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PERFORMANCE SPECIFICATION

HYDRAULIC FLUID, RUST INHIBITED, FIRE RESISTANT, SYNTHETIC HYDROCARBON BASE, NATO CODE NO. H-544

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

1. SCOPE

1.1 Scope. This specification covers the requirements for one type of synthetic hydrocarbon base hydraulic fluid (see [6.1](#)) for use in the -40°C to 200°C temperature range in recoil mechanisms and ground vehicle and equipment hydraulic systems. This hydraulic fluid will not be used for aircraft systems, aircraft ground support equipment, or the preservation of aircraft components.

1.2 Type. The type of hydraulic fluid is as follows:

Type I - Undyed and Identified by Military Symbol FRH and NATO Code No. H-544.

Comments, suggestions, or questions on this document should be addressed to U.S. Army RDECOM, Tank Automotive Research, Development and Engineering Center, ATTN: RDTA-EN/STND/TRANS MS #268, 6501 E. 11 Mile Road, Warren, MI 48397-5000 or emailed to usarmy.detroit.rdecom.mbx.tardec-standardization@mail.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

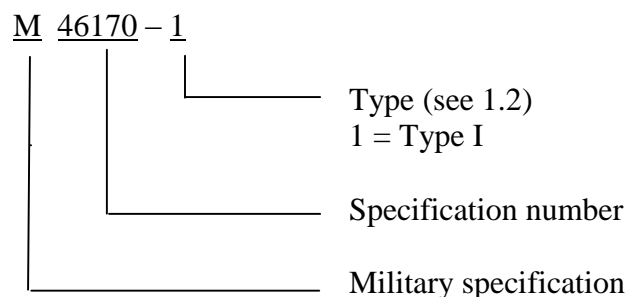
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1.3 Part or identifying number (PIN). The PINs to be used for hydraulic fluid acquired to this specification are created as shown below.



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 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 requirement 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 (see [6.2](#) and [6.11](#)).

FEDERAL SPECIFICATION

TT-T-656 - Tricresyl Phosphate

FEDERAL STANDARDS

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

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-5606 - Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance.
MIL-PRF-6083 - Hydraulic Fluid, Petroleum Base, for Preservation and Operation

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- MIL-PRF-83282 - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537.
- MIL-PRF-87257 - Hydraulic Fluid, Fire Resistant; Low Temperature, Synthetic Hydrocarbon Base, Aircraft and Missile.

(Copies of the above specifications, standards, and handbooks are available from Document Automation and Production Service, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094 or website: <http://quicksearch.dla.mil>)

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 those cited in the solicitation or contract (see [6.2](#)).

ASTM INTERNATIONAL

- ASTM D92 - Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester (DoD Adopted).
- ASTM D97 - Standard Test Method for Pour Point of Petroleum Products (DoD Adopted).
- ASTM D130 - Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test (DoD Adopted).
- ASTM D445 - Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity) (DoD Adopted).
- ASTM D664 - Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration (DoD Adopted).
- ASTM D892 - Standard Test Method for Foaming Characteristics of Lubricating Oils (DoD Adopted).
- ASTM D972 - Standard Test Method for Evaporation Loss of Lubricating Greases and Oils (DoD Adopted).
- ASTM D1193 - Standard Specification for Reagent Water
- ASTM D1298 - Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method (DoD Adopted).
- ASTM D1748 - Standard Test Method for Rust Protection by Metal Preservatives in the Humidity Cabinet (DoD Adopted).
- ASTM D2273 - Standard Test Method for Trace Sediment in Lubricating Oils (DoD Adopted).
- ASTM D4057 - Standard Practice for Manual Sampling of Petroleum and Petroleum Products (DoD Adopted).
- ASTM D4172 - Standard Test Method for Wear Preventive Characteristics of Lubricating Fluid (Four-Ball Method) (DoD Adopted).
- ASTM D4177 - Standard Practice for Automatic Sampling of Petroleum and Petroleum Products (DoD Adopted).

