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AEROSPACE MATERIAL SPECIFICATION

SAE AMS-C-22542

Issued SEP 1998

Submitted for recognition as an American National Standard

Cleaning Compound, High Pressure Cleaner, Liquid

NOTICE

This document has been taken directly from U.S. Military Specification MIL-C-22542B(AS) and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-C-22542B(AS). Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualifications requirements and associated qualified products lists are mandatory to DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this technical report.

1. SCOPE:

1.1 Scope:

The specification establishes the requirements for a liquid cleaning compound intended for use in steam cleaning machines to clean metallic and painted, soiled surfaces.

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2. APPLICABLE DOCUMENTS:

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

2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet
QQ-A-250/5	Aluminum Alloy Alclad 2024, Plate and Sheet
QQ-A-250/13	Aluminum Alloy Alclad 7075, Plate and Sheet
QQ-M-44	Magnesium Alloy Plate and Sheet (AZ31b)
QQ-P-416	Plating, Cadmium (Electrodeposited)
PPP-D-732	Drum, Metal, 55 Gallon Reconditioned (For Shipment of Noncorrosive Material)
PPP-P-704	Pail, Metal; (Shipping, Steel 1 through 12 Gallons)
MIL-A-356	Asphaltum (Gilsonite)
MIL-C-506	Carbon, Activated, Powdered
MIL-M-3171	Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on
MIL-L-6082	Lubricating Oil, Aircraft Reciprocating Engine (Piston)
MIL-S-7952	Steel, Sheet and Strip, Uncoated, Carbon (1020 and 1025) (Aircraft Quality)
MIL-P-7962	Primer Coating, Cellulose Nitrate Modified Alkyd Type, Corrosion Inhibiting, Fast Drying (For Spray Application Over Pretreatment Coating)
MIL-C-8514	Coating Compound, Metal Pretreatment, Resin-Acid
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-L-19537	Lacquer; Acrylic-Nitrocellulose, Gloss (For Aircraft Use)
MIL-I-22590	Impregnated Wadding, Metal Polish
MIL-C-22750	Coating, Epoxy Polyamide
MIL-P-23377	Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-L-81352	Lacquer, Acrylic (For Naval Weapons Systems)
MIL-C-83286	Coating, Urethane, Aliphatic, Isocyanate, for Aerospace Applications
FED-STD-313	Material Safety Data Sheet, Preparation and Submission of
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
40 CFR	Protection of Environment
49 CFR 100-199	Department of Transportation (DOT) Regulations of the Transportation of Explosive and Other Dangerous Articles by Land and Water

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 13	Specification for Spirits of Turpentine
ASTM D 95	Test for Water in Petroleum and BItuminous Materials by Distillation
ASTM D 1172	Test for pH of Aqueous Solutions of Soaps and Detergents
ASTM F 502	Test Method for Effects of Cleaning and Chemical Maintenance on Painted Aircraft Surfaces

2.3 Uniform Classification Committee, Agent:

Available from Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.

Uniform Freight Classification Rules

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).

3.1.1 Field evaluation tests: When required by the qualifying activity, the cleaning compound shall be evaluated as specified in 4.3.3.1. The performance of the cleaning compound shall be satisfactory with no objectionable odor.

3.2 Materials:

The composition of the cleaning compound shall be optional with the manufacturer but shall be restricted by the requirements of this specification. In addition products shall contain no ammonia, urea or other compounds which might form ammonia or obnoxious odors, no chromates and no Total Toxic Organics (TTO). TTO compounds are listed in 40 CRF. The cleaning compound shall contain no known or suspected human carcinogens or heavy metals.

3.2.1 Water content: When the cleaning compound is tested in accordance with 4.5.2 the water content shall be less than 60 percent by weight.

3.2.2 Alcohol insoluble matter: The cleaning compound, when tested as specified in 4.5.3 shall contain alcohol insoluble matter amounting to not less than 22 percent by weight.

