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Canadian General  
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CAN/CGSB-3.18-2010

Reaffirmed 2016  
Confirmée 2016

ICS 75.160.20

## WITHDRAWAL

September 2021

### Diesel Fuel for locomotive-type medium-speed diesel engines

With approval of the CGSB Committee on Middle Distillate Fuels, this Standard is hereby withdrawn. It has been determined that the product covered by this Standard no longer supports Canadian industry in advancing the national economy, facilitating trade and/or representing industrial practice. Note: Fuel meeting standard CAN/CGSB-3.517 may be used for applications that were formerly covered by CAN/CGSB-3.18-2010. Consult federal and provincial regulations within CAN/CGSB-3.517. This list may not be inclusive of applicable statutes.

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## RETRAIT

Septembre 2021

### Carburant diesel pour moteurs diesels de locomotive à régime moyen

En accord avec le Comité des combustibles de distillat moyen de l'ONGC, cette norme est, par le présent avis, retirée. Il a été constaté que le produit qui fait l'objet de la présente norme n'aide plus l'industrie canadienne à faire progresser l'économie nationale, ne facilite plus le commerce ou ne représente plus les pratiques de l'industrie. Remarque: Le carburant conforme à la norme CAN/CGSB-3.517 peut être utilisé dans des équipements auparavant visés par la norme CAN/CGSB-3.18-2010. Veuillez consulter les règlements provinciaux énumérés dans la norme CAN/CGSB-3.517. La présente liste n'est peut-être pas inclusive quant aux règlements en vigueur.

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**CAN/CGSB-3.18-2010**

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May 2016**

## National Standard of Canada

### Diesel fuel for locomotive-type medium-speed diesel engines

Withdrawn

Canadian General Standards Board 



Standards Council of Canada  
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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.

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NATIONAL STANDARD OF CANADA

**CAN/CGSB-3.18-2010**

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May 2016

## **Diesel fuel for locomotive-type medium-speed diesel engines**

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

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## CAN/CGSB-3.18-2010

Supersedes CAN/CGSB-3.18-2000

Reaffirmed  
May 2016

### Preface to the National Standard of Canada

This National Standard of Canada has been reaffirmed by the CGSB Committee on Middle Distillates Fuels. Editorial changes have been made by the correction of the following paragraphs:

- Footnote 1 Fuel suitable for diesel-powered equipment is covered by CAN/CGSB-3.517, *Diesel fuel*, and CAN/CGSB-3.520, *Diesel fuel containing low levels of biodiesel (B1-B5)*.
- 3.1 The 2.5% Low-End Design Temperature for most weather stations in Canada by half month period is available on the Canadian Fuels Association website<sup>2</sup>.
- Footnote 2 Available at <http://www.canadianfuels.ca/Fuels-and-Transportation/Conventional-Transportation-Fuels/>.
- 7.3.1 The publication referred to in par. 2.1.1 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. Web site [www.tpsgc-pwgsc.gc.ca/ongc-cgsb/index-eng.html](http://www.tpsgc-pwgsc.gc.ca/ongc-cgsb/index-eng.html).
- 7.3.2 The regulations referred to in par. 2.1.2 may be obtained from Government of Canada Publications, Ottawa, Canada. Telephone 1-800-635-7943 or 613-941-5995. Fax 1-800-565-7757. Web site [www.publications.gc.ca](http://www.publications.gc.ca). They are also available on-line at the CEPA Registry on the Environment Canada Web site [ec.gc.ca](http://ec.gc.ca) or at the Department of Justice Canada Web site [laws-lois.justice.gc.ca](http://laws-lois.justice.gc.ca).
- 7.3.3 The publications referred to in par. 2.1.3 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, or from IHS Global Canada Ltd., 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](http://www.global.ihs.com).
- 7.3.4 The weather data referred to in par. 2.1.4 is available at the Canada Fuels Association Web site at <http://www.canadianfuels.ca/Fuels-and-Transportation/Conventional-Transportation-Fuels/>.
- Appendix A 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.
- Appendix C, Footnote C1 ASTM D6468 Standard Test Method for High Temperature Stability of Middle Distillate Fuels.