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- ASTM D4289 - Standard Test Method for Elastomer Compatibility of Lubricating Greases and Fluids (DoD Adopted).
- ASTM D4636 - Standard Test Method for Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants, and Other Highly Refined Oils (DoD Adopted).
- ASTM D4898 - Standard Test Method for Insoluble Contamination of Hydraulic Fluids by Gravimetric Analysis (DoD Adopted).
- ASTM D5306 - Standard Test Method for Linear Flame Propagation Rate of Lubricating Oils and Hydraulic Fluids
- ASTM D6304 - Standard Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration
- ASTM D6547 - Standard Test Method for Corrosiveness of Lubricating Fluid to Bimetallic Couple
- ASTM D6793 - Standard Test Method for Determination of Isothermal Secant and Tangent Bulk Modulus
- ASTM E659 - Standard Test Method for Autoignition Temperature of Liquid Chemicals

(Copies of these documents are available from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959 or website: <http://www.astm.org>)

SAE INTERNATIONAL

- SAE AMS3217/2 - Test Slabs, Acrylonitrile Butadiene (NBR-L), Low Acrylonitrile, 65-75.

(Copies of these documents are available from the SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or website: <http://www.sae.org>)

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. The hydraulic fluid furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (6.3). Any change in the formulation of a qualified product will require re-qualification.

3.1.1 Qualification period. All hydraulic fluid, which satisfies the requirements of this specification, shall be qualified for a period not exceeding five (5) years from the date of its original qualification.

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3.1.2 Tolerances. The hydraulic fluid supplied under contract shall have the same formulation as when qualified. The finished oil properties shall fall within permissible tolerances assigned by the qualifying activity to the product receiving qualification.

3.2 Materials. Unless otherwise specified herein, the chemical formula of the hydraulic fluid is the prerogative of the contractor as long as all articles submitted to the Government fully meet the operating, interface, support and ownership, and environmental requirements specified (see 4.5).

3.2.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible providing that the material meets or exceeds the operational and maintenance requirements and promotes economically advantageous life cycle costs.

3.2.2 Hydraulic fluid. The hydraulic fluid shall consist of a synthetic hydrocarbon base stock (alpha-olefin polymer). Additives shall not include resins, soaps, gums, fatty oils, oxidized hydrocarbons, chlorine or silica.

3.3 Additive materials. There shall be no restriction on the types of materials used as additives in the fluid except for those listed and those imposed by technical requirements of this specification. Pour point depressants and viscosity index improvers shall NOT be used.

3.3.1 Oxidation inhibitors. Oxidation inhibitors (phenolic- type) shall be added to the base oil in quantities not to exceed a concentration of 2.0 percent by weight.

3.3.2 Corrosion inhibitors. Corrosion inhibiting materials shall be added to the base oil in quantities necessary to comply with the requirements of this specification.

3.3.3 Anti-Wear Agent. Anti-wear agents, such as tricresyl phosphate (TCP) conforming to TT-T-656, shall be blended in sufficient quantity, not to exceed 3.0 weight percent, to permit the finished oil to meet the Steel-on-Steel requirement specified in Table I. If TCP is used, the finished fluid shall not contain more than 0.03 weight percent of the ortho isomer.

3.3.4 Blending fluid. Blending Fluids, such as diesters, may enhance the finished fluid's rubber swell characteristic and viscosity at -40°C. When blending fluids are used, their quantity shall not be greater than 30 percent by weight.

3.4 Hydraulic fluid properties. The properties of the hydraulic fluid shall be as specified in Table I, Table II, and 3.4.1 through 3.5.

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TABLE I. Hydraulic fluid properties and test methods.