3.2.3 Toxicity: The material shall have no adverse effect on the health of personnel when used for its intended purpose. The cleaning compound shall contain no components which produce noxious vapors in such concentrations as to be an annoyance to personnel during cleaning operations under conditions of adequate ventilation while exercising caution to avoid prolonged contact with the skin and while observing Occupational Safety and Health Administration (OSHA) guidelines. Questions pertaining to the toxic effect shall be referred by the procuring activity to the appropriate departmental medical service who will act as an advisor to the procuring activity (see 6.4). Material safety data sheets shall be prepared and submitted in accordance with FED-STD-313, one copy of which shall be forwarded to the preparing activity of this specification.

3.3 pH value:

The pH value of a one-half percent by weight solution of the cleaning compound in distilled water shall be not less than 10.3 nor more than 11.4 at 25°C (77°F) when the cleaning compound is tested as specified in 4.5.4.

3.4 Corrosiveness:

A 6 percent by weight aqueous solution of the cleaning compound tested as specified in 4.5.5, shall cause no visible staining, discoloration, nor attack of the metals listed in Table II.

3.5 Flammability:

The cleaning compound, when tested as specified in 4.5.6 shall not continue to burn after removal of a flame.

3.6 Solubility in water:

The cleaning compound, when tested as specified in 4.5.7 shall be completely soluble in water.

3.7 Stability in hard water:

A solution of the cleaning compound shall show no evidence of precipitation nor curd formation when mixed with hard water as specified in 4.5.8.

3.8 Rinsability:

The cleaning compound shall not leave a visible film of residue on aluminum clad aluminum alloy, magnesium alloy, nor anodized aluminum alloy panels after a dried film of the cleaning compound is rinsed as specified in 4.5.9.

3.9 Effects on painted surfaces:

The cleaning compound shall not cause a loss of more than two pencil hardness units nor shall it cause discoloration or dulling of painted surfaces when tested as specified in 4.5.10.

3.10 Cleaning performance:

A 6 percent by weight aqueous solution of the cleaning compound shall effect the removal of 80 percent of soil on the surface of an aluminum clad aluminum alloy panel when cleaning performance is determined as specified in 4.5.11.

3.11 Temperature stability:

The cleaning compound, when tested as specified in 4.5.12 shall not separate into layers and shall retain its homogeneity after exposure to heat at 60 ± 2°C (140 ± 3°F) for 6 hours and exposure to cold at -18 ± 5°C (0 ± 9°F) for 1 hour.

3.12 Storage stability:

The cleaning compound, when tested as specified in 4.5.13, shall not separate, crystallize, nor show other visible evidence of deterioration after storage in the dark for 12 months at 24 ± 3°C (75 ± 5°F). The stored cleaning compound shall then meet the requirements of this specification for stability in hard water, rinsability, and cleaning performance. The pail in which the cleaning compound is stored shall not show any evidence of leakage, distortion or internal corrosion.

3.14 Workmanship:

The cleaning compound shall be a clear liquid, showing no separated solids or phase separation.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility of 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 purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance: All items must meet all requirements of Sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Certification of compliance: Where certificates of compliance are submitted, they shall contain verifiable actual test and inspection data. The Government reserves the right to inspect and test the cleaning compound to verify the validity of the certification.

4.2 Classification of inspection:

The examination and testing of the cleaning compound shall be classified as follows:

a. Qualification inspection (see 4.3).

(1) Field evaluation tests.

b. Quality conformance inspection (see 4.4).

4.3 Qualification inspection:

The qualification inspection shall consist of the tests specified in Table I.

TABLE I. Qualification inspection

Characteristic	Requirement	Test
Materials	3.2	4.5.1
Workmanship	3.14	4.5.1
Water Content	3.2.1	4.5.2
Alcohol Insoluble Matter	3.2.2	4.5.3
pH Value	3.3	4.5.4
Corrosiveness	3.4	4.5.5
Flammability	3.5	4.5.6
Solubility in Water	3.6	4.5.7
Stability in Hard Water	3.7	4.5.8
Rinsability	3.8	4.5.9
Effects on Painted Surfaces	3.9	4.5.10
Cleaning Performance	3.10	4.5.11
Temperature Stability	3.11	4.5.12
Storage Stability	3.12	4.5.13

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

4.3.2 Qualification samples: The qualification sample shall consist of three gallons of the cleaning compound. The gallon sample submitted for the storage stability test shall be furnished in a one gallon pail with suitable interior coating conforming to PPP-P-704 Type I, Class 3 (see 5.1.1.3). Samples shall be identified with the manufacturer's production code number (not experimental number) and any additional identification required by letter of authorization. Instructions for submittal of samples will be specified in the letter of authorization by the activity responsible for qualification (see 6.3).

