Doc No.: PCD 03 (22730) WC
June 2023

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Draft Indian Standard

FUEL OILS - SPECIFICATION

(*Fourth Revision*)

(ICS 75.160.20)

Petroleum and their Related Products of Synthesis or Biological Origin, PCD 3	Last date for comments **22 August 2023**

FOREWORD

(*Formal clauses to be added later*)

This standard was originally published in 1960 and subsequently revised in 1971. The second revision was formulated in 1982 in which the requirements for pour point, as optional requirement agreed to between the purchaser and the supplier, and relative density were incorporated.

The third revision was carried out in 2018 after the review of the standard considering requirements of fuel oils for various end uses. In this revision, test parameters like asphaltene content, total sediment and cleanliness spot test were incorporated as optional requirements, as agreed to between the purchaser and the supplier, and requirement of carbon residue was also added. Further, the special requirement for naval use, which was mentioned in **4** and Note 2 below Table 1 in second revision, was removed because a separate specification - ISO 8217 - existing for marine fuels.

This fourth revision is being carried out to update the test method references for the requirements set out in the standard. Also, few editorial corrections have been made and unit of measurement for gross calorific value has been included.

This standard contains clauses **4.2** to **4.5** which calls for an agreement between the purchaser and the supplier.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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FUEL OILS - SPECIFICATION

(*Fourth Revision*)

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for fuel oils, essentially residual in character, for industrial uses. These fuel oils are primarily intended for oil fired furnaces. The low viscosity grade oil is suitable for use as diluents for creosote.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text constitute the provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standard.

3 GRADES

There shall be following four grades of the material:

a) Grade LV : Low viscosity
b) Grade MV1 : Medium viscosity
c) Grade MV2 : Medium viscosity
d) Grade HV : High viscosity

4 REQUIREMENTS

4.1 General

The material shall be hydrocarbon oil derived from petroleum or shale. This, however, shall not preclude the incorporation of small amounts of additives of hydrocarbon or non-hydrocarbon origin intended to improve ignition, combustion or other characteristics.

4.1.1 The material shall be free from grit and other foreign impurities.

4.2 Pour Point

The pour point of the fuel oil, when tested as per IS 1448 (Part 10/Sec 2), shall be as agreed to between the purchaser and the supplier.

4.3 Asphaltene Content

The asphaltene content of the fuel oil, when tested as per IS 1448 (Part 22) or ASTM D6560 or IP 143, shall be as agreed to between the purchaser and the supplier.

4.4 Total Sediment

The total sediment content in the fuel oil, when tested as per ISO 10307 (Part 1) or ISO 10307 (Part 2) or ASTM D4870, shall be as agreed to between the purchaser and the supplier.

4.5 Spot Test

The requirement for spot test of the fuel oil, when tested as per ASTM D4740, shall be as agreed to between the purchaser and the supplier.

4.6 The fuel oil shall also comply with the requirements prescribed in Table 1, when tested according to the appropriate methods given in col 7 of Table 1.

Table 1 Requirements for Fuel Oils
(*Clause* 4.6)

Sl No.	Characteristic	Requirement				Method of Test, Parts of IS 1448 / ISO / ASTM / IP
		Grade LV	Grade MV1	Grade MV2	Grade HV	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Acidity, inorganic	Nil	Nil	Nil	Nil	ASTM D974[1)] / IP 139
ii)	Ash, percent by mass, *Max*	0.1	0.1	0.1	0.1	IS 1448 (Part 4/Sec 1)[1)] / ASTM D482
iii)	Carbon residue, mass percent, *Max*	14	16	18	20	IS 1448 (Part 122) / ISO 10370[1)] / IP 13 / IP 398 / ASTM D4530
iv)	Gross calorific value, cal/g	Not limited, but to be reported[2)]				IS 1448 (Part 6)[1)] / IS 1448 (Part 7)
v)	Density at 15 °C or Relative density at 15.6/15.6 °C, kg/m^3	Not limited, but to be reported[2)]				IS 1448 (Part 16) / IS 1448 (Part 32) / ASTM D1298 / ASTM D4052
vi)	Flash point (Pensky Martens (closed), °C, *Min*	66	66	66	66	IS 1448 (Part 21)[1)] / ASTM D93 (Procedure B)
vii)	Kinematic viscosity at 50 °C, cSt	80 (*Max*)	80 – 125	125 – 180	180- 380	IS 1448 (Part 25/Sec 1)[1)] / ASTM D7042 / ASTM D445
viii)	Sediment, percent by mass, *Max*	0.25	0.25	0.25	0.25	IS 1448 (Part 30)[1)] / ASTM D473
ix)	Sulphur, total, percent by mass, *Max*[3)]	3.5	4.0	4.0	4.5	IS 1448 (Part 33) / ISO 8754[1)] / ASTM D4294 / ASTM D2622
x)	Water content, percent by volume, *Max*	1.0	1.0	1.0	1.0	IS 1448 (Part 40)[1)] / ASTM D95

[1)] In case of dispute, this method shall be referee method

[2)] Normally the gross calorific value is of the order of 10 000 cal/g

[3)] Recognizing the necessity for low-sulphur fuel oils in some specialized uses, a lower limit may be agreed to between purchaser and supplier by mutual agreement
between the purchaser and the supplier.

5 PACKING AND MARKING

5.1 Packing

The fuel oil shall be packed in suitable containers as agreed to between the purchaser and the supplier, and subject to the provisions of *Railways Red Tariff Rules* and *Red Tariff No. 20* issued by the Indian Railways Conference Association along with any future amendments.

