

PERFORMANCE SPECIFICATION
CLEANING COMPOUND, SOLVENT
(FOR BORE OF SMALL ARMS AND AUTOMATIC AIRCRAFT WEAPONS)

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 type of bore cleaner for use in the removal of primer salts and as a temporary preservative for metallic items.

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

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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

Beneficial comments recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U. S. Army TACOM-ARDEC, Attn: AMSTA-AR-QAW-E, Picatinny Arsenal, N. J. 07806-5000 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

SPECIFICATIONS

FEDERAL

- O-M-232 - Methanol (Methyl Alcohol)
- QQ-S-698 - Steel, Sheet and Strip, Low-Carbon
- TT-N-95 - Naphtha, Aliphatic
- PPP-C-96 - Cans, Metal, 28 Gage and Lighter

(Unless otherwise indicated, copies of the above specifications are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094).

2.3 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated a DOD adopted shall be the issue listed in the current DODISS, and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 56 - Flash Point by Tag Closed Tester
- D 445 Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity), Test for
- D 1748 Rust Protection by Metal Preservatives in the Humidity Cabinet.
- D 4057 Manual Sampling of Petroleum and Petroleum Products
- D 4177 Automatic Sampling of Petroleum and Petroleum Products

(Copies of ASTM publications may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conchohocken, PA 19428-2959)

2.4 .Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the test of this specification shall take precedence.

3. REQUIREMENTS

3.1 Qualification. The bore cleaner furnished under this specification shall be a product which has been tested and passed the qualification tests specified herein (see 4.3.1 and 6.5), and has been listed on or approved for listing on the applicable qualified products list.

3.2 Material. The bore cleaner shall be made of such materials as shall meet all requirements of this specification. The cleaner shall contain no ingredients which may be injurious to personnel using it, under reasonable safety precautions.

3.3 Physical requirements. The clearer shall have the following physical requirements:

Flash Point, °C, minimum 49 (120°F)

Kinematic viscosity, centistokes (cSt) {square meters per second (m^2/s) }

- a. 38°C (100°F), Max - 15 cSt (0.000015 m^2/s)
- b. -29°C (-20°F), Max - 1500 cSt (0.0015 m^2/s)

3.4 Stability.

3.4.1 Freezing. The cleaner shall show no separation after storage throughout a temperature range of -54°C (-65°F) to 25°C (77°F).

3.4.2 Heating. The cleaner shall show no separation after storage at 66°C (150°F).

3.5. Residue and fluidity at low temperature. The residue remaining after evaporation at 54°C (130°F) shall be free from solid particles and not tacky, and shall permit movement at -54°C (-65°F) when tested as specified in 4.6.

3.6 Appearance. The cleaner shall be clear and transparent when viewed by transmitted light.

3.7 Odor. The cleaner shall be free from disagreeable and offensive odors when tested as specified in 4.7. (An obviously strong offensive odor shall be cause for immediate rejection without conducting the test.)

3.8 Corrosion protection.

3.8.1 Humidity cabinet. The cleaner shall be capable of protecting parts against corrosion during continuous condensation on parts at temperatures up to 49°C (120°F).

3.8.2 Water displacement and water stability. The cleaner, after storage in contact with water, shall satisfactorily displace water as evidenced by the absence of rust, mottling, or other abnormal surface strains on the test specimens.

3.8.3 Container corrosion. The cleaner shall not produce visually evident corrosive effects or a weight gain or loss in excess of the following:

Container finish	Milligrams per square centimeter
Electrolytic tinplate	
0.25 lbs (113.4 gms) per base box	0.3

3.9 Toxicity. When used for its intended purpose, the cleaner shall have no adverse effect on the health of personnel.

4. VERIFICATION

4.1 Lot. An inspection lot shall consist of cleaner of a single batch or composition, manufactured under essentially the same condition, and presented for inspection at the same time. However, a lot shall not exceed 5,000 gallons (19 cubic meters) in any case.

