

VV-F-800D  
October 27, 1987  
SUPERSEDING  
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September 15, 1980

FEDERAL SPECIFICATION

FUEL OIL, DIESEL

This specification was approved by the Assistant Administrator, Office of Federal Supply and Services, General Services Administration, for the use of all Federal Agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers diesel fuel oils suitable for use in compression-ignition engines and gas turbine engines other than aircraft under all climatic conditions (see 6.1).

1.2 Classification. The diesel fuel oils shall be of three grades, as follows:

<u>Military Symbol</u>	<u>Nato Code No.</u>	<u>Description</u>
DF-A	---	Arctic grade
DF-1	---	Winter grade
DF-2	F-54	Regular grade

2. APPLICABLE DOCUMENTS

2.1 Specifications and standards. The following documents in effect on date of invitation for bids or solicitation for offers, form a part of the specification to the extent specified herein:

Federal Standards

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

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions, as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S Government Printing Office, Washington, DC 20402.

AMSC N/A

FSC 9140

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(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

**Military Specifications:**

MIL-I-25017 - Inhibitor, Corrosion, Fuel Soluble.  
MIL-I-27686 - Inhibitor, Fuel System Icing.  
MIL-S-53021 - Stabilizer Additive, Diesel Fuel.  
MIL-I-85470 - Fuel System Icing Inhibitor, High Flash Point.

**Military Standards:**

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

(Copies of specifications, standards, 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 officer.)

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 non-Government documents which is current on the date of the solicitation.

**American Society for Testing and Materials Publications:**

D 86 - Distillation of Petroleum Products.  
D 93 - Flash Point by Pensky-Martens Closed Tester.  
D 97 - Pour Point of Petroleum Oils.  
D 129 - Sulfur in Petroleum Products by the Bomb Method.  
D 130 - Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test.

- D 445 - Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity).
- D 482 - Ash from Petroleum Products.
- D 524 - Ramsbottom Carbon Residue of Petroleum Products.
- D 613 - Ignition Quality of Diesel Fuels by the Cetane Method.
- D 974 - Neutralization Number by Color-Indicator Titration.
- D 976 - Calculated Cetane Index of Distillate Fuels.
- D 1298 - Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.
- D 1552 - Sulfur in Petroleum Products (High-Temperature Method).
- D 2274 - Oxidation Stability of Distillate Fuel Oil (Accelerated Method).
- D 2276 - Particulate Contaminant in Aviation Turbine Fuels.
- D 2500 - Cloud Point of Petroleum Oils.
- D 2622 - Sulfur in Petroleum Products (X-Ray Spectrographic Method).
- D 4057 - Manual Sampling of Petroleum and Petroleum Products.
- D 4176 - Free Water and Particulate Contamination in Distillate Fuels (Clear and Bright Pass/Fail Procedures).
- D 4177 - Automatic Sampling of Petroleum and Petroleum Products.
- D 4294 - Sulfur in Petroleum Products by Nondispersive X-Ray Fluorescence Spectrometry.

(The ASTM Methods listed above are included in Volumes 05.01 through 05.04 of the Annual Book of ASTM Standards and are available individually. Application for copies of all ASTM publications should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Non-Government 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.)

### 3. REQUIREMENTS

3.1 Material. The diesel fuels supplied under this specification shall be refined petroleum distillates, and may contain additives in accordance with 3.2.

3.2 Additives. Diesel fuel shall contain only those additives permitted by 3.2.1 through 3.2.5 when the fuel is purchased for the following purposes:

- a. For military use outside the continental U.S. (OCONUS)
- b. When interchanged under NATO Code No. F-54.
- c. For long term storage (more than six months).
- d. For use in pre-positioned or standby equipment.

Diesel fuel purchased for all other purposes may contain additives in addition to those permitted by 3.2.1 through 3.2.5 without prior approval, provided that the finished fuel meets the requirements of this specification.

