

MIL-H-6083E

14 August 1986

SUPERSEDING

MIL-H-6083D

28 September 1973

MILITARY SPECIFICATION

HYDRAULIC FLUID, PETROLEUM BASE, FOR PRESERVATION AND OPERATION

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 grade of petroleum base hydraulic fluid identified by military symbol OHT and NATO symbol C-635.

1.2 Military part numbers. Petroleum based hydraulic fluid for preservation and operation under this specification shall be identified by a military part number consisting of "M" prefix and basic specification number followed by a two-digit number taken from Table I indicating national stock numbers (NSN) and corresponding container size followed by the military symbol "OHT" as shown in the following example:

EXAMPLE	M6083-03-OHT
"M" prefix for "MIL-H" and basic specification number _____	
Dash number from table I indicating NSN and minimum size _____	
OHT is military symbol _____	

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development and Engineering Center, ATTN: STRBE-TSE, Fort Belvoir, VA 22060-5606 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter. -

AMSC N/A

FSC 9150

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-H-6083E

TABLE I. NSN and corresponding minimum container size.

Dash number	National stock number (NSN)	Container size size minimum
01	9150-00-935-9807	1 quart
02	9150-00-159-4472	16 ounces
03	9150-00-935-9808	1 gallon
04	9150-00-935-9809	5 gallon
05	9150-00-935-9810	55 gallon drum

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

- TT-T-656 - Tricresyl Phosphate.
- PPP-C-96 - Can, Metal, 28 Gage and Lighter.
- PPP-D-729 - Drums, Shipping and Storage, Steel, 55 Gallon (208 Liters).
- PPP-P-704 - Pails, Metal: (Shipping, Steel, 1 Through 12 Gallons).

STANDARDS

FEDERAL

- FED-STD-313 - Material Safety Data Sheets Preparation and Submission of.
- FED-STD-791 - Lubricants, Liquid Fuels, and Related Products; Methods of Testing.

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-290 - Packaging, of Petroleum and Related Products.

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

MIL-H-6083E

BULLETIN

AF 539 - Standard Elastomer Stock.

DEPARTMENT OF LABOR (DOL)

OSHA 29 CFR 1910.1200 Hazard Communication Interpretation Regarding Lubricating Oils.

(Guidline CPL 2-2.38 may be obtained from OSHA Publication Office, Room S-4203, 200 Constitution Avenue, NW, Washington, DC 20210.)

(Copies of specifications, standards, handbooks, drawings, publications, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 93 - Flash Point by Pensky-Martens Closed Tester.
- D 97 - Pour Point of Petroleum Oils.
- D 130 - Detection of Copper Corrosion from Petroleum Products, by the Copper Strip Tarnish Test.
- D 445 - Viscosity of Transparent and Opaque Liquids (Kinematic and Dynamic Viscosities).
- D 664 - Neutralization Number by Potentiometric Titration.
- D 892 - Foaming Characteristics of Lubricating Oils.
- D 972 - Evaporation Loss of Lubricating Grease and Oils.
- D 1193 - Reagent Water.
- D 1298 - Density, Specific Gravity or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.
- D 1500 - ASTM Color of Petroleum Products (ASTM Color Scale).
- D 1744 - Water in Liquid Petroleum Products by Karl Fischer Reagent.
- D 1748 - Rust Protection by Metal Preservatives in the Humidity Cabinet.
- D 2273 - Trace Sediment in Lubricating Oils.
- D 2500 - Cloud Point of Petroleum Oils.
- D 4057 - Manual Sampling of Petroleum and Petroleum Products.
- D 4172 - Wear Preventive Characteristics of Lubricating Fluid (Four-Ball Method), Test Method for.
- D 4177 - Automatic Sampling of Petroleum and Petroleum Products.
- E 1 - ASTM Thermometers.
- E 200 - Preparation, Standardization, and Storage of Standard Solutions for Chemical Analysis.
- F 313 - Insoluble Contamination of Hydraulic Fluids by Gravimetric Analysis.

MIL-H-6083E

The ASTM test methods and specification listed above are included in Parts 05.01, 05.02, and 05.03 of the Annual Book of ASTM Standards and are available individually. Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, (except for associated detail specifications, specifications sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. Hydraulic fluids 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 4.5.1 and 6.3).

3.1.1 Requalification. Requalification will be required if there is a change in the base stock source, refining treatment, or additives. A minor change in the fluid formulation may be made without requalification, but only after notification to, and approval by, the qualifying activity. The qualifying activity may, at its discretion, waive complete requalification or may require only partial requalification testing in order to determine the significance and acceptability of the proposed formulation change.

3.1.2 Tolerances. The hydraulic fluid supplied under contract shall be identical, within permissible tolerances assigned by the qualifying activity for the properties listed in 3.5, to the product receiving qualification. The values resulting after the application of the tolerances shall not exceed the maximum nor fall below the minimum limits specified herein (see table III and 3.5.1 through 3.5.15).

