



Government
of Canada

Gouvernement
du Canada

Canadian General
Standards Board

Office des normes
générales du Canada

CGSB-3.11-2017

Supersedes CGSB-3.11-2010

CGSB Standard

Naval distillate fuel

Canadian General Standards Board 

Canada 

Experience and excellence

Expérience et excellence



The CANADIAN GENERAL STANDARDS BOARD (CGSB), under whose auspices this standard has been developed, is a government agency within Public Services and Procurement Canada. CGSB is engaged in the production of voluntary standards in a wide range of subject areas through the media of standards committees and the consensus process. The standards committees are composed of representatives of relevant interests including producers, consumers and other users, retailers, governments, educational institutions, technical, professional and trade societies, and research and testing organizations. Any given standard is developed on the consensus of views expressed by such representatives.

CGSB has been accredited by the Standards Council of Canada as a national standards-development organization. The standards that it develops and offers as National Standards of Canada conform to the criteria and procedures established for this purpose by the Standards Council of Canada. In addition to standards it publishes as National Standards of Canada, CGSB produces standards to meet particular needs, in response to requests from a variety of sources in both the public and private sectors. Both CGSB standards and CGSB national standards are developed in conformance with the policies described in the CGSB Policy and Procedures Manual for the Development and Maintenance of Standards.

CGSB standards are subject to review and revision to ensure that they keep abreast of technological progress. CGSB will initiate the review of this standard within five years of the date of publication. Suggestions for their improvement, which are always welcome, should be brought to the notice of the standards committees concerned. Changes to standards are issued either as separate amendment sheets or in new editions of standards.

An up-to-date listing of CGSB standards, including details on latest issues and amendments, and ordering instructions, is found in the CGSB Catalogue at our Web site — www.tpsgc-pwgsc.gc.ca/ongc-cgsb/index-eng.html along with more information about CGSB products and services.

Although the intended primary application of this standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

The testing and evaluation of a product against this standard may require the use of materials and/or equipment that could be hazardous. This document does not purport to address all the safety aspects associated with its use. Anyone using this standard has the responsibility to consult the appropriate authorities and to establish appropriate health and safety practices in conjunction with any applicable regulatory requirements prior to its use. CGSB neither assumes nor accepts any responsibility for any injury or damage that may occur during or as the result of tests, wherever performed.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. CGSB shall not be held responsible for identifying any or all such patent rights. Users of this standard are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

Language

In this Standard, “shall” states a mandatory requirement, “should” expresses a recommendation and “may” is used to express an option or that which is permissible within the limits of this Standard. Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material. Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

Further information on CGSB and its services and standards may be obtained from:

The Manager
Standards Division
Canadian General Standards Board
Gatineau, Canada
K1A 1G6

How to order **CGSB** Publications:

- by telephone — 819-956-0425 *or*
— 1-800-665-2472
- by fax — 819-956-5740
- by mail — CGSB Sales Centre
Gatineau, Canada
K1A 1G6
- in person — Place du Portage
Phase III, 6B1
11 Laurier Street
Gatineau, Quebec
- by email — ncr.cgsb-ongc@tpsgc-pwgsc.gc.ca
- on the Web — www.tpsgc-pwgsc.gc.ca/ongc-cgsb/index-eng.html

Naval distillate fuel

CETTE NORME DE L'ONGC EST DISPONIBLE EN VERSIONS
FRANÇAISE ET ANGLAISE.

ICS 75.160.20

Prepared by the
Canadian General Standards Board **CGSB**

Published February 2017 by the
Canadian General Standards Board
Gatineau, Canada K1A 1G6

© HER MAJESTY THE QUEEN IN RIGHT OF CANADA,
as represented by the Minister of Public Services and Procurement,
the Minister responsible for the Canadian General Standards Board, (2017).

No part of this publication may be reproduced in any form without the prior permission of the publisher.