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3.2.1 Antioxidants. The following antioxidants may be blended separately or in combination into the diesel fuel to retard the formation of gum and other oxidation products:

- a. 2,4-Dimethyl-6-tert-butylphenol
- b. 2,6-Di-tert-butyl-4-methylphenol
- c. 2,6-Di-tert-butylphenol
- d. 2,6-Di-tert-butylphenol (75 weight percent minimum) and a mixture of tert-butylphenols and tri-tert-butylphenols (25 weight percent maximum)
- e. 2,4-Di-tert-butylphenol (60 weight percent minimum) and mixed tert-butylphenols (40 weight percent maximum)

The total concentration of antioxidants shall not exceed 24 grams per cubic metre on an active ingredient basis. The addition of antioxidants other than those listed herein may be permitted, provided that prior approval is obtained from the U.S. Army Belvoir Research, Development, and Engineering Center, ATTN: STRBE-VF, Fort Belvoir, VA 22060-5606. Requests for approval shall contain the chemical or trade name of the additive, Material Safety Data Sheet, concentration to be used, and laboratory test data demonstrating the effectiveness of the additive in diesel fuels.

3.2.2 Cetane improvers. Any one or any combination of the following cetane improvers may be added to the diesel fuel to meet the cetane number requirements specified in table I:

- a. Amyl nitrate
- b. Isopropyl nitrate
- c. Hexyl nitrate
- d. Cyclohexyl nitrate
- e. 2-Ethylhexyl nitrate
- f. Octyl nitrate

Concentration of the cetane improvers shall not exceed 0.25 weight percent in grade DF-A, and 0.5 weight percent in grades DF-1 and DF-2.

3.2.3 Corrosion inhibitors. DF-2 intended for OCONUS use shall contain a corrosion inhibitor conforming to MIL-I-25017. The concentration of corrosion inhibitor shall be within the minimum and maximum limits listed in the latest qualified products list (see 6.7).

3.2.4 Fuel system icing inhibitors. Fuel system icing inhibitors conforming to MIL-I-27686 (NATO Code S-748) or MIL-I-85470 (NATO Code S-1745) may be blended into the diesel fuel to purge small quantities of water from the fuel system. The concentration of icing inhibitor shall not exceed 0.15 volume percent when tested in accordance with FED-STD-791, methods 5327, 5330, 5340, or 5342. MIL-I-27686 and MIL-I-85470 have flash points of approximately 46 deg. C and 96 deg. C, respectively. If MIL-I-27686 is added to Grade DF-2, it may cause the flash point of the DF-2 to be lowered slightly. In such cases, the flash point of the finished fuel shall be checked after blending in the additive to ensure that it meets the requirements in table I.

3.2.5 Stabilizer additive. Diesel fuel stabilizer additive conforming to MIL-S-53021 may be blended into the diesel fuel when additional protection against deterioration is required (see 6.6). Additives conforming to MIL-S-53021 perform the following functions: antioxidant, biocide, corrosion inhibitor, dispersant, and metal deactivator.

3.3 Physical and chemical requirements. The finished diesel fuels shall conform to the requirements specified in table I, 3.4, and 3.5 (see 6.4).

TABLE I. Physical and chemical requirements.

Properties	Values			
	Grade DF-A	Grade DF-1	Grade DF-2:	
			CONUS	OCONUS
Density, kg/L @ 15 deg. C	Report	Report	Report	0.815 to 0.860
Flash point, deg. C min.	38	38	52	56[1]
Cloud point, deg. C max.	-51	[2]	[2]	[2]
Pour point, deg. C max.	Report	Report	Report	[3]
Kinematic viscosity, cSt @ 20 deg. C	-	-	-	1.8 to 9.5
@ 40 deg. C	1.1 to 2.4	1.3 to 2.9	1.9 to 4.4	
Distillation, deg. C:				
50% evaporated	Report	Report	Report	Report
90% evaporated, max	288	288	338	357
End point, max.	300	330	370	370
Residue, vol. %, max	3	3	3	3
Carbon residue on 10% bottoms, mass %, max.[4]	0.10	0.15	.35	.20
Sulfur, mass %, max.[5]	0.25	0.50	0.50	0.30
Copper strip corrosion, 3 hrs. @ 50 deg. C max. rating	3	3	3	1
Ash, mass %, max.	0.01	0.01	0.01	0.02
Accelerated stability, total insolubles, mg/100 mL, max.	1.5	1.5	1.5	1.5
Neutralization number, TAN, max.	0.05	--	--	0.10
Particulate contamination, mg/L, max.	10	10	10	10
Cetane number, min.[6]	40	40	40	45