4.3.2.1 Reports: The manufacturer shall furnish the following data with the initial request for qualification:

a. Two copies of results of all specification tests in duplicate.

b. The supplier shall furnish toxicological data necessary to evaluate the safety of the cleaning compound for the proposed use, and a certified statement specifically identifying each ingredient in the compound by a readily recognizable chemical name, source, and percentage by weight.

4.3.3 Field evaluation samples: Pending completion of storage stability tests, and after a product has met all other qualification requirements, the manufacturer shall furnish field evaluation test samples as requested and in accordance with instructions provided by the qualifying activity (see 6.3.1).

4.3.3.1 Field evaluation tests: The field evaluation tests performed by an activity designated by the activity responsible for qualification (see 6.3) shall consist of field evaluation of the service test sample (4.3.3) under service conditions, conducted with standard operational procedures to determine suitability of cleaning compound for military use.

4.4 Quality conformance inspection (lot by lot):

The quality conformance inspection shall consist of all the examinations and tests required under this specification except storage stability and field evaluation tests.

4.4.1 Lot formation: A lot shall consist of all the cleaning compound manufactured at the same time, from the same batches of raw material, and submitted for inspection at one time.

4.4.2 Quality conformance test samples: An adequate amount of the cleaning compound shall be selected to perform the quality conformance inspection tests (4.4). The samples shall be selected at random from each lot (4.4.1). The lot shall be unacceptable if a sample fails to meet any of the test requirements specified.

4.4.3 Quality conformance samples for examination of filled containers: A random sample of filled unit containers, and shipping containers fully prepared for delivery shall be selected from each lot (4.4.1) in accordance with MIL-STD-105 at inspection level 1 and acceptable quality level (AQL) = 2.5 percent defective.

4.4.4 Inspection of the end item:

4.4.4.1 Examination of the end item: Examination of the end item shall be made in accordance with the following classification of defects at the inspection levels and AQLs expressed in defects per hundred units contained in 4.4.3. The lot size, for purposes of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of filled primary containers for the examinations specified in 4.4.4.1.1 and 4.4.4.1.2, in units of shipping containers for the examination specified in 4.4.5.1, and in units of pallets for the examination in 4.4.5.2.

4.4.4.1.1 Examination of the contents of shipping container: The sample unit for this examination shall be one filled shipping container.

Examine	Defect
Appearance of cleaning compound	Presence of foreign matter. Not uniform liquid.

4.4.4.1.2 Examination for net contents: The average net content of sample units shall be not less than the specified or indicated quantity. The sample unit for this examination shall be one filled primary container. The volume shall be calculated to 15.6°C (60°F) (see 6.2.b).

4.4.5 Examination of preparation for delivery:

4.4.5.1 Examination for packing and marking: An examination shall be made to determine that packing and marking comply with the requirements of Section 5 of this specification. Defects shall be scored in accordance with the list below. The sample unit for this examination shall be one shipping container fully prepared for delivery except that it shall not be palletized and need not be sealed. Shipping containers fully prepared for delivery that have not been palletized shall be examined for defects of closure. The lot size shall be the number of shipping containers in the end item inspection lot.

Examine	Defect
Packing	Container not as specified. Closures not accomplished by specified or required methods of materials. Any leakage or seepage of contents. Any nonconforming component, component missing, damaged or otherwise defective. Bulged or distorted container.
Markings	Data, including directions for use omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements.

4.4.5.2 Examination for palletization: An examination shall be made to determine that palletization complies with the requirements of Section 5 of this specification. Defects shall be scored in accordance with the list below. The sample unit shall be one palletized unit load fully prepared for delivery. The lot size shall be the number of palletized unit loads in the end item inspection lot.