**CANADIAN GENERAL STANDARDS BOARD**  
**DIESEL FUEL FOR LOCOMOTIVE-TYPE**  
**MEDIUM-SPEED DIESEL ENGINES**

**1. SCOPE**

- 1.1 This standard applies to one type of diesel fuel that is suitable for use in locomotive-type medium-speed diesel engines.
- 1.2 This type of fuel may be suitable for use<sup>1</sup> in other medium-speed diesel applications.
- 1.3 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. REFERENCED PUBLICATIONS**

- 2.1 The following publications are referenced in this standard:

2.1.1 Canadian General Standards Board (CGSB)

CAN/CGSB-3.0 — Methods of Testing Petroleum and Associated Products:

No. 16.0 — Sulphur in Diesel Fuel and Similar Middle Distillates by Energy Dispersive X-Ray Fluorescence Spectrometry (EDXRF)

No. 20.9 — CGSB Cetane Index of Diesel Fuels

No. 28.8 — Visual Haze Rating of Distillate Fuel Oils

No. 140.1 — Low Temperature Flow Test (LTFT) for Diesel Fuels

CAN/CGSB-3.2 — Heating Fuel Oil.

2.1.2 Environment Canada

*Sulphur in Diesel Fuel Regulations.*

2.1.3 ASTM International

Annual Book of ASTM Standards (Appendix A).

2.1.4 Weather Data Analysis Pack.

- 2.2 See Appendix B for regulations that apply to diesel fuels.

<sup>1</sup> Fuel suitable for on-road diesel-powered equipment is covered by CAN/CGSB-3.517, Automotive (On-Road) Diesel Fuel, and CAN/CGSB-3.520, Automotive Low-Sulphur Diesel Fuel Containing Low Levels of Biodiesel Esters (B1-B5), and for off-road applications, by CAN/CGSB-3.6, Off-road Diesel Fuel.

2.3 A dated reference in this standard is to the issue specified. An undated reference in this standard is to the latest issue, unless otherwise specified by the authority applying this standard. The sources are given in the Notes section.

### 3. DEFINITIONS

The following definitions apply in this standard:

3.1 **2.5 Percentile Low-End Design Temperature** — The 2.5 percentile design value is the temperature for which 2.5% of the hourly outside air temperatures for an indicated half month are observed to occur at or below this value. (The 2.5% Low-End Design Temperature for most weather stations in Canada by half month period may be derived from the Weather Data Analysis Pack.<sup>2</sup>)

3.2 **Diesel Fuel** — A middle distillate fuel composed of hydrocarbons and naturally occurring, petroleum-derived, non-hydrocarbons that boils in the range of 150 and 400°C and that is intended for use as a fuel in compression-ignition engines.

3.3 **Medium-Speed Diesel Engine** — An internal combustion engine of the compression-ignition type that generates full power at speeds between approximately 400 and 1200 r/min.

3.4 **Representative Fuel** — A sample of fuel with inspection properties that are typical of the fuel as supplied.

### 4. GENERAL REQUIREMENTS

4.1 The fuels specified shall be hydrocarbons that may contain additives designed to improve their properties or performance, for example, diesel ignition quality, low-temperature flow properties and static charge dissipation (Appendix C<sup>3</sup>).

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

4.3 The fuel shall not contain used lubricating oils or fluids.

4.4 See Appendix B for regulations that apply to diesel fuels.

### 5. DETAILED REQUIREMENTS

For an explanation of the significance of tests and the test methods used in this standard, see Appendix C.

#### 5.1 Low-Temperature Flow Properties

5.1.1 Low-temperature flow properties of the fuel shall be designed (par. 7.1.1 a) to give satisfactory performance at the temperatures indicated by the 2.5% low-end design temperature data for the period and location of intended use. However, when the 2.5% low-end design temperature is colder than -48°C, a fuel meeting a -48°C operability limit may be provided. See Appendix C, section C8 for further information.

