INCH-POUND

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SUPERSEDING
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PERFORMANCE SPECIFICATION

LUBRICANT, CLEANER AND PRESERVATIVE FOR WEAPONS AND WEAPONS SYSTEMS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification describes the performance requirements and verification methods for a type of LUBRICANT, CLEANER AND PRESERVATIVE FOR WEAPONS AND WEAPONS SYSTEMS. This product is for use in cleaning, lubricating and short-term (see 6.9.5) preservation of both small and large caliber military weapons, operating in the temperature range of -51 to + 71 °C (-60 to +160 °F), (see 6.1).

1.2 Identification. This lubricant is identified by Military Symbol CLP and North Atlantic Treaty Organization (NATO) Code Number S-758.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of 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, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Comments, suggestions or questions on this document should be addressed to: Commander, U S Army Armament Research, Development, and Engineering Center (ARDEC), ATTN: AMSRD-AAR-QES-E, Picatinny, NJ 07806-5000, or emailed to ardec-stdzn@pica.army.mil. Since contact information can change, you may want to verify the currency of this address using the ASSIST Online database at http://assist.daps.dla.mil.

AMSC/NA FSC 9150

FEDERAL SPECIFICATIONS

O-E-751	Ether, Petroleum; Technical-grade.
O-M-232	Methanol (Methyl Alcohol).
TT-N-95	Naphtha, Aliphatic

FEDERAL STANDARDS

FED-STD-791	Lubricants, Liquid Fuels, and Related Products; Methods of Testing.

COMMERCIAL ITEM DESCRIPTIONS

A-A-51126	Anodes, Cadmium.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-680	Degreasing Solvent.
MIL-A-18001	Anodes, Sacrificial Zinc Alloy
MIL-P-51408	Paper, Chemical Agent Detector, VGH, ABC-M8
MIL-DTL-51518	Paper, Chemical Agent Detector: M9 (SR119 DYE).

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

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

US ARMY DEVELOPMENTAL TEST COMMAND

TOP 3-2-045	Auto Weapons, Machine Guns, and Hand and Shoulder Weapons

(This document may be ordered from the US Army Developmental Test Command, ATTN: Publications, 314 Longs Corner Road, Aberdeen Proving Ground, MD 21005-5005 or online at http://www.dtc.army.mil/publications/topsindex.aspx.)

ARMY TECHNICAL MANUAL

TM 9-1005-201-10	Technical Manual, Machine Gun, 5.56MM, M249

(This TM may be viewed and printed at https://www.logsa.army.mil/etms/online.htm.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM A109/A109M	Standard Specification for Steel, Strip, Carbon, (0.25 Maximum Percent), Cold-Rolled
ASTM B16/B16M	Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
ASTM B152/B152M	Standard Specification for Copper Sheet, Strip, Plate and Rolled Bar
ASTM B209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM D56	Standard Test Method for Flash Point by Tag Closed Cup Tester
ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D97	Standard Test Method for Pour Point of Petroleum Products
ASTM D445	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D972	Standard Test Method for Evaporation Loss of Lubricating Greases and Oils
ASTM D1748	Standard Test Method for Rust Protection by Metal Preservatives in the Humidity Cabinet
ASTM D4057	Standard Practice for Manual Sampling of Petroleum and Petroleum Products
ASTM D4172	Standard Test Method for Wear Preventive Characteristics of Lubricating Fluid (Four-Ball Method)
ASTM D4177	Standard Practice for Automatic Sampling of Petroleum and Petroleum Products
ASTM D5620	Standard Test Method for Evaluating Thin Film Fluid Lubricants in a Drain and Dry Mode Using a Pin and Vee Block Test Machine

(Copies of these documents may be ordered at www.astm.org or from the ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

AMS 4376	Plate, Magnesium Alloy 3.0 Al – 1.0 Zn – 0.20 Mn (AZ31B-H26) Cold Rolled and Partially Annealed

(Copies of this document may be ordered on line at www.sae.org or from the SAE World Headquarters, 400 Commonwealth Drive, Warren dale, PA 15096)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. CLP furnished under this specification shall be products authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award (see 4.1.1, 6.3).

3.1.1 Conformance inspection. When specified, a sample of CLP shall be subjected to a qualification conformance inspection (see 4.1.2 and TABLE III).

3.2 Support and ownership requirements.

3.2.1 Graphite. CLP shall contain no graphite or powdered metals.

3.2.2 Ozone depleting substances (ODSs). CLP shall contain no ODSs.

3.2.3 Toxicity and hazardous materials. CLP shall have no adverse effect on the health of personnel when used for its intended purpose.

3.2.4 Color and appearance. CLP shall be uniform in color and appearance when examined in reflected light, and shall have no visible residue after shaking.

