

NAVSEA  
STANDARD ITEM

FY-27

ITEM NO: 009-063

DATE: 01 OCT 2024

CATEGORY: II

1. SCOPE:

1.1 Title: Lubricating Oil and Hydraulic Fluid; analyze

2. REFERENCES:

2.1 S9086-H7-STM-010/CH-262, Lubricating Oils, Greases, Specialty Lubricants, and Lubrication Systems

2.2 S9086-S4-STM-010/CH-556, Hydraulic Equipment (Power Transmission and Control)

3. REQUIREMENTS:

3.1 Provide samples (lubricant oil or hydraulic fluids) to a certified laboratory as listed in Table 262-4-2 of 2.1. Navy Oil Analysis Program (NOAP) Laboratories Capabilities or a certified commercial laboratory (minimum ISO 9000 or ISO 17025 registered). Minimum sample label requirements are listed in 262-4.4.1.1 NOAP Sample Label of 2.1.

3.2 Accomplish tests of each sample in accordance with the specified test methods listed in Appendix B NOAP Equipment Wear Metal Limits, Appendix C NOAP Physical Properties Limits, and Appendix E DRS Physical Property and Wear Metal Limits of 2.1, as applicable, and Table 556-8-1 Allowable Use Limits of Hydraulic Fluids of 2.2. All flushes at a minimum, require particulate and water testing. If the system has been exposed to any fluid besides the oil for the system, foaming and wear metal testing are also required. Additional testing based on specific system is listed in Appendix B NOAP Equipment Wear Metal Limits, Appendix C NOAP Physical Properties Limits and Appendix E DRS Physical Property and Wear Metal Limits of 2.1.

3.2.1 Test selections must be based on the sample type and service.

3.2.2 Fluid property test name, applicable ASTM Test Method and associated NSTM reference used to perform sample testing are listed in TABLE 1 below.

Table 1. Fluid property, applicable ASTM Test Method and associated NSTM reference for lubricating oil and hydraulic fluid sample testing.

FLUID PROPERTY	ASTM TEST METHOD	NSTM REFERENCE
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Viscosity at 40°C	ASTM D445	NSTM 262-4.5.1
Viscosity at 100°C	ASTM D445	NSTM 262-4.5.2
Acid Number	ASTM D664 or ASTM D974	NSTM 262-4.5.3
Water by Karl Fischer	ASTM D6304	NSTM 262-4.5.5
Particle Count		NSTM 262-4.5.6
Total Base Number	ASTM D4739 or ASTM D2896	NSTM 262-4.5.7
Fuel Dilution	ASTM D7593	NSTM 262-4.5.8
Flashpoint	ASTM D93 or ASTM D6450	NSTM 262-4.5.8.2
Spectrometric Analysis	ASTM D6595 or ASTM D5185	NSTM 262-4.5.11.2

3.3 Analyze each sample for water contamination by utilizing an automatic coulometric titrator by Karl Fischer in accordance with ASTM D-6304 as described in 262-4.5.5 Water by Karl Fischer Method of 2.1.

3.3.1 Determine if water contamination is fresh or salt water based on high sodium levels. Seawater contamination results in sodium levels at or above approximately 5ppm of sodium present when water results are 0.05 percent and approximately 20 ppm of sodium present when water results are 0.20 percent.

3.3.2 The sensitivity and reliability of the equipment used for the test must be in accordance with ASTM D-6595 and ASTM D-6304, respectively.

3.4 Analyze each sample for metal content by utilizing a spectrographic analysis in accordance with ASTM D-6595 as described in 262-4.5.11.2 Spectrometric Wear Metal Analysis of 2.1.

3.4.1 Record and report the concentration of the following elements in ppm with the indicated degree of accuracy:

IRON	COPPER	TIN	MAGNESIUM	LEAD
ALUMINUM	SILVER	CHROMIUM	NICKEL	SILICON
SODIUM				

3.4.1.1 The sensitivity and reliability of the equipment used for the test must be in accordance with ASTM D-6595.

3.5 Accomplish specific gravity test for each MIL-H-19457 hydraulic fluid sample and determine hydrocarbon oil content in accordance with Table 556-8-1 Allowable Use Limits of Hydraulic Fluids of 2.2.