Property	Test Limits	Test Method	
		ASTM Method	FED-STD-791
Acid Number, mgKOH/g (max)	0.20	D664	
Autoignition Temperature, °C (min)	343	E659	
Compatibility	See 3.4.1	See 4.5.2	
Corrosion Protection (Humidity Cabinet) Sand-blasted (3 panels) and Polished Panels (3 panels) (100 ± 1 hours at 48.9 ± 1.1°C air temperature)	See 3.4.2	D1748	
Corrosiveness (Bimetallic Couple)	See 3.4.3	D6547	
Corrosiveness and Oxidation Stability (168 hrs at 121 ± 1°C)		D4636 Proc 2	
Metal specimen weight change, mg/cm ² (max) ⁽¹⁾			
Cadmium Anod ⁽²⁾	±0.2		
Steel Grade 1010	±0.2		
Aluminum Alloy	±0.2		
Magnesium	±0.2		
Copper ⁽³⁾	±0.6		
Percent change in viscosity at 40°C (max)	±10		
Change in acid number, mgKOH/g (max)	0.30		
Separation of insoluble materials or gumming of the fluid	None		
Evaporation Loss (22 hours at 149 ± 0.5°C), % by weight (max)	5	D972	
Fire Point, °C (min)	246	D92	
Flash Point, °C (min)	218	D92	
Foaming Characteristics		D892	
Foaming Tendency			
Foam volume (mL) at end of 5 minute blowing period (max)	65		
At 24°C	65		
At 94°C	65		
At 24°C after test at 94°C			
Foam Stability ⁽⁴⁾			
Foam volume (mL) at end of 10 minute setting period (max)	0		
At 24°C	0		
At 94°C	0		
At 24°C after test at 94°C			
High Temperature-High Pressure Spray Ignition	See 3.4.4		6052
Isothermal secant bulk modulus @ 40°C and 27.6 MPa (4000 psig), MPa (psi) (minimum)	1379 (200,000)	D6793	
Linear Flame Propagation Rate, cm/s (max)	0.30	D5306	

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TABLE I. Hydraulic fluid properties and test methods - Continued

Property	Test Limits	Test Method	
		ASTM Method	FED-STD-791
Low Temperature Stability (-40±6°C for 72 hrs)	See 3.4.5		3458
Particulate Contamination ⁽⁵⁾⁽⁶⁾			
Particle Count	See Table II		3012
Gravimetric method, mg/100 mL (max)	0.5	D4898 ⁽⁷⁾	
Pour Point (°C) max	-54	D97	
Relative Density @ 15.6°C/15.6°C	See 3.4.7	D1298	
Rubber Swell, Standard Synthetic Rubber ⁽⁸⁾ , NBR-L, % (168 ± 0.5 hours at 70 ± 2.5°C)	15.0 to 25.0	D4289	
Steel-on-Steel wear (average wear scar), mm in diameter (max) ⁽⁹⁾		D4172	
Test Load 147N	0.30		
Test Load 392N	0.65		
Storage Stability (24 ± 3°C for 12 months)	See 3.4.8		3465
Trace Sediment, mL (max)	0.005	D2273	
Viscosity, centistokes (mm ² /s)		D445	
At -40°C (max)	2600		
At 40°C (max)	19.5		
At 100°C (min)	3.4		
Water, mass % (max)	0.05	D6304	
Water Sensitivity, Light Transmittance % (min)	90	See 4.5.1	
Workmanship	See 3.4.9		

1. There shall be no pitting, etching, or visible corrosion on the surface of any of the metals when viewed under magnification of 20 diameters.
2. A slight discoloration is permitted.
3. Any corrosion (discoloration) produced on the surface of the copper shall be not greater than No.3 of the ASTM D130 Copper Corrosion Standard.
4. There shall be no remaining foam in excess of a ring of bubbles around the edge of the test container.
5. The container shall be thoroughly shaken immediately prior to withdrawing the sample. Two determinations per sample are required. Each determination shall be made on 100mL portions of the sample.
6. See 3.4.6
7. See 3.4.6.2
8. Use standard synthetic rubber NBR-L (as referenced in SAE AMS3217/2) within 6 months of date of manufacture. Store rubber under 60°F.
9. Test Condition B. A different 10±0.5mL sample shall be used for each test.

