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CAN/CGSB-3.3-2019

Supersedes CAN/CGSB-3.3-2014



Kerosene

Canadian General Standards Board **CGSB**



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NATIONAL STANDARD OF CANADA

CAN/CGSB-3.3-2019

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Kerosene

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FRANÇAISE ET ANGLAISE.

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

This National Standard of Canada CAN/CGSB-3.3-2019 supersedes the 2014 edition.

Changes since the previous edition

- Explicit inclusion of synthetic hydrocarbons
- Changes in the wording about specified limiting values
- Additional test method for kinematic viscosity and distillation
- Revised wording for cautions on fuel colour
- New cautions regarding synthetic hydrocarbons

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Kerosene

1 Scope

This National Standard of Canada applies to two types of petroleum distillates intended for use in applications as described below.

Type No. 1-K Kerosene is intended for use in unvented space heaters as described in CAN/CSA-B140.9.3, when used in well-ventilated surroundings, and in wick-fed illuminating lamps.

Type No. 2-K Kerosene is intended for use in flue-connected stoves and heaters and should not be used in unvented applications.

NOTE The term “kerosene” also describes products used for other purposes not covered by this standard.

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 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.

2.1 Canadian General Standards Board (CGSB)

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

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

2.2.1 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.

It may also be obtained from the Government of Canada Publications, Publishing and Depository Services, Public Services and Procurement Canada, Ottawa, ON, K1A 0S5. Telephone: 1-800-635-7943 or 613-941-5995. Fax 1-800-565-7757 or 613-954-5779. Email publications@tpsgc-pwgsc.gc.ca. Website: <http://publications.gc.ca/site/eng/home.html>.

2.2 Canadian Standards Association (CSA)

CAN3-B140.9.3 — *Portable Kerosine-Fired Heaters*.

2.2.1 Source

The above may be obtained from CSA Standards, 5060 Spectrum Way, Suite 100, Mississauga, ON, L4W 5N6, telephone 416-747-4044, 1-800-463-6727, fax 416-747-2510, e-mail sales@csgroup.org, Web site: www.csa.ca.

2.3 ASTM International

Annual Book of ASTM Standards (see Annex A).

2.3.1 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.

3 Terms and definitions

For the purposes of this National Standard of Canada, the following term and definition apply.

3.1

synthetic hydrocarbon

hydrocarbons derived from non-petroleum sources such as biomass, natural gas, coal, fats and oils by processes such as gasification, reforming, Fischer-Tropsch synthesis, hydroprocessing or hydrocracking (including co-processing with petroleum).

4 Classification

4.1 Kerosene shall be supplied in the following types, as specified (see 8.1):

4.1.1 Types

Type No. 1-K

Type No. 2-K

5 General requirements

5.1 Kerosene composition

5.1.1 The fuels specified shall be hydrocarbons, either petroleum-derived or synthetic, or mixtures of both (see 9.6), that may contain additives designed to improve their properties or performance. Fatty Acid Alkyl Esters (FAAE) are not allowed in this standard except at concentrations below 1% by volume.

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

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

5.2 Type No. 1-K kerosene shall not be dyed (see. 6.11 and 9.2).

5.3 See Annex B for federal, provincial and other regulations applicable to kerosene.

6 Detailed requirements

6.1 Specified limiting values

6.1.1 The kerosene 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.

6.1.2 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 6.3).

6.1.3 If an alternate test method referenced in this standard provides a bias correction to the referee method, adherence to the specified limiting value shall be based on the bias-corrected result.

6.1.4 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 $P = 0.5$.

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

6.2 Test methods

6.2.1 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.

6.2.2 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.

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

6.2.4 In the event of a dispute, the procedures given in 6.1 shall be used.

6.2.5 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	Minimum	Maximum	ASTM Test method
6.3	Flash point ^{a,b} , °C	38.0	—	D56 ^c , D93 or D3828
6.4	Kinematic viscosity, at 40 °C, mm ² /s (cSt) ^d	0.9	1.9	D445 ^c , or D7042
6.5	Distillation, °C			D86 ^e , D2887 or D7345
	a) T10 recovered	—	205	
	b) end point	—	300.	
6.6	Sulphur, % by mass			D1266, D2622, D4294, D5453 ^c , D7039
	a) Type No. 1-K Kerosene	—	0.04	
	b) Type No. 2-K Kerosene	—	0.30	
6.7	Mercaptan sulphur ^f , % by mass (see 8.2) Type No. 1-K Kerosene	—	0.003	D3227
6.8	Copper strip corrosion, 3 h at minimum temperature of 50°C ^g	—	No. 1	D130
6.9	Electrical conductivity, at point, time and temperature of delivery to purchaser, pS/m (see 8.1)	25	—	D2624
6.10	Low-temperature flow properties ^h , one of the following (a or b):			
	a) Cloud point, °C or	—	-40.	D2500 or D5773 ^c
	b) Freezing point, °C	—	-40.	D2386 or D5972
6.11	Colour (Saybolt) (see also 5.2 and 9.2)			D156 ^c or D6045
	a) Type No. 1-K Kerosene	+20	—	
	b) Type No. 2-K Kerosene ⁱ	report	—	
	Smoke point ^j , mm	19.0	—	