3.6 Submit one legible copy, in hard copy or approved transferrable media, of a report listing completed test results of 3.2 through 3.5 for each sample to the SUPERVISOR. (See Note 4.1)

3.6.1 Reports must be submitted within 2 days after the qualified chemical laboratory (as listed in Table 262-4-2 NOAP Laboratories with Capabilities and Contact Information of 2.1) receives each sample.

3.6.2 Reports must include recommendations for continued use, disposal, or re-sampling of each tested oil or fluid sample. If a commercial lab is used, and clarification of results is required, contact NAVSEA via [NSWCPD\\_Lubricants@us.navy.mil](mailto:NSWCPD_Lubricants@us.navy.mil) for further guidance.

3.7 Use Appendix B NOAP Equipment Wear Metal Limits, Appendix C NOAP Physical Properties Limits and Appendix E DRS Physical Property and Wear Metal Limits of 2.1, and Table 556-8-1 Allowable Use Limits of Hydraulic Fluids of 2.2 for guidance for test accept and reject criteria for each in-service sample.

3.7.1 For foaming results interpretation forward results to NAVSEA via [NSWCPD\\_Lubricants@us.navy.mil](mailto:NSWCPD_Lubricants@us.navy.mil) for further guidance.

3.7.2 Note that when converting from ppm to percent, multiply the ppm result by 1000. Or when converting from percent to ppm, divide by 1000.

3.8 Submit one legible copy, in hard copy or approved transferrable media, of original manufacturer's certificate of compliance and material conformance test data in Appendix B NOAP Equipment Wear Metal Limits, Appendix C NOAP Physical Properties Limits and Appendix E DRS Physical Property and Wear Metal Limits of 2.1, as applicable, and Table 556-8-1 Allowable Use Limits of Hydraulic Fluids of 2.2, 7 days prior to use of new fluids and oils.

#### 4. NOTES:

4.1 For boats and craft 65 feet or less in length modify sections 3.1, 3.5, 3.6 and 3.7 to include Original Equipment Manufacturer (OEM) laboratories, procedures, specifications and test results.

## Attachment A

## LUBERCATING

ASTM TEST METHOD	MIL-PRF-17672 MS-2075-TH MS-2110-TH MS-2135-TH	MIL-PRF-17331 MS-2190-TEP	MIL-PRF-9000 9250	MIL-PRF-2104 15W/40	MIL-PRF-23699	VV-L-825
FUEL DILUTION VIA FLASH POINT ASTM D93 Or VIA ASTM D7593			X	X		
FLASH POINT ASTM D93 When used in MRG systems		X		X		
PERCENT WATER ASTM D6304	X	X		X		X
VISCOSITY ASTM D445		X	X	X	X	
ACID NO. ASTM D974	X	X		X	X	X
TOTAL BASE NO. ASTM D2896			X	X		
SPECTROGRAPHIC ANALYSIS ASTM D6595	X	X	X	X	X	X

PARTICLE COUNT NAS/SAE 4059  When used in MRG systems (Automatic Particle Count Method)		X	X			
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X - IDENTIFIES EACH TEST REQUIRED FOR EACH FLUID TYPE

Attachment B

HYDRALIC FLUIDS

ASTM TEST METHOD	MIL-DTL-17111	MIL-H-19457	MIL-PRF-2104 MIL-PRF-17672 MS-2075-TH MS-2110-TH MS-2135-TH	MIL-PRF-17331 MS-2190-TEP	MIL-H-22072
FLASH POINT ASTM D93	X			X	X
PERCENT WATER ASTM D95					X
PERCENT WATER ASTM D6304	X	X	X	X	
VISCOSITY ASTM D445	X		X	X	
ACID NO. ASTM D974	X	X	X	X	
PARTICLE COUNT NAS/SAE 4059 (Automatic Particle Count Method)	X	X	X	X	X

X - IDENTIFIES EACH TEST REQUIRED FOR EACH FLUID TYPE