CANADIAN GENERAL STANDARDS BOARD
Committee on Middle Distillate Fuels

(Voting membership at date of approval)

Chair (Voting)

Mitchell, K. Shell Canada (Producer)

General interest category

Hanganu, A. Inspectorate Canada
Hérsant, G. Oleotek Inc.
Jääskeläinen, H. Consultant
Jacula, T. Maxxam Analytics Inc.
MacLean, G. Intertek Commodities Division
Menard, L. Advanced Engine Technology Ltd.
Moser, P. Saskatchewan Research Council
Pama, M. Certispec Services Inc.
Pickard, A.L. Consultant
Talbot, R. Natural Resources Canada
Tharby, R.D. Tharby Technology, Consultants
Wispinski, D. InnoTech Alberta

Producer category

Campbell, S. Advanced Biofuels Canada
Cosentino, J. Afton Chemical Corporation
Geoffroy, L. Valero Energy Inc.
Gropp, R. GE Water and Process Technologies
McKnight, A. Innospec Inc.
Morel, G. Canadian Fuels Association
Munroe, D. Suncor Energy Products Partnership
Paik, N. Biox Corporation
Payne, J.P. Infineum Canada Ltd.
Pierceall, R. Archer Daniels Midland
Porter, S. Renewable Industries Canada
Rickard, A. Rothsay
Rockwell, G. Imperial Oil Ltd.
Taracha, J. The Lubrizol Corporation
Tetreault, D. Baker Hughes
Titus, J. Irving Oil Ltd.
Vezeau, C. Husky Energy
White, M. North Atlantic

Regulator category

Archambault, R.	Gouvernement du Québec, ministère de l'Énergie et des Ressources naturelles
Parsons, R.	Government of Manitoba, Innovation, Energy and Mines
Rensing, M.J.	Government of British Columbia, Ministry of Energy and Mines

User category

Briggs, D.	Government of the Northwest Territories, Public Works and Services
Bryksaw, G.	General Motors of Canada Company
Chabot, D.	Canadian Coast Guard
Cooper, S.	Government of Nunavut
Cowan, B.	Government of Ontario, Ministry of Transportation
Kilso, R.	Finning Canada
Lemieux, J.	Public Services and Procurement Canada
Poitras, P.	National Defence
Wilson, S.	Canadian Oil Heat Association

Secretary (non-voting)

Schuessler, M.	Canadian General Standards Board
----------------	----------------------------------

Acknowledgment is made for the translation of this CGSB Standard by the Translation Bureau of Public Services and Procurement Canada.

Contents

Page

1 **Scope**..... 1

2 **Normative references**..... 1

3 **Terms and definitions** 2

4 **Classification** 3

5 **General requirements** 3

6 **Detailed requirements**..... 3

7 **Inspection**..... 7

8 **Options** 7

9 **Precautions** 8

Annex A (normative) Referenced ASTM International publications 10

Annex B (informative) Federal regulations applicable to diesel fuels 13

Naval distillate fuel

1 Scope

This standard applies to two types of middle distillate fuel, Type 11 and Type 15 (corresponding to military grades F-76 and F-75 respectively), that are suitable for marine (naval) applications such as gas turbine power plants, high-speed and medium-speed internal combustion engines of the compression-ignition type, and boilers. Fuel produced to this standard is not intended for use in aircraft turbine engines.

This standard describes two military grade fuels normally used in naval operations whose product parameters are influenced by international military standardization agreements. F-76 and F-75 are NATO code numbers for products conforming to this standard. It may also be suitable for non-military use.

Type 11 is intended for equipment operating at an ambient temperature of -1°C or above. This grade is the primary fuel for naval requirements.

Type 15¹ is intended for use in equipment operating at an ambient temperature above -12°C .

Subject to purchaser approval, for designated DND vessels in non-combat use, CAN/CGSB-3.517 or CAN/CGSB-3.520 may be applicable for use. Other marine vessel users outside of the Department of National Defence may refer to ISO 8217, which include grades that allow up to 7.0 volume % of Fatty Acid Methyl Ester(s) (FAME).

