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Canadian General Standards Board
Office des normes générales du Canada

CAN/CGSB-3.3-2024

Supersedes CAN/CGSB-3.3-2019

Kerosene

Canadian General Standards Board CGSB

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NATIONAL STANDARD OF CANADA **CAN/CGSB-3.3-2024**

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Kerosene

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE.

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Translation of this National Standard of Canada was conducted by the Government of Canada.

Preface

This National Standard of Canada CAN/CGSB-3.3-2024 supersedes the 2019 edition.

Changes since the previous edition

- Addition of title to Table 1 – Specified limiting values.
- Added ASTM D7094 as an alternative test method for measurement of Flash point in sections 6.3, 6.13 and 9.7, and in Annex A.
- Moved Table 1 footnote a information to new Flash point section 6.13.
- Moved Table 1 footnote b information to Fuel flammability section 9.7.
- Moved Table 1 footnote h information to new Low-temperature flow properties section 6.15.
- Added section 6.14, Distillation.
- Revised and renamed section 9.7 – Fuel flammability and Flash point test methods.
- Removed subsection 8 a) and re-numbered accordingly; mercaptan sulfur determination information provided in Table 1 footnote c.
- Updated Ministry information and various websites in Annex B.

The following definitions apply in understanding how to implement this National Standard of Canada:

- "shall" indicates a **requirement**;
- "should" indicates a **recommendation**;
- "may" is used to indicate that something is **permitted**;
- "can" is used to indicate that something is **possible**, for example, that an organization is able to do something.

Notes accompanying clauses do not include requirements or alternative requirements. The purpose of a note accompanying a clause is to separate explanatory or informative material from the text. Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

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Tables

Kerosene

1 Scope

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

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

b) 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.

Units of measurement – Quantities and dimensions used in this standard are provided in units from the International System of Units (SI units). This standard expresses the industry standard nominal units of measurement in North America of “% by mass” and “% by volume”. The SI equivalent expressions for these units are % (m/m) and % (V/V) respectively.

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 contact information provided below was 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*

2.1.1 Contact information

The above standards may be obtained from the Canadian General Standards Board. Telephone: 1-800-665-2472. E-mail: ncr.cgsb-ongc@tpsgc-pwgsc.gc.ca. Web site: https://www.tpsgc-pwgsc.gc.ca/ongc-cgsb/index-eng.html.

They may also be obtained from the Government of Canada Publications, Publishing and Depository Services, Public Services and Procurement Canada. Telephone: 1-800-622-6232. Web site: https://publications.gc.ca/site/eng/home.html.

2.2 CSA Group

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

2.2.1 Contact information

The above may be obtained from the CSA Group, Sales. Telephone: 416-747-2496. Web site: https://www.csagroup.org.

2.3 ASTM International

Annual Book of ASTM Standards (see Annex A)

2.3.1 Contact information

The above may be obtained from ASTM International. Telephone: 1-877-909-2786. Web site: https://www.astm.org. It can also be obtained from Standards Store by Accuris. Telephone: 1-800-447-2273. Web site: https://global.ihs.com.

3 Terms and definitions

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

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):

Type No. 1-K

Type No. 2-K

5 General requirements

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.

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

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.

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

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

6 Detailed requirements

6.1 Specified limiting values

The kerosene shall comply with the specified limiting values (6.3 to 6.12). The specified limiting values shall not be changed. This precludes any allowances for the test method precision and for adding or subtracting digits.

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 6.13).

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.

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 $P = 0.5$.

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

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.

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.

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

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

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.

Table 1 – Specified limiting values

		Specified limiting values		
	Property	**Minimum**	**Maximum**	**ASTM Test method**
6.3	Flash point, ºC (see 6.13 and 9.7)	38.0	—	D56[a], D93, D3828 or D7094
6.4	Kinematic viscosity, at 40 °C, mm²/s (cSt)[b]	0.9	1.9	D445[a], or D7042
6.5	Distillation, ºC (see 6.14)	—		D86[a] , D2887 or D7345
	a) T10 recovered	—	205	
	b) end point	—	300.	

	Property	Specified limiting values		ASTM Test method
		Minimum	Maximum	
6.6	Sulphur, % by mass	—		D1266, D2622, D4294, D5453[a], D7039
	a) Type No. 1-K Kerosene	—	0.04	
	b) Type No. 2-K Kerosene	—	0.30	
6.7	Mercaptan sulphur[c], a) or b) Type No. 1-K Kerosene	—		
	a) % by mass	—	0.003	D3227
	b) Doctor test	negative		D4952
6.8	Copper strip corrosion, 3 h at minimum temperature of 50 ºC[d]	—	No. 1	D130
6.9	Electrical conductivity, at point, time and temperature of delivery to purchaser, pS/m (see 9.1)	25	—	D2624
6.10	Low-temperature flow properties, one of the following [a) or b)] (see 6.15):			
	a) Cloud point, ºC or	—	-40.	D2500 or D5773[a]
	b) Freezing point, ºC	—	-40.	D2386 or D5972
6.11	Colour (Saybolt) (see 5.4 and 9.2)	—		D156[a] or D6045
	a) Type No. 1-K Kerosene	+20	—	
	b) Type No. 2-K Kerosene[e]	report	—	
6.12	Smoke point[f], mm	19.0	—	D1322

[a] The referee method to be used in the event of a dispute.