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

4.4.3 Inspection levels and AQLs for examinations: The inspection levels for determining the sample size and the AQLs expressed in defects per 100 units shall be as follows:

Examination Paragraph	Inspection Level	AQL
4.4.4.1.1	S-3	2.5
4.4.4.1.2	S-2	-
4.4.5.1	S-2	4.0
4.4.5.2	S-1	6.5

4.5 Test methods:

4.5.1 Materials and workmanship: Conformance of the cleaning compound to the requirements for materials (3.2) and workmanship (3.15) shall be determined by appropriate examination and testing.

4.5.2 Water content: The water content of the cleaning compound shall be determined in accordance with ASTM Method D 95.

4.5.3 Alcohol insoluble matter: One hundred (100) grams of the cleaning compound shall be placed in a tared evaporating dish and heated on a hot plate at low heat until all liquid is evaporated. The residue shall be removed from the evaporating dish by means of a spatula into a tared extraction thimble. Final removal shall be effected by rinsing with small portions of ethyl alcohol. The residue shall then be extracted with 95 percent ethyl alcohol for two hours. The extraction thimble and contents shall be placed in an oven at 105°C (221°F) for two hours, cooled for one hour in a desiccator and then weighed. The percentage of alcohol insoluble matter shall be calculated.

4.5.4 pH value: The pH of the cleaning compound shall be determined electrometrically using glass electrodes in accordance with ASTM Method D 1172, except that a one half percent by weight solution of the cleaning compound shall be measured.

4.5.5 Corrosiveness:

4.5.5.1 Preparation of test panels: Test panels, 1 by 1 by 0.05 inches shall be made from each of the metals specified in Table II. Panels shall be cleaned with CP 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.

4.5.5.2 Procedure: One each of the cleaned panels shall be placed without touching each other in a beaker containing 100 mls of 6 percent by weight aqueous solution of the cleaning compound and the temperature maintained at 96 to 100°C (205 to 212°F) for one hour, following which the panels shall be removed, rinsed with tap water, distilled water and finally with absolute alcohol. They shall then be examined for evidence of attack, oxidation, or discoloration.

TABLE II. Metal test panels

No.	Metal	Specification	Surface	Specification
1	Aluminum Clad Aluminum Alloy	QQ-A-250/13		
2	Aluminum Alloy	QQ-A-250/4	Anodized	MIL-A-8625
3	Steel	MIL-S-7952	Polished	
4	Steel	MIL-S-7952	Cadmium Plated	QQ-P-416
5	Magnesium Alloy	QQ-M-44 (Condition H)	Chrome Pickled	MIL-M-3171, Type I

4.5.6 Flammability:

4.5.6.1 Preparation of panels: One end of a clean metal panel 6 by 1 inch, shall be held at an angle of approximately 45 degrees. The cleaning compound shall be poured along the upper edge of the panel, allowing the compound to drain freely over the surface. The cleaning compound settling on the reverse side of the panel shall be wiped clean before proceeding with the test.

4.5.6.2 Procedure: A microburner flame, not exceeding 3/16 inch in length shall be passed back and forth along the lower edge of the panel within a 2-second period. This operation shall be repeated three times at 3-second intervals. If the cleaning compound ignites, the burner flame shall be removed and observation made to ascertain whether the cleaning compound continues to burn.

4.5.7 Solubility in water: A 15.0 gram sample of cleaning compound shall be placed in a 250 ml glass stoppered graduated cylinder. Distilled water shall be added to the 250 ml mark, the cylinder stoppered and shaken thoroughly, the contents examined, and then allowed to stand undisturbed for 6 hours. The contents of the cylinder shall then be examined for insoluble matter, layer separation or excessive haze.

4.5.8 Stability in hard water:

4.5.8.1 Preparation of stock solution: A 10-grain hard water stock solution shall be prepared by dissolving 0.20 ± 0.005g of analytical reagent grade calcium acetate, $Ca(C_2H_3O_2)_2.H_2O$, and 0.14 ± 0.005g of analytical reagent grade magnesium sulfate, $MgSO_4.7H_2O$, in one liter of boiled distilled water.