See Annex B for regulations that apply to diesel fuels.

The testing and evaluation of a product against this standard may require the use of materials and/or equipment that could be hazardous. This document does not purport to address all the safety aspects associated with its use. Anyone using this standard has the responsibility to consult the appropriate authorities and to establish appropriate health and safety practices in conjunction with any applicable regulatory requirements prior to its use.

2 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this CGSB Standard. The referenced documents may be obtained from the sources noted below.

NOTE The addresses provided below were valid at the date of publication of this standard.

An undated reference is to the latest edition or revision of the reference or document in question, unless otherwise specified by the authority applying this standard. A dated reference is to the specified revision or edition of the reference or document in question.

¹ Prior to 1996, this grade was described in CGSB standard 3-GP-15Mb, *Naval distillate fuel (-18° Pour)*.

2.1 Canadian General Standards Board (CGSB)

CAN/CGSB 3.0 – *Methods of testing petroleum and associated products:*

No. 20.9 – *CGSB Cetane index of diesel fuels*

No. 28.8 – *Visual haze rating of liquid fuels*

CAN/CGSB-3.517 – *Diesel fuel*

CAN/CGSB-3.520 – *Diesel fuel containing low levels of biodiesel (B1–B5).*

2.1.1 Source

The above may be obtained from the Canadian General Standards Board, Sales Centre, Gatineau, Canada K1A 1G6. Telephone 819-956-0425 or 1-800-665-2472. Fax 819-956-5740. E-mail ncr.cgsb-ongc@tpsgc-pwgsc.gc.ca. Web site www.tpsgc-pwgsc.gc.ca/ongc-cgsb/index-eng.html.

2.2 ASTM International

Annual Book of ASTM Standards (see Annex A).

2.2.1 Source

The above may be obtained from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, U.S.A., telephone 610-832-9585, fax 610-832-9555, Web site www.astm.org, or from IHS Markit, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1-800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

2.3 International Standardization Organization (ISO)

ISO 8217 — *Petroleum products — Fuels (class F) — Specifications of marine fuels.*

2.3.1 Source

The above may be obtained from IHS Markit, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1-800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

2.4 SAE International

SAE Paper 952370 — *The lubricity of winter diesel fuels*

SAE Paper 961180 — *The lubricity of winter diesel fuels — Part 2: pump rig test results*

SAE Paper 981363 — *Continued evaluation of diesel fuel lubricity by Pump Rig Tests.*

2.4.1 Source

The above may be obtained from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, U.S.A., telephone 877-606-7323, fax 724-776-0790, Web site www.sae.org/servlets/index.

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1 distillate diesel fuel

middle distillate fuel composed of hydrocarbons and naturally occurring, petroleum-derived, non-hydrocarbons that boils in the range of 130°–400 °C and that is intended for use as a fuel in compression-ignition engines.

3.2 representative fuel

sample of fuel with inspection properties that are typical of the fuel as commercially supplied.

4 Classification

4.1 The naval distillate fuel shall be supplied in the following types, as specified (see 8.1):

4.1.1 Types

Type 11

Type 15

5 General requirements

5.1 The fuels specified shall be hydrocarbons that may contain additives (see 6.1 and 6.34) designed to improve their properties or performance, for example, diesel ignition quality, low-temperature flow properties and static charge dissipation. Fatty Acid Alkyl Esters (FAAE), including Fatty Acid Methyl Esters (FAME) are not an approved component. The amount of incidental FAME (as defined by ASTM D6751 or CAN/CGSB-3.524) shall not exceed 0.1% volume. Producers, distributors and users need to take appropriate precautions to avoid contamination. The supplier shall establish the need to test for FAME based on various risk factors that can lead to FAME contamination.