[b] The SI unit for kinematic viscosity is the square metre per second (m^2/s). The preferred multiple for fluids in this viscosity range is the square millimetre per second (mm^2/s), which is equivalent to a centiStoke (i.e. 1 mm^2/s = 1 cSt).

[c] The mercaptan sulphur determination may be waived if the fuel is considered “sweet” and received a negative result by the doctor test described in ASTM D4952.

[d] Copper corrosion testing for 2 h at 100 °C has been shown to be more severe than 3 h at 50 °C.

[e] The colour shall be determined before the addition of a dye.

[f] 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.

6.13 Flash point

The test values shall be reported to the nearest 0.5 °C in accordance with ASTM D56, D93, D7094 or D3828.

6.14 Distillation

When testing in accordance with ASTM D2887, the correlation in the appendix shall be used to convert the results to estimates of ASTM D86 results. In the event of a dispute, the automated method of ASTM D86 shall be the referee test method.

6.15 Low-temperature flow properties

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.

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), a sample of at least 2.7 L shall be collected.

8 Options

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

a) Type of kerosene (see 4.1).

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

a) 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 sufficiently treated with 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. It should be noted that samples in clear bottles exposed to sunlight can also show a rapid depletion in conductivity. For more information, refer to ASTM D2624 and D4865.

9.2 Fuel colour

Fuels having unusual shades of colour should be investigated to determine fitness for use.

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. Kerosene can present several different hues or colours depending on feedstock type and/or manufacturing processes.

9.2.2 Change in fuel colour

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 further information on visual haze testing, refer to CAN/CGSB-3.0 No. 28.8 or ASTM D4176, Procedure 2.

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 (for example density, aromatic content) associated with the use of synthetic hydrocarbons.

9.7 Fuel flammability and flash point test methods

9.7.1 Fuel flammability

A number of properties should be considered in assessing the overall flammability hazard. 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. Electrostatic discharges are one possible source of ignition during fuel handling. However, the fuel's flash point is only an indication of the potential flammability risk. Oxygen concentration as well as the presence of other flammable vapours in the atmosphere are additional factors affecting flammability risk.

Investigations 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 because 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.

9.7.2 Flash point test methods

Flash point test methods such as ASTM D56, D93, D3828, D7094 as well as many published by other standards organizations are “closed cup” but use different heating rates, sample volumes, ullage volumes, test cup geometries, ignition sources and stirring conditions. Therefore, a given fuel sample can yield different results depending upon the test method used. The different test methods also vary in precision (repeatability and reproducibility).

Many regulations, codes, industry guidelines and labeling requirements use flash point to classify fuel flammability. However, the flash point test method is often not specified or is only stated as “closed cup”. In other cases, a few different closed cup methods are quoted with no indication of a referee test method, or ASTM D56 is quoted specifically. This standard specifies the use of ASTM D56 with D93, D3828 and D7094 listed as alternates.

Flash point can only be defined in terms of a specific test method. Tests of commercial fuels and pure compounds indicate that a result by ASTM D93 or D7094 can average 1 °C to 2 °C higher than D56 with individual test results ranging from 1 °C lower to 3 °C higher. A result by ASTM D3828 can be 1 °C to 1.5 °C lower than by ASTM D56. The differences between results, however, are not consistent enough to establish fixed relative biases.

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 D445 Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and calculation of Dynamic Viscosity)

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 D3764 Standard Practice for Validation of the Performance of Process Stream Analyzer Systems

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 Sulfur 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 D5773	Standard Test Method for Cloud Point of Petroleum Products and Liquid Fuels (Constant Cooling Rate Method)
ASTM D5854	Standard Practice for Mixing and Handling of Liquid Samples of Petroleum and Petroleum Products
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 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
ASTM D7039	Standard Test Method for Sulfur in Gasoline, Diesel Fuel, Jet Fuel, Kerosine, Biodiesel, Biodiesel Blends, and Gasoline-Ethanol Blends 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 D7094	Standard Test Method for Flash Point by Modified Continuously Closed Cup (MCCCFP) Tester
ASTM D7345	Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure (Micro Distillation Method)
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/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/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.1.2.2 *Contaminated Fuel Regulations* (SOR/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.

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[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. Provincial and territorial regulations may be obtained from the relevant authority, however, if a Web site becomes inoperative, the Canadian Legal Information Institute (CANLII) Web site, at https://www.canlii.org/en/, may also be useful.

[3] The Act and regulations may be obtained from Government of Canada Publications, Publishing and Depository Services, Public Services and Procurement Canada. Telephone: 1-800-622-6232. Web site: https://publications.gc.ca/site/eng/home.html. They may also be obtained electronically at https://laws-lois.justice.gc.ca/eng/.

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, c. P-30.01, *Règlement sur les produits pétroliers*, RLRQ, c. P-30.01, r.2 or *Petroleum Products Act*, CQLR, c. 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 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, 2 and 2 (B6-B20) and fuel oil types 4, 5 and 6. Amendments and editions published apply only 90 days after the last day of the month that the French text of the amendments or editions was published. The Direction Générale des combustibles propres et des réservoirs of the ministère de l'Économie, de l'Innovation et de l'Énergie is responsible for the application and revision of this regulation. Web site: https://www.legisquebec.gouv.qc.ca/en/document/cs/P-30.01.

B.3 Municipal regulations

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

[4] Available from Les Publications du Québec. Telephone 1-800-463-2100 or 418-643-5150. Also available on-line at https://boutique.publicationsduquebec.gouv.qc.ca/en-US/.