



Standard Specification for Marine Fuels¹

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This standard has been approved for use by agencies of the Department of Defense.

INTRODUCTION

This specification is intended to be technically equivalent to International Organization for Standardization, ISO 8217:1987(E), Petroleum Products—Fuels (Class F)—Specifications of Marine Fuels. The ASTM format for specifications has been used and, where possible, equivalent ASTM test methods have replaced the ISO standards.

The original ISO specification was prepared in cooperation with the marine and petroleum industries. The ISO specification gives the characteristics of marine fuels that are required worldwide for consumption aboard ships. Crude oil supplies, refining methods, ships' machinery, and local conditions vary considerably, so historically, a large number of residual fuels have been available. To cover the various possibilities, the ISO specification incorporates fifteen categories of residual fuel in addition to four categories of distillate fuel. The ISO designations for these nineteen categories of fuel have been retained in this test method.

1. Scope

1.1 This specification specifies the required properties at the time and place of custody transfer for petroleum fuels for marine use in diesel engines and boilers. It is for the guidance of interested parties such as marine equipment designers, and suppliers and purchasers of marine fuels.

1.2 This specification excludes marine fuels intended for gas turbine use. Gas turbine fuels for non-aviation use are covered by Specification D 2880 (or equivalent ISO 4261).

1.3 This specification does not imply the availability of all categories of fuel at all ports.

1.4 This specification shall not preclude observance of national or local regulations that may be more restrictive.

NOTE 1—This specification takes into account the international requirements for flash point as stated in the International Maritime Organization (IMO) Convention for Safety of Life at Sea (SOLAS) 1974, Amendment 1, Chapter II—2, Regulation 15.

1.5 The values stated in SI units are to be regarded as standard. The values stated in inch-pound units are for information only.

1.6 The following precautionary statement pertains to the test method portion only, Section 6, of this specification. *This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health*

practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:

D 93 Test Methods for Flash Point by Pensky-Martens Closed Cup Tester²

D 95 Test Method for Water in Petroleum Products and Bituminous Materials by Distillation²

D 97 Test Method for Pour Point of Petroleum Oils²

D 189 Test Method for Conradson Carbon Residue of Petroleum Products²

D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)²

D 473 Test Method for Sediment in Crude Oils and Fuel Oils by the Extraction Method²

D 482 Test Method for Ash from Petroleum Products²

D 524 Test Method for Ramsbottom Carbon Residue of Petroleum Products²

D 613 Test for Ignition Quality of Diesel Fuels by the Cetane Method³

D 1250 Guide for Petroleum Measurement Tables²

D 1298 Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method²

D 2500 Test Method for Cloud Point of Petroleum Oils²

¹ This specification is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.E0.07 on Marine Fuels.

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² Annual Book of ASTM Standards, Vol 05.01.

³ Annual Book of ASTM Standards, Vol 05.04.



- D 2880 Specification for Gas Turbine Fuel Oils⁴
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products⁴
- D 4176 Test Method for Free Water and Particulate Contamination in Distillate Fuels (Clear and Bright Pass/Fail Procedures)⁴
- D 4294 Test Method for Sulfur in Petroleum Products by Non-Dispersive X-Ray Fluorescence Spectrometry⁴
- D 4868 Test Method for Estimation of Net and Gross Heat of Combustion of Petroleum Fuels⁵