5.2 The fuel shall be a stable homogeneous liquid free from foreign matter likely to clog filters or nozzles, or to damage equipment.

5.3 There shall be no intentional addition of used lubricating oils, used solvents, unconverted triglycerides (such as raw vegetable oils, animal fats, fish oils or used cooking oils), or other fluids that are not normal components of the fuel.

6 Detailed requirements

6.1 Additives may be incorporated into the fuel to improve the performance characteristics, for example, static charge dissipation, low temperature flow properties, ignition quality, and oxidation stability. Dyes may be used for identification purposes and a lubricity additive is used to meet lubricity requirements.

6.2 Specified limiting values

6.2.1 The fuel shall comply with the specified limiting values. The specified limiting values shall not be changed. This precludes any allowances for the test method precision and for adding or subtracting digits.

6.2.2 For purposes of determining conformance with the specified limiting values, an observed value or a calculated value shall be rounded off “to the nearest unit” in the last right-hand digit used in expressing the specified limiting value, in accordance with the rounding-off method of ASTM E29. There is one exception (see 6.4 and 6.23).

6.2.3 Where test values differ between two parties, a resolution shall be in accordance with ASTM D3244 in order to determine conformance with the specified limiting values, with the criticality of the limits set at $P = 0.5$.

6.2.4 Zeroes trailing the last nonzero digit for numbers represented with a decimal point are significant digits, in accordance with ASTM E29.

6.3 Test methods

6.3.1 Test methods other than those referenced in this standard may be used only if they have been validated in accordance with ASTM D3764 or D6708.

6.3.2 Validated test methods shall correlate with methods referenced in the standard. Differences in precision, sensitivity and bias between methods referenced in the standard and the validated methods shall be noted when using results from validated methods.

6.3.3 Validated test methods shall only be used within the bounds of the data covered in their validation.

6.3.4 In the event of a dispute, the procedures given in 6.2 shall be used.

6.3.5 If parties in a dispute cannot agree on an analytical method to resolve the dispute, the referee method listed in the standard shall be used.

Specified limiting values			
Property	Min.	Max.	Test method
			ASTM
6.4 Flash point, °C (see 6.23 and 8.2)	60.0	—	D93 ^a , D7094 or D3828 ^b
6.5 Kinematic viscosity at 40°C, mm ² /s (cSt) ^{c, d}	1.7	4.3	D445 ^a or D7042
6.6 Density at 15°C, kg/m ³	800.0	880.0	D1298 or D4052 ^a
6.7 Distillation, 90% recovered, (see 6.25) °C	—	360.	D86 ^a , D2887 or D7345
6.8 Water and sediment, % by volume (see 6.26)	—	0.02	D1796 ^a (modified) or D2709
6.9 Carbon residue on 10% bottoms, % by mass (see 6.27)	—	0.2	D524 or D4530 ^a
6.10 Ash, % by mass	—	0.005	D482
6.11 Cloud point, °C (see. 6.28) a) Type 11 b) Type 15	— —	-1 -12	D2500 or D5773 ^a
6.12 Pour point, °C a) Type 11 (see 6.28) b) Type 15	— —	-6 -18	D97 or D5949 ^a