[1] DF-2 intended for entry into the Central European Pipeline System shall have a minimum value of 58 deg. C.

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- [2] As specified by the procuring activity based on guidance in Appendix A. DF-2 for Europe and S. Korea shall have maximum limit of minus 13 deg. C.
- [3] As specified by the procuring activity (see 6.2). DF-2 for Europe and S. Korea shall have a maximum limit of minus 18 deg. C.
- [4] See Appendix B. If the fuel contains cetane improvers, the test must be performed on the base fuel blend only.
- [5] Diesel fuel intended for consumption in Southern California shall meet the requirements of the Southern California Air Quality Management District and Air Resource Board, which currently limits sulfur in diesel fuel to 0.05 mass percent maximum.
- [6] If cetane quality is determined as calculated cetane index, the minimum cetane index shall be 43 for grades DF-A, DF-1, and CONUS DF-2.

3.4 Material Safety Data Sheets. Material Safety Data Sheets shall be prepared in accordance with FED-STD-313 (see 6.5). Material Safety Data Sheets are required when fuel is packaged in drums or cans, but not for bulk deliveries.

3.5 Workmanship. The finished diesel fuel shall be visually free from undissolved water, sediment, and suspended matter; and shall be clear and bright when tested in accordance with method A or B of ASTM D 4176.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 specifications set forth in the specification where such inspections are deemed necessary to assure that 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.

4.1.2 Component and material inspection. The contractor is responsible for insuring that components and materials are manufactured, examined, and tested in accordance with referenced specifications and standards, as applicable.

4.2 Lot.

4.2.1 Bulk lot. An indefinite quantity of a homogeneous blend of diesel fuel of one grade offered for acceptance in a single isolated container; or manufactured in a single plant run (not exceeding 24 hours) through the same blending or processing equipment, with no change in ingredient material.

4.2.2 Packaged lot. An indefinite number of 55-gallon drums or other unit containers of identical size and type, offered for acceptance, and filled with a homogeneous blend of diesel fuel of one grade from one isolated container; or filled with a homogeneous blend of diesel fuel of one grade manufactured in a single plant run (not exceeding 24 hours) through the same blending or processing equipment, with no change in ingredient material.

#### 4.3 Sampling.

4.3.1 Sampling for the inspection of filled containers. Take a random sample of filled containers from each lot in accordance with MIL-STD-105, at inspection level II and acceptable quality level (AQL) shall be 1.0 percent defective.

4.3.2 Sampling for tests. Take samples for tests in accordance with ASTM D 4057 or D 4177. Test the samples in accordance with 4.6.

4.4 Inspection. Perform inspection in accordance with FED-STD-791, method 9601.

4.4.1 Examination of the preparation for delivery. Examine samples taken in accordance with 4.3.1 for compliance with MIL-STD-290 with regard to fill, closure, sealing, leakage, packaging, packing, and marking requirements. Reject any container having one or more defects or under the required fill. Reject the lot represented by the sample if the number of defective or underfilled containers exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105. Reject packaged lot if Material Safety Data Sheet is not prepared in accordance with FED-STD-313.

4.5 Classification of tests. All tests are quality conformance tests.

4.6 Test methods. Perform tests in accordance with the applicable methods listed in table II and Appendix B.

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TABLE II. Test methods.

