MIL-F-16884H
3 May 1983
SUPERSEDING
MIL-F-16884G
7 March 1973
(See 6.4)

MILITARY SPECIFICATION

FUEL, NAVAL DISTILLATE

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

1. SCOPE

1.1 Scope. This specification covers one grade of Naval distillate fuel (NATO symbol F-76).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Standards. Unless otherwise specified, the following standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

STANDARDS

FEDERAL

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

MILITARY

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

(Copies of standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 86 - Distillation of Petroleum Products, Method For. (DoD adopted)
D 93 - Flash Point by Pensky-Martens Closed Tester, Test Method For. (DoD adopted)
D 97 - Pour Point of Petroleum Oils, Test Method For. (DoD adopted)
D 129 - Sulfur in Petroleum Products (General Bomb Method), Test Method For. (DoD adopted)
D 130 - Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test, Method For. (DoD adopted)
D 270 - Standard Method of Sampling Petroleum and Petroleum Products. (DoD adopted)
D 287 - API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method), Test Method For. (DoD adopted)
D 445 - Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity), Test Method For. (DoD adopted)
D 482 - Ash from Petroleum Products, Test Method For. (DoD adopted)
D 524 - Ramsbottom Carbon Residue of Petroleum Products, Test Method For. (DoD adopted)
D 611 - Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents, Test Method For. (DoD adopted)
D 613 - Ignition Quality of Diesel Fuels by the Cetane Method, Test Method For.
D 665 - Rust-Preventing Characteristics of Steam-Turbine Oil in the Presence of Water, Test Method For. (DoD adopted)
D 974 - Neutralization Number by Color-Indicator Titration, Test Method For. (DoD adopted)
D 976 - Calculated Cetane Index of Distillate Fuels, Test Method For.
D 1298 - Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method, Test Method For. (DoD adopted)
D 1401 - Emulsion Characteristics of Petroleum Oils and Synthetic Fluids, Test Method For.
D 1500 - ASTM Color of Petroleum Products (ASTM Color Scale), Test Method For. (DoD adopted)
D 1552 - Sulfur in Petroleum Products (High-Temperature Method), Test Method For. (DoD adopted)
D 2274 - Oxidation Stability of Distillate Fuel Oil (Accelerated Method), Test Method For.
D 2500 - Cloud Point of Petroleum Oils, Test Method For. (DoD adopted)
D 2622 - Sulfur in Petroleum Products (X-Ray Spectrographic Method), Test Method For. (DoD adopted)

D 2709 - Water and Sediment in Distillate Fuels by Centrifuge, Test Method For. (DoD adopted)
E 29 - Recommended Practice for Indicating Which Places of Figures Are To Be Considered Significant in Specified Limiting Values. (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups using Federal agencies.)

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

3. REQUIREMENTS

3.1 General. Requirements contained herein are not subject to corrections for tolerance of test methods. If multiple determinations are made by the inspecting laboratory, average results will be used except for those test methods where repeatability data are given. In those cases, the average value derived from the individual results that agree within the repeatability limits given may be used at the discretion of the inspection authority, provided an indication is given of the total number or results obtained and the number falling outside the repeatability limits. For purposes of determining conformance with each requirement, an observed value or calculated value shall be rounded off "to the nearest unit" in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off procedure given in ASTM E 29.

3.2 Material. The fuel supplied under this specification shall be distillate fuel and may contain only those additives specified in 3.2.1 through 3.2.4.

3.2.1 Additives. The additives listed herein may be used singly or in combination in amounts not to exceed those specified.