5.1.2 The following shall be reported:

- a. The 2.5% low-end temperature to which the fuel is designed.
- b. The test method used to determine the operability temperature:
  - i. Cloud point (ASTM D2500 or D5773<sup>4</sup>); or
  - ii. Low-temperature flow test (LTFT) for diesel fuels (CAN/CGSB-3.0 No. 140.1);
- c. The test method result.

<sup>2</sup> The Weather Data Analysis Pack was developed by Petro-Canada for the Canadian Petroleum Industry.

<sup>3</sup> Appendix C is not a mandatory part of this standard.

<sup>4</sup> In the event of a dispute, ASTM D2500 shall be the referee method.

- 5.2 The diesel 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 adding or subtracting digits.
- 5.3 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 (par. 5.16).
- 5.3.1 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  $p = 0.5$ .
- 5.4 Test methods other than those referenced in this standard may be used only if they have been validated in accordance with ASTM D3764 or D4855.
- 5.4.1 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. For more information on this subject, see Appendix C, par. C2.1.
- 5.4.2 Validated test methods shall only be used within the bounds of the data covered in their validation.
- 5.4.3 In the event of a dispute, the procedures given in par. 5.3 and 5.3.1 shall be used. If parties in a dispute cannot agree on an analytical method to resolve the dispute, the method listed in the standard shall be used. Where more than one method is listed for a given detailed requirement, the referee method shall be used.
- 5.5 **Ignition Quality**
- 5.5.1 Unless otherwise specified (par. 7.1.1 b), the minimum cetane number shall be 37.0 (par. 7.2.1) when tested in accordance with ASTM D613, D6890 or D7170. In the event of a dispute, ASTM D613 shall be the referee test method.
- 5.5.2 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 with diesel fuel for control purposes. The user shall refer to the appropriate test method. These calculation techniques shall not be used for determining the ignition quality of fuel containing cetane improver additives. For more information on this subject see Appendix C, par. C2.1.

### Specified Limiting Values

					Test Method	
		Min.	Max.	ASTM	CGSB	
5.6	Flash point, °C (par. 7.1.2)	40.0	—	D93 or D3828 (par. 5.16)	—	
5.7	Kinematic viscosity <sup>5</sup> at 40°C, mm <sup>2</sup> /s (cSt)	1.70 <sup>6</sup>	5.00	D445	—	
5.8	Distillation, 90% recovered, °C	—	360	D86 (par. 5.17)	—	
5.9	Water and sediment, % by volume	—	0.05	D1796 (modified) or D2709 (par. 5.18)	—	
5.10	Acid number, mg KOH/g	—	0.10	D974	—	
5.11	Sulphur, <sup>7</sup> mg/kg (par. 7.1.2)	—	500	D2622 D5453 or D7039  (par. 5.19)	CAN/ CGSB- 3.0 No.16.0	
5.12	Copper strip corrosion, 3 h at 50°C	—	No. 1	D130	—	
5.13	Carbon residue on 10% bottoms, % by mass	—	0.4	D524 or D4530 (par. 5.20)	—	
5.14	Ash, % by mass	—	0.010	D482	—	
5.15	Electrical conductivity at point, time and temperature of delivery to purchaser, pS/m (par. 7.2.2)	25	—	D2624	—	

<sup>5</sup> 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 mm<sup>2</sup>/s = 1 cSt).

<sup>6</sup> If the fuel is designed for an operability temperature colder than -20°C, then the minimum viscosity shall be 1.30 cSt.

<sup>7</sup> The sulphur limit is established by government regulations or as specified by contractual agreement. Sulphur limits are in accordance with the Sulphur in Diesel Fuel Regulations, *SOR/2002-254*.

- 5.16 **Flash Point** — The test values shall be reported to the nearest 0.5°C in accordance with ASTM D93 or D3828, Method B. In the event of a dispute, ASTM D93 shall be the referee test method.
- 5.17 **Distillation** — In case of a dispute, the automatic test method shall be selected as the referee test method.
- 5.18 **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.
- 5.19 **Sulphur** — Testing shall be conducted in accordance with ASTM D2622, D5453, D7039 or CAN/CGSB-3.0 No. 16.0. In the event of a dispute, ASTM D5453 shall be the referee test method.
- 5.20 **Carbon Residue** — Testing should be conducted prior to the addition of any cetane improver additive to the fuel. In the event of a dispute, ASTM D4530 shall be the referee test method.