Test	Test Method No.
Density	ASTM D 1298
Flash point	ASTM D 93
Cloud point	ASTM D 2500
Pour point	ASTM D 97
Kinematic viscosity	ASTM D 445
Distillation	ASTM D 86
Carbon residue[1]	ASTM D 524
Sulfur[2]	ASTM D 1552, D 129, D 2622, or D 4294
Copper strip corrosion	ASTM D 130
Ash	ASTM D 482
Accelerated stability	ASTM D 2274
Neutralization	ASTM D 974
Particulate contamination	ASTM D 2276 (Appendix A2)
Cetane number[3]	ASTM D 613 or D 976
Fuel system icing inhibitor	FED-STD-791, method 5327, 5330, 5340, or 5342
Workmanship	ASTM D 4176, method A or B

[1] See Appendix B.

[2] ASTM D 1552 is the preferred method but ASTM D 129, D 2622, or D 4294 may be used as an alternate.

[3] ASTM D 613 is the preferred method of determining cetane quality. When cetane number by ASTM D 613 is not available, ASTM D 976 may be used as an alternate. If ASTM D 976 is used, the minimum calculated cetane index shall be 43 for grades DF-A, DF-1, and CONUS DF-2. ASTM D 976 shall not be permitted as an alternate for OCONUS DF-2 intended for use as NATO F-54 Military Diesel Fuel.

## 5. PREPARATION FOR DELIVERY

5.1 Packaging, packing, and marking. Unless otherwise specified in the contract or order (see 6.2), packaging, packing, and marking shall be in accordance with MIL-STD-290.

## 6. NOTES

### 6.1 Intended use.

6.1.1 Military symbol DF-A. Arctic-grade diesel fuel oil is intended for use in high-speed automotive-type diesel engines, gas turbine engines other than aircraft, and pot-type burner space-heaters, in areas where ambient temperatures



lower than -32 deg. C generally occur, and where it is impractical to maintain dual storage capabilities. This grade of diesel fuel should not be used for slow-speed stationary engine applications.

6.1.2 Military symbol DF-1. Winter-grade diesel fuel oil is intended for use in high-speed automotive diesel engines and gas turbine engines other than aircraft, in areas in which ambient temperatures as low as -32 deg. C may occur (see Appendix A). This grade of diesel fuel may be used for medium-speed stationary engine applications, where fuel heating facilities are not available.

6.1.3 Military symbol DF-2. Regular-grade diesel fuel oil is intended for use in all automotive high-speed/medium-speed engine applications and gas turbine engines other than aircraft, in temperate climates according to guidelines in Appendix A.

6.1.4 Use of diesel fuel oil in space heaters. Diesel fuel oil should not be burned in space heaters which are not vented to the outside to prevent personnel from being overcome by sulfur dioxide and other combustion products.

6.2 Ordering data. Purchasers should select the preferred options offered herein and include the following information in procurement documents:

- a. Title, number, and date of this specification.
- b. Grade designation (military symbol; see 1.2).
- c. Size and type container required (see 5.1).
- d. Quantity of diesel fuel required. The unit of purchase is the U.S. gallon (231 cubic inches at 60 deg. F (15.6 deg. C).
- e. Level of packaging and level of packing required (see 5.1).
- f. Cloud point for DF-1 and DF-2 (see Appendix A).
- g. Pour point for OCONUS DF-2 (see note 3, table I).

6.3 Standardization agreements. Certain provisions of this specification are the subject of international standardization agreements (NATO STANAGS 1135, 2754, and 2845). 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 channels, including departmental standardization offices, if required.

6.4 NATO and non-NATO applications of grade DF-2 OCONUS. The requirements for grade DF-2 OCONUS specified in table I are intended primarily for the acquisition of NATO Code F-54 military diesel fuel in accordance with the STANAGS cited in 6.3. In some non-NATO OCONUS areas, diesel fuel meeting these requirements may not be commercially available. In such cases, the contracting officer may permit limited waivers of requirements in table I on a country-by-country basis as needed to ensure adequate fuel availability.