3.2.2 Antioxidants. The following active inhibitors may be blended separately or in combination into the fuel in total concentration not in excess of 8.4 pounds of inhibitor (not including weight of solvent) per 1,000 barrels of fuel (9.1 grams/100 gallons (U.S.), 24 milligrams (mg)/liter or 109 mg/gallons (U.K.)) in order to prevent the formation of gum:

(a) N,N' - diisopropyl-para-phenylenediamine
(b) N,N' - disecondary butyl-para-phenylenediamine
(c) 2,6 - ditertiary butyl-4-methylphenol
(d) 2,4 - dimethyl-6-tertiary butylphenol
(e) 2,6 - ditertiary butylphenol
(f) 75 percent minimum 2,6-ditertiary butylphenol
25 percent maximum tertiary and tritertiary butylphenols

3.2.3 Metal deactivator. A metal deactivator, N, N' - disalicyclidene-1, 2 propanediamine may be blended into the fuel in an amount not to exceed 2 pounds of active ingredient per 1,000 barrels of fuel (2.2 grams/100 gallons (U.S.), 5.8 mg/liter or 25 mg/gallons (U.K.)).

3.2.4 Ignition improver. The following additives, to raise the ignition quality of the fuel, may be used as required to conform to this specification:

Amyl nitrate (mixed primary nitrates).
Hexyl nitrate (N-hexyl nitrate).
Cyclohexyl nitrate.
Octyl nitrate.

3.3 Chemical and physical requirements. The diesel fuel shall conform to the physical and chemical requirements specified in table I.

TABLE I. Chemical and physical requirements.

Characteristics	Requirements	FED-STD-791 test method	ASTM test method
Ignition quality, cetane number (min) (see 4.5.1)	45		D 613
Appearance at 21°C (70°F) or ambient temperature whichever is higher	Clear, bright, and free from visible particulate matter1/		
Distillation:			
50 percent point, °C (°F)	Record		
90 percent point, °C (°F) (max)	357°C (675°F)		D 86
End point, °C (°F) (max)2/	385°C (725°F)		
Residue plus loss, percent (max)	3.0		
Flash point, °C (°F) (min)	60°C (140°F)		D 93
Pour point, °C (°F) (max)	-6°C (20°F)5/		D 97
Cloud point, °C (°F) (max)	-1°C (30°F)5/		D 2500
Viscosity at 40°C (104°F) Kinematic, centistokes	1.7 - 4.3		D 445
Carbon residue, on 10 percent bottoms, percent (max) (see 4.5.2)	0.20		D 524
Sulfur, percent (max)	1.00		3/D 129
Corrosion (max) at 100°C (212°F)	No. 1 ASTM		D 130
Color (max)	3		D 1500
Ash, percent (max)	0.005		D 482

See footnotes at end of table.

TABLE I. Chemical and physical requirements. - Continued

Characteristics	Requirements	FED-STD-791 test method	ASTM test method
Gravity (hydrometer)	Record		4/D 1298
Demulsification at 25°C (77°F), minutes (max) (see 4.5.3)	10		D 1401
Acid number (max)	0.30		D 974
Neutrality	Neutral	5101	-------
Aniline point, °C (°F)	Record		D 611
Accelerated stability, total insolubles mg/100 mL (max)	6/1.5		D 2274

1/ A slight haze is acceptable providing a maximum (max) water and sediment of 0.01 percent is obtained using procedure ASTM D 2709.
2/ As the end point of the distillation is approached, if either a thermometer reading 385°C (725°F) or a decomposition point is observed, discontinue the heating and resume the procedure as directed in ASTM D 86.
3/ ASTM D 1552 and ASTM D 2622 may be used as alternative methods.
4/ ASTM D 287 may be used as an alternative method.
5/ The ASTM methods for pour and cloud points permit optional use of either Celsius or Fahrenheit procedures; therefore requirements are specified for either option.
6/ Average of three determinations is acceptable.

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 the prescribed requirements.

4.2 Lot.

4.2.1 Bulk lot. Bulk lot shall be considered an indefinite quantity of a homogenous mixture of material offered for acceptance in a single isolated container.

4.2.2 Packaged lot. Packaged lot shall be considered an indefinite number of 55-gallon drums or smaller unit containers of identical size and type, offered for acceptance, and filled with a homogenous mixture of material from one isolated container; or filled with a homogenous mixture of material manufactured in a single plant run (not exceeding 24 hours) through the same processing equipment, with no change in ingredient material.

4.3 Sampling.

4.3.1 Sampling for examination of the preparation for delivery. A random sample of packed containers shall be taken from each lot in accordance with MIL-STD-105, at inspection level II, and acceptable quality level (AQL) equals 2.5 percent defective. The sample shall be examined in accordance with 4.4.1.