## 6. INSPECTION

### 6.1 Sampling

- 6.1.1 Sample equipment and procedures shall be designed and used to obtain representative samples of a product. Sample lines, hose volumes, etc. should be flushed prior to taking a sample. Procedures shall be in accordance with ASTM D4057, D4177 or D5854.
- 6.1.2 Sample volume should be consistent with the requirement of the testing laboratory or the authority having jurisdiction or both. Unless otherwise specified (par. 7.1.2), or the amount required is not specified, a sample of at least 3 L shall be collected.

## 7. NOTES

### 7.1 Options

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

- a. Low-temperature design requirements for period and location of intended use (par. 5.1.1)
- b. Cetane number (par. 5.5.1).

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

- a. Flash point (par. 5.6)
- b. Sulphur (par. 5.11)
- c. Sample size (par. 6.1.2).

### 7.2 Precautionary Notes

- 7.2.1 **Ignition Quality** — Canadian railways have successfully used a minimum of 32.0 cetane number (par. 5.5.1). If specifying a minimum value for a cetane number lower than 37.0, the user is cautioned to consult with the engine manufacturer regarding the significance and acceptability of the cetane number for any particular design and model under specific operating conditions. Locomotive engines manufactured to meet environmental emissions regulations such as U.S. EPA (Environmental Protection Agency) Tier 2 can require a 40.0 minimum cetane number (par. 5.5.1).
- 7.2.2 **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 conductivity-improver additive to ensure that the electrical conductivity requirement in par. 5.15 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 on this subject, see ASTM D4865 and D2624.

- 7.2.3 **Heating Oil Application** — At times diesel fuel can be used in a heating oil application. In these cases, refer to CAN/CGSB-3.2 for detailed requirements.
- 7.2.4 **Refinery Processing** — Contamination from manufacturing processes or treatments can be carried over in trace quantities into the diesel 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 or sand, and amine process additives are examples of possible contaminants.
- 7.2.5 **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 ASTM D4176, Procedure 2.
- 7.3 **Sources of Referenced Publications**
- 7.3.1 The publications referred to in par. 2.1.1 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@pwgsc-tpsgc.gc.ca. Web site [www.ongc-cgsb.gc.ca](http://www.ongc-cgsb.gc.ca).
- 7.3.2 The regulations referred to in par. 2.1.2 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 [publications.gc.ca/helpAndInfo/cntcts-e.htm](http://publications.gc.ca/helpAndInfo/cntcts-e.htm). They are also available on-line at the CEPA Registry on the Environment Canada Web site [ec.gc.ca/ceparegistry](http://ec.gc.ca/ceparegistry) or at the Department of Justice Canada Web site [laws-lois.justice.gc.ca](http://laws-lois.justice.gc.ca).
- 3.3.3 The publications referred to in par. 2.1.3 and C16.2 may be obtained from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, U.S.A., Web site [www.astm.org](http://www.astm.org), or from IHS Canada, 1 Antares Drive, Suite 200, Ottawa, Ontario K2E 8C4, telephone 613-237-4250 or 1-800-267-8220, fax 613-237-4251, Web site [canada.ihs.com](http://canada.ihs.com).
- 7.3.4 The weather data referred to in par. 2.1.4 is available at Petro-Canada Web site, [petro-canada.ca/weatherdataanalysispack](http://petro-canada.ca/weatherdataanalysispack).

(This appendix forms a mandatory part of the standard.)