3.2.5 Physical properties. CLP shall conform to properties specified in TABLE I.

TABLE I. Physical properties.

Properties	Values
Flash Point, min	65 °C (149 °F)
Pour Point, max	-59 °C (-74 °F)
Viscosity, Kinematic (w/ solvent) @ +40 °C (104 °F), min	14.0 cSt
Viscosity, Kinematic (w/ solvent evaporated) @ -40 °C (-40 °F), max	5000 cSt (see 6.7)
Wear Preventive Characteristics, avg., Scar Diameter, max	0.8 mm
Falex Load Carrying Capacity, Jaw Load, min	500 lbs

3.3 Interface requirements.

3.3.1 Corrosion production. CLP, when applied to the following metals, shall not produce visual evidence of corrosion such as pitting, etching, or dark discoloration, nor shall it cause a weight change in excess of the values in TABLE II:

TABLE II. Allowable weight change.

Metal	mg/sq cm	Metal	mg/sq cm
Zinc	1.5	Copper	1.5
Aluminum	0.2	Magnesium	0.5
Brass	1.0	Cadmium	1.5
Steel	0.2		

3.3.2 Interference with chemical agent detector paper. CLP applied to and allowed to soak into chemical agent detector paper shall cause no discoloration, in the soaked portion of the paper (see 6.5).

3.4 Environmental requirements.

3.4.1 Humidity resistance. CLP, applied to three test panels, shall provide humidity resistance so that not more than three corrosion dots, none exceeding one millimeter in length, width, or diameter, shall be evident on test panels after 900 hours exposure in a humidity cabinet. The total of such corrosion dots on all three test panels shall not exceed three.

3.4.2 Salt-spray resistance. CLP, applied to three test panels, shall provide salt-spray resistance so that not more than three corrosion dots, none exceeding one millimeter (length, width, or diameter), shall be evident on test panels after 100 hours exposure to a spray of 5 % salt solution. The total of such corrosion dots on all three test panels shall not exceed nine.

3.4.3 Corrosion-protection from propellant reaction products. CLP, applied to three test panels, shall provide corrosion protection from propellant reaction so that no rust spots involving visible pitting or etching of the metal, size two millimeters or larger (length, width or diameter), shall be evident on any of three test panels after exposure to the ignition of WC 844 propellant, (see 6.6) and 96 hours conditioning at 49 ± 2 °C (120 ± 4 °F) and 100 % Relative Humidity.

3.4.4 Water displacement and water stability. CLP, applied to three test panels, shall displace water so that there is no evidence of rust, mottling, or other abnormal surface stains on the test panels after storage in the static humidity chamber for one hour.

3.5 Operating requirements.

3.5.1 Firing residue removal. CLP shall provide cleaning capability to remove a minimum average of 80 % of the residue generated from the ignition of WC 844 propellant.

3.5.2 Weapon performance. CLP shall provide cleaning, lubricating and preservative characteristics to support operating requirements of the MACHINE GUN: 5.56MM, M249, hereafter referred to as M249 (see 6.9.1 through 6.9.3) when exposed to the following conditions.

3.5.2.1 Cold temperature. CLP applied to a machine gun that is then exposed to severe cold conditions shall prevent any Class II or III stoppages, shall allow no more than two Class I stoppages in 200 rounds, and shall sustain a rate of fire of at least 650 rounds per minute.

3.5.2.2 Sand/dust environments. CLP applied to a machine gun that is then exposed to very fine blowing dust shall prevent any Class II or III stoppages, shall allow no more than five Class I stoppages in 500 rounds, and shall sustain a rate of fire of at least 650 rounds per minute.

3.5.2.3 Salt water immersion. CLP applied to a machine gun that is then immersed in salt water for one minute and stored in high humidity conditions for ten days between firing cycles shall prevent any Class II or III stoppages, shall allow no more than five Class I stoppages in 1000 rounds, and shall sustain a rate of fire of at least 650 rounds per minute.

4. VERIFICATION

TABLE III. Requirement/verification cross-reference matrix.

Property	Section 3 Requirement	Section 4 Verification	Qualification Testing	Conformance Inspection
Qualification	3.1	4.1.1	X	
Conformance inspection	3.1.1	4.1.2		X
Graphite	3.2.1	4.2.1	X	X
ODSs	3.2.2	4.2.2	X	X
Toxicity and hazardous materials	3.2.3	4.2.3	X	X
Color and appearance	3.2.4	4.2.4	X	X
Flash Point	Table I	Table IV	X	X
Pour Point	Table I	Table IV	X	X
Viscosity, Kinematic @ + 40 °C (104 °F)	Table I	Table IV	X	X
Viscosity, Kinematic @ -40 °C (-40 °F)	Table I	Table IV	X	X
Wear Preventive Characteristics	Table I	Table IV	X	X
Falex Load Carrying Capacity	Table I	4.2.6	X	X
Corrosion Production	3.3.1	4.3.1	X	X
Chemical Agent Detector Paper	3.3.2	4.3.2	X	X
Humidity Resistance	3.4.1	4.4.1	X	X
Salt-spray Resistance	3.4.2	4.4.2	X	X
Corrosion-Propellant Reaction	3.4.3	4.4.3	X	X
Water Displacement/Stability	3.4.4	4.4.4	X	X
Firing Residue Removal	3.5.1	4.5.1	X	X
Cold Temp - Weapons Firing	3.5.2.1	4.5.2.3	X	
Sand/dust - Weapons Firing	3.5.2.2	4.5.2.4	X	
Salt Water Immersion-Weapons Firing	3.5.2.3	4.5.2.5	X	