4.5.8.2 Procedure: Ten milliliters of cleaning compound shall be added to each of three 100-ml graduated cylinders. Ninety milliliters of the synthetic hard water shall be added to each of the graduated cylinders and the solution mixed well. Allow the solution to stand undisturbed for 16 hours at a temperature of 25° ± 5°C (77° ± 9°F). At the end of the 16 hours, examine the solutions for precipitation of curd formation.

4.5.9 Rinsability: One inch square panels Nos. 1, 2 and 5 of Table II, previously cleaned as specified in 4.5.5.1, shall each be covered with approximately 0.5 ml of a solution of 1 ml of 6 percent by weight aqueous solution of cleaning compound diluted to 10 mls with distilled water. A duplicate set of panels shall be similarly covered with a solution of 1 ml of 6 percent by weight solution of cleaning compound diluted to 10 mls with 12-1/2 grain hard water. The panels shall be placed in an oven at 60°C (140°F) until dry. The panels shall then be removed and rinsed under a flowing stream of distilled water not to exceed 150 mls in volume and again placed under the lamp until dry. The panels shall then be examined for evidence of a film of residue.

4.5.10 Effects on painted surfaces: Test panels shall be made from aluminum alloy sheets conforming to QQ-A-250/5 anodized to conform to MIL-A-8625 (chromic acid type film) and finished as specified in Table III. The effect on painted surfaces shall be determined in accordance with ASTM F 502, using a 6 percent by weight solution of the cleaning compound in distilled water.

4.5.11 Cleaning performance:

4.5.11.1 Preparation of standard panels: A circular aluminum alloy panel measuring six inches in diameter and 0.010 and 0.020 inches in thickness shall be polished with impregnated wadding conforming to MIL-I-22590 and then cleaned as specified in 4.5.5.1. The panel shall be weighed to the nearest 0.1 milligram. The panel shall be soiled with standard soil as follows: An even coat of soil shall be painted onto an area of the test panel 11.43 cm (4 1/2 inch) in diameter with a small brush. The panel shall be hung vertically and allowed to dry at room temperature for a half hour. The panel shall be suspended in an oven at 124°C (255°F) for one hour. The panel shall be cooled at room temperature and any excess soil on the border shall be removed with a clean cloth, and the panel weighed. The weight of the panel shall be 0.60 to 0.65 grams.

4.5.11.2 Standard soil: The standard soil shall be as specified in Table IV. The asphaltum shall be melted by using an oil bath. The Grade 1100 oil and the lanolin shall be added with stirring until a smooth mixture results. The mixture shall be cooled to 25 ± 1°C (77 ± 2°F). The turpentine and carbon shall be added in that order with stirring.

TABLE III. Painted surfaces

Processing Steps	Materials	Number of Coats and Thickness Per Coat	Drying Time	
			Between Coats	After Final Coat
		TEST PANEL FINISH A1		
1	Primer Coating Epoxy Polyamide MIL-P-23377	1 (0.5 - 0.8 mil)	1 hr at room temp.	----
2	Lacquer Acrylic Nitrocellulose Gloss MIL-L-19537	2 (0.4 - 0.5 mil)	1 hr at room temp.	72 hours
		TEST PANEL FINISH A2		
1	Primer Coating, Epoxy Polyamide MIL-P-23377	1 (0.5 - 0.8 mil)	1 hr at room temp.	----
2	Epoxy Polyamide Gloss White MIL-C-22750	Mist Coat	30 min at room temp.	----
3	Epoxy Polyamide Gloss White MIL-C-22750	Wet (1.5 - 2.1 coat mil)		Air dry one week at room temp. then bake at (180°F ± 3°C) 82°C ± 2°C for 18 h ours
		TEST PANEL FINISH A3		
1	Primer, Epoxy Polyamide MIL-P-23377	1 (0.6 - 0.9 mil)	1 hr at room temp.	----
2	Coating, Poly-urethane Gloss White MIL-C-83286	Mist Coat	30 min at room temp.	----
3	Coating, Poly-urethane Gloss White MIL-C-83286	Wet (1.0 - 1.5 coat mil)	---	Air dry one week at room temp.

