

Diesel Fuels

In the United States, diesel fuel is controlled according to the American Society for Testing and Materials Standard D975-97. This standard describes a limited number of properties that diesel fuels must meet. It should be noted that the requirements are all performance-based. They do not mandate the composition of the fuel, only the specific performance related requirements demanded of a fuel for a diesel engine. The requirements of D975-97 are described below.

ASTM Specifications for Diesel Fuel Oils (D975-97)

Diesel fuel is characterized in the United States by the ASTM standard D 975. This standard identifies five grades of diesel fuel described below.

Grade No. 1-D and Low Sulfur 1-D: A light distillate fuel for applications requiring a higher volatility fuel for rapidly fluctuating loads and speeds as in light trucks and buses. The specification for this grade of diesel fuel overlaps with kerosene and jet fuel and all three are commonly produced from the same base stock. One major use for No. 1-D diesel fuel is to blend with No. 2-D during winter to provide improved cold flow properties. Low sulfur fuel is required for on-highway use with sulfur level < 0.05%.

Grade No. 2-D and Low Sulfur 2-D: A middle distillate fuel for applications that do not require a high volatility fuel. Typical applications are high-speed engines that operate for sustained periods at high load. Low sulfur fuel is required for on-highway use with sulfur level < 0.05%.

Grade No. 4-D: A heavy distillate fuel that is viscous and may require fuel heating for proper atomization of the fuel. It is used primarily in low and medium speed engines. ASTM D975 specifies the property values shown in Table 2 for these grades of diesel fuel. The surprising aspect about ASTM D 975 is how few requirements are actually included. The standard says nothing about the composition of the fuel or its source. It only defines some of the property values needed to provide acceptable engine operation and safe storage and transportation.

Requirements for Diesel Fuel Oils (ASTM D 975-97)

	Grade	Grade	Grade	Grade	Grade
Property	LS #1	LS #2	No. 1-D	No. 2-D	No. 4-D
Flash point °C, min	38	52	38	52	55
Water and sediment, % vol, max.	0.05	0.05	0.05	0.05	0.50
Distillation temp., °C, 90%					
Min.	--	282	--	282	--
Max.	288	338	288	338	--
Kinematic Viscosity, mm ² /s at 40°C					
Min.	1.3	1.9	1.3	1.9	5.5

Max.	2.4	4.1	2.4	4.1	24.0
Ramsbottom carbon residue,					
on 10%, %mass, max.	0.15	0.35	0.15	0.35	--
Ash, % mass, max.	0.01	0.01	0.01	0.01 0.10	
Sulfur, % mass, max	0.05	0.05	0.50	0.50 2.00	
Copper strip corrosion,					
Max 3 hours at 50°C	No. 3	No. 3	No. 3	No. 3	--
Cetane Number, min.	40	40	40	40	30
One of the following					
Properties must be met:					
(1) cetane index	40	40	--	--	--
(2) Aromaticity,					
% vol, max	35	35	--	--	--