4.1 Classification of inspection. Inspection requirements specified herein are as follows:

a. Qualification inspection (see 4.1.1).
b. Conformance inspection (see 4.1.2).

4.1.1 Qualification inspection. Upon formal application, CLP qualification inspection shall consist of specified tests for all requirements specified in Section 3, (see Table III). If a product sample fails to meet any of the requirements specified in Section 3, that product shall not be qualified, and shall not be listed on the QPL.

4.1.1.1 Qualification samples. Qualification testing shall require three gallons of product. If the final formulation contains solid materials, a one-half gallon sample shall be provided identical to the final product but without the addition of solid materials.

4.1.2 Conformance inspection. When specified, conformance inspection of production lots (See 6.9.4) shall consist of specified tests for all the requirements specified in Section 3 except for live-fire weapons tests (see Table III).

4.1.2.1 Rejection of lots. If a product sample fails to pass any of the specified tests, the production lot represented by that sample, shall be rejected.

4.1.3 Sampling for tests. Samples for tests shall be taken in accordance with ASTM D4057 or ASTM D4177, as applicable.

4.2 Support and ownership verifications.

4.2.1 Graphite. Objective evidence shall be examined to verify the product formulation contains no graphite or powdered metals. (See 6.3.2)

4.2.2 Ozone depleting substances. Objective evidence shall be examined to verify the product formulation contains no ODSs. (See 6.3.2)

4.2.3 Toxicity and hazardous materials. A Toxicity Clearance by the US Army Center for Health Promotion and Preventive Medicine (CHPPM) shall confirm conformance with the requirements of 3.2.3. (see 6.4).

4.2.4 Color and appearance. A 4 oz translucent container of product shall be shaken for a period not to exceed 30 seconds to disperse all visible residue. Immediately after shaking, the product shall be visually inspected to check for full dispersion of residue. Failure of residue to fully disperse after shaking or failure of the product to achieve a uniform color shall be cause for failure of product qualification.

4.2.5 Physical properties. Verification tests shall be performed IAW methods listed in Table IV, and 4.2.6 to verify that the physical properties meet specified requirements.

TABLE IV. Test methods.

Properties	**Method**
Flash Point	ASTM D56 1/
Pour Point	ASTM D97
Viscosity (w/o solid materials @ +40 °C)	ASTM D445 2/ a.
Viscosity (w/o solids & solvent @ -40 °C)	ASTM D445 2/ a. & b.
Wear Preventive Characteristics	ASTM D4172 3/ (test condition B)

1/ If the flash point is over 79 °C (175 °F), use the Cleveland Open Cup method, ASTM D92.

2/ Use this method with the following exception:

a. The Kinematic viscosity shall be determined on that portion of the product containing no solid materials. Where periodic qualification re-evaluation tests or quality conformance tests are conducted on lots received from a manufacturer whose product contains particulate matter, the product must be centrifuged and pressure filtered using a Gelman, Filter-Gauge, 0.45 micron pore diameter and 0.2 micron pore diameter, stack (top to bottom), or equivalent method.

b. When evaluating the viscosity of the product without solvents, evaporate the solvents using ASTM D972 at 100 °C (212 °F) for the required time or until no further weight loss is observed. Note: Conventional laboratory ovens may be used in lieu of that specified in the test method.

3/ Use this method with the following exceptions:

a. Use a sample of 10 ± 0.5 milliliters.

b. Perform three runs and report the average of the three wear scar determinations

4.2.6 Falex load carrying capacity.

4.2.6.1 Falex pin & vee block preparation. Use Standard Coined Vee Blocks of AISI 1137 steel, and Standard No. 8 Test Pins of AISI 3135 steel, in accordance with ASTM D5620. Thoroughly clean the blocks and pins in accordance with Annex A, of ASTM D5620, except that vee blocks and pins shall not be sand blasted or phosphated.