4. Sampling.

4.2.1 Sampling material for testing. Each lot of material shall be sampled in accordance with ASTM D270.

4.2.2 Qualification test samples. Qualification samples shall consist of two one-gallon (3.79 liter) containers of the cleaner.

4.2.3 Qualification samples. The qualification samples shall be accompanied by test data indicating results of all tests except the container corrosion test.

4.3 Classification of tests.

4.3.1 Qualification tests. Qualification tests shall consist of all the test of this specification.

4.3.2 Acceptance tests. Acceptance tests shall consist of all the tests of this specification except the odor test (see 4.7) and the container corrosion test (see 4.11).

4.4 Physical and chemical tests. Physical and chemical tests shall be conducted in accordance with ASTM Methods as follows:

- a. Flash Point - D 56
- b. Kinematic Viscosity - D 445

4.5 Stability.

4.5.1 Freezing. A sample of the cleaner shall be placed in a pour point tube, stoppered, and subjected to $-54 \pm 3^{\circ}\text{C}$ ($-65 \pm 5^{\circ}\text{F}$) for 16 hours followed by 8 hours at $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$). This cycle shall be repeated for a total of three times. Following this procedure the sample shall be inverted once, permitted to stand at $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$) for 16 hours, and then examined for separation. Any evidence of separation in this sample shall be cause for rejection.

4.5.2 Heating. A sample of the cleaner shall be placed in a pour point tube, loosely stoppered, and subjected to 66°C (150°F) for 30 minutes. Upon completion of the heating period, the sample is permitted to cool to $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$) and examined for separation. Any evidence of separation in the sample shall be cause for rejection.

4.6 Residue and fluidity at low temperature. Twenty-five milliliters (ml) of the cleaner shall be placed in a flat bottom petri dish, approximately 10 centimeters (cm) in diameter, and heated in an oven maintained at $54 \pm 3^{\circ}\text{C}$ ($130 \pm 5^{\circ}\text{F}$) for 40 hours. At the end of the heating period, the sample shall be cooled to $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$) and examined for tackiness by touching the residue. A visual examination shall be made for solid particles. A sufficient quantity of the residue shall be placed upon the end of a glass slide approximately 1 by 3 inches (2.5 by 7.6 cm). Another slide shall be placed over the residue so that an overlap of approximately one square inch (6.45 square centimeters) is formed. A one-kilogram weight is placed on the test area for 30

seconds. The weight is then removed and the slides subjected to $-54 \pm 3^{\circ}\text{C}$ ($-65 \pm 5^{\circ}\text{F}$) for 24 hours. While at a temperature of to $-54 \pm 3^{\circ}\text{C}$ ($-65 \pm 5^{\circ}\text{F}$) the two slides shall be separated by hand, using a sliding action. If no movement is detected within a period of one second the material shall be rejected.

4.7 Appearance. A pour point tube shall be filled to the mark with the sample to be tested. The sample, when viewed by transmitted light shall be clear and transparent.

4.8 Odor.

4.8.1 Procedure. Twenty ml of the cleaner is placed in a weighing bottle, 70 mm I.D. and 30 mm in height, sealed with a ground-glass stopper, and maintained in an oven at $38 \pm 3^{\circ}\text{C}$ ($100 \pm 5^{\circ}\text{F}$) for 30 minutes. Immediately after removal from the oven, the container is transferred to a draft-free area, the stopper is removed, and the vapors rated by each of three operators, as to being agreeable or offensive (see 4.7.2) according to the following procedure:

- a. The operator should not be more than 2-3 inches (5.1 - 7.6 cm) from the weighing bottle when removing the stopper and smelling the vapors.

(Note. In case strong odors are present, it is recommended that the operator partially fill his lungs with air prior to removing stopper to only permit exposure to sufficient vapors for odor detection.)