Specified limiting values				
Property	Min.	Max.	Test method	
			ASTM	
6.13	Ignition quality, cetane number (see 6.30)	40.0	—	D613 ^a , D6890, D7170 or D7668
6.14	Sulphur ^e , mg/kg	—	15	D2622, D5453 ^a or D7039
6.15	Strong acid number, mg KOH/g	—	Nil	D974
6.16	Acid number, mg KOH/g	—	0.30	D664 or D974 ^a
6.17	Storage stability, total insolubles, mg/100 mL	—	1.5	D2274
6.18	Colour, ASTM (see 6.32 and 8.1)	—	3.0	D1500 ^a or D6045
6.19	Copper strip corrosion, 3 h at a minimum test temperature of 50 °C	—	No. 1	D130
6.20	Electrical conductivity, at point, time and temperature of delivery to purchaser, pS/m (see 9.1)	25	—	D2624
6.21	Lubricity	See 6.34 and 6.35		—
6.22	Water separability, separation time, min (see 6.33)	—	10.	D1401
<p>^a The referee method to be used in the event of a dispute.</p> <p>^b The results obtained by ASTM D3828 can be more than to 2°C lower than those obtained by ASTM D93, the referee method.</p> <p>^c The SI unit for kinematic viscosity is the square metre per second. The preferred multiple for fluids in the viscosity range is the square millimetre per second, which is equivalent to a centiStokes (i.e. 1mm²/s = 1 cSt).</p> <p>^d If the fuel is designed for an operability temperature of -10°C or colder, then the minimum viscosity shall be 1.50 cSt. If the fuel is designed for an operability temperature of -20°C or colder, then the minimum viscosity shall be 1.30 cSt.</p> <p>^e Maximum limit may be higher for some applications when allowed by federal regulation.</p>				

6.23 Flash point

The test values shall be reported to the nearest 0.5°C in accordance with ASTM D93 or D3828. In the event of a dispute, ASTM D93 shall be the referee test method.

6.24 Kinematic viscosity

Only bias-corrected values from ASTM D7042 may be used as an alternate to ASTM D445.

6.25 Distillation

Testing shall be in accordance with ASTM D86, D2887 or D7345. When testing in accordance with ASTM D2887, use the method in the appendix to convert the results to estimates of ASTM D86. Only bias-corrected values from ASTM D7345 may be used as an alternate to ASTM D86. In the event of a dispute, the automated method of ASTM D86 shall be the referee test method.

6.26 Water and sediment

Testing shall be conducted in accordance with ASTM D1796 (modified) or D2709. The test in ASTM D1796 shall be modified by substituting the centrifuge tube specified in ASTM D2273 for that in ASTM D1796. In the event of a dispute, ASTM D1796 (modified) shall be the referee test method.

6.27 Carbon residue

Testing should be performed prior to the addition of any additives to the fuel. ASTM D524 may be used as an alternative test to ASTM D4530. In the event of a dispute, ASTM D4530 shall be the referee test method.

6.28 Cloud point

Type 11 fuel for use on the Atlantic coast from October 1 to April 1 shall have a maximum cloud point of -4°C .

6.29 Pour point

Type 11 fuel for use on the Atlantic coast from October 1 to April 1 shall have a maximum pour point of -9°C .

6.30 Ignition quality

Testing shall be conducted in accordance with ASTM D613, D6890, D7170 or D7668. The calculated cetane index according to ASTM D976 or D4737, CAN/CGSB-3.0 No. 20.9 or other calculation techniques that approximate cetane number by ASTM D613, may be used for control purposes. The user should refer to the appropriate test method. Calculation techniques should not be used for determining the ignition quality of field fuel samples if they are suspected of containing cetane improver additives. In the event of a dispute, ASTM D613 shall be the referee test method.

6.31 Sulphur

Testing shall be conducted in accordance with ASTM D2622, D5453 or D7039. In the event of a dispute, ASTM D5453 shall be the referee test method.

6.32 Colour

The colour shall be determined before the addition of a dye and as specified (see 8.1). See also 6.34.

6.33 Water separability

When tested in accordance with ASTM D1401, complete separation shall occur within 10 min in the following proportions: fuel:water:emulsion in millilitres (40:40:0). Disregard a trace of lacy interface between the fuel and water layers. Perform the test at 25°C using synthetic seawater prepared in accordance with ASTM D665. See also 6.34.

6.34 Additives

6.34.1 If an additive is required, the supplier shall ensure that the purchaser provides approval prior to their use, unless otherwise specified (see 6.35, 6.36, and 8.1).

6.34.2 The supplier shall ensure that additized fuel meets the water separability requirement of this standard (see 6.22 and 6.33).