3.4.1 Compatibility. The hydraulic fluid shall be compatible in all concentrations with each of the fluids approved under this specification. The hydraulic fluid shall be miscible with MIL-PRF-5606, MIL-PRF-6083, MIL-PRF-83282, and MIL-PRF-87257 fluids in all

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concentrations from -40°C to 135°C. No formation of gums, sludge, turbidity, crystallization or insoluble material shall occur. (see [4.5.2](#))

3.4.2 Corrosion protection (humidity cabinet). The hydraulic fluid shall protect specially prepared steel test panel surfaces (both sand blasted and polished) to the extent that no more than three (3) corrosion dots, no one of which is larger than 1 millimeter (mm) in diameter, occur on any of the surfaces of the prepared panels.

3.4.3 Corrosiveness (bimetallic couple). The hydraulic fluid shall prevent corrosion, etching, pitting, or staining on the steel disks covered with a brass clip. The fluid shall be deemed failing if either of the following are met:

- a. the test areas of more than one disk show signs of corrosion, pitting, or other attack.
- b. if two disks are free of corrosion, but the third shows more than three affected spots.

3.4.4 High temperature - high pressure spray ignition. The hydraulic fluid, when sprayed and ignited, shall self-extinguish and shall not continue to burn when the source of ignition is removed.

3.4.5 Low temperature stability. The hydraulic fluid shall show no evidence of gelling, crystallization, solidification or separation of ingredients. The presence of a dense cloud that does not settle shall not be cause for failure.

3.4.6 Particulate contamination.

3.4.6.1 Particle size. The number of solid particles per 100mL of the hydraulic fluid shall not exceed the number specified in Table II. The particle count of the hydraulic fluid shall be measured by the use of an automatic particle counter employing the light interruption principle. The operating directions in the manual for the respective instrument shall be used.

TABLE II. Particle size.

Particle size range, <u>1</u> / micrometers	Max. allowable number of particles
5-25	10 000
26-50	250
51-100	50
over 100	10

1/ Size is determined by the largest dimension of the particle.

3.4.6.2 Gravimetric method. Gravimetric determination shall be made in accordance with ASTM D4898, with the following additional requirements:

Exposure of the filter to open air shall be minimized. While the filter is in the petri dish, the lid shall remain on at all times.

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- a). Select two (2), white, 0.45-micron, polypropylene membrane filters (such as Pall-Gelman, GH-Polypro). Place each filter in a clean petri dish, cover, and put both dishes in a desiccator for at least 15 minutes.
- b). Remove petri dishes containing filters from the desiccators. Take a filter from its petri dish, pass it through an ionizer for 10 seconds, and then weigh it. After weighing, immediately return the filter to its petri dish. Repeat with the second filter.
- c). Mark one filter as the control filter and one filter as the test filter. Stack the test filter on top of the control filter and place on the filtration apparatus.
- d). After filtering and drying on a filtration apparatus, dry the filters in their covered petri dishes for 15 minutes in a 75°C oven. Do not use other drying methods. Remove closed petri dish from the oven; allow filters to equilibrate to ambient room conditions in a desiccator for 15 minutes before weighing.

3.4.7 Relative Density. The relative density of the hydraulic fluid shall be determined and reported, but not limited during qualification inspection. For conformance inspections, the relative density of the hydraulic fluid shall be the value obtained during qualification inspection ± 0.008 .

3.4.8 Storage stability. Fully blended hydraulic fluid shall show neither separation of ingredients nor evidence of crystallization after 12 months of storage at $24 \pm 3^\circ\text{C}$. The blended product shall be clear and transparent when examined visually, and shall conform to all requirements specified herein, except particulate contamination.