4.2.6.2 Falex load carrying capacity. Test Pins and Vee Blocks shall be prepared and inserted in the machine. The load carrying capacity is then determined in accordance with ASTM D5620, Procedure B. This test shall be performed three times, using a new set of test pin and vee blocks each time and allowing the Falex machine jaws and chuck to cool to room temperature of 20 ± 2 °C (68 ± 4 °F) prior to each run.

4.2.6.3 Falex failure criteria. The load carrying capacity of the lubricant is the load of the step below which failure of the lubricant film occurs. The failure point is indicated by any of the following: 1) breaking of the shear pin or test pin, 2) a rapid rise in torque (10 in./lb or more above the running torque), or 3) failure to maintain a constant load on the test pieces due to rapid wear of the metal. Failure to successfully sustain the 500 pound load on any of the three test iterations shall be cause for failure of product qualification.

4.3 Interface verifications.

4.3.1 Corrosion production. Test Coupons measuring 25 by 51 by 6.4 mm made from metals as specified in TABLE V shall be used for the corrosion test.

TABLE V. Metal coupons for corrosion production tests.

Metal	Specification	Metal	Specification
Zinc	MIL-A-18001	Copper	ASTM B152/B152M
Aluminum	ASTM B209	Magnesium	AMS 4376
Brass	ASTM B16/B16M	Cadmium	A-A-51126
Steel	ASTM A109/A109M		

4.3.1.1 Preparation of test coupons. Polish all surfaces of the Test Coupons using progressively finer abrasive paper. The final polishing shall be done using a slow speed horizontal metallurgical polishing wheel with 240-grit aluminum oxide paper or cloth moistened with Type II dry cleaning solvent conforming to MIL-PRF-680. Test Coupons shall then be cleaned by swabbing in hot naphtha with a final rinse in warm anhydrous methanol conforming to Grade A of O-M-232 (use 95 % ethanol for the magnesium specimen). The Test Coupons shall be held in a manner to avoid contact with the operator's hands.

4.3.1.2 Exposure of test coupons. After weighing, place the Test Coupons, in order listed above, in a jar measuring approximately 90 mm in diameter and 95 mm deep and having a screw cap. Stand the Test Coupons on one 6.4 mm edge in a circular pattern so that the 25mm length is parallel to the jar circumference as indicated in Figure 1. Position the coupons along the jar circumference so that there is an approximately equal spacing between each. The test coupons shall be covered with enough of the product supplied, containing no solid particles, so that the

tops of the coupons are at least 6 mm below the surface of the product. Screw the jar lid closed and place the jar in a convection oven maintained at 54.4 ± 1 °C (130 ± 2° F) for a period of 7 days ± 15 minutes.

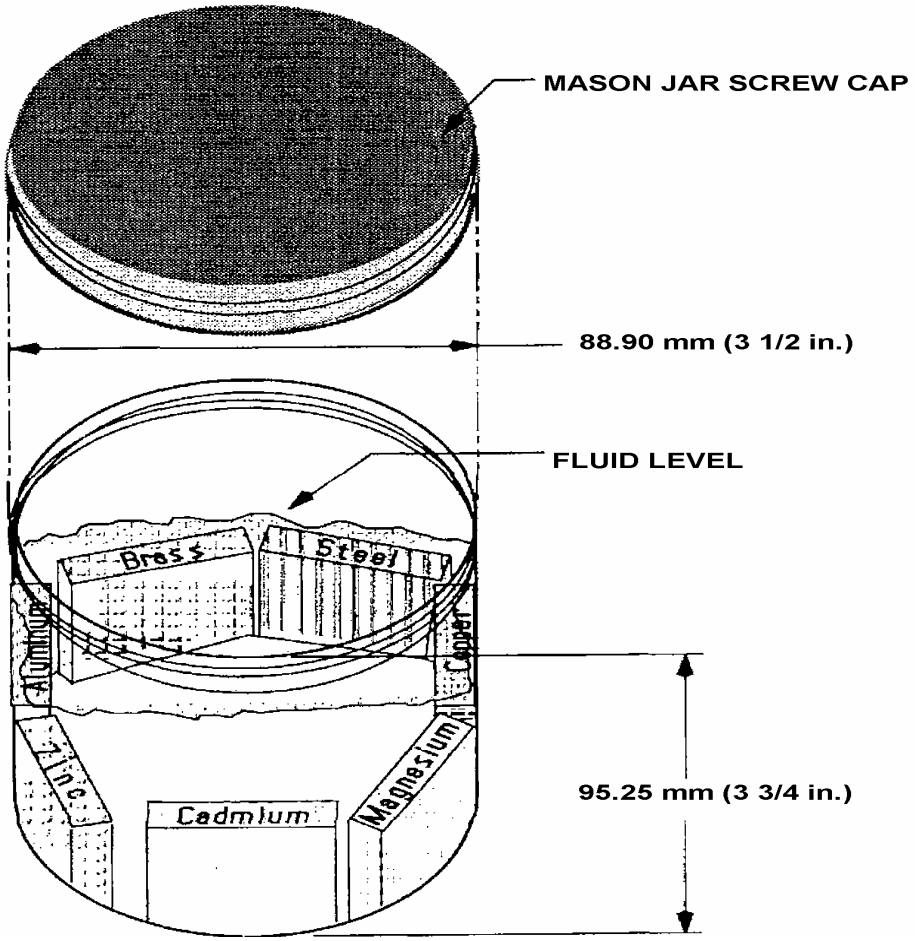

FIGURE 1. Corrosion production test.