3.2 Materials. The hydraulic fluid shall consist of petroleum base oil with additive materials to inhibit corrosion and to improve the viscosity temperature characteristics, lubricity, and resistance to oxidation of the finished product (see 6.9). The contractor shall certify that no carcinogenic or potentially carcinogenic constituents are present as defined under the Hazard Communication Standard (HCS) (29 CFR 1910.1200). Certification to this effect shall be made available to the contracting officer or the contracting officer's designated representative.

3.2.1 Safety data sheet. Material safety data sheets shall be prepared in accordance with FED-STD-313 (see 6.11).

3.3 Petroleum base stock properties. The properties of the petroleum base stock used in compounding the hydraulic fluid, before the addition of any other ingredients required herein, shall be as specified in table II.

MIL-H-6083E

TABLE II. Petroleum base stock properties.

Property	Value
Cloud point °C (max)	-54
Pour point °C (max) ^{1/}	-59
Flash point °C (min)	82°
Acid or base number mgKOH/g (max)	0.10
Trace sediment, mL (max)	0.005
Color, ASTM (max)	1

^{1/} Pour-point depressants shall not be used.

3.4 Additive materials. Additive materials shall be as specified herein.

3.4.1 Viscosity-temperature coefficient improvers. Acrylic polymeric materials only may be added to the petroleum base stock in quantities not to exceed 20 percent by weight, in order to adjust the viscosity of the finished fluid to the values specified in 3.5.

3.4.2 Oxidation inhibitors. Oxidation inhibitors shall be added in quantities not to exceed 2 percent by weight.

3.4.3 Corrosion inhibitors. Corrosion inhibiting materials shall be added to the blend in quantities necessary to comply with the requirements of this specification. When tested in accordance with 4.6.6 the chloride content of corrosion inhibitors calculated as calcium chloride shall be not more than 0.02 percent, the sulfate content calculated as calcium sulfate shall be not more than 0.05 percent; and the acid number shall not be more than 0.10 and mgKOH/g.

3.4.4 Antiwear agent. A maximum of 0.5 +0.1 percent of anti-wear agents, such as tricresyl phosphate conforming to TT-T-656, shall be blended in sufficient quantity to permit the finished oil to meet the lubricity requirements specified in 3.5.12. When tricresyl phosphate is used, it shall contain not more than one percent of the ortho-isomer.

3.4.5 Toxic products and formulations. The material shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to the effect shall be referred by the contracting activity to the appropriate departmental medical service who will act as an advisor to the contracting agency.

3.4.6 Labeling requirements. Labeling shall be in accordance with 5.5.1, 6.8.1 and 6.8.2.

3.5 Hydraulic fluid properties. The properties of the hydraulic fluid shall be as specified in table III and 3.5.1 through 3.5.14.

MIL-H-6083E

TABLE III. Hydraulic fluid properties.

Property	Value
Viscosity at 40 °C centistokes (min)	13
Viscosity at -40 °C centistokes (max)	800
Viscosity at -54 °C centistokes (max)	3500
Pour point °C (max) ^{1/}	-59
Flash point °C (min)	82
Acid or base number mgKOH/g (max)	0.20
Trace sediment, mL, (max)	0.005
Water, percent (max)	0.05

^{1/} Pour-point depressants shall not be used.

3.5.1 Color. The hydraulic fluid shall be clear and transparent and shall not contain dye in concentration greater than 1 part of dye per 10,000 parts of fluid by weight. There shall be no readily discernible difference in the color of the finished fluid and the standard color when tested in accordance with 4.6.1.2.

3.5.2 Corrosiveness and oxidation stability. The test shall be performed in accordance with 4.6 (method 5308, FED-STD-791).

3.5.2.1 Corrosiveness. The change in weight of cadmium-plated steel, steel, aluminum alloy, and magnesium alloy when subjected to the action of the hydraulic fluid for 168 hours at 121 °C shall be not greater than +0.2 milligram per square centimeter of surface. The change in weight of copper shall be not more than +0.6 milligram per square centimeter of surface. There shall be no pitting, etching, nor visible corrosion on the surface of any of the metals when viewed under magnification of 20 diameters. Slight discoloration of the surface of the copper will be permitted, but dark brown, black, or gray stain shall be cause for rejection. A slight discoloration of the cadmium-plated strip will be permitted.

3.5.2.2 Resistance to oxidation. The hydraulic fluid shall not have changed more than -5 to +20 percent from the original viscosity in centistokes at 40 °C after the corrosiveness and oxidation stability test. The viscosity shall be determined in accordance with 4.6 (ASTM D 445). The acid number increase shall be not greater than 0.20 after oxidation, as determined in accordance with 4.6 (ASTM D 664). There shall be no evidence of separation of insoluble materials nor gumming of the fluid.