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

3.5. Marking and labeling requirements. In addition to any special marking required in the contract or order, the unit containers shall also be marked with the following:

**“MILITARY SYMBOL FRH
NATO CODE NUMBER H-544
NOT TO BE USED FOR AIR APPLICATIONS”**

Containers shall also be marked with the following:

INSTRUCTIONS: This fluid is not interchangeable with any other type or grade of hydraulic fluid due to the fire resistant properties. It is compatible with MIL-PRF-5606, MIL-PRF-6083, MIL-PRF-83282, and MIL-PRF-87257 remaining after draining, no flushing required.

WARNING: This fluid may contain less than trace amounts of the ortho isomer of tricresyl 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.”

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4. VERIFICATION

4.1 Classification of inspection.

- a. Qualification inspection (see 4.2)
- b. Conformance inspection (see 4.3)

4.2 Qualification inspection.

4.2.1 Qualification inspection sample. Qualification samples shall consist of a one (1) gallon container of hydraulic fluid. The qualifying activity may request samples of the basestock and additives used in the formulation. The qualifying activity will request data as listed in TARDEC's Guide for Qualification of Hydraulic Fluids, Greases, Solid Film Lubricants, Solvent, Preservatives, & Stabilizer Additives.

4.2.2 Qualification tests. Qualification sample(s) shall be subjected to all tests specified in Section 3 and Tables I and II.

4.2.3 Retention of qualification. The government reserves the right to re-examine the qualified product whenever deemed necessary to determine that the product continues to meet any or all of the specification requirements. Requalification is required every 5 years. Changes in formulation or materials shall require requalification.

4.3 Conformance inspection. When manufactured for the fulfillment of military contracts, the hydraulic fluid shall use the same base stocks and additives, at the appropriate concentrations, as when qualified. Satisfactory performance shall be demonstrated when oils are tested in accordance with 4.3 and the finished oil properties fall within the permissible tolerances. Conformance tests shall consist of tests for all of the requirements specified in Section 3 except the following:

- a. Bulk modulus
- b. High temperature-high pressure spray ignition
- c. Linear flame propagation
- d. Corrosiveness and oxidation stability
- e. Compatibility
- f. Storage stability

4.4 Sampling.

4.4.1 Sampling for examination of filled containers. Random samples of filled containers shall be taken from each packaged lot.

4.4.2 Sampling for tests (except particle size). Samples of hydraulic fluid for all tests except particle size shall be taken IAW ASTM D4057 or D4177.

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4.4.3 Sampling for particle size test. Samples of hydraulic fluid for particle size test shall be taken in containers (see [6.2](#)) as specified in table III.

TABLE III. Sample for particle size.

Container size	Sample size, mL	Number of determinations per sample ^{1/}
1 quart	100	1
1 gallon	200	2
5 gallon	300	3
55 gallon	600	6

^{1/} Each determination shall be made on 100-mL portions of the sample.

4.4.3.1 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 a packaging of a batch commences, for testing IAW [3.4.6.2](#).

4.5 Methods of inspection and test. Qualification inspection shall consist of the tests for all of the requirements specified in Section 3 and Table 1 and Table II. Tests shall be in accordance with Table I and with 4.5.1 through 4.5.3 as applicable. Unless otherwise specified (see [6.2](#)), reagent water conforming to the requirements for type III of ASTM D1193 and reagent-grade chemicals shall be used in all tests. Blank determinations shall be run and corrections applied when necessary.

4.5.1 Water sensitivity. The hydraulic fluid shall be tested IAW 4.5.1.1 and 4.5.1.2. The light transmittance of the water-treated hydraulic fluid shall be a minimum of 90%.