CAUTION: The corrosion production test should not be performed with a “Flash Point” that is not in conformance to that required by TABLE I. Therefore, it is essential that Flash Point be established prior to this Corrosion production test.

4.3.1.3 Examination of test coupons. Upon completion of the test, remove the CLP and any loose corrosion products from the specimen by swabbing with surgical gauze pads moistened with naphtha, then with methanol (use 95 % ethanol for the magnesium), and follow by clean solvent rinses. Visually examine and re-weigh the specimens and calculate the weight loss or gain in milligrams per square centimeter. Visual evidence of corrosion such as pitting, etching or dark discoloration, or a weight change in excess of TABLE II shall be cause for rejection of product qualification.

4.3.2 Interference with chemical agent detector paper. This test shall be conducted using both M8 and M9 Chemical Agent Detector Paper, per MIL-P-51408 and MIL-DTL-51518 respectively. Shake the CLP container for 10 to 15 seconds before application. Dip a nylon

bristle tooth brush into the CLP container and using a dull knife blade brushed across the bristles, spatter fine droplets of the product onto a 50 mm square of each type detector paper. The paper shall be observed for color change after 5 minutes. The CLP shall be considered unacceptable if the fine droplets cause discoloration of the detector paper. Pink, orange, red-brown, yellow, green and blue are examples of unacceptable colors for the M8 paper and any shade of red, including pink, red-brown, red-purple, are unacceptable for the M9 paper.

4.4 Environmental verifications.

4.4.1 Humidity resistance. Three test panels shall be used to evaluate CLP for corrosion protection in high humidity in accordance with method 5329 of FED-STD-791. Visually examine the test panels after exposure for compliance with requirements of 3.4.1. Corrosion on the outer 6.4mm of the panels shall not be cause for rejection.

4.4.2 Salt-spray resistance. Prepare three test panels in accordance with FED-STD-791, Method 5329, except that, in place of the silica sand detailed in the materials section, 120 grit white aluminum oxide shall be used. Evaluation of CLP for salt-spray resistance (5 % solution) shall be in accordance with method 4001 of FED-STD-791, except that the panels shall be placed at an angle of 10-20 ° during exposure to salt-spray within the cabinet. Visually examine the test panels after exposure for compliance with requirements of 3.4.2. Corrosion on the outer 6.4 mm of the panels shall not be cause for rejection.

4.4.3 Corrosion-protection from propellant reaction products. Humidity cabinet corrosion test panels (ASTM D1748 Annex, A1.10 Steel Panels) shall be used. Thoroughly clean three panels first in heated petroleum naphtha in accordance with TT-N-95 and then in heated methanol in accordance with O-M-232. Solvents shall be heated sufficiently so that the solvent will evaporate from the panels immediately upon withdrawal from the solvent baths.

4.4.3.1 Exposure of test panels to candidate CLP. Place the panels in a desiccator and after they have cooled, slosh each panel in a beaker of the test oil for a period of one minute, then suspend them from a rack and allow them to drain for a period of two hours. After the two hour period slosh each panel for one minute in a beaker containing a solution of 5 % sodium chloride by weight dissolved in distilled water. Drain the panels again for a period of fifteen minutes.

4.4.3.2 Exposure of test panels to propellant combustion. While the panels are draining, weigh out 3 ± 0.1 gram of WC 844 propellant powder into each of three shallow-form porcelain evaporating dishes measuring 120 mm in diameter with 195 ml capacity, such as a Coors #60234. Concentrate the powder into a strip measuring approximately 25 mm wide across the bottom of the dish. After completion of the 15 minute drain period, place a panel across the top of a test fixture constructed of four humidity cabinet test panels fastened together to form a box-like structure opened at top and bottom with the interior dimensions measuring 10.2 cm in length, 4.45 cm in width, and 5.1 cm in height. Place the fixture with the test panel unit across the rim of the evaporating dish centered over and parallel to the strip of propellant and ignite the powder so that one face of the test panel is exposed to the burning propellant. Repeat this operation on the other two panels and then suspend the three panels in an environmental chamber maintained at 49 ± 2 °C (120 ± 4 °F) and 100 % relative humidity.