2.2 ISO Standards:

- ISO 91-1 Petroleum Measurement Tables—Part 1: Tables Based on Referenced Temperatures of 15°C and 60°F⁶
- ISO 2719 Petroleum Products—Determination of Flash Point—Pensky-Martens Closed Cup Method⁶
- ISO 3015 Petroleum Oils—Determination of Cloud Point⁶
- ISO 3016 Petroleum Oils—Determination of Pour Point⁶
- ISO 3104 Petroleum Products—Transparent and Opaque Liquids—Determination of Kinematic Viscosity and Calculation of Dynamic Viscosity⁶
- ISO 3170 Petroleum Products—Liquid Hydrocarbons—Manual Sampling⁶
- ISO 3675 Crude Petroleum and Liquid Petroleum Products—Laboratory Determination of Density or Relative Density—Hydrometer Method⁶
- ISO 3733 Petroleum Products and Bituminous Materials—Determination of Water—Distillation Method⁶
- ISO 3735 Crude Petroleum and Fuel Oils—Determination of Sediment—Extraction Method⁶
- ISO 4261 Petroleum Products—Fuel (Class F)—Specifications—Gas Turbine Fuels for Industrial and Marine Applications⁶
- ISO 4262 Petroleum Products—Determination of Carbon Residue—Ramsbottom Method⁶
- ISO 5165 Diesel Fuels—Determination of Ignition Quality—Cetane Method⁶
- ISO 6245 Petroleum Products—Determination of Ash⁶
- ISO 6615 Petroleum Products—Determination of Carbon Residue—Conradson Method⁶
- ISO 8216 Petroleum Products—Fuels (Class F)—Classification Part 0: General; Part 1: Categories of Marine Fuels⁶
- ISO 8217 Petroleum Products—Fuels (Class F)—Specifications of Marine Fuels⁶
- ISO 8754 Petroleum Products—Determination of Sulfur Content—Non-Dispersive X-Ray Fluorescence Method⁶

2.3 DIN Standard:

DIN 51 790, Part 2 (July 1978), Testing of Liquid Fuels; Determination of Vanadium Content—Analysis by X-Ray Spectrometry⁷

3. Classification

3.1 The marine fuels are classified into two types, distillate and residual fuels.

3.2 The basis for the classification in 3.1 is shown in Annex A1.

4. Materials and Manufacture

4.1 The fuels shall be blends of hydrocarbons derived from petroleum refining. This shall not preclude the addition of small amounts of additives intended to improve some aspect of performance. The fuels shall be free from inorganic acid.

NOTE 2—For the purpose of this test method, the term “petroleum” is used to include oil from tar sands and from shale.

5. Other Requirements

5.1 The various grades of marine distillate fuels shall conform to the limiting requirements shown in Table 1. A representative distillate fuel sample shall be taken for testing in accordance with Practice D 4057 (or equivalent ISO 3170).

5.2 The various grades of marine residual fuels shall conform to the limiting requirements shown in Table 2. A representative residual fuel sample shall be taken for testing in accordance with Practice D 4057 (or equivalent ISO 3170).

NOTE 3—Specific energy is not a part of this specification. If required, the net and gross heat of combustion can be estimated using Test Method D 4868.

6. Test Methods

6.1 The requirements enumerated in this specification shall be determined in accordance with the following ASTM or equivalent ISO test methods:

6.1.1 *Density*—Test Method D 1298 (or ISO 3675). For Table 2, Test Method D 1298 (or ISO 3675) shall be used at a temperature between 50 and 60°C and the hydrometer readings obtained converted to 15°C using Table 53 (b) (53 (b)) using inch-pound units) referred to in Guide D 1250 (or ISO 91-1).

6.1.2 *Viscosity*—Test Method D 445 (or ISO 3104).

6.1.3 *Flash Point*—Test Method D 93 (or ISO 2719).

6.1.4 *Pour Point*—Test Method D 97 (or ISO 3016).

6.1.5 *Cloud Point*—Test Method D 2500 (or ISO 3015).

6.1.6 *Carbon Residue*—Test Method D 189 (or ISO 6615) for marine residual fuels and Test Method D 524 (or ISO 4262)

⁴ Annual Book of ASTM Standards, Vol 05.02.

⁵ Annual Book of ASTM Standards, Vol 05.03.

⁶ Published by the International Organization for Standardization (ISO), Switzerland. Available from American National Standards Institute, 11 West 42nd St., 13th floor, NY, NY 10036.

⁷ Available from the Deutsches Institut für Normung (DIN), Berlin.