposed for 120 hr ± 1 to 2° C ± 3 (35° F ± 5) and to 49° C ± 6 (120° F ± 10). The product shall also be tested in accordance with ASTM F503 and the results reported.

3.2.3.5 Fabric Stain Test: The product shall not appreciably stain 2 x 2 in. (50 x 50 mm) test samples of white 100% cotton, light-colored nylon, and light-colored wool when spotted with the product. The spotted fabric samples shall be allowed to dry at 60° C ± 3 (140° F ± 5) and washed with a commercial detergent. Presence of any stain remaining on any of the three types of fabrics shall be reported.

3.2.3.6 Solubility: The product shall be fully soluble in both hard and soft water and shall produce no detectable precipitate, determined in accordance with 3.2.3.6.1.

3.2.3.6.1 One set of two samples of the product shall be prepared using 0.5 fl oz (14.8 mL) of concentrate in 1 gal (3.8 mL) of distilled or deionized water or diluted to the midpoint of the vendor's recommended concentration range and a second set using the same amount of product in 1 gal (3.8 mL) of hard water containing at least 180 ppm $CaCo_3$ hardness. After stirring vigorously for not less than 1 min., samples shall be allowed to stand for 15 min. ± 1, and examined for evidence of precipitation.

3.2.3.7 Effect on Rubber and Plastic Materials: The product shall neither cause swelling greater than 10%, determined in accordance with ASTM D471, nor cause staining, discoloration, or evidence of degradation of rubber or plastic materials normally incorporated in aircraft lavatory fixtures, using the materials listed in 3.2.3.7.1 and tested as in 3.2.3.7.2. When specified by purchaser, tensile strength and elongation of exposed test specimens, determined in accordance with ASTM D471, shall be not lower than 75% of tensile strength and elongation values determined on unexposed test specimens.

3.2.3.7.1 Test specimens shall be of ethylene propylene (EPT), fluorosilicone, silicone, chloroprene, NBR, and fluorocarbon rubbers; of acetal, polysulfone, nylon, and polycarbonate plastics; of epoxy-glass fabric laminates; and of glass fabric.

3.2.3.7.2 Duplicate test strips of each material shall be placed in test tubes containing the product. Test strips for determination of volume change and, when specified, change in tensile strength and elongation shall be completely immersed in the solution. Test strips for determination of staining, discoloration, and visual evidence of degradation shall be immersed so that the bottom-half of each strip is in the solution and the top-half is in air. The test tubes shall be capped and stored at ambient temperature for 30 days. After this exposure, the immersed and unimmersed areas of each partially-immersed specimen shall be compared visually for evidence of deleterious effects. Volume change and, when specified, tensile strength and elongation shall be determined on the totally-immersed specimens and the values compared with those of unimmersed specimens.

3.3 Quality: The product shall be homogeneous, free from skins and lumps, and uniformly blue in color, with a faint, pleasant, perfume odor.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to specific gravity (3.2.1.1), flash point (3.2.1.2), color (3.2.1.3), foam volume (3.2.2.2), and pH (3.2.3.1) requirements are classified as acceptance tests.

4.2.2 Periodic Tests and Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as periodic tests and as preproduction tests.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with ASTM D1568, unless otherwise specified by purchaser.