- b. The operator should breathe carefully while exposed to the vapors for 15 seconds after removing stopper.
- c. The operator shall determine the length of time he can sense or notice the odor after completion of the 15-second exposure period

4.8.2 Rating the odor. Each operator shall rate the odor as follows as to category and/or type:

Category 1 - Agreeable

- Type A - Pleasant
- Type B - No odor
- Type C - Neutral odor

Category 2 - Offensive

- Type A - Nauseous
- Type B - Repellent
- Type C - Burning
- Type D - Strongly penetrating
- Type E - Causing drying
- Type F - Lachrymose
- Type G - Persistent after 15 second exposure
- Type H - Causing dizziness
- Type I - Causing sneezing
- Type J - Causing other adverse effects

4.8.3 Criterion for failure. If any 2 of 3 operators rate the odor as offensive, the material shall be considered unsatisfactory for use and rejected.

4.9 Corrosion protection, humidity cabinet.

4.9.1 Test panels. The test panels shall be approximately 2 by 4 by 1/8 inch (5.1 by 10.2 by 0.32 cm); low carbon, cold-rolled 1020 steel conforming to QQ-S-698. Badly rusted stock shall not be used for making test panels. The edges of the panels shall be rounded and suspension holes reamed in accordance with ASTM D 1748 prior to cleaning.

4.9.2 Cleaning test panels. The test surfaces of the panels shall be cleaned with naphtha, conforming to TT-N-95, and methanol, conforming to O-M-232, Grade A, as follows:

- a. While cleaning the test panels, they shall be handled with hooks or forceps at all times. All precautions shall be taken to guard against impurities on the test panels by avoiding contact with any type of contaminated surfaces. The utensils and solvents used must be cleaned and free of contamination.
- b. The solvents shall be maintained at a temperature high enough to keep the temperature of the panels above the dew point during handling operations when they are not submerged in solvent or stored in a desiccator.
- c. Wipe the surfaces clean with solvent-soaked rags and scrub with surgical gauze swabs in a beaker of hot naphtha.
- d. Rinse in a beaker of hot methanol. Air-dry the panels and store in a desiccator until further processing.

4.9.3 Sand Blasting test panels. The unnumbered side of the test panels shall be sandblasted to a fresh, uniformly abraded surface with clean, white, dry, sharp sand, of a size that will allow all of it to pass through a number 10 sieve, a minimum of 90 percent to pass through a number 20 sieve, and not more than 10 percent to pass through a number 50 sieve. The size designation of all sieves shall conform to ASTM E11 or ASTM E323, as applicable. Immediately after sandblasting, the panels shall be placed into a container of anhydrous methanol. Remaining residue and contamination shall be removed by holding the panels in a rack at 20° from the vertical and spraying downward with naphtha. Flush the test surface, then the back of the panel and the test surface again. The panels shall then be rinsed in hot naphtha and hot methanol. After the panels are dry they shall be stored in a desiccator and used the same day as prepared

4.9.4. Test Procedure. The test panels shall be dipped in the test cleaner at a temperature of $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$) and agitated gently for one minute. The panels shall then be suspended by means of stainless steel or Monel hooks and drained for two hours at that temperature. The panels shall then be subjected to 7 days of the

humidity cabinet test specified in ASTM D 1748. At the end of the 7-day exposure period, the panels shall be removed, decoated with naphtha and examined in the significant area of the panels as defined in ASTM D1748. At least two of the panels shall be free of corrosion and the third panel shall have no more than three corrosion dots, none of which exceed one millimeter in diameter. Corrosion in excess of this amount shall be cause for rejection.

4.10 Water displacement and water stability.

4.10.1 Test panels. Four panels for this test shall be approximately 2 by 3 by 1/16 inch (5.1 by 7.6 by 0.16 cm) of the same material specified in 4.9.1 and cleaned and sandblasted as specified in 4.9.2 and 4.9.3.