4.4.3.3 Examination of test panels after combustion. After a period of 96 hours remove the test panels from the chamber, wipe the panels lightly with a soft cloth or tissue paper soaked with petroleum ether and measure any rust spots on the test face of the panels for compliance with the requirements of 3.4.3. Rust spots occurring within 3 mm of the edges of the test panel shall not be cause for failure.

4.4.4 Water displacement and water stability. Conduct the water displacement and water stability test in accordance with method 3007 of FED-STD-791, except that the test shall be made only on the compound-water mixture.

4.5 Operating requirements verifications.

4.5.1 Firing residue removal. Weigh 5.0 ± 0.5 grams of WC 844 propellant powder into a clean porcelain evaporating dish (round bottom type) of approximately 102mm in diameter and spread it around evenly with a small brush. Ignite the propellant with a Bunsen burner and burn until all visible propellant is consumed. Allow dish to cool for 20 minutes.

4.5.1.1 Dish preparation. Invert the dish, rap it sharply several times against the table top and then blow it out with a 15 psi stream of filtered air, to remove any non-adhering residue. The dish shall be held approximately 15 cm from the end of the air hose. Weigh the dish with the adhering residue, and subtract the weight of the evaporating dish (empty) to determine the weight of propellant residue adhering to the dish (W_1).

4.5.1.2 Cleaning process. Add 25 ± 1 ml of the CLP product and permit it to soak for 45 ± 3 min, at 54 ± 1 °C (129 ± 2 °F) in convection oven. Remove the dish and immediately swab the residue with a cotton muslin cleaning pad wrapped around the wide end of a Coors # 60323 porcelain pestle, weighing approximately 470 grams and measuring approximately 190 mm high by 57 mm at its widest point. Swab the dish in both a circular and back and forth motion for a period of 90 seconds, letting the weight of the pestle perform the actual removal of the residue. Do not apply any downward force to the pestle.

4.5.1.3 Calculation of residue removed. After swabbing, decant the remaining oil and thoroughly wash the inside of the dish with 75 ml of petroleum ether in accordance with O-E-751. Heat the evaporating dish to 55 ± 1° C (131 ± 2 °F) for 30 ± 2 minutes, cool to room temperature and weigh the dish with the remaining residue. Subtract the weight of the evaporating dish (empty) to determine the weight of propellant residue still adhering to the dish after the cleaning cycle (W_2). Calculate the percent residue removed by the equation:

$$\% \text{ residue removed } = 100 \times \frac{W_1 - W_2}{W_1}$$

4.5.1.4 Firing residue removal failure criteria. This test is run three times. If the average residue removal of the three test iterations is less than eighty percent (80 %), the product shall fail to qualify.

4.5.2 Weapon performance. The performance of the candidate CLP product in cold temperatures, after exposure to blowing dust, and after salt water immersion shall be tested by live-fire weapons tests in accordance with TOP 3-2-045, except as noted herein. The test

weapon shall be the MACHINE GUN, 5.56 MM: M249, and three weapons shall be used for each candidate lubricant. New weapons (guns that have been fired less than 5000 rounds, or guns with a used receiver with an all new operating group) shall be used. Belts of ammunition shall be loaded as "combat mix", (4 ball (M855) and 1 tracer (M856)). Summary data for weapons firing tests are presented in TABLE VI.

TABLE VI. Weapons firing test summary.

Firing test	Application	Test condition	Rounds	Failure criteria (Note 1)
Inspection	Normal (note 2)	Ambient temp	30	<650 rds/min
Cold temp (2 Cycles)	Light (note 3)	-51 ± 2 °C (-60 ± 4 °F)	200	<650 rds/min, or >2 Class I stops/200 rds
Sand/dust (5 Cycles)	Generous (note 4)	After dusting Ambient temp	500	<650 rds/min, or >5 Class I stops/500 rds
Salt water (5 Cycles)	Normal	After immersion Ambient temp	1000	<650 rds/min, or >5 Class I stops/1000 rds

Note 1 Any Class II or III weapon stoppage during any test is cause for failure of the test.
Note 2 Normal application - as described in the operator's manual TM 9-1005-201-10.
Note 3 Light application - apply a thin film of lube barely visible to the eye.
Note 4 Generous application - apply lube heavy enough so that it can be spread with a finger.

4.5.2.1 Inspection and preparation of test weapons. Disassemble the machine gun and inspect the headspace, bore erosion, chamber dimensions, firing pin protrusion and indentation, trigger pull and overall condition. While disassembled, clean all traces of lubricant and dirt by washing with a volatile mineral spirits, such as MIL-PRF-680, Dry Cleaning Solvent or TT-N-95, Naphtha. After complete removal of the solvent from all surfaces of the weapons by use of water-free compressed air or by air-drying, lubricate each weapon with the candidate product, utilizing the application method for the environmental condition to be tested as specified in TABLE VI. A lint-free patch shall then be used to remove excess CLP from gun components.