TABLE IV. Standard soil

Ingredient	Specification	Parts by Weight
Asphaltum (Gilsonite)	MIL-A-356	5.0
Lanolin (Anhydrous) USP		15.0
Lubricating Oil, Grade 1100	MIL-L-6082	20.0
Turpentine	ASTM D 13	25.0
Carbon, Activated, Powdered	MIL-C-506	20.0

4.5.11.3 Procedure: Using an apparatus as shown in figures 1 and 2, the test shall be conducted as follows:

a. The panel shall be rotated at 220 ± 10 rpm.
b. A simulated steam gun as shown in figure 1 shall be used with the nozzle horizontal and 15.24 cm (6 inches) from the panel.
c. The steam pressure shall be 8-9 lbs/sq inch measured at the entrance to the nozzle.
d. Three hundred (300) mls of 6 percent by weight aqueous solution of the cleaning compound shall be used, the rate of delivery being so regulated that the cleaning time is 20-25 minutes.
e. The spray from the steam gun shall be moved from the center of the panel to the edge in such a manner that the impingement angle is always 90°. The cleaned panel shall be rinsed with 500 mls of distilled water using a wash bottle, air dried for several hours, and then placed in a desiccator for 3 hours prior to weighing.

Calculation:

$$\text{Percent Soil Removal} = \frac{(A - B) \times 100}{(A - C)}$$

Where:

A = weight of panel + soil before cleaning
B = weight of panel + soil after cleaning
C = weight of panel before soiling

4.5.12 Temperature stability:

4.5.12.1 Heat stability: Fifty mls of the cleaning compound shall be placed in a 50 ml glass stoppered graduated cylinder. The cylinder shall be placed in a water bath maintained at 60 ± 2°C (140 ± 3°F) for 6 hours. The depth of water in the bath shall be sufficient to cover at least 30 mls of the compound. At the end of the test period, no separation or layering of the compound shall be evident.

4.5.12.2 Cold stability: Approximately 50 mls of the cleaning compound shall be poured into a suitable size test tube and cooled to -18 ± 5°C (0 ± 9°F). This temperature shall be maintained for 1hour. The compound shall then be allowed to return to room temperature and examined for homogeneity.

4.5.13 Storage stability: One gallon of the cleaning compound shall be stored for 12 months at 24 ± 3°C (75 ± 5°F) in a one gallon pail conforming to PPP-P-704, Type I, Class 3. At the expiration of the storage period the cleaning compound shall be examined for separation, crystallization, and other evidence of deterioration, and the pail examined for distortion or leaking. The top of the pail shall be removed and the internal surface examined for corrosion. The stored cleaning compound shall then be tested for stability in hard water, cleaning performance and rinsability.

5. PACKAGING:

5.1 Packaging:

Packaging shall be level A or Commercial, as specified (see 6.2).

5.1.1 Level A:

5.1.1.1 Five gallons: Five gallons of cleaning compound shall be packed in 5 gallon capacity pail conforming to PPP-P-704, Type I, Class 3. Options concerning spouts and closures shall be specified by the procuring activity (see 6.2).

5.1.1.2 Fifty-five gallons: Fifty-five gallons of cleaning compound shall be placed in a 55 gallon capacity metal drum conforming to PPP-D-729, Type II.

5.1.1.3 Compatibility of materials: The container closure, lining or sealing compound shall not interact, physically or chemically, with the contents so as to be altered or to alter the strength, quality or purity of the contents. All interior surfaces of containers shall be coated with a material of the same composition and a thickness not less than that provided on the container (see 4.3.2) subject to the storage stability test when the cleaning compound was qualified.

5.1.2 Commercial: The cleaning compound shall be packaged in specified quantities in a manner that will afford adequate protection against deterioration and physical damage during shipment from the supply source to the first receiving activity and for a minimum of 30 days storage, utilizing containers required by the Department of Transportation in Title 49, Code of Federal Regulations, Parts 100-199.