## REFERENCED ASTM PUBLICATIONS (par. 2.1.3)

### Annual Book of ASTM Standards

D86	Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure
D93	Standard Test Methods for Flash-Point by Pensky-Martens Closed Cup Tester
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
D974	Standard Test Method for Acid and Base Number by Color-Indicator Titration
D976	Standard Test Methods for Calculated Cetane Index of Distillate Fuels
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 Lubrication Oils
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
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
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 Procedures)
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
D4855	Standard Practice for Comparing Test Methods
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
- 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 Sulfur in Gasoline and Diesel Fuel by Monochromatic Wavelength Dispersive X-ray Fluorescence Spectrometry
- D7170 Standard Test Method for Determination of Derived Cetane Number (DCN) of Diesel Fuel Oils — Fixed Range Injection Period, Constant Volume Combustion Chamber Method
- E29 Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications.

Withdrawn



(This appendix does not form a mandatory part of the standard.)

## FEDERAL, PROVINCIAL AND OTHER REGULATIONS APPLICABLE TO DIESEL FUELS (par. 2.2)<sup>B1 and B2</sup>

### B1. FEDERAL REGULATIONS

The following federal regulations have been enacted under the *Canadian Environmental Protection Act*:<sup>B3</sup>

- B1.1 ***Fuels Information Regulations, No. 1*** — These regulations require producers and importers to submit information on sulphur and additive contents (other than lead).
- B1.2 ***Contaminated Fuel Regulations*** — These regulations prohibit the importation of fuels that have been contaminated with hazardous wastes.
- B1.3 ***Sulphur in Diesel Fuel Regulations*** — These regulations, SOR/2002-254 as amended by SOR/2005-305 and SOR/2006-163, define the maximum concentration of sulphur and timing for diesel fuel for on-road and off-road diesel engines.

### B2. PROVINCIAL REGULATIONS

#### B2.1 Ontario

- B2.1.1 ***Safety related*** requirements are controlled under the *Technical Standards and Safety Act*, 2000, S.O. 2000, c. 16, approved by Order in Council, March 5, 2001. Under this Act, the *Liquid Fuels Handling Code*, June 1<sup>st</sup>, 2007, was published by the Technical Standards and Safety Authority.

#### B2.2 Quebec

- B2.2.1 ***General Requirements*** — The general requirements are controlled under the latest version of the *Petroleum Products Act*, R.S.Q., chapter P-30.01, and the *Petroleum Products Regulations*, c. P-30.01, r.1 [O.C. 226-2007, 2007 G.O. 2, 1244B].<sup>B4</sup> In this regulation, Quebec quality requirements for aviation gasolines, aviation turbine fuels, automotive gasolines, gasolines containing fuel ethanol, diesel fuels, diesel fuels containing biodiesel fuel, stove oil, furnace oil and heavy fuel oil are listed. Fuel used for locomotives is exempt from these regulations. Amendments and new editions published after April 1, 2007, apply only 90 days after the last day of the month that the French text of the amendments or new editions was published. The Direction générale du développement des hydrocarbures et des biocarburants of the Ministère des Ressources naturelles et de la Faune is responsible for the application and revision of this regulation. Web site [www.mrnf.gouv.qc.ca/english/energy/index.jsp](http://www.mrnf.gouv.qc.ca/english/energy/index.jsp).

<sup>B1</sup>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 regulations takes precedence.

<sup>B2</sup>The requirements in provinces other than those listed above will be added as information becomes available in future revisions and amendments to this standard.

<sup>B3</sup>The Act 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 [publications.gc.ca/helpAndInfo/cntcts-e.htm](http://publications.gc.ca/helpAndInfo/cntcts-e.htm). They are also available on-line at the CEPA Registry on the Environment Canada Web site [ec.gc.ca/ceparegistry](http://ec.gc.ca/ceparegistry) or at the Department of Justice Canada Web site [laws-lois.justice.gc.ca](http://laws-lois.justice.gc.ca).

<sup>B4</sup>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](http://www2.publicationsduquebec.gouv.qc.ca/home.php).