6.34.3 The supplier shall report any additive usage and its dosage, unless otherwise specified (see 8.1).

6.35 Lubricity

The fuel shall meet any one of the lubricity criteria listed in 6.36.1 through 6.36.3 (see 6.34.1). A lubricity additive may be incorporated in the fuel to meet this requirement.

6.36 Lubricity additive requirements

If a lubricity additive is required (see 6.35), its dosage shall be shown to provide acceptable lubricity performance in a representative fuel (see 3.2) and to give **acceptable** lubricity performance in accordance with **any one** of the following criteria to the purchaser:

6.36.1 Pump wear with a representative fuel in a distributor-type diesel fuel injection pump in a vehicle field test

The required vehicle field test methodology is described in SAE Paper 952370. An acceptable pump-wear result is defined as an overall pump rating of 4.0 or less using the rating method described in SAE Paper 961180.

6.36.2 Pump wear with a representative fuel in a distributor-type diesel fuel injection pump rig test

The required pump rig test methodology is described in SAE Paper 981363. SAE Papers 961180 and 952370 provide additional background information. An acceptable pump-wear result is defined as an overall pump rating of 4.0 or less using the rating method described in SAE Papers 981363 and 961180.

6.36.3 Lab bench test results with a representative fuel using the high frequency reciprocating rig test

The required high frequency reciprocating rig test is described in ASTM D6079 and D7688, and shall be run at 60°C. An acceptable test result is defined as a wear scar diameter of less than, or equal to, 520 µm at 60°C. In the event of a dispute, ASTM D7688 shall be the referee test method for this criterion.

7 Inspection

7.1 Sampling

7.1.1 Sampling equipment and procedures shall be designed and used to obtain representative samples of a product. Sampling lines, hose volumes, etc. should be adequately flushed prior to taking a sample. Procedures shall be in accordance with ASTM D4057, D4177 or D5854.

7.1.2 Sample volume should be consistent with the requirement of the testing laboratory or the authority having jurisdiction or both. Unless otherwise specified (see 8.1), or the amount required is not known, a sample of at least 2.7 L shall be collected.

8 Options

8.1 The following options shall be specified in the application of this standard:

- a) Type of fuel (see 4.1.1)
- b) Dye requirement (see 6.18 and 6.34)

- c) Requirement for purchaser pre-approval of additives (see 6.34.1)
- d) Requirement to report on additive usage and dosage to the purchaser (see 6.34.1.)
- e) Sample size (see 7.1.2), if other than 2.7 L.

8.2 NATO codes

Products complying with the requirements for Type 11 or Type 15 will comply with NATO F-76 or F-75, respectively.

9 Precautions

9.1 Conductivity depletion

Due to the normal depletion of fuel conductivity during commingling, storage, and distribution, or at low temperatures, the fuel should be sufficiently treated with a conductivity-improver additive to ensure that the electrical conductivity requirement in 6.20 is met. The temperature at the point of use and the method of distribution could require a substantially **higher** conductivity level than 25 pS/m at the point of additive treatment. For more information, refer to ASTM D4865 and D2624.

9.2 Fuel lubricity

Processes used to desulphurize diesel fuel reduce the natural lubricating qualities of the diesel fuel. Since engines require the diesel fuel to act as a lubricant for their injection systems, the diesel fuel shall have sufficient lubricity to give adequate protection against excessive injection system wear. Additives are used to improve diesel fuel lubricity. Lubricity additives can have unwanted side effects particularly when used at excessive concentrations or in combination with other additives or contaminants.

9.3 Manufacturing processes

Contamination from manufacturing processes or treatments can be carried over in trace quantities into the fuel and cause unexpected problems. Moreover, these contaminants might not be detected by the requirements listed in this standard. It is recommended that adequate quality assurance procedures be put in place to ensure that manufacturing processes capable of such contamination are identified and controlled. Sodium, calcium, chlorides, sulphates, clay, sand, acids, caustics, soaps, and amine process additives are examples of possible contaminants or potential precipitates.