4.5.2.2 Validation of test weapons. Each weapon shall then test fire a 30-round belt in three each, 10-round bursts, in an ambient temperature from 10 to 32 °C (50 to 90 °F). Any weapon that fails to achieve a baseline cyclic rate of 700 to 850 rounds per minute (rpm) shall be disqualified for use as a test weapon.

4.5.2.3 Cold temperature test.

4.5.2.3.1 Inspection and preparation. The test weapons shall be disassembled, cleaned and lubricated with a light application utilizing only that portion of the candidate product remaining after evaporation in accordance with ASTM D972. With the bolt open and the safety set in the "safe" position, the machine gun shall be loaded with a 100 round belt of ammunition. The gun, with ammunition belt loaded, is then conditioned at -51 ± 2 °C (-60 ± 4 °F) for 16 ± 1 hours.

4.5.2.3.2 Weapons firing. An initial 10-round burst shall be fired to validate the firing rate and the remainder of the belt shall be fired in 5 to 7-round bursts to check for stoppages. Repeat the cycle by conditioning the weapon and ammunition for an additional 2 hours at the same

temperature. Fire this second 100 rounds in the same manner employed in the first cold temperature firing cycle.

4.5.2.3.3 Cold temperature failure criteria. Any Class II or III weapon stoppage, more than two Class I stoppages in 200 rounds, or a reduction in the rate of fire below 650 rounds per minute, experienced on any of the three test weapons shall be cause for rejection of the lubricant.

4.5.2.4 Sand/dust test. This test shall be conducted IAW provisions for Static dust test of TOP 3-2-045, except as noted.

4.5.2.4.1 Inspection and preparation. The test weapons shall be disassembled, cleaned and lubricated with a generous application of the candidate product. The weapons (with bolts closed, and barrel dust caps installed, or muzzles taped) shall be exposed to blowing dust. The five each, 100 round belts of ammunition required for this test shall remain outside the dust chamber, and shall not be exposed to the blowing dust. Dusting shall be IAW TOP 3-2-045, except that the dusting cycle time shall be 15 minutes and the dust mixture shall be 100 % 140-grit Silica dust.

4.5.2.4.2 Weapons firing. The weapon shall be moved to the firing position, loaded with an un-conditioned 100 round belt and fired. An initial 10-round burst shall be fired to validate the firing rate, and the remainder of the 100 round belt shall be fired in 5 to 7-round bursts to check for stoppages. This conditioning and firing sequence shall be repeated four times for a total of 500 rounds fired per weapon.

4.5.2.4.3 Sand/dust test failure criteria. Any Class II or III stoppage, more than five Class I stoppages in 500 rounds, or a reduction in the rate of fire below 650 rounds per minute, experienced on any of the three test weapons shall be cause for rejection of the lubricant.

4.5.2.5 Salt-water immersion test.

4.5.2.5.1 Inspection and preparation. The test weapons shall be disassembled, cleaned and lubricated with a normal application of the candidate product. With the bolt open and the safety set in the "safe" position, the machine gun shall be loaded with a 100 round belt of ammunition. The loaded weapon and an additional 100 round belt of ammunition shall be immersed in a 5 % salt water solution per TOP 3-2-045 for 1 minute. Remove the weapon and ammunition and drain the salt water solution from the bore.

4.5.2.5.2 Weapons firing and initial storage. The first 10-round burst shall be fired to validate rate of fire and remaining rounds fired in 5-7 round bursts to check for stoppages. After completion of this initial firing cycle, and between each subsequent firing the weapons shall be stored in a humidity chamber as specified in TOP 3-2-045.

4.5.2.5.3 Subsequent weapons firing and storage. Using clean (not conditioned) ammunition, the firing cycles shall be repeated four times, once each on the third, fifth, eighth and tenth day following the first firing. Weapons shall not be cleaned, and additional CLP shall not be added during these additional firings.

4.5.2.5.4 Salt water immersion failure criteria. Any Class II or III stoppage, more than five Class I stoppages in 1000 rounds, or a reduction in the rate of fire below 650 rounds per minute, experienced on any of the three test weapons shall be cause for rejection of the lubricant.

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 or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. CLP covered by this specification is a highly penetrating, mobile liquid and is intended for field application to satisfy the complete need of cleaning, lubricating, and short term preservation of military weapons. CLP facilitates the effective removal of firing residues, gums and other contaminants from weapon components while providing lubrication and short term preservation for reliable weapons operation.

6.1.1 Other uses. CLP may be used in lieu of MIL-C-372 (RBC), MIL-PRF-3150 (PL-M), MIL-PRF-14107 (LAW) and MIL-L-46000 (LSA) where authorized by the appropriate weapons manual or lubrication order.