6.5 Material Safety Data Sheets. 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.

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6.6 Stabilizer additive. Diesel fuel stabilizer additive conforming to MIL-S-53021 is not intended for routine use in all diesel fuels but should be used only in situations where a high degree of protection against deterioration is required. Typical applications are to pre-positioned fuel, pre-positioned equipment stored fully-fueled, equipment undergoing depot storage or rebuild, National Guard and Reserve equipment which may be inactive for long periods, fuel supplies for designated high-priority missions, and marginally stable fuel scheduled for consumption during extremely hot weather which tends to accelerate deterioration.

6.7 Corrosion inhibitors. The minimum and maximum concentration limits for each corrosion inhibitor are shown on QPL-25017.

6.8 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. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

## MILITARY INTEREST:

## CIVIL AGENCY COORDINATING ACTIVITIES:

## Custodians:

GSA - FSS

DOT - NHT

HHS - FEC, NIH

Army - ME

Navy - SH

Air Force - 68

## Preparing Activity:

## Review activities:

Army - ME

Army - AT, MI

Navy - YD

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## User activities:

Army - AR

Navy - MC

## APPENDIX A

TENTH PERCENTILE MINIMUM AMBIENT TEMPERATURE FOR DEFINING SATISFACTORY  
LOW TEMPERATURE PROPERTIES OF DIESEL FUEL

## 10. SCOPE

10.1 This appendix covers a method to assess the low temperature operability limit for automotive diesel fuel.

## 20. METHODOLOGY

20.1 Minimum daily temperatures compiled from weather stations were statistically evaluated to determine the probability for various temperature occurrences. A method of reporting this probability is with the use of percentiles which evaluate the compiled distribution and report the temperatures corresponding to their probabilities of occurrence. To predict limiting low ambient temperatures, the 10th percentile minimum temperature values have been selected as a realistic guide. By definition, the 10th percentile minimum temperature predicts a 10 percent chance that the daily minimum will be lower than the predicted value, or a 90 percent chance that the daily minimum will be no lower than the predicted value.

## 30. APPLICATION

30.1 The 10th percentile minimum temperature values for the United States and OCONUS areas are tabulated and presented in table III and IV. Satisfactory operation should be achieved in most cases if the cloud point is specified at or below the 10th percentile minimum temperature. This guidance is of general nature as some equipment design, use of flow improvers, fuel properties, and type of operating conditions may allow higher or require lower cloud point fuels.

TABLE III. United States 10th percentile minimum temperatures, deg. C.

State	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Alabama	13	4	-3	-6	-7	-3	-2
Alaska:[1]							
Northern	-7	-25	-37	-45	-49	-47	-43
Southern	-1	-11	-13	-18	-32	-32	-29
South East	1	-4	-11	-16	-19	-13	-12
Arizona:							
N 34 deg. LAT	1	-4	-12	-14	-17	-16	-12
S 34 deg. LAT	13	7		-2	-4	-3	-1
Arkansas	9	2	-4	-7	-11	-7	-3
California:[2]							
N and S Coast	6	4	0	-2	-2	-1	-1
Interior and SE	6	1	-6	-8	-11	-7	-6

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TABLE III. United States 10th percentile minimum temperatures, deg. C. (Cont'd)