9.4 Visual haze

The solubility of water in fuel is a function of temperature. When fuel is exposed to low ambient temperatures, water can separate causing a haze or cloudy appearance. It has been a common industry practice to perform the visual haze test at 4°C for fuel destined for use in winter and at 15°C for fuel destined for use in summer. Experience has indicated that fuel passing these requirements has been acceptable in the appropriate season. For further information on the visual haze test, refer to CAN/CGSB-3.0 No. 28.8 or to ASTM D4176, Procedure 2.

9.5 Fuel flammability

A number of properties shall be considered in assessing the overall flammability hazard of a fuel. Flash point is the minimum fuel temperature at which a mixture of air and fuel vapour can form and be ignited by a spark or flame under specified laboratory conditions. However, the flash point is only an indication of the potential flammability risk of a fuel. Oxygen concentration in the atmosphere is an additional factor affecting flammability. Investigation of fuel related fires in marine vessel engine rooms and underground mining applications has shown that these fires are generally initiated through direct contact of a fuel spray or spill with hot surfaces having a temperature exceeding the auto-ignition temperature of the fuel. The flash point of the fuel has little bearing on the probability of such fires occurring. Similarly, fires in fuel tanks are typically initiated as a result of hot work (e.g., welding) on the exterior surface of the tank causing fuel adhering to the interior tank wall surface to evaporate and spontaneously ignite after having exceeded its auto-ignition temperature.

9.6 Hydrogen sulphide

Hydrogen sulphide (H_2S) can occasionally be found in limited concentration in the vapour phase above diesel fuels. H_2S is toxic at low concentrations in air. Additives are available that can react with H_2S in the liquid phase and reduce the concentration of H_2S both in the fuel and in the vapour phase.

Annex A
(normative)

Referenced ASTM International publications (see 2.2)

Annual Book of ASTM Standards

- D86 Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure
- D93 Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester
- D97 Standard Test Method for Pour Point of Petroleum Products
- D130 Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test
- D445 Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
- D482 Standard Test Method for Ash from Petroleum Products
- D524 Standard Test Method for Ramsbottom Carbon Residue of Petroleum Products
- D613 Standard Test Method for Cetane Number of Diesel Fuel Oil
- D664 Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration
- D665 Standard Test Method for Rust-Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water
- D974 Standard Test Method for Acid and Base Number by Color-Indicator Titration
- D976 Standard Test Methods for Calculated Cetane Index of Distillate Fuels
- D1298 Standard Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method
- D1401 Standard Test Method for Water Separability of Petroleum Oils and Synthetic Fluids
- D1500 Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)
- D1796 Standard Test Method for Water and Sediment in Fuel Oils by the Centrifuge Method (Laboratory Procedure)
- D2273 Standard Test Method for Trace Sediment in Lubricating Oils
- D2274 Standard Test Method for Oxidation Stability of Distillate Fuel Oil (Accelerated Method)
- D2500 Standard Test Method for Cloud Point of Petroleum Products
- D2622 Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry
- D2624 Standard Test Methods for Electrical Conductivity of Aviation and Distillate Fuels
- D2709 Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge

- D2887 Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography
- D3244 Standard Practice for Utilization of Test Data to Determine Conformance with Specifications
- D3764 Standard Practice for Validation of the Performance of Process Stream Analyzer Systems
- D3828 Standard Test Methods for Flash Point by Small Scale Closed Cup Tester
- D4052 Standard Test Method for Density and Relative Density of Liquids by Digital Density Meter
- D4057 Standard Practice for Manual Sampling of Petroleum and Petroleum Products
- D4176 Standard Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedure)
- D4177 Standard Practice for Automatic Sampling of Petroleum and Petroleum Products
- D4530 Standard Test Method for Determination of Carbon Residue (Micro Method)
- D4737 Standard Test Method for Calculated Cetane Index by Four Variable Equation
- D4865 Standard Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems
- D5453 Standard Test Method for Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence
- D5773 Standard Test Method for Cloud Point of Petroleum Products (Constant Cooling Rate Method)
- D5854 Standard Practice for Mixing and Handling of Liquid Samples of Petroleum and Petroleum Products
- D5949 Standard Test Method for Pour Point of Petroleum Products (Automatic Pressure Pulsing Method)
- D6079 Standard Test Method for Evaluating Lubricity of Diesel Fuels by the High-Frequency Reciprocating Rig (HFRR)
- D6708 Standard Practice for Statistical Assessment and Improvement of Expected Agreement Between Two Test Methods that Purport to Measure the Same Property of a Material
- D6751 Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels
- D6890 Standard Test Method for Determination of Ignition Delay and Derived Cetane Number (DCN) of Diesel Fuel Oils by Combustion in a Constant Volume Chamber
- D7039 Standard Test Method for Sulphur in Gasoline and Diesel Fuel by Monochromatic Wavelength Dispersive X-ray Fluorescence Spectrometry
- D7042 Standard Test Method for Dynamic Viscosity and Density of Liquids by Stabinger Viscometer (and the Calculation of Kinematic Viscosity)
- D7094 Standard Test Method for Flash Point by Modified Continuously Closed Cup (MCCCFP) Tester
- D7170 Standard Test Method for Determination of Derived Cetane Number (DCN) of Diesel Fuel Oils – Fixed Range Injection Period, Constant Volume Combustion Chamber Method
- D7345 Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure (Micro Distillation Method)

CGSB-3.11-2017

- D7668 Standard Test Method for Determination of Derived Cetane Number (DCN) of Diesel Fuel Oils—Ignition Delay and Combustion Delay Using a Constant Volume Combustion Chamber Method
- D7688 Standard Test Method for Evaluating Lubricity of Diesel Fuels by the High-Frequency Reciprocating Rig (HFRR) by Visual Observation
- E29 Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications.

Annex B (informative)

Federal regulations applicable to diesel fuels^{2, 3}

B.1 Canadian Environmental Protection Act

The following federal regulations have been enacted under the *Canadian Environmental Protection Act*: 1999.

B.1.1 Fuels Information Regulations, No. 1 (C.R.C. c. 407 amended by SOR/DORS/79-280, 80-138 and 2000-104)

These regulations require producers and importers to submit information on sulphur and additive contents (other than lead) of liquid fuels.

B.1.2 Contaminated Fuel Regulations (SOR/DORS/91-486)

These regulations prohibit the importation of fuels that have been contaminated with hazardous wastes.

B.1.3 Sulphur in Diesel Fuel Regulations (SOR/DORS/2002-254)

These regulations define the sulphur limits for fuels used in diesel engines.

B.1.4 Renewable Fuels Regulations (SOR/DORS/2010-189)

These regulations define the renewable fuel content requirements for gasoline, diesel and heating oil.

B.2 The following federal regulations also apply to fuels meeting this standard:

B.2.1 Marine Machinery Regulations (SOR 90/264)

These regulations, enacted under the *Canada Shipping Act, 2001*, specify details related to the construction, installation and inspection of marine machinery. Safety requirements for diesel fuels used in marine applications are also specified.

B.2.2 Transportation of Dangerous Goods Regulations (SOR/DORS/2001-286)

These regulations, enacted under the *Transportation of Dangerous Goods Act, 1992*, give detailed packaging, labelling and documentation requirements for transporting fuels in Canada.

² The regulations listed are subject to revision by the relevant authority. The user should consult the relevant authority to confirm the current regulations. The information provided about the regulations is for information only. In case of conflict, the text of the regulation takes precedence.

³ The requirements in jurisdiction other than those listed above will be added as information becomes available in future revisions and amendments to this standard.