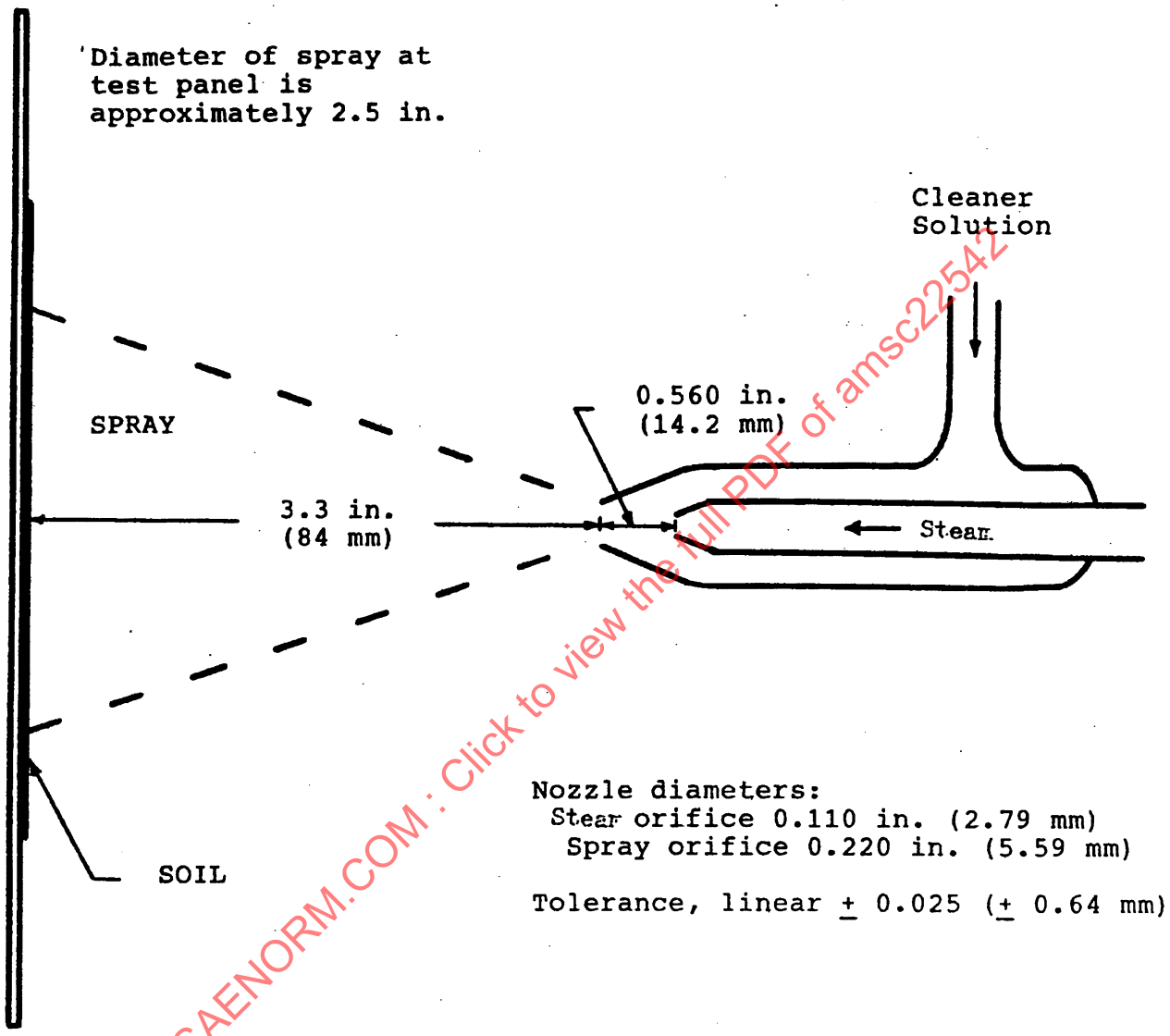

FIGURE 1 - SIDE VIEW OF TEST APPARATUS