- ^a The test values shall be reported to the nearest 0.5°C in accordance with ASTM D56, D93 or D3828, Method B.
- ^b The results obtained by ASTM D3828 can be more than 2°C lower than those obtained by ASTM D93.
- ^c The referee method to be used in the event of a dispute.
- ^d The SI unit for kinematic viscosity is the square metre per second. The preferred multiple for fluids in this viscosity range is the square millimetre per second, which is equivalent to a centiStokes (i.e. 1 mm²/s = 1 cSt).
- ^e In the event of a dispute, the automated test method of ASTM D86 shall be used as the referee method.
- ^f The mercaptan sulphur determination may be waived (see 8.2) if the fuel is considered negative (“sweet”) in accordance with ASTM D4952.
- ^g Copper corrosion testing for 2 h at 100°C has been shown to be more severe than 3 h at 50°C.
- ^h The kerosene may be tested according to cloud point or freezing point. ASTM D5773 shall be the referee test method for determining low-temperature flow properties.
- ⁱ The colour shall be determined before the addition of a dye.
- ^j A comparison of ASTM D187 and ASTM D1322 has shown that the specified minimum limit of 19.0 mm by ASTM D1322 is equivalent to the 16 h requirement using ASTM D187, as required in ASTM D3699.
- ^k In the event of a dispute, the automated test method of ASTM D1322 shall be used as the referee method.

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, hoses, etc. should be adequately flushed prior to taking a sample. Samples should be stored in a cool, dark place. 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 8.2), or if the amount required is not known, a sample of at least 2.7 L shall be collected.

8 Options

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

- a) Type of kerosene (see 4.1)

8.2 The following options may be specified if the requirements are more stringent than those stipulated in this standard:

- a) Mercaptan sulphur limit, if this option is specified then use of ASTM D4952 is no longer allowed (see 6.7 and footnote ‘f’)
- b) Sample size (see 7.1.2).

9 Precautions

9.1 Conductivity depletion

Due to the normal depletion of fuel electrical conductivity during commingling, storage and distribution, or at low temperatures, the kerosene should be treated with sufficient conductivity-improver additive to ensure that the electrical conductivity requirement in 6.9 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. Samples in clear bottles exposed to sunlight can show a rapid conductivity depletion. For more information on this subject, refer to ASTM D4865 and D2624.

9.2 Fuel colour

9.2.1 Existing fuel colour

Although Type No. 2-K Kerosene in this standard does not have a colour requirement, colour can be a useful indicator of fuel quality or contamination. Fuel having an unusual colour should be investigated to determine fitness for use. Note, however, that fuel can present several different hues or colours depending on feedstock type and/or manufacturing processes.

9.2.2 Fuel colour change

Fuel in long term storage can darken owing to oxidation of trace components. If the darkening is accompanied by the formation of sediment, the fuel could be rendered not acceptable for use.

9.3 Additives

The user is cautioned against incorporating additives in the kerosene, unless detailed test data are first obtained confirming that performance is improved without harmful side effects.

9.4 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, caustic, soaps, and amine process additives are examples of possible contaminants or potential precipitates.

9.5 Visual haze

The solubility of water in fuel is a function of temperature. When fuel is exposed to low ambient temperature, water can separate causing a haze or cloudy appearance. For information on testing for visual haze, refer to CAN/CGSB-3.0 No. 28.8 or ASTM D4176.

9.6 Synthetic hydrocarbons

Synthetic hydrocarbons include hydrocarbons derived from non-petroleum sources such as biomass, natural gas, coal, fats and oils by processes such as gasification, reforming, Fischer-Tropsch synthesis, hydroprocessing or hydrocracking (including co-processing with petroleum). Other terms used to refer to synthetic middle-distillate hydrocarbons include: biomass-to-liquid (BTL) diesel, gas-to-liquid (GTL) diesel, coal-to-liquid (CTL) diesel, hydrogenation-derived renewable diesel (HDRD), hydrotreated vegetable oil (HVO), renewable hydrocarbon diesel (RHD) and synthesized paraffinic diesel (SPD). As with petroleum hydrocarbons, fuel suppliers should consider potential impacts of significant and abrupt changes in blend properties (e.g., density, aromatic content) associated with the use of synthetic hydrocarbons.

9.7 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.