**B3. OTHER REGULATIONS**

- B3.1 The Communauté métropolitaine de Montréal (CMM) regulation 2001-10<sup>B5</sup> requires that diesel fuel with less than 500 mg/kg sulphur be used on Montreal Island. Diesel fuel supplied to a railway company for locomotive use is exempt from this requirement.
- B3.2 Environmental Protection Agency regulation, *Emissions Standards for Locomotives and Locomotive Engine* (U.S. Code of Federal Regulations – 40 CFR, Parts 85, 89 and 92, April 16, 1998<sup>B6</sup>) contains three levels of locomotive-specific emissions limits corresponding to the date of a locomotive's original manufacture or remanufacture (i.e. Tier 0, Tier 1 and Tier 2).

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<sup>B5</sup> Available on-line from the Communauté métropolitaine de Montréal at [www.cmm.qc.ca/fileadmin/user\\_upload/reglements/09\\_4.pdf](http://www.cmm.qc.ca/fileadmin/user_upload/reglements/09_4.pdf).

<sup>B6</sup> Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: IDCC, 732 N. Capitol St., NW, Washington, DC 20401, U.S.A. Telephone 866-512-1800. Fax 202-512-2104. Web site [bookstore.gpo.gov/help/index.jsp](http://bookstore.gpo.gov/help/index.jsp).

*(This appendix does not form a mandatory part of the standard.)*

## **SIGNIFICANCE OF REQUIREMENTS FOR DIESEL FUELS**

### **C1. INTRODUCTION**

C1.1 The properties of commercial diesel fuels depend on the refining practices employed and the nature of the crude oils from which they are produced. For example, diesel fuel produced within the boiling range of 150 and 400°C can have many possible combinations of various properties such as volatility, ignition quality, viscosity and other characteristics.

C1.2 CAN/CGSB-3.18 is intended as a statement of permissible limits of significant properties used for specifying fuel that is suitable for use in locomotive-type medium-speed diesel engines (par. 1.2). These engines generally generate full power at speeds between 400 and 1200 r/min, as used in railroad locomotive engines.

C1.3 The significance of some of the fuel properties used in this standard is outlined below:

### **C2. IGNITION QUALITY: CETANE NUMBER AND CALCULATED CETANE INDEX**

C2.1 Cetane number is a measure of the ignition quality of the fuel and influences combustion characteristics. The cetane number requirements depend on engine design and size, nature of speed and load variations, and starting and atmospheric conditions. The calculated cetane index is a useful technique for approximating the cetane number of fuels that do not contain a cetane-improver additive.

### **C3. DISTILLATION**

C3.1 The fuel volatility requirements also depend on the engine design and size, nature of speed and load variations, and starting and atmospheric conditions. For engines in services involving rapidly fluctuating loads and speeds, the more volatile fuels can provide better performance particularly with respect to smoke and odour. However, better fuel economy is generally obtained from the heavier types of fuel because of their higher energy content.

### **C4. VISCOSITY**

C4.1 For some engines, it is advantageous to specify a minimum viscosity because of power loss due to injection pump and injector leakage. Maximum viscosity, on the other hand, is limited by considerations involved in engine design and size, fuel temperature and the characteristics of the injection system.

### **C5. CARBON RESIDUE**

C5.1 Carbon residue gives a measure of the carbon-depositing tendencies of a diesel fuel after evaporation and pyrolysis under prescribed conditions. While not directly correlating with engine deposits, this property is considered a guide.

### **C6. SULPHUR**

C6.1 The effect of sulphur content on engine wear and on deposits varies considerably in importance and depends largely on operating conditions. Diesel fuels meeting the sulphur contents specified in this standard are generally not suitable for use in engines equipped with advanced exhaust after treatment emission control technologies that are poisoned by higher sulphur fuels.

**C7. FLASH POINT**

C7.1 The flash point is not related to engine performance. It is, however, of importance in connection with legal requirements (such as the *Transportation of Dangerous Goods [TDG] Regulations*) and safety precautions involved in fuel handling and storage. It is normally specified to meet insurance and fire regulations.

**C8. LOW-TEMPERATURE OPERABILITY**

C8.1 Low-temperature operability of diesel fuels may be defined by the cloud point, low-temperature flow tests or some combination thereof.