State	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Colorado:							
E 105 deg. LONG	4	-2	-12	-14	-19	-15	-12
W 105 deg. LONG	-3	-8	-18	-25	-30	-24	-16
Connecticut	4	-1	-7	-16	-17	-16	-9
Delaware	8	2	-3	-10	-11	-10	-6
Florida	17	7	1	-1	-3	-1	4
Georgia	12	3	-2	-6	-7	-6	-2
Idaho	2	-4	-13	-18	-21	-18	-13
Illinois	5	-1	-9	-19	-21	-18	-11
Indiana	6	-1	-7	-16	-18	-16	-9
Iowa	4	-2	-13	-23	-26	-22	-16
Kansas	4	-2	-11	-15	-19	-14	-13
Kentucky	7	1	-6	-13	-14	-11	-6
Louisiana	14	5	-1	-3	-4	-2	1
Maine	1	-3	-10	-23	-26	-26	-18
Maryland	8	2	-3	-10	-12	-10	-4
Massachusetts	3	-2	-7	-16	-18	-17	-10
Michigan	1	-2	-11	-20	-23	-23	-18
Minnesota	-1	-4	-18	-30	-34	-31	-24
Mississippi	13	3	-3	-6	-6	-4	-1
Missouri	8	1	-7	-14	-16	-13	-8
Montana	-1	-7	-18	-24	-30	-24	-21
Nebraska	3	-3	-13	-18	-22	-19	-13
Nevada:							
N 38 deg. LAT	-2	-7	-14	-18	-22	-18	-13
S 38 deg. LAT	14	8	0	-3	-4	-2	1
New Hampshire	1	-3	-8	-18	-21	-21	-12
New Jersey	8	2	-3	-11	-12	-11	-6
New Mexico	5	-2	-11	-14	-17	-14	-11
New York	1	-3	-8	-21	-24	-24	-16
North Carolina	6	-1	-7	-10	-11	-9	-5
North Dakota	1	-4	-20	-27	-31	-29	-22
Ohio	4	-1	-7	-16	-17	-15	-9
Oklahoma	9	1	-8	-12	-13	-8	-7
Oregon:							
E 122 deg. LONG	-1	-6	-11	-14	-19	-21	-9
W 122 deg. LONG	4	0	-4	-5	-7	-4	-3
Pennsylvania	0	-3	-8	-19	-20	-21	-15
Rhode Island	6	1	-3	-12	-13	-13	-7
South Carolina	13	5	-1	-5	-5	-3	-2
South Dakota	3	-4	-14	-24	-27	-24	-18
Tennessee	7	1	-5	-9	-11	-9	-4
Texas:							
N 31 deg. LAT	9	3	-6	-9	-13	-9	-7
S 31 deg. LAT	16	9	2	-2	-3	-1	2

TABLE III. United States 10th percentile minimum temperatures, deg. C. (Cont'd)

State	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Utah	4	-2	-11	-14	-18	-14	-8
Vermont	3	-3	-8	-20	-23	-24	-15
Virginia	8	2	-3	-9	-11	-9	-4
Washington:							
E 122 deg. LONG	2	-2	-8	-11	-18	-11	-8
W 122 deg. LONG	3	0	-3	-3	-7	-4	-3
West Virginia	3	-3	-8	-15	-16	-14	-9
Wisconsin	2	-3	-14	-24	-28	-24	-18
Wyoming	1	-4	-15	-18	-26	-19	-16

[1] Details of state division are as indicated:

- \* Northern Region: Area north of the 62 deg. LAT.
- \* Southern Region: Area bordered on the north by the 62 deg. LAT, bordered on the east by the 141 deg. LONG., and bordered on the south by the 56 deg. LAT.
- \* Southeastern Coast and Aleutian Islands: Area bordered on the north by Canada, bordered on the west by the 141 deg. LONG., and the remaining area bordered on the north by the 56 deg. LAT.

[2] Details of state division by county as indicated:

- California, North Coast - Alameda, Contra Costa, Del Norte, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, Trinity
- California, Interior - Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Fresno, Glenn, Kern (except that portion lying east of the Los Angeles County Aqueduct), Kings, Lassen, Medera, Mariposa, Merced, Nodoc, Nevada, Placer, Plumas, Sacramento, San Joaquin, Shasta, Sierra, Siskiyou, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Yolo, Yuba
- California, South Coast - Los Angeles (except that portion north of the San Gabriel Mountain range and east of the Los Angeles County Aqueduct), Orange, San Diego, San Luis Obispo, Santa Barbara, Ventura
- California, Southeast - Imperial, Inyo, Kern (that portion lying east of the Los Angeles County Aqueduct), Los Angeles (that portion north of the San Gabriel Mountain range and east of the Los Angeles County Aqueduct), Mono, Riverside, San Bernardino

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TABLE IV. OCONUS 10th percentile minimum temperatures, deg. C.