4.5.1.1 Preparation of test samples. Clean two 475-mL glass bottles with caps by washing with a detergent (Alconox or equivalent), rinsing with tap water, then water IAW Type III of ASTM D 1193, then anhydrous isopropyl alcohol and finally filtered petroleum ether. After the petroleum ether rinse, allow the bottles to drain upside down in the dust-free clean room where they are to be used. Clean a 250-mL volumetric flask, a funnel, a punch, and the top of the can using the same method used to clean the 475-mL bottles above. In the clean room, shake the can to be tested (clean and hermetically sealed) to distribute uniformly any settled material. Punch the top of the can and transfer a 250-mL sample of oil into each of the cleaned bottles using the volumetric flask and the funnel mentioned above. To one of the samples add 0.50-mL of water conforming to type II of ASTM D 1193, using a clean, 1.0-mL graduated pipette. Place the cap on the bottle and shake it thoroughly for 60 seconds. Allow this mixture to stand for 24 hours at a temperature of $24 \pm 3^{\circ}\text{C}$.

4.5.1.2 Light transmittance test procedure. At the end of the 24-hour period, place the untreated hydraulic fluid sample in a single beam spectrophotometer capable of being adjusted to 100% light transmittance at approximately 540 nanometers (nm), using a cell with a path length of 1 centimeter (cm). Adjust the light transmittance at 540 nm to 100%. Remove the untreated sample and replace it with the water-treated sample, again using a cell with a 1-cm path length.

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Record the transmittance reading. (NOTE: The comparison described in 4.3.1.2 may be performed in a differential mode, as an alternative.)

4.5.2 Compatibility. Samples of the hydraulic fluid in amounts of 25 mL, 50 mL and 75 mL shall be mixed with samples from each of the fluids previously approved under this specification. Total volume of each mixture shall be 150 mL. Mixtures shall be prepared in 250 mL stoppered flasks. The flasks shall be thoroughly agitated and then stored in an oven at 135°C for 3 hours. At the end of this time, none of the mixtures shall show any signs of sediment, turbidity or crystallization. The sample shall then be stored at -40°C for 3 hours. Slight turbidity, at this time, that later disappears will be permitted in the samples. Compatibility tests described herein shall also be conducted with a representative fluid qualified to MIL-PRF-5606, MIL-PRF-6083, MIL-PRF-83282, and MIL-PRF-87257.

4.5.3 Product identification. The hydraulic fluid unit containers shall be examined for the proper product warning/identification.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be specified in the contract or order (see 6.2). When actual packaging of materiel 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 activities within the Military Services 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. The hydraulic fluid covered by this specification is intended for use in recoil mechanisms and hydraulic systems of military ground vehicles and equipment. If used in other mechanisms or systems, a study should be made to determine its applicability for such usage, with particular attention given to operation at high and low temperatures and the topic of elastomer compatibility. The hydraulic fluid is rust inhibited and may be used as a preservative medium for hydraulic systems and components. The hydraulic fluid has a wide range of operating temperatures and is thermally stable, corrosion inhibited, and fire resistant. The combination of all of these fluid properties is not found in commercial hydraulic fluids. This fluid is adopted for military use by NATO countries. (NOTE: TYPE II of revision "C" is no longer available.)

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number and date of this specification.

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- b. Type of fluid required (see 1.2)
- c. If required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- d. Sample type for particle size contamination (see 4.4.3).
- e. If test methods other than as specified (see 4.5).
- f. Packaging requirements (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List (QPL) No. 46170 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 US ARMY TARDEC, 6501 E 11 Mile Rd, RDTA-SIE-ES-FPT-FLT, MS110, Attn: Fuels and Lubricants Technology Team, Warren, MI 48397 or by email: tardec.pol.help@us.army.mil.

6.4 Standard elastomer. Samples of the standard synthetic rubber NBR-L for the swelling of synthetic rubber test may be obtained from the outside vendor such as Rubber-Tech, 5208 Wadsworth Road, Dayton, OH 45414, telephone: (937) 274.1114, website: www.rubber-tech.com.

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 Recommended corrosion inhibitor. It has been found that $1.75 \pm 0.25\%$ barium dinonylnaphthalene sulfonate provides the required degree of rust protection. The diluent of the rust inhibitor should be the synthetic hydrocarbon base stock.