3.5.3 Copper strip corrosion. When the hydraulic fluid is tested as specified in 4.6.2, the corrosion produced shall be less than 3a of the ASTM corrosion scale.

3.5.4 Corrosion inhibition. When tested as specified in 4.6.3, the hydraulic fluid shall afford protection against corrosion of both sand-blasted and polished steel panels.

MIL-H-6083E

3.5.5 Low temperature stability. When tested at $-54\text{ }^{\circ}\text{C}$, for 72 hours, in accordance with 4.6 (method 3458, FED-STD-791), the hydraulic fluid shall not gel, crystallize, nor show separation. The presence of a dense cloud that does not settle shall not be cause for rejection.

3.5.6 Shear stability. When tested in accordance with 4.6.4, the decrease in viscosity of the candidate hydraulic fluid at $40\text{ }^{\circ}\text{C}$ shall not be more than 2.0 percent greater than the decrease in viscosity of the shear stability reference fluid.

3.5.7 Swelling of synthetic rubber. When tested as specified in 4.6.5, swelling of the Standard Synthetic Rubber L by the test fluid shall be within the range of 19.0 to 28.0 percent.

3.5.8 Evaporation loss. When tested for 22 hours at $100\text{ }^{\circ}\text{C}$ in accordance with 4.6 (ASTM D 972), the evaporation loss shall not exceed 70 percent by weight.

3.5.9 Solid particle contamination.

3.5.9.1 Particle size. When samples taken for particle count are tested in accordance with 4.6.7.1, in a clean dust-free atmosphere, the number of solid contamination particles per 100 mL of the fluid shall not exceed the number specified in table IV.

TABLE IV. Particle size.

Particle size range (largest dimension) micrometers	Allowable number (max) each determination
5-25	10,000
26-50	250
51-100	50
over 100	10

3.5.9.2 Gravimetric method. The sample for solid particle contamination when tested in accordance with 4.6.7.2 shall not exceed 0.5 mg/100 mL.

3.5.9.3 Filtration time. The filtering time for each determination in 4.6.7.3 shall be 15 minutes maximum at $25\text{ }^{\circ}\text{C} \pm 5$.

3.5.10 Specific gravity. The specific gravity shall be determined in accordance with 4.6 (ASTM D 1298) but shall not be limited. Samples of hydraulic fluid submitted for quality conformance testing shall not vary more than ± 0.008 at $15.6/15.6\text{ }^{\circ}\text{C}$ from the specific gravity of the sample approved in qualification testing.

3.5.11 Corrosivity. When tested in accordance with 4.6 (method 5322.1 FED-STD-791), the hydraulic fluid shall prevent corrosion, etching, pitting, or staining on steel disks covered with a brass clip.

MIL-H-6083E

3.5.12 Steel-on-steel wear. When the fluid is tested in accordance with 4.6 (ASTM D 4172), the average wear scar diameter shall not exceed one millimeter in diameter.

3.5.13 Foaming characteristics. When tested in accordance with 4.6 (ASTM D 892), the foaming characteristics of the hydraulic fluid shall be as specified in table V.

TABLE V. Foaming characteristics.

	Foaming tendency	Foam stability
	Foam volume, mL, at end of 5-minute blowing period (max)	Foam volume, mL, at end of 10-minute settling period
At 24 °C	65	Complete collapse.
At 94 °C	65	Complete collapse.
At 24 °C after test at 94° C	65	Complete collapse.

3.5.14 Storage stability. After 12 months of storage in accordance with 4.6 (method 3465, FED-STD-791), the fully blended product shall show no separation of ingredients nor evidence of crystallization. The blended product shall be clear and transparent when examined visually, and shall conform to the requirements of section 3, except particulate contamination.

3.5.15 Workmanship. The hydraulic fluid shall be a clear, transparent product, homogeneous in appearance, and free from visible sediment and suspended matter.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or 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.

MIL-H-6083E

4.2 Lot.

4.2.1 Bulk lot. A bulk lot is an indefinite quantity of a homogeneous mixture of hydraulic fluid, offered for acceptance in a single, isolated container; or manufactured in a single plant run (not exceeding 24 hours), through the same processing equipment, with no change in the ingredient materials.

4.2.2 Packaged lot. A packaged lot is an indefinite number of 55-gallon drums or smaller unit containers of identical size and type, offered for acceptance, and filled with a homogeneous mixture of hydraulic fluid from a single, isolated container; or filled with a homogeneous mixture of hydraulic fluid, manufactured in a single plant run (not exceeding 24 hours), through the same processing equipment, with no change in the ingredient materials.

4.3 Sampling.

4.3.1 Sampling for tests (except particulate contamination). Take samples for tests, except particulate contamination, in accordance with ASTM D 4057 or D 4177.