Country	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Austria	-1	-5	-12	-10	-9	-6	-1
Belgium	0	-3	-9	-7	-6	-6	-3
Denmark	-1	-3	-6	-7	-7	-7	-3
France	0	-2	-9	-9	-5	-5	-1
Germany	-2	-5	-13	-13	-12	-9	-5
Greece	5	0	-3	-3	-2	-1	3
Iceland	-1	-5	-7	-9	-7	-7	-4
Italy	1	-3	-6	-8	-7	-3	-1
Korea	1	-6	-13	-20	-15	-7	-1
Luxembourg	1	-3	-7	-7	-6	-4	-2
Netherlands	0	-2	-8	-8	-6	-5	-2
Norway	-6	-14	-16	-18	-18	-16	-6
Portugal	8	4	1	1	1	1	5
Turkey	-1	-6	-10	-16	-16	-6	-1

## APPENDIX B

## DETECTION OF NITRATE-TYPE IGNITION IMPROVERS IN DIESEL FUEL

## 10. SCOPE

10.1 This method of test covers the determination of organic nitrate ester type cetane improver additives used in diesel fuel. It is intended as a screening test for those diesel fuel inspection test procedures that are affected by the presence of Cetane improvers; namely, ASTM D 524, Standard Test Method for Ramsbottom Carbon Residue of Petroleum Products, and ASTM D 976, Standard Methods for Calculated Cetane Index of Distillate Fuels.

## 20. SUMMARY

20.1 A diesel fuel sample is saponified in a potassium hydroxide-1-butanol mixture and then filtered through a glass fiber filter disk. The material remaining on the disc is treated with diphenylamine reagent after drying. The presence of a nitrate ester cetane improver is revealed by the formation of a blue ring or blue-black spot due to oxidation of diphenylamine to intense blue quinoidal compounds by the nitrate salt. No color change confirms the absence of a cetane improver.

## 30. APPARATUS

30.1 Reaction bottle - Screw-cap bottle, 29.6 mL (1 fl. oz.) capacity, wide mouth, flint glass, with screw cap lined with tin or (TFE) resin.

30.2 Glass fiber filter paper - 37 mm diameter, Grade 934 AH (H. Reeve Angel, Inc., Clifton, N.J., or equivalent).

30.3 Pipette - 10 mL capacity, fitted with a pipetting bulb. Several types and makes of pipetting bulbs and assemblies are available. One of the following is suggested: Fisher Cat. No. 13-681, Pipet Filler, Fisher Safety, or equal; Fisher Cat. No. 13-681-50, Pipet Filler, or equal; Fisher Cat No. Pipet Adapter, Fisher, or equal.

30.4 Graduated cylinders - 10 mL and 25 mL capacity.

30.5 Suction flask with a Suitable holder to accommodate a 60 mL glass-fitted crucible.

30.6 Crucible - 60 mL capacity, glass-fritted, medium porosity.

30.7 Oven suitable for drying filter discs at 110 deg. C.

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#### 40. REAGENTS

40.1 Saponification mixture (1N) - Prepared by mixing 6.5 g potassium hydroxide (ACS grade) with 100 mL absolute 1-butanol (ACS grade) and heating to dissolve the KOH. After the solution cools, the mixture is filtered through the glass fiber filter paper.

40.2 Diphenylamine (1 percent solution) - Prepared by dissolving 0.230 g diphenylamine (ACS indicator grade) in 25 mL sulfuric acid (sp. gr. 1.834).

40.3 Toluene (ACS reagent grade).

NOTE: Toluene is flammable and toxic. Avoid breathing vapors or contact with skin.

#### 50. PROCEDURE

50.1 Pipette 10 mL of sample into the reaction bottle and add 5 mL of toluene followed by 10 mL of the saponification mixture.

NOTE: Oral pipetting techniques should not be used because of the toxicity of the substances involved. A pipeting bulb or assembly similar to one of those described in 30.3 should be used.

50.2 Affix cap to the reaction bottle tightly and, after mixing the contents, place it in an oven maintained at 110 deg. C for 4 hours.

