



## Detroit Diesel Recommended Diesel Fuel Properties

All information subject to change without notice. (Rev. 10/05)

5-3

7SE270 0510 Copyright © 2005 DETROIT DIESEL CORPORATION

**TABLE 5.1**

| Property<br>(Test Method)  | Detroit Diesel<br>Recommended<br>Specifications  | E-C in fuel<br>[test used]                             | General Description   |
|--|--|--|---|
| <b>Viscosity</b><br>(ASTM D 445)<br>(ISO 3104)                     | 1.3 to 2.4 centistokes<br>(1.3 to 2.4 mm/s) at 40C<br>(104F)                               | <b>1.966 mm/s</b><br><br>[ISO 3104]                    | Proper viscosity provides adequate pumping and lubricating characteristics to fuel system components.   |
| <b>Cetane Number</b><br>(ASTM D 613)<br>(ISO 5165)                 | 43 Minimum above 0C (32F)  | <b>52.5</b><br><br>[SS-EN-ISO 5165]                    | Cetane number is a measure of the starting and warm-up characteristics of a fuel. In cold weather or in service with pro- longed low loads, a higher cetane number is desirable.  |
| <b>Sulfur Content</b><br>(ASTM D2622)<br>(ISO 4260)                | Not to exceed 0.05 mass %  | <b>0.0001 mass %</b><br><br>[ASTM D5453]               | Diesel fuels contain varying amounts of various sulfur compounds. Fuel sulfur contributes to acid formation and exhaust particulates. Reduced sulfur is required to meet particulate emissions and to avoid poisoning aftertreatment devices. Higher sulfur fuel also needs higher TBN lubricants to compensate for acid corrosion. |
| <b>Active Sulfur</b><br>(ASTM D 130)<br>(ISO 2160)                 | <b>Copper Strip Corrosion</b> not to exceed No. 3a rating after three hours at 50C (122F). | <b>1a</b><br><br>[EN-ISO 2160]                         | Some sulfur compounds in fuel are actively corrosive.   |
| <b>Carbon Residue</b><br>(ASTM D524)<br>(ASTM D189)<br>(ISO 10370) | Not to exceed 0.35 mass % on 10 volume % residuum.   | <b>&lt; 0.01 %</b><br><br>[EN-ISO 10370]               | The tendency of a diesel fuel to form carbon deposits in an engine can be estimated by determining the Ramsbottom or Conradson carbon residue of the fuel after 90 percent of the fuel has been evaporated.   |
| <b>Density</b><br>(ASTM D287)<br>(ASTM D4052)<br>(ISO 3675)        | 0.806 to 0.825 g/cc at 15C<br>(60F).   | <b>0.819 g/cc at 15C</b><br><br>[SS-EN-ISO 12185]      | API gravity is a measure of the density of a diesel fuel. The higher the API gravity, the less dense the fuel sample is. API Gravity can provide useful information concerning a fuel's composition and performance- related characteristics such as power economy, low-temperature properties and smoking tendencies.              |
| <b>Cloud Point</b><br>(ASTM D97)<br>(ISO 3015)                     | 6C (10F) below lowest ambient temperature at which the fuel is expected to operate.        | <b>-26C</b><br><b>(- 15F)</b><br><br>[SS-EN-ISO 23015] | The cloud point of the fuel is the temperature at which crystals of paraffin wax first appear. Crystals can be detected by cloudiness of the fuel. These crystals will cause filters to plug.   |

|  |  |  |   |
|--|--|--|---|
| <b>Ash</b><br>(ASTM D482)<br>(ISO 6245)                    | Not to exceed 0.01 mass percent  | <b>&lt; 0.01</b><br><br>[SS-EN-ISO 6245]                   | The small amount of non-combustible metallic material found in almost all petroleum products commonly is called ash.  |
| <b>Distillation</b><br>(ASTM D86)<br>(ISO 3405)            | Distillation 10% typical 221<br><br>Distillation 90% max 335           | <b>10% 202.3</b><br><br><b>90% 284.5</b><br><br>[ISO 3405] | At least 90% of the fuel must evaporate at less than 260C (500F).   |
| <b>Carbon Residue, on 10%, % mass</b><br>(D524)            | 0.15   | <b>&lt; 0.10</b><br><br>[IS010370]                         |   |
| <b>Water, % Maximum</b><br>(D2709)                         | 0.02   | <b>0.005</b><br><br>[D4928]                                |   |
| <b>Sediment &gt; 1µm, mg/L Maximum</b><br>(D 2276) (D5452) | 10   | <b>0.3</b><br><br>[EN 12662]                               |   |
| <b>Flash Point, °C Minimum</b><br>(ISO 2719)               | 38 – 52  | <b>68</b><br><br>[ISO 2719]                                |   |
| <b>Lubricity Wear Scar, µm, Maximum</b><br>(D6079)         | Wear Scar Diameter (WSD) less than 520 µm at 60C HFRR.<br><br>520 MAX. | <b>116</b><br><br>[ISO 12156]                              | Lubricity is the ability of a liquid to provide hydrodynamic and/or boundary lubrication to prevent wear between moving parts. Fuel with lower sulfur and/or viscosity tends to have lower lubricity. |

### 5.1.1 FUEL LUBRICITY

It is recommended that all fuels used in DDC engines meet the minimum lubricity requirements listed in Table 5-1, “Diesel Fuel Specifications.”

**Fuels not meeting the lubricity requirements may use additives to meet them.**