4.10.2 Preparation of compound. Fifty ml of the test compound shall be placed in a 125 ml Erlenmeyer flask, 5 ml of distilled water added, and the mixture thoroughly shaken. The stopper flask shall be stored in an oven at $54 \pm 3^{\circ}\text{C}$ ($130 \pm 5^{\circ}\text{F}$) for 16 hours and then cooled to $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$) for testing.

4.10.3 Test procedure. Three test panels shall be dipped into distilled water momentarily and drained in a vertical position for not more than five seconds, with the bottom edge in contact with absorbent paper. The panels shall be immersed horizontally and without agitation for 15 seconds in a petri or evaporating dish containing 50 ml of the test compound. After draining momentarily, the panels shall be placed in a static humidity chamber, (for example, a desiccator body containing distilled water), for one hour at $25 \pm 3^{\circ}\text{C}$ ($77 \pm 3^{\circ}\text{F}$). The fourth panel shall be used as the control and stored in a desiccator while the test proceeds. At the completion of the static humidity exposure the panels shall be decoated with naphtha and compared to the control panel. The presence of rust, mottling or other abnormal surface stains shall be cause for rejection.

4.11..Container Corrosion.

4.11.1 Test containers. This test shall be conducted utilizing the following containers: round, 6-fluid-ounce (177.5 milliliters) capacity, conforming to PPP-C-96:

Electrolytic tinfoil - 0.25 lbs. and 0.11kg per base box

4.11.2 Preparation of test containers. The containers shall be rinsed in hot naphtha followed by a rinse in hot methyl alcohol. The containers shall be permitted to cool to $24 \pm 3^{\circ}\text{C}$ ($75 \pm 5^{\circ}\text{F}$) prior to further processing. Avoid touching containers with the hands after the cleaning process.

4.11.3 Test procedure. Weigh each container and add 11.0 ml of the compound under test. The lids shall be securely attached and the containers placed in an oven at $54 \pm 3^{\circ}\text{C}$ ($130 \pm 5^{\circ}\text{F}$) for 7 days. Upon completion of the test, the cleaner shall be removed and the containers rinsed in hot naphtha and hot methyl alcohol. After cooling to $24 \pm 3^{\circ}\text{C}$ ($75 \pm 5^{\circ}\text{F}$) reweigh the containers and calculate the change in weight in milligrams per square centimeter.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging is to be performed by DoD 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

6.1 Intended use. The bore cleaner covered by this specification is a highly penetrating, mobile liquid and is intended for use in cleaning the bores of small arms and automatic aircraft weapons. The material provides a temporary rust-resistant coating for the cleaned surface.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title and number of this specification
- b. Packaging
- c. Size and type of container
- d. Any special marking required
- e. Quantity desired

6.3 Surface area. The surface areas of the containers can be determined by utilizing the following formulas:

$$\text{Area of circle} = \Pi r^2$$

$$\text{Area of cylinder} = 2\Pi r h$$

where r (centimeters) = radius of bottom of container
and h (centimeters) = height of liquid in container

The total surface area can be obtained by combining the individual values.

6.4 Toxicity. Any questions raised regarding toxicity should be referred by the procuring agency to the departmental medical authority. In the case of Army procurement, the Surgeon General will act as advisor to the procuring agency.

6.5 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 contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is U. S Army TACOM-ARDEC, ATTN: AMSTA-AR-QAW-E, Picatinny Arsenal, N. J. 07806-5000 and information pertaining to qualification of products may be obtained from that activity.

6.6 Subject term (key word) listing.

Corrosion protection
Humidity cabinet
Odor
Stability

6.7 Changes form 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.

CONCLUDING MATERIAL

Custodians
Army - AR
Navy - AS
Air Force – 68
DLA – GS

Preparing activity
Army - AR

(Project 6850-1221)

Review activities:
Army – CR4, SM
Navy – MC, OS
DLA - PS