Annex A

(normative)

Referenced ASTM International publications (see 2.2)

Annual Book of ASTM Standards

ASTM D56	Standard Test Method for Flash Point by Tag Closed Cup Tester
ASTM D86	Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure
ASTM D93	Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester
ASTM D130	Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test
ASTM D156	Standard Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
ASTM D187	Standard Test Method for Burning Quality of Kerosine
ASTM D1266	Standard Test Method for Sulfur in Petroleum Products (Lamp Method)
ASTM D1322	Standard Test Method for Smoke Point of Kerosine and Aviation Turbine Fuel
ASTM D2386	Standard Test Method for Freezing Point of Aviation Fuels
ASTM D2500	Standard Test Method for Cloud Point of Petroleum Products
ASTM D2622	Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry
ASTM D2624	Standard Test Methods for Electrical Conductivity of Aviation and Distillate Fuels
ASTM D2887	Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography
ASTM D3227	Standard Test Method for (Thiol Mercaptan) Sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels (Potentiometric Method)
ASTM D3244	Standard Practice for Utilization of Test Data to Determine Conformance with Specifications
ASTM D3699	Standard Specification for Kerosine
ASTM D3828	Standard Test Methods for Flash Point by Small Scale Closed Cup Tester
ASTM D4057	Standard Practice for Manual Sampling of Petroleum and Petroleum Products
ASTM D4176	Standard Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures)
ASTM D4177	Standard Practice for Automatic Sampling of Petroleum and Petroleum Products
ASTM D4294	Standard Test Method for Sulphur in Petroleum and Petroleum Products by Energy-Dispersive X-Ray Fluorescence Spectrometry
ASTM D4865	Standard Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems

- ASTM D4952 Standard Test Method for Qualitative Analysis for Active Sulfur Species in Fuels and Solvents (Doctor Test)
- ASTM 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
- ASTM D5854 Standard Practice for Mixing and Handling of Liquid Samples of Petroleum and Petroleum Products
- ASTM D5773 Standard Test Method for Cloud Point of Petroleum Products (Constant Cooling Rate Method)
- ASTM D5972 Standard Test Method for Freezing Point of Aviation Fuels (Automatic Phase Transition Method)
- ASTM D6045 Standard Test Method for Colour of Petroleum Products by the Automatic Tristimulus Method
- ASTM D7039 Standard Test Method for Sulfur in Gasoline and Diesel Fuel by Monochromatic Wavelength Dispersive X-ray Fluorescence Spectrometry
- ASTM D7042 Standard Test Method for Dynamic Viscosity and Density of Liquids by Stabinger Viscometer (and the Calculation of Kinematic Viscosity)
- ASTM E29 Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

Annex B (informative)

Federal, provincial and other regulations applicable to kerosene^{1,2}

B.1 Federal regulations

B.1.1 *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.

B.1.2 *Canadian Environmental Protection Act*

The following federal regulations have been enacted under the *Canadian Environmental Protection Act*³:

B.1.2.1 *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.1.1.2 *Contaminated Fuel Regulations* (SOR/DORS/91-486)

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

B.2 Provincial regulations

B.2.1 Ontario

B.2.1.1 General requirements

Safety related requirements are controlled under the *Technical Standards and Safety Act, 2000*, c. 16, approved March 5, 2001. Under this Act, the *Liquid Fuels Handling Code*, June 1st, 2007, was published by the Technical Standards and Safety Authority.

B.2.2 Quebec

B.2.2.1 General requirements

The general requirements are controlled under the latest version of the *Loi sur les produits pétroliers*, RLRQ, chapitre P-30.01, *Règlement sur les produits pétroliers*, RLRQ, chapitre P-30.01, r.2 or *Petroleum Products Act*, CQLR, chapter, P-30.01, *Petroleum Products Regulation*, CQLR, chapter P-30.01, r.2.⁴ This regulation lists Quebec quality requirements for aviation gasolines, aviation turbine fuels, automotive gasolines, gasolines containing denatured

¹ 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.

² The requirements in provinces other than those listed above will be added as information becomes available in future revisions and amendments to this standard.

³ The Acts and Regulations may be obtained from Government of Canada Publications, Ottawa, Canada. Telephone 1-800-635-7943 or 613-941-5995. Fax 1-800-565-7757 or 613-954-5779. Web site <http://publications.gc.ca/site/eng/home.html>. Provincial Acts may be obtained from their relevant authority, however if a Web site becomes inoperative, the Canadian Legal Information Institute Web site at www.canlii.com may also be useful.

⁴ Available from Les Publications du Québec. Telephone 1-800-463-2100 or 418-643-5150. Fax 1-800-561-3479 or 418-643-6177. Also available on-line at www2.publicationsduquebec.gouv.qc.ca/home.php.

fuel ethanol for use in automotive spark ignition fuels, diesel fuels, diesel fuels containing biodiesel (B100) for blending in middle distillate fuels, fuel oil types 0, 1 and 2, and fuel oil types 4, 5 and 6.

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B.3 Municipal regulations

A number of municipalities have regulations governing the maximum allowable sulphur content; check with local authorities