6.7 Handling and safety precautions. CAUTION: Personnel handling the product should wear appropriate impervious clothing to prevent repeated or prolonged skin contact. The local environmental officials will relate health and safety implications as well as to prescribe precise application of protective clothing. If skin or clothing becomes moistened with the product, personnel should promptly wash with soap or mild detergent and water. Respirators are not required unless there is a potential for inhalation exposure to misting. Personnel should wear protective clothing when using the product and when cleaning up spills.

6.8 Background (safety). The product may contain 3.0wt% tricresyl phosphate, of which not more than 0.03wt% 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. The corrosion inhibitor may contain barium (see 6.6). The accumulated waste liquids will have the exterior of the outer pack marked as containing barium and tricresyl phosphate to assist disposal facilities to

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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 (see 6.13).

6.9 Storage conditions. Prior to use of product in the intended equipment, the product may be stored under conditions of covered or uncovered storage on geographic areas ranging in temperature from -57°C to 71°C .

6.10 Definitions.

6.10.1 Bulk lot. 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.

6.10.2 Packaged lot. An indefinite number of 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 ingredient materials.

6.11 International standardization agreement implementation. This specification implements STANAG 1135, ANNEX C “Interchangeability of Fuel, Lubricants, and Associated Products Used by the Armed Forces of the North Atlantic Treaty Nations” and STANAG 7093, “Guide Specification for NATO Land System Automotive Fluids”. 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 <https://assist.dla.mil>.

6.12 Interchangeability and compatibility. MIL-PRF-46170 fluids are not interchangeable with any other fluids. MIL-PRF-46170 fluids are to be regarded as compatible only with fluids conforming to MIL-PRF-5606, MIL-PRF-6083, MIL-PRF-83282, and MIL-PRF-87257. Dilution with MIL-PRF-5606 or MIL-PRF-6083 severely lowers the flash point and fire-resistant capability.

6.13 Disposal actions.

6.13.1 Field operations. Depending on the size of spills, paper towels or absorbents will be used to absorb the liquid. Contaminated soil will be removed and placed in a box with absorbents or towels. This box with spill clean-up wastes should either be buried along with ordinary refuse at a rate not to exceed 10 pounds of clean-up wastes per spill event or be incinerated in a permitted municipal waste incinerator. Bulk wastes and contaminated liquids should not be disposed in landfills. Partially full containers of contaminated product should be collected centrally and stored for later recycle or heat recovery use. State requirements may vary regarding recycle alternatives. Liquids for recycle or heat recovery should be accumulated by repouring in appropriately sized and labeled larger containers (see 6.13.3).

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6.13.2 Depot-type operations. Additionally, used product that has been drained from hydraulic systems will be combined with unused but contaminated fluid from partially full containers and then recycled (see 6.13.1).

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

6.14 Subject term (key word) listing.

Acetone
Barium chloride
Barium dinonylnaphthalene sulfonate
Bromine
Cadmium
Chromic acid
Diethylether
Naphtha
NATO STANAG 1135
NATO STANAG 7093
Petroleum ether

6.15 Safety Data Sheets (SDS). Contracting officers will identify those activities requiring copies of completed SDS prepared IAW FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313; and 29 CFR 1910.1200 requires that the SDS for each hazardous chemical used in an operation must be readily available to personnel using the material. Contracting officers will identify the activities requiring copies of the SDS.

6.16 Changes from previous issue. Marginal notations are not used in this revision to identifying changes with respect to the previous issue due to the extensiveness of the changes.

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Custodians:

Army - AT
Navy - AS
Air Force - 68

Preparing Activity:

Army – AT

(Project 9150-2013-005)

Review Activities:

Army – AR, MI, MD
Navy – MC, OS, SA, SH
Air Force – 03, 11
DLA – GS, PS
CIV – 6FEE

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 <https://assist.dla.mil>.