C8.2 Cloud point defines the temperature at which the smallest observable cluster of hydrocarbon crystals first appears in a fuel upon cooling under prescribed test conditions. It is the most common measure of low-temperature operability.

C8.3 The low-temperature flow test was developed in order to predict low-temperature operability of fuels to which a wax modifier has been added to improve said quality. A cloud point test on such additized fuels will not accurately measure the low-temperature improvements due to the wax-modifier additives. However the low-temperature flow test will predict the low-temperature operability fuels that do not contain wax-modifier additives.

**C9. ASH**

C9.1 Ash-forming materials can be present in diesel fuels in two forms: (1) abrasive solids and (2) soluble metallic soaps. Abrasive solids contribute to injector, fuel pump, piston and ring wear, and also to engine deposits. Soluble metallic soaps have little effect on wear but can contribute to engine deposits.

**C10. ACIDITY**

C10.1 There is directional evidence that acidic fuels

- a. can have poorer stability;
- b. can cause increased corrosion of mild steel; and
- c. could cause deposit formation in some types of fuel injection equipment.

**C11. COPPER STRIP CORROSION**

C11.1 This test serves as a measure of possible corrosion of copper, brass or bronze parts in the fuel system, due to reactive sulphur compounds.

**C12. ELECTRICAL CONDUCTIVITY**

C12.1 The ability of a fuel to dissipate electric charge that has been generated during pumping and filtering operations is controlled by its conductivity. If a fuel's conductivity is sufficiently high, the static electric charge dissipates fast enough to prevent its accumulation and dangerously high electrical potentials are avoided.

**C13. RECOMMENDED PRACTICES FOR THE STORAGE AND HANDLING OF DIESEL FUELS**

C13.1 Diesel fuels should be stored under cool, clean and dry conditions. Free water should regularly be drained from storage tanks and filter housings. Diesel fuels that are to be kept in storage can require the addition of a biocide to minimize potential microbial contamination and related degradation in fuel quality (should free water be present). Organic sediment can appear in diesel fuels in long-term storage. Primary filtration of these fuels is recommended prior to use. Where long-term storage of diesel fuels is contemplated, use of stability additives (e.g. anti-oxidants, metal deactivators, dispersants) could be considered. The fuel supplier should be consulted. Fuel storage containers and tanks should be opaque. Some translucent (plastic) tanks exposed to light have proven to be unsatisfactory for the storage of diesel fuels.

**C14. USED LUBRICATING OILS OR FLUIDS**

- C14.1 Used lubricating oils or fluids are not suitable components for use in diesel fuels. The addition of used lubricating oils or fluids to diesel fuels will
- a. increase exhaust emissions;
  - b. increase wear of engine components such as injectors;
  - c. increase deposits in the engine; and
  - d. cause premature fuel filter plugging.

**C15. FUEL COLOUR**

- C15.1 While this standard does not have a colour requirement, colour can be a useful indicator of fuel quality or contamination. Normally fuel colour ranges from water white (colourless) to an amber or light brownish colour depending on crude oil type or refinery processes. Fuel in long-term storage can darken, due to oxidation of trace components, but this will not affect its performance. However, if the darkening is accompanied by the formation of sediment, the fuel could be rendered not acceptable for use. Fuels having unusual shades of colour should be investigated to determine fitness for use.

**C16. THERMAL STABILITY**

- C16.1 Heat transfer is a design function of diesel fuels in many modern diesel engines. Only a portion of the fuel that is circulated and pressurized by the fuel injection system is actually combusted. The remainder of the fuel is recycled back to the fuel tank. The bulk fuel temperature can be well above ambient levels. Inadequate high-temperature stability of a diesel fuel can result in the formation of insoluble degradation products that can then cause filter plugging.
- C16.2 ASTM D6468<sup>c</sup> can be used to measure diesel fuel thermal stability. A higher percentage reflectance rating in this test indicates better thermal stability and a reduced tendency to cause filter plugging.

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<sup>c</sup> *ASTM D6468* — Standard Test Method for High Temperature Stability of Distillate Fuels.