4.3.2 Sampling for tests. Samples for tests shall be taken in accordance with ASTM D 270. Samples shall be tested in accordance with table I and 4.5.

4.4 Inspection. Inspection shall be performed in accordance with method 9601 of FED-STD-791.

4.4.1 Examination of the preparation for delivery. Samples taken in accordance with 4.3.1 shall be examined for compliance with MIL-STD-290 with regard to fill, closure, sealing, leakage, packaging, packing, and marking requirements. Any container having one or more defects, or under the required fill shall be rejected. If the number of defective or underfilled containers exceeds the acceptance number for the appropriate plan of MIL-STD-105, the lot represented by the sample shall be rejected.

4.5 Test methods.

4.5.1 Ignition quality. When the apparatus specified in ASTM D 613 is not available for product inspection purposes, the cetane index may be authorized in lieu of the cetane number, provided that sufficient data are available to establish the cetane index number correlation for a finished product or a blend of products from the same manufacturing process or processes and the same specific crude source. In all instances, the product submitted shall be of sufficiently high cetane index to assure a cetane number at least as high as that shown in table I. In no case shall the cetane index be less than 45. The calculated cetane index shall not be used in determining the ignition quality of fuel containing ignition improvers. The cetane index shall be determined by ASTM D 976 and the corresponding cetane number from the manufacturers correlation data shall be reported.

4.5.2 Carbon residue. When the finished fuel contains a cetane improver the carbon residue requirement specified in table I shall apply to the base fuel without the cetane improver.

4.5.3 Demulsification. The demulsification test shall be conducted in accordance with ASTM D 1401 with the following exceptions:

(a) Synthetic sea water prepared in accordance with ASTM D 665 shall be used as the emulsifying fluid.
(b) The test temperature shall be 25° ± 1.1°C (77° ± 2°F).
(c) The demulsification time shall be that required for separation into two layers with no cuff at the interface. A lacy emulsion which does not form a band or cuff on the wall of the cylinder shall be disregarded. The fuel, water, and emulsion layer volumes shall be recorded at 1 minute intervals and the demulsification time reported shall be to the nearest minute.

4.6 Test reports. The contractor shall prepare test reports in accordance with the data ordering document (see 6.2.2).

4.7 Inspection of preparation for delivery. The packaging, packing, and marking shall be inspected for compliance with section 5 of this specification.

5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government acquisition.)

5.1 Packaging, packing, and marking. Packaging, packing, and marking shall be in accordance with MIL-STD-290. The level of packaging, level of packing, type, and size shall be as specified (see 6.2.1).

6. NOTES

6.1 Intended use. Naval distillate fuel is intended for use in all shipboard boilers, gas turbines, and diesel engines at ambient temperatures above -1.1°C (30°F). Other uses may be specified according to the needs of the Department of Defense. When gas turbines and diesel engines are exposed to ambient temperatures that consistently fall below -1.1°C (30°F), JP-5 per MIL-T-5624 should be used instead of naval distillate.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

(a) Title, number, and date of this specification.
(b) Applicable level of packaging and packing required (see 5.1).
(c) Unit container quantity (see 5.1).

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n)(2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

Paragraph no.	Data requirement title	Applicable DID no.	Option
4.6	Reports, test	DI-T-2072	10.1.b

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L., Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 International interest. Certain provisions of this specification are the subject of international standardization agreement NATO STANAG-1135. When amendment, revision, or cancellation of this specification is proposed which will modify the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental standardization offices to change the agreement or make other appropriate accommodations.

6.4 Changes from previous issue. Asterisks 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 - SH
Air Force - 68
Review activities:
Army - ME
Navy - YD, SA
DLA - PS, GS
User activities:
Navy - MC, CG

Preparing activity:
Navy - SH
(Project 9140-0103)

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge *(DO NOT STAPLE)*, and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. Ii block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document*(s)* or to amend contractual requirements.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-F-16884H	Fuel, Naval Distillate

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ 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)*

DD FORM 82 MAR 1426

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