4.3.2 Sampling for determination of particle size contamination. Take samples for determination of particle size contamination in accordance with MIL-STD-105 at inspection level S-3. The sample size and number of determinations per sample for the respective containers shall be as specified in table VI.

TABLE VI. Sampling for particle size contamination.

Container size	Sample size, ^{1/} milliliters	No. of determinations per sample ^{1/}
1 qt. (0.946 liter)	100	1
1 gal. (3.785 liters)	200	2
5 gal. (18.9 liters)	300	3
55 gal. (208.2 liters)	600	6

^{1/} 100 ml sample shall be used for each determination.

4.3.2.1 Sample for determination of solid particle contamination (gravimetric method). One sample shall be taken from the orifice of the filler during the first day that packaging of a batch commences, for testing in accordance with 4.6.7.2.

4.3.3 Qualification samples. Qualification samples shall consist of two 1 gallon (3.785 liters) containers of hydraulic fluid, 1 gallon (3.785 liters) of the base stock, 8 ounces (226.8 grams) of rust inhibitor, and 2 ounces (56.8 grams) each of other additives. If additives are supplied as concentrated solutions, an equivalent quantity of the solution shall be furnished. The samples shall be accompanied by Material Safety Data Sheets for each ingredient of the finished product in accordance with FED-STD-313, and test reports from

MIL-H-6083E

the manufacturer or from a commercial laboratory showing quantitative results for all tests required for the base stocks and for the finished product as listed in the specification. The packet shall also contain complete information as to the source and types of base stock(s) and all additives, the formulation reported as composition present by weight of the finished product. The samples, reports, and safety data sheet shall be forwarded to the US Army Belvoir Research, Development, and Engineering Center, ATTN: STRBE-VF, Fort Belvoir, VA 22060-5606. The samples shall be plainly identified by durable tags or labels, securely attached, and marked with the following information:

Sample for qualification inspection.
 HYDRAULIC FLUID, petroleum base for preservation and operation.
 Name of ingredient (for ingredient material).
 Name of manufacturer.
 Product code number.
 Date of manufacture.

Submitted by (name) and (date) for qualification inspection in accordance with the requirements of MIL-H-6083 under authorization of (reference authorizing letter) (see 6.3).

4.3.3.1 Formulation sheet. The formulation sheet, indicating the percentage and identity of each ingredient, shall be of the following form:

Base stock (Composition)	percent
Rubber swell fluid	percent
Anti-wear additive (Mfr's name and No.)	percent
Oxidation inhibitor (Mfr's name and No.)	percent
Other additives	percent

4.4 Inspection. Perform inspection in accordance with method 9601 of FED-STD-791. Certification of non-carcinogenicity as specified (i.e. materials are not considered carcinogenic or potentially carcinogenic shall be made available (see 3.2.1).

4.5 Classification of tests.

- a. Qualification tests.
- b. Quality conformance tests.
- c. Inspection of packaging.

MIL-H-6083E

4.5.1 Qualification tests. Qualification tests shall consist of tests for all of the requirements specified in section 3.

4.5.2 Quality conformance tests. Quality conformance tests shall consist of tests for all of the requirements specified in section 3 except the following:

- Corrosiveness and oxidation stability (see 3.5.2).
- Shear stability (see 3.5.6).
- Evaporation loss (see 3.5.8).
- Storage stability (see 3.5.14).

Unless otherwise specified, the sample representative of each fifth batch shall be subjected to test for all of the requirements specified in section 3 except the following:

- Shear stability (see 3.5.6).
- Storage stability (see 3.5.14).

4.6 Test methods. Perform tests in accordance with table VII and with 4.6.1 through 4.6.6 as applicable. Use reagent water conforming to the requirements for type III of ASTM D 1193 and reagent-grade chemicals in all tests, unless otherwise specified. Run blank determinations and apply corrections when necessary. Unless otherwise specified, use the applicable ASTM E 1 thermometers.

TABLE VII. Test methods.

Test	Test method No. FED-STD-791	Test method No. ASTM
Cloud point.		D 2500
Pour point.		D 97
Flash point.		D 93
Acid or base number.		D 664
Trace sediment.		D 2273
Color (see 4.6.1).		D 1500
Corrosion inhibitors:		
Chloride content (see 4.6.6.1).		
Sulfate content (see 4.6.6.2).		
Viscosity.		D 445
Water		D 1744
Corrosiveness and Oxidation stability.	5308	
Copper strip corrosion (see 4.6.2).		D 130
Corrosion inhibition (see 4.6.3).		D 1748
Low temperature stability.	3458	
Shear stability (see 4.6.4).		
Swelling of synthetic rubber (see 4.6.5).	3603	
Evaporation loss.		D 972
Specific gravity.		D 1298
Corrosivity	5322	
Steel-on-steel wear.		D 4172
Foaming characteristics		D 892
Storage stability.	3465	

MIL-H-6083E

4.6.1 Color.

4.6.1.1 ASTM color of petroleum base stock. Determine the color of the petroleum base stock in accordance with ASTM D 1500.