6.1.2 Ventilation requirements. Due to the solvent systems often employed in CLP type formulations, field users should avoid using CLP in conditions of limited ventilation, that is, closed rooms, sealed vehicles, etc.

6.1.3 Preservative application limitation. Caution should be exercised when using CLP where ventilation of the treated surface, prior to sealing, is not practicable. CLP should not be used for preservation for long-term storage without consulting the qualifying activity (see 6.3.1).

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification, and its related QPL (see 6.3.1)
b. Title, number, and date of all documents referenced (see 2.1).
c. Quantity of lubricating oil required.
d. Conformance tests required (contact activity listed in 6.3).
e. Type and size of container (see 6.8).
f. Packaging requirements (see 5.1)
g. Toxicological Data Requirements (see 3.2.3 and 4.2.3 and 6.4).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products that are, at the time of award of contract, qualified for inclusion in Qualified Products List, QPL-63460, 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 purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from U.S. Army ARDEC, ATTN: AMSRD-AAR-QES-E, Picatinny, N.J. 07806-5000 or by email at or email ardec-stdzn@pica.army.mil.

6.3.1 QPL access. QPLs are available to view or download at http://assist.daps.dla.mil.

6.3.2 Product formulation disclosure. CLP suppliers must submit to the Qualifying Activity a detailed quantitative description of the product formulation, identifying each constituent material (solvent, base oil, additive etc.) by percentage used in the finished product and the manufacturing source of each component, and the location of the manufacturing facility of the finished product.

6.4 Toxicity clearance. Department of the Army (DA) regulations AR 40-5, Preventive Medicine, AR-70-1, Acquisition Policy, and DA Pamphlet 70-3, Acquisition Procedures, require that all new chemicals and materials being added to the Army supply system have a Toxicity Clearance. This involves a toxicological evaluation of materials to assure the safety of their use. Any toxicity questions, and the Toxicity Clearance request should be addressed to: Commander, US Army Center for Health Promotion and Preventive Medicine (MCHB-TS-T), 5158 Blackhawk Road, Aberdeen Proving Ground, MD 21010-5403.

6.5 Chemical agent detector paper. The source of supply for M8 and M9 Chemical Agent Detector Paper may be obtained upon request from the qualifying activity as indicated in 6.3.1.

6.6 WC 844 propellant. The source of supply for WC 844 propellant may be obtained upon request from the qualifying activity as indicated in 6.3.1.

6.7 Cold temperature viscosity. Candidate suppliers should note that although the maximum cold temperature viscosity is stated at 5000 cSt in TABLE I, viscosities in excess of 3700 cSt may result in failures during live-fire weapons testing.

6.8 Container materials. Container material must be of a density sufficient to prevent migration of the product or any constituents through the container. Container may require pretreatment to ensure that printed identification will properly adhere and will not be removed by the product.

6.9 Definitions.

6.9.1 Class I weapon stoppage. A failure that is immediately clearable (within 10 seconds or less) by the operator following prescribed immediate action procedures.

6.9.2 Class II weapon stoppage. A failure that is clearable by the operator (requiring more than 10 seconds but not more than 10 minutes) using only the equipment and tools issued with the weapon.

6.9.3 Class III weapon stoppage. A failure of a severe nature. The failure; (1) is operator correctable but requires more than 10 minutes, (2) operator cannot correct and requires assistance (no time limit), (3) requires higher level of maintenance, or authorized operator correction cannot be accomplished because of unavailability of necessary tools, equipment or parts.

6.9.4 Production lot. An indefinite quantity of a homogeneous mixture of product offered for acceptance in a single, isolated container, or manufactured in a single plant run, through the same processing equipment, with no change in the ingredient materials in a 24 hour time period.

6.9.5 Short term preservation. Preservation period of time not to exceed 30 days.

6.10 International standardization agreements. This specification implements NATO STANAG 1135, Interchangeability of Fuels, Lubricants and Associated Products used by the Armed Forces of NATO Nations. When amendment, revision, or cancellation of this specification is proposed the preparing activity must coordinate the action with the U. S. National Point of Contact for the international standardization agreement, as identified in the ASSIST database at http://assist.daps.dla.mil.

6.11 Subject term (keyword listing).

corrosion	methanol	residue
ether	naphtha	viscosity
formulation	petroleum	water stability
humidity	propellant	

6.12 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to previous issue due to the extent of the changes.

Custodian:
Army - AR
Navy - AS
Air Force - 11
DLA - GS

Preparing activity:
Army - AR
(Project: 9150-2006-006)

Review activities:
Army - AT, MD, MI
Navy - OS
Air Force - 68, 06

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST online database at http://assist.daps.dla.mil.