50.3 Remove the reaction bottle from the oven and allow to cool to 25 +/- 3 deg. C.

50.4 Filter the contents of the reaction bottle through the 60 mL glass fritted crucible fitted with the glass filter disc.

50.5 Wash the reaction bottle with 25 mL of toluene and transfer it to the glass-fritted crucible.

50.6 Carefully remove the glass fiber filter disc and dry it in oven at 110 deg. C for 15 minutes.

50.7 Remove the filter disc and cool it to 25 +/- 3 deg. C.

50.8 Add 3 drops of diphenylamine solution to the center of the disc and observe whether a blue or blue-black color forms.

#### 60. REPORT

60.1 The presence of organic nitrate ester-type cetane improvers will be reported if the formation of a blue color occurs. Reference samples of diesel fuels containing 0.5 percent by volume of any one of the approved cetane



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improvers (amyl nitrate, cyclohexyl nitrate, hexyl nitrate, isopropyl nitrate, 2-ethylhexyl nitrate, and octyl nitrate) give an intense blue to blue-black color throughout the reagent spot whereas those samples containing only 0.1 percent by volume produce a blue ring at the outer boundary of the reagent. If a positive reaction occurs (i.e., a blue or blue-black coloration), the carbon residue determination (ASTM D 524) must be performed on a neat or base fuel blend.

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Orders for this publication are to be placed with General Services Administration, acting as an agent for the superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein.

VV-F-800D  
AMENDMENT 2  
July 29, 1988  
SUPERSEDING  
AMENDMENT 1  
November 13, 1987

FEDERAL SPECIFICATION

FUEL OIL, DIESEL

This amendment, which forms a part of Federal Specification VV-F-800D, dated October 27, 1987, was approved by the Assistant Administrator, Office of Federal Supply and Services, General Services Administration, for the use of all Federal Agencies.

PAGE 1

- \* 1.2, line 3, delete "Nato" and substitute "NATO".
- \* 2.2, D 4294 title, line 2, delete "Flourescence" and substitute "Fluorescence".

3.1, delete in its entirety and substitute:

"3.1 Material. The diesel fuels supplied under this specification shall be refined hydrocarbon distillate fuel oils containing additives in accordance with 3.2 The feed stock from which the diesel fuel is refined shall be crude oils derived from petroleum, tar sands, oil shale, or mixtures thereof."

- \* 3.2a, delete in its entirety.

PAGE 4

- \* 3.2.3, line 1, delete "OCONUS" and substitute "NATO F-54".

PAGE 5

- \* Table I, under column heading "Grade DF-2:", delete "CONUS" and OCONUS" and substitute "Standard" and NATO F-54", respectively.

PAGE 6

- \* Table I, footnote 6, line 2, delete "CONUS" and substitute "standard".

AMSC N/A

FSC 9140

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AMENDMENT 2

PAGE 8

- \* Table II, footnote 3, line 4, delete "CONUS" and substitute "standard".  
Line 5, delete "OCONUS".

PAGE 9

- \* 6.2g, delete "OCONUS" and substitute "NATO F-54".
- \* 6.4, delete in its entirety and substitute:

"6.4 NATO and non-NATO applications of grade DF-2. The requirements for F-54 grade DF-2 specified in table I are intended primarily for the acquisition of military diesel fuel in accordance with the STANAGS cited in 6.3. In CONUS and non-NATO areas overseas, standard DF-2 also may be used for military applications. If fuel meeting standard DF-2 requirements is not commercially available in non-NATO areas overseas, the contracting officer may permit limited waivers of the requirements in table I on a case-by-case basis to ensure adequate fuel availability."

The margins of the amendment are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletion) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

MILITARY INTEREST:

CIVIL AGENCY COORDINATING ACTIVITIES:

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DOT - NHT

HHS - FED, NIH

Army - ME

Navy - SH

Air Force - 68

Review activities:

Preparing Activity:

Army - ME

Army - AT, MI

Navy - YD

DLA - PS

User activities:

Project 9140-0124

Army - AR

Navy - MC