4.6.1.2 Color of finished hydraulic fluid. Compare the color of the hydraulic fluid with a standard sample prepared by adding one part of dye, Passaic Color and Chemical Company's "Oil Red 235" to 10,000 parts of an oil not darker than 5 ASTM color scale. Make the color comparison using the sample container and procedures described in ASTM D 1500. Nonconformance to 3.5.1 shall constitute failure of this test.

4.6.2 Copper strip corrosion. Perform the test in accordance with ASTM D 130 at 100 °C, for 72 hours. Nonconformance to 3.5.3 shall constitute failure of this test.

4.6.3 Corrosion inhibition. Prepare six test panels, three polished and three sandblasted, in accordance with ASTM D 1748. Perform the test in accordance with ASTM D 1748 for 100 \pm 1 hours, at 49 \pm 1 °C and 95 to 100 percent relative humidity. Nonconformance to 3.5.4 shall constitute failure of this test.

4.6.4 Shear stability. Determine the shear stability by subjecting one 30 mL sample of the candidate fluid and one 30 mL sample of the reference fluid to sonic oscillation (see 6.10). Test the respective fluids consecutively in the same apparatus and under the same test conditions. Each test shall be of 30 minutes duration. The test temperature shall be 40 °C. Regulate the apparatus so that the decrease in viscosity of the reference fluid is approximately 15 percent at 40 °C. Nonconformance to 3.5.6 shall constitute failure of this test.

4.6.5 Swelling of synthetic rubber. Determine the increase in volume of the synthetic rubber samples, resulting from the swelling action of the hydraulic fluid, in accordance with method 3603 of FED-STD-791. Perform the swelling test on three samples of Standard Synthetic Rubber L (see 6.4) conforming to AF 539. Report the average value of the three test results. Use the synthetic rubber within 6 months of manufacture. The test shall be considered invalid if the volume percentage of swell for the individual samples differ from each other by more than 5 percent. Nonconformance to 3.5.7 shall constitute failure of this test.

4.6.6 Corrosion inhibitors. Determine chloride, sulfate and acid number of the corrosion inhibitors in accordance with 4.6.6.1, 4.6.6.2, and 4.6.6.3. Nonconformance to 3.4.3 shall constitute failure of these tests.

4.6.6.1 Chloride content. Use the reagents specified in 4.6.6.1.1 and the procedure specified in 4.6.6.1.2 in performing the test for chloride content.

4.6.6.1.1 Reagents. Prepare reagent solutions in accordance with the applicable sections of ASTM E 200. The following reagents are required:

MIL-H-6083E

0.1 N potassium thiocyanate (KCNS): 9.70 g KCNS per liter of solution.

0.1 N silver nitrate (AgNO₃): 16.99 g AgNO₃ per liter of solution.
Saturated solution of ferric ammonium sulfate (FeNH₄(SO₄)₂ · 12 H₂O).

4.6.6.1.2 Procedure. Weigh a 50 ±0.5 g sample of sulfonate into a 250 mL beaker. Add 50 ml of ethyl ether and stir occasionally until sample is dissolved. Transfer to a 250 mL separatory funnel using an additional 50 ml of ethyl ether for this purpose. Add 25 mL of HNO₃ (1 HNO₃ : 9 H₂O), shake vigorously, allow to settle, and draw the acid layer into another 250 mL separatory funnel. Extract the ether layer with three additional portions of dilute HNO₃ combining the acid extracts in the second separatory funnel. Wash with one 50 mL portion of ether. Draw the acid layer into a 250 mL beaker, discard ether layer and wash out funnel with a few ml of water, adding this to the beaker. Add a few drops of methyl orange indicator to the beaker, neutralize with 35 percent sodium hydroxide (NaOH) and make just acid with dilute HNO₃ (pink color), then add 5 mL more of concentrated HNO₃. Add an excess of 0.1 N AgNO₃ and 1 mL of nitrobenzene. Add 5 mL of saturated ferric ammonium sulfate solution. Shake the mixture and titrate with 0.1 N KCNS.

WARNING: Nitrobenzene, used in the above procedure, is extremely hazardous when absorbed through the skin or inhaled as a vapor. Such exposure may cause cyanosis; prolonged exposure may cause anemia. Do not get in eyes, skin, or on clothing. Avoid breathing vapor. Use only with adequate ventilation.

$$\text{Calcium chloride, percent} = \frac{[(A \times N_1) - (B \times N_2)] \times 0.0555 \times 100}{W}$$

where: A = milliliters of AgNO₃ solution added.
B = total milliliters of KCNS solution added.
N₁ = normality of AgNO₃ solution used.
N₂ = normality of KCNS solution used.
W = grams of sample used.