5.2 Marking

5.2.1 The material shall be supplied in accordance with the marking and delivery instructions given by the purchaser.

5.2.2 Each container shall be marked with the following information:

a) Name and grade of the material;
b) Manufacturers' name and trade-mark;
c) Volume of the contents in litres; and
d) Year of manufacture or packing.

5.2.3 *BIS Certification Marking*

Each container may also be marked with the Standard Mark.

5.2.3.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 2016 and the rules and regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6 SAMPLING

6.1 Representative samples of the material shall be drawn as prescribed in IS 1447 (Part 3).

6.2 All the requirements given in this specification shall be tested on the composite sample.

6.3 The lot shall be declared as conforming to the requirements of this specification, if all the test results on the composite sample meet the corresponding specification requirements.

ANNEX A

(*Clause* 2)

REFERENCES

IS /International Standard No.	***Title***
IS 1447 (Part 3) : 2021	Methods of sampling of petroleum and its products Part 3 Method of sampling of semi-solid and solid petroleum products (*second revision*)
IS 1448 (Part 4/Sec 1) : 2021	Methods of test for petroleum and its products Part 4/Sec 1 Determination of ash
IS 1448 (Part 6) :1984	Methods of test for petroleum and its products Part 6 Heat of combustion of liquid hydrocarbon fuels by bomb calorimeter method (*first revision*)
IS 1448 (Part 7) : 2004	Methods of test for petroleum and its products Part 7 Determination of calorific value by calculation (*first revision*)
IS 1448 (Part 10/Sec 2) : 2021 / ISO 3016 : 2019	Methods of test for petroleum and its products Part 10 Petroleum and related products from natural or synthetic sources Section 2 Determination of pour point
IS 1448 (Part 16) : 2014 / ISO 3675 : 1998	Methods of test for petroleum and its products Part 16 Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method (*fourth revision*)
IS 1448 (Part 21) : 2019 / ISO 2719 : 2016	Methods of test for petroleum and its products Part 21 Determination of flash point — Pensky- martens closed cup method (*fourth revision*)
IS 1448 (Part 22) : 2019	Methods of test for petroleum and its products Part 22 Determination of asphaltenes (heptane insolubles) in crude petroleum and petroleum products (*third revision*)
IS 1448 (Part 25/Sec 1) : 2018 / ISO 3104 : 1994	Methods of test for petroleum and its products Part 25 Transparent and opaque liquids Section 1 Determination of kinematic viscosity and calculation of dynamic viscosity (*second revision*)
IS 1448 (Part 30) : 2013 / ISO 3735 : 1999	Methods of test for petroleum and its products Part 30 Crude petroleum and fuel oils — Determination of sediment — Extraction method (*second revision*)
IS 1448 (Part 32) : 2019 / ISO 3838 : 2004	Methods of test for petroleum and its products Part 32 Crude petroleum and liquid or solid petroleum products — Determination of density or relative density — Capillary stoppered pyknometer and graduated bicapillary pyknometer methods (*third revision*)

IS 1448 (Part 33) : 2021	Methods of test for petroleum and its products Part 33 Sulphur by high pressure decomposition device method (*third revision*)
IS 1448 (Part 40 : 2015 / ISO 3733 : 1999	Methods of test for petroleum and its products Part 40 Petroleum products and bituminous materials — Determination of water — Distillation method (*fourth revision*)
IS 1448 (Part 122) : 2013 / ISO 6615 : 1993	Methods of test for petroleum and its products Part 122 Determination of carbon residue — Conradson method (*first revision*)
ISO 8754 : 2003	Petroleum products — Determination of sulfur content — Energy-dispersive X-ray fluorescence spectrometry
ISO 10307-1 : 2009	Petroleum products — Total sediment in residual fuel oils — Part 1 Determination by hot filtration
ISO 10307-2 : 2009	Petroleum products — Total sediment in residual fuel oils — Part 2 Determination using standard procedures for ageing
ISO 10370 : 2014	Petroleum products — Determination of carbon residue — Micro method
ASTM D93	Standard test methods for flash point by pensky-martens closed cup tester
ASTM D95	Standard test method for water in petroleum products and bituminous materials by distillation
ASTM D445	Standard test method for kinematic viscosity of transparent and opaque liquids (and calculation of dynamic viscosity)
ASTM D473	Standard test method for sediment in crude oils and fuel oils by the extraction method
ASTM D482	Standard test method for ash from petroleum products
ASTM D974	Standard test method for acid and base number by color-indicator titration
ASTM D1298	Standard test method for density, relative density, or api gravity of crude petroleum and liquid petroleum products by hydrometer method
ASTM D2622	Standard test method for sulfur in petroleum products by wavelength dispersive x-ray fluorescence spectrometry
ASTM D4052	Standard test method for density, relative density, and api gravity of liquids by digital density meter
ASTM D4294	Standard test method for sulfur in petroleum and petroleum products by energy dispersive x-ray fluorescence spectrometry

ASTM D4530	Standard test method for determination of carbon residue (micro method)
ASTM D4870	Standard test method for determination of total sediment in residual fuels
ASTM D6560	Standard test method for determination of asphaltenes (heptane insolubles) in crude petroleum and petroleum products
ASTM D7042	Standard test method for dynamic viscosity and density of liquids by stabinger viscometer (and the calculation of kinematic viscosity)
IP 13	Petroleum products - Determination of carbon residue - Conradson method
IP 143	Determination of asphaltenes (heptane insolubles) in crude petroleum and petroleum products
IP 139	Petroleum products and lubricants - Determination of acid or base number - Colour-indicator titration method
IP 398	Petroleum products - Determination of carbon residue - Micro method