4.6.6.2 Sulfate content. Use the reagents specified in 4.6.6.2.1 and the procedure specified in 4.6.6.2.2 to determine the sulfate content.

4.6.6.2.1 Reagents.

Ethyl ether.

Hydrochloric acid (3HCl:7H₂O) containing 35 mL of saturated (at room temperature) bromine water per liter.

Ammonium chloride 1 percent solution.

Barium chloride 100 g BaCl₂ · 2H₂O per liter.

4.6.6.2.2 Procedure. Weigh a 20 ±0.01 g sample of sulfonate into a 100 mL beaker. Transfer into a 250 mL separatory funnel using approximately 100 mL ethyl ether. Add 25 mL of the 3-7 HCl-bromine water reagent, shake for 1 minute, venting frequently, allow the layers to settle, and draw the lower

MIL-H-6083E

(aqueous) layer into another 250 mL separatory funnel. Extract the ethyl layer with one additional 25 mL and one 20 mL portion of the reagent, combine the three extracts, and wash with a 50 mL portion of ethyl ether in the second separatory funnel. Transfer the combined acid extracts to a 250 mL beaker. Rinse the 50 mL portion of ethyl ether with 5 mL of the reagent, let settle and combine the acid with the extracts in the 250 mL beaker. Neutralize, using methyl orange as indicator, with ammonium hydroxide, and boil until the dissolved ether has been removed (approximately 20 minutes). Make just acid with dilute HCl and add 20 mL of the barium chloride solution. Bring to boiling and place beaker on a steam bath for one-half hour. Filter through a No. 42 Whatman filter paper, wash free of excess barium chloride by using three hot ammonium chloride washes. Place the filter paper containing the precipitate into a weighed crucible, ignite until free from carbonaceous matter, cool and reweigh.

$$\text{Calcium sulfate, percent} = \frac{\text{Grams of BaSO}_4 \times 58.3}{\text{Grams of sample}}$$

4.6.6.3 Acid number. Determine the acid number by ASTM D 664.

4.6.7 Solid particle contamination.

4.6.7.1 Particle size. Particle size shall be measured by the use of automatic particle counters in lieu of the optical procedure detailed in method 3009 of FED-STD-791. H1AC/Royco counter, model 4111 or equivalent, counting to the limits specified in table IV may be used. Directions in the manual for the respective instruments shall be followed. Nonconformance to 3.5.9.1 and table IV shall constitute failure of this test.

4.6.7.2 Gravimetric method. A gravimetric determination shall also be made, by ASTM F 313, using two 0.45 micrometer filter membranes. Nonconformance to 3.5.9.2 shall constitute failure of this test.

4.6.7.3 Filtration time. Filtration time will be measured in accordance with method 3009, FED-STD-791, using a single 0.45 micrometer filter. Nonconformance to 3.5.9.3 shall constitute failure of this test.

4.7 Inspection of packaging.

4.7.1 Quality conformance inspection of containers.

4.7.1.1 Inspection stages. Inspection shall be in three stages as follows:

- a. The first stage shall include inspection of empty containers for cleanliness and construction.
- b. The second stage shall include inspection of filled containers with regard to fill, closure, sealing, leakage, and individual container markings.
- c. The third stage shall include inspection of exterior containers and markings.

MIL-H-6083E

4.7.1.1.1 Units of product. For the purpose of inspection, a unit of product for the first and second stages of inspection shall be a unit container. For the third stage of inspection, a unit of product shall be the shipping container.

4.7.1.1.2 Inspection lot. An inspection lot shall consist of the number of containers necessary to satisfy the requirements of 4.2.

4.7.1.2 Sampling. Sampling for examination of containers shall be in accordance with MIL-STD-105.

4.7.1.3 Examination. Samples selected in accordance with 4.7.1.2 shall be examined for the following defects. AQL shall be 1.0 percent defective for each inspection stage.

101. Presence of loose solder, dirt, fibers, lint, metal particles, seaming compound, corrosion products, water, or other foreign contaminants after cleaning and rinsing (see 5.1).
102. Visible traces of seaming compound at bottom and side seams not within requirements (see 5.1).
103. Presence of soldering flux on inside seams (see 5.1).
104. Unit container size not as specified (see 5.2.1).
105. Unit container not constructed in accordance with referenced document (see 5.2.3, 5.2.4, 5.2.5).
106. Closure and sealing not as specified in referenced document (see 5.2.3, 5.2.4, 5.2.5).
107. Container shows evidence of leakage when filled and sealed (see 5.2.2).
108. Unit container markings not as specified (see 5.5 and 5.5.1).
109. Color coating not in accordance with referenced document (see 5.4).
110. Exterior containers not as specified (see 5.3).
111. Exterior containers not marked as specified (see 5.5 and 5.5.1).

5. PACKAGING

5.1 Cleaning. Prior to filling, all containers shall be thoroughly cleaned, rinsed with clean filtered fluid and examined to insure absolute absence of loose solder, dirt, fibers, lint, metal particles, seaming compound, corrosion products, water, or other foreign contaminants. The bottom seam shall show no extruded seaming compound and there shall be no seaming compound on the body immediately adjacent to the side seam. Visible seaming compound, evenly distributed and forming a very fine edge at the point of contact of the seam with the body, shall not be considered a defect. When a soldered seam is used in the fabrication of the can, residual soldering flux shall not be present on the inside seam of the container.

5.2 Preservation (unit container). Preservation shall be level B, C, or commercial as specified (see 6.2).

5.2.1 Size. The hydraulic fluid shall be furnished in 1-quart, 1-gallon, 5-gallon, or 55-gallon metal containers as specified (see 6.2).

5.2.2 Leakage. After filling and closure, the unit containers shall show no sign of leakage.

MIL-H-6083E

5.2.3 Level B. Unit containers shall conform to the requirements of MIL-STD-290 and the following: 1-quart and 1-gallon containers shall conform to PPP-C-96, type I, class 3; 5-gallon containers shall conform to PPP-P-704, type I, class 3; and 55-gallon containers shall conform to PPP-D-729, type II.

5.2.4 Level C. Unit containers shall meet the level C requirements of MIL-STD-290 for the sizes specified in 5.2.1.

5.2.5 Commercial. Unit containers shall meet the commercial requirements of MIL-STD-290 for the sizes specified in 5.2.1.

5.3 Packing. Packing of unit containers, when appropriate, shall be in accordance with MIL-STD-290, level B, C, or commercial as specified (see 6.2).

5.4 Color coating. Exterior color coating of the metal containers shall be in accordance with the requirements of MIL-STD-290.

5.5 Marking. Marking shall be in accordance with the requirements of MIL-STD-290 and as specified herein.

5.5.1 Special marking. Unit and exterior containers shall be marked with the following:

"MILITARY SYMBOL OHT
NATO CODE NUMBER C-635

INSTRUCTIONS: THIS FLUID IS NOT INTERCHANGEABLE WITH ANY OTHER TYPE OR GRADE OF HYDRAULIC FLUID. IT IS COMPATIBLE WITH MIL-H-5606, MIL-H-46170, AND MIL-H-83282. THIS FLUID CAN BE MIXED (COMPATIBLE) WITH MIL-H-5606, MIL-H-46170 and MIL-H-83282; IT CAN NOT BE USED AS A SUBSTITUTE (INTERCHANGEABLE) WITH THE ABOVE NAMED HYDRAULIC FLUIDS.

WARNING: THIS FLUID MAY CONTAIN LESS THAN TRACE AMOUNTS OF THE ORTHO ISOMER OF TRISRESYL PHOSPHATE, WHICH IS NEUROTOXIC. FOR THE SAFE USE OF THIS PRODUCT, APPROPRIATE PROTECTIVE MEASURES (e.g. GLOVES, CLOTHING, RESPIRATORS) SHOULD BE TAKEN. AVOID INHALATION, INGESTION, OR CONTACT WITH THE SKIN. DO NOT REUSE CONTAINERS.

6. NOTES

6.1 Intended use. The hydraulic fluid is intended primarily for use as a preservative fluid for aircraft hydraulic systems and components where MIL-H-5606 is used as an operational fluid and for use as an operational preservative fluid for all tactical and support ordnance equipment where a determination has been made that MIL-H-46170 (FRH) hydraulic fluid cannot be used. This will include primarily all vehicles except combat armored vehicles/equipment which require FRH. Examples of ordnance use are recoil mechanism and hydraulic systems for rotating weapons or aiming devices. It may be used over a wide temperature range, -54 °C to 135 °C, applications depending upon the operational parameters of the system.

MIL-H-6083E

6.2 Ordering data. Procurement documents should specify:

- a. Title, number and date of this specification.
- b. Size of container (see 5.2.1 and 6.2.1).
- c. Quantity.
- d. Level of packing required (see 5.3).

6.2.1 Unit of purchase. The material should be purchased by volume, unit being of a US gallon of 231 cubic inches at 15.6 °C.

6.3 Qualification. Awards will be made only for products which are qualified for inclusion on the Qualified Products List at the time set for opening bids. This qualification shall be approved by the qualifying activity for a period not to exceed 5 years from the date of original qualification. If a product is submitted for requalification and there have been no changes in the specification requirement, the qualifying activity may, at its discretion, waive complete retesting or require only partial testing of the product to determine continued acceptability. The activity responsible for the qualified products list is US Army Belvoir Research, Development, and Engineering Center, ATTN: STRBE-VF, Fort Belvoir, VA 22060-5606 and information pertaining to qualification of products may be obtained from that activity.

6.4 Standard elastomer. Samples of the standard synthetic rubber NBR-L for the test for swelling or synthetic rubber specified in table VI may be obtained from the qualification activity (see 6.3).

6.5 Fluid handling. Owing to the difficulty of preventing contamination after the opening of a container, it is recommended that the hydraulic fluid be purchased in 1-quart and 1-gallon containers by all users. If the fluid is dispensed from larger containers, strict procedures must be employed to exclude and remove moisture, solid particles or other contaminants from the fluid.

6.6 International standardization. Certain provisions of this specification are the subject of international standardization agreement (NATO STANAG 1135 STANAG 3149). When amendment, revision, or cancellation of this specification is proposed which would affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization offices, if required.

6.7 Interchangeability and compatibility. MIL-H-6083 fluids are not substituted for (interchangeable with) any other fluids. MIL-H-6083 fluids should not be mixed (regarded as compatible) with any other fluids except those conforming to MIL-H-5606, MIL-H-46170, and MIL-H-83282.

6.8 Disposal actions.

6.8.1 Background. The product contains 0.5 percent tricresyl phosphate, which not more than 0.01 percent may be present as the ortho isomer. If this ortho isomer of Tricresyl phosphate is absorbed through the skin or taken internally it may cause paralysis. Accumulated waste liquids shall have the exterior of the outer pack marked as containing tricresyl phosphate to assist

MIL-H-6083E

disposal facilities to manage the product according to regulations promulgated by the US Environmental Protection Agency under Public Law 94-580, Resource Conservation and Recovery Act of 1976.

6.8.2 Handling and safety precautions. Personnel handling the product shall wear appropriate impervious clothing to prevent repeated or prolonged skin contact. Local appraisal is required for exact health and safety implications and compliance with OSHA regulations. Product labeling and Material Safety Data Sheets (MSDS) information should be used by safety and health office of using activity to prescribe precise application of protective measures. If skin or clothing becomes moistened with the product, personnel shall promptly wash with soap or mild detergent and water. Respirators are not required unless there is an inhalation exposure to mists. Personnel shall wear protective clothing when using the product and when cleaning up spills.

6.8.3 Disposal.

6.8.3.1 Field operations. Depending on the size of spills, paper towels or absorbents shall be used to absorb the liquid. Contaminated soil shall be removed and placed in a box with absorbents or towels. This box with spill clean-up wastes shall either be buried along with ordinary refuse at a rate not to exceed 10 pounds of clean-up waste per spill event or be incinerated in a permitted municipal waste incinerator. Bulk wastes and contaminated liquids shall not be landfilled. Partially full containers or contaminated product shall be collected centrally for commercial recycling by a commercial reprocessing firm. Recycling by DoD military field activities, including depot-type operations, are not authorized at this time. Liquid products used for heat recovery are regulated by the Environmental Protection Agency under Public Law 94-580, Resource Conservation and Recovery Act of 1976. Heat recovery is required to meet the standard in 40 CFR 266, subpart E, Used Oil, burned energy recovery.

6.8.3.2 Container disposal. Tops from one-time-use containers shall be discarded with ordinary refuse. Containers shall be made as empty as possible using gravity draining, after which they shall be crushed and buried in a authorized sanitary landfill or incinerated with general refuse. No special decontamination procedures are required for empty containers or their lids.

6.9 Recommended maximum blending temperature. At no time during compounding process or any operations subsequent thereto, should the temperature of any of the ingredients of the liquid, or the fluid itself, be greater than 149 °C (300 °F).

6.10 Sonic shear test equipment. A 250W, 10KC magnetostrictive oscillator model DF-101 supplied by the Raytheon Corporation, or its equivalent, may be used in the shear stability test (see 4.6.4). Directions in the manual for respective instruments shall be followed.

MIL-H-6083E

6.11 Material safety data sheets. The contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. The pertinent government mailing addresses for submission of data are listed in appendix B of FED-STD-313.

6.12 Subject term (key word) listing.

Hydraulic fluids.
 Hydraulic oils.
 Hydraulic fluid, petroleum base.
 Hydraulic fluid, preservation.
 Hydraulic fluid, operation.
 Hydraulic fluid, aircraft, preservative.
 Hydraulic fluid, ordnance, operational, preservative.

6.13 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - ME
 Navy - AS
 Air Force - 20

Preparing activity:

Army - ME

Project 9150-0686

Review activities:

Army - AT, MD, AR, AL, MI, AV
 Navy - SA, SH, MC, OS
 Air Force - 68
 DLA - GS, PS

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL*(See Instructions - Reverse Side)*

1. DOCUMENT NUMBER MIL-H-6083E		2. DOCUMENT TITLE Hydraulic Fluid, Petroleum Base, for Preservation and Operation	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify) _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording			
b. Recommended Wording			
c. Reason